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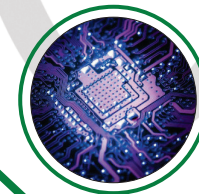


International Conference on Science,
Technology and Humanities 2018

" Global partnership for advancing innovation
on sciences, technology and humanity solutions
resilient to climate change "

PATRA JASA BALI
RESORT & VILLAS

22-23 October 2018



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International Conference on Science,
Technology and Humanities

RESEARCH AND COMMUNITY SERVICE FOR PROSPERITY
(LPPM)
UNIVERSITAS UDAYANA

*"Global partnership for advancing innovation on sciences, technology
and humanity solutions resilient to climate change"*

Kuta, 22 - 23 October 2018

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PRELIMINARY

National Science and Technology Seminar (SENASTEK) is an annually agenda of Research and Community Service Institute of Udayana University and for 2018 is the fifth SENASTEK agenda. This seminar is aimed to disseminate the results of the researcher and community servicer and it was a means of communication for the researcher and community servicer from wide university, education institutes, research institutes, and industry to accelerate the enhancement of science and technology.

Generally in the senastek , it would be disseminated the research and community service results. The community service in senastek is an academic activity that aimed to implemented and civilized science and technology for improving society prosperity and educate the nations life, in which those results could be perceived by the society and as well as it become a benchmark as to what extent those research results could be implemented to welfare the society.

The 5th SENASTEK is slightly different with the previous seminar, this fifth seminar is wider into an international conference, named International Conference on Science, Technology and Humanities (ICoSTH). This conference by then become the means of communications between the researcher and the community of university, research institute, education institute, to accelerate the development of science and technology in Indonesia and internationally as well. The topic in this conference is included Humanity, Food Security, Health and Medicines, New and Renewable Energy, Transportation and Manufacture, Information and Communication Technology, Defense and Security, Orderliness and Disaster, Biodiversity and Natural Resources

ICoSTH is being held in accordance with the 56th anniversary of Udayana University which invite international keynote and invited speaker from Indonesian Ministry of Research, Technology and Higher Education, as well as other well-known scientific international researcher. This international seminar is conducted to encourage the exchange of information, knowledge and experience in the applications of science, technology and humanity to solve the problem in community. In additions, other seminar objectives is to improve the quality and quantity of research publication and at the same time, networking or collaboration can be performed or widened among the participants and researchers.

In the future, there would be a sustain improvement for the SENASTEK and ICoSTH that could be provided a wider communications and knowledge exchange that could improve the community life and prosperity. Herewith we would like to deliver many thank for all the participant that has already attended this conference. Hope many experiences in this conference would be useful in improving our collaboration, communication and knowledge exchange.

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Performance Analysis of Hydraulic Ram at Various Diameter of Its Snifter Valve

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Abstract. A hydraulic ram pump is equipped with a snifter valve in order to reduce the pressure shock in air chamber. Moreover, the snifter valve serves to suck outside air into the pump body to replace the reduction in air in the air chamber which flows along with the delivery water. However, a reference for determining the orifice diameter of the snifter valve is unavailable yet. The practitioners make a hole with diameter of about 2 mm below the delivery valve on the body of the hydraulic ram. Instead, this orifice will make water leakage from the pump body and reduce the pressure at compression phase of the hydraulic ram cycles. Consequently, it decreases the power of the hydraulic ram pump. Therefore, an investigation has been conducted to analyze the performance of a hydraulic ram at variation of the snifter valve orifice diameters that are 0.5, 1.0, 1.5, 2.0 and 2.5 mm. The results presented that orifice diameter of 1.0 mm give the best performance of the hydraulic ram.

Keywords: max 5 words; snifter valve; hydraulic ram; orifice diameter; performance

1. Introduction

A hydraulic ram is an appropriate technology to pump water to a higher elevation without using electric or fuel, it is using renewable energy [1, 2]. The first hydraulic ram pump was termed the "pulsation engine" that worked manually at 1775 by John Whitehurst. Then, in 1797, an automatic mechanism of hydraulic ram was patented by Joseph Michel Montgolfier. In its development, the pump was used to pump water for irrigation system. At 18th century, this device was using widely because it has simple construction. It consist of pump body, waste valve, delivery valve, snifter valve, and air chamber [3]. In its cycle, when the waste valve closed suddenly produces a high pressure or water hammer in the pump body [4]. This generates impulse force [5]. Then, the delivery valve opened to flow a fraction of the water. Within the cycle amount of air in the air chamber gets carried away to delivery pipe. This makes the air in the chamber progressively diminish. Therefore, it requires an external air replacement into the pump body through a snifter-valve. In its implementation, this snifter-valve valve is generally only a hole with 1 ÷ 2 mm diameter at a distance of about 2 cm below the height of delivery valve of the pump body (Figure 1). This will result in the decrease of water hammer pressure due to a leakage of flow through the hole, and then it will also be able to reduce the performance of the hydraulic ram system.

In line with the construction design, Yang proposed a novel design of hydraulic ram pumps with the note that it is advisable not to use a conical enlargement on the valve portion of the waste but cambered diffuser with an angle between 25° and 90°, to avoid the asymmetric pressure distribution on the disk valve waste [6]. Waste and delivery valve are only moving part in the hydraulic ram mechanism. They should be designed precisely in order to get a good performance. Hence, the forces that take place on the both valves were analysed algebraically [7]. Various ways have been proposed in designing and implementing a hydraulic ram [8]. Furthermore, the waste valve is an important element, hence, it need to optimize its design for improving the total efficiency and further development of the hydraulic ram system [9].



Figure 1. Orifice of the snifter-valve

Mathematical equations of the performance stream of a water ram with regard to the height of water delivery has been developed [10]. The main aim of this work is to define the mathematical relationship that allows determination of the impact of the height of water on the performance of water ram. The obtained mathematical dependence (regression equation) shows that by increasing the height of water delivery it will reduce the performance. Then, a study carried out into how to determine the effect of improved design to significant effect on flow analysis and simulation study [11]. They confirmed that the by adding control mechanism to the newly design component delivery and waste valve have enhance about 20% more efficiency than current design. Moreover, investigation on modification of the waste and delivery valve design show detail velocity vector and pressure contour for some cases in relation to the hydraulic ram performance [12].

In addition, a design, manufacture and test a hydraulic ram have been built to observe that if the water in the tank decreased the time taken between strokes increased and the pump ceased to work. Shortening the stroke increased the frequency of strokes [13]. Thus, a certain amount of water has to be maintained in order to pump water via the ram pump satisfactorily. Furthermore, a method with numerical simulation and model experiment developed for determining the optimal design and performance of hydraulic ram [14]. Their result show that efficiency of the new pump will achieve about 50% to 70% if the delivery head is not exceed 50 m.

Therefore, it is necessary to conduct a research to investigate the hydraulic ram performance without and/or equipped with snifter-valve. This research is very important because of the lack of research and development of the hydraulic ram pump design, especially the reference in determining the dimensions of its valves. With a more appropriate snifter-valve design, it is expected to produce more optimal hydraulic ram pump performance. Furthermore, with the availability of the design is expected to develop the manufacture and utilization of hydraulic ram pumps in the community.

2. Materials And Methods

Considering that in its implementation in community, the snifter-valve of hydraulic ram is only a small hole with diameter of about $1 \div 2$ mm, hence, the research was conducted to compare the performance of the hydraulic ram pump system which is unequipped with a snifter-valve, equipped with snifter-valve which is only a 1 mm diameter hole and a snifter-valve design/model of non-return valve with 1 mm orifice diameter (Figure 2). The investigation conducted experimentally on the hydraulic ram pump model that available in the laboratory of Energy Conversion of Mechanical Engineering Department of Udayana University.

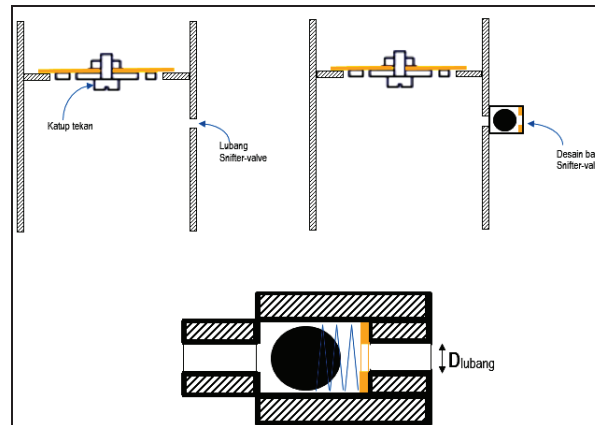


Figure 2. Snifter-valve

The experiment was carried out on hydraulic ram system that available in the laboratory of Mechanical Engineering study program of Udayana University. The supply water level has a drive head (Z_s) of 1.82 m, and the delivery head (Z_d) of 2.02 m. The addition of variation of delivery head is adjusted by controlling the valve opening on the delivery pipe. The pump system equipped with the drive pipe that has diameter (D_s) 36 mm with length (L_s) of 12.2 m, and the delivery pipe has diameter (D_d) of 12 mm with length 1.36 m. In addition, the diameter of the waste valve disk is 47 mm, and the stroke length is 6.0 mm. The waste valve has a mass (moving parts) of 490 grams. Volume of air chamber is 0.0083 m^3 . The hydraulic ram model operated with snifter-valve model variation of no hole, 1 mm diameter hole, and a non-return valve with 1 mm orifice diameter.

Investigating of the snifter-valve in the pump hydraulic ram system in the laboratory is carried out through the testing stages. Firstly, preparation of pumps and valve models, with water supply height (Z_s) of 1.82 meters, the diameter of the drive pipe (D_s) of $1\frac{1}{4}$ inch and the length L_s of 9 meters. Setup hydraulic ram pump without hole or snifter-valve. Setup of pumping height (Z_d) of 2.02 meters. Flowing the water into the drive tank to full and be kept in an always-over-flow condition so that the height of the driving head is constant. Open the water supply control valve, to drain the water from the supply tank to the pump body. Start the pump work by opening and closing the waste valve so that the pump can work and let the pump run for a while. Setup head of pumping pressure (P_d) of 0.5 bars. While the pump is working and it has been stable record data recording such as height of the water flow on V-notch weir (h_{vw}) coming out from the waste valve, time for collecting of 1 liter of water volume coming out of the delivery pipes (T_d), pressure on the delivery pipe manometer (P_d), and the frequency of the pump work cycle (F). Repeat the steps for pumping pressure heads (P_d) of 1.0, 1.5, 2.0, 2.5, and 3.0 bars. Moreover, repeat the steps for a snifter-valve design/model of 1 mm diameter orifice.

3. Results

Based on the data of the experiments results, then the performance of hydraulic ram on the variation of orifice diameter of the snifter-valve hydraulic rams tested at various ratios of pumping head to the static head of the hydraulic ram water supply are presented as in Figure 3 up to 6.

The larger diameter of the snifter valve orifice, the smaller flow rate of the pump generated (Figure 3). This is because of the pressure increase in the pump body reduced, hence, the pump cycle frequency also slows down and then the driving water flow rate decreases. In addition, a higher pumping head results in a smaller driving water supply due to the pump cycle slowdown.

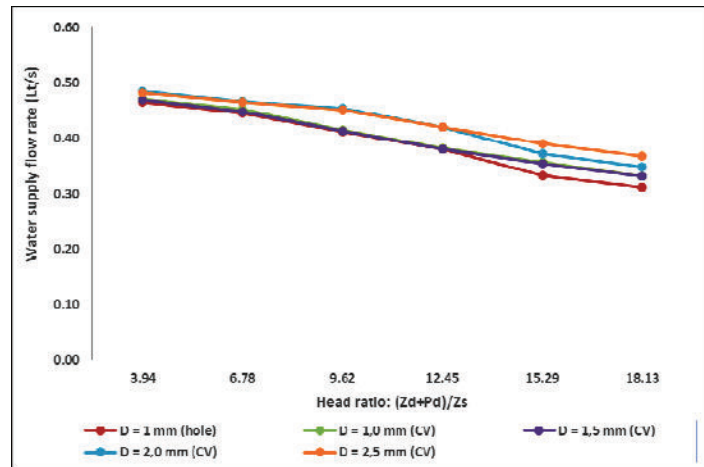


Figure 3. Drive flow of the hydraulic ram

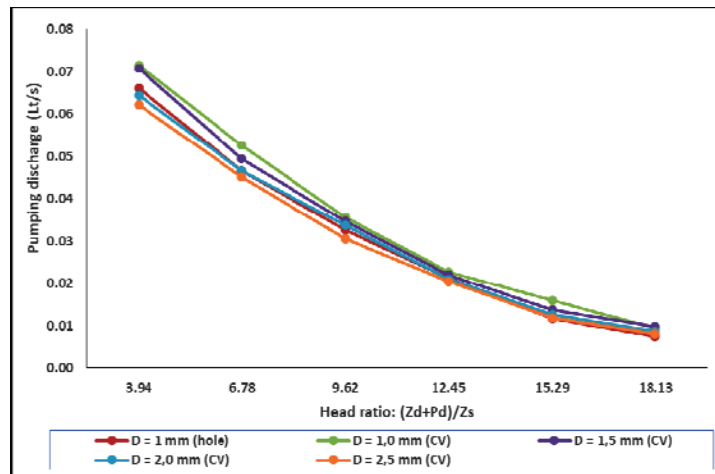


Figure 4. Pumping discharge of the hydraulic ram

In accordance with the power equation of a fluid machinery which is the product of the multiplication of the discharge and head, hence, the higher pumping head causes the lower discharge (Figure 4). Interestingly, the snifter valve with orifice diameter of 1 mm generates the best pumping discharge of the hydraulic ram. On the contrary, orifice's diameter bigger than 1 mm produces a smaller pumping flow rate.

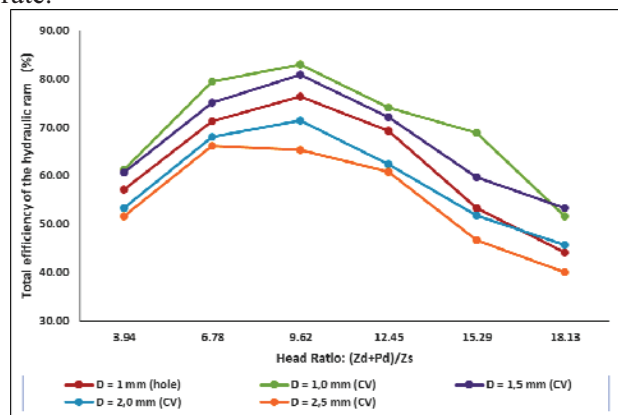


Figure 5. The total efficiency of the hydraulic ram

Furthermore, the hydraulic ram generates the best of the total efficiency at head ratio between delivery and supply head is about 10 (Figure 5). In addition, the orifice diameter of the Snifter-valve of 1 mm produces the highest total efficiency. It is coincidence with the pumping flow rate that delivered to a reservoir.

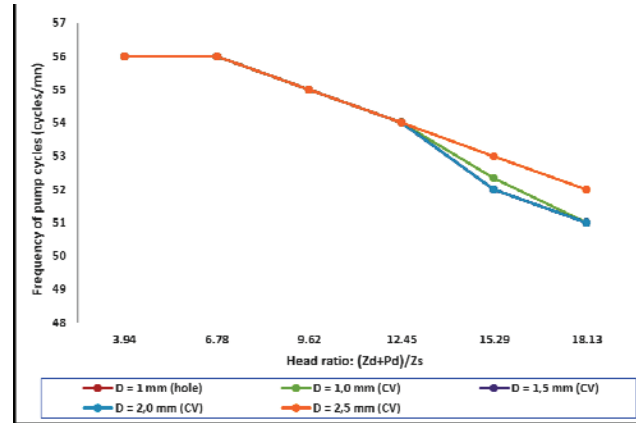


Figure 6. Frequency of the hydraulic ram cycles

Frequency of the hydraulic ram cycle is nearly unaffected by the diameter of the snifter valve orifice. However, it is influenced by the pumping head ratio. The higher of the delivery head slows down the hydraulic ram cycle.

4. Discussions

In general, the higher of the pumping head causes hydraulic pumping flow rate is getting smaller, and the larger the snifter-valve diameter generates smaller of the pumping discharge. The large diameter of the snifter valve orifice makes a lot of water leakage out from the pump body and loss a pressure force that needed to drive the hydraulic ram. It decreases the useful power and its performance. On the other hand, it should be noted that a hydraulic ram should be equipped with a snifter valve, because in the pump operation within a certain period of time the amount of air in the air vessel will be diminishing thus disrupting the pump operation even stop operating.

Snifter-valve with a 1 mm of orifice diameter provides the highest pumping flow rate and the total efficiency of the hydraulic ram. At this snifter valve design the loss power is in minimum and the useful power is in maximum. This is because of it can optimize the utilization of water hammer pressure that occurs during the compression phase and the external air suction process during the recoil phase. However, further study is needed over a longer period of time, for instance one week or more to determine the reduction or addition of air volume in the air chamber of the hydraulic rams.

5. Conclusions

The snifter-valve with 1 mm of the orifice diameter produces the best performance of the hydraulic ram both in pumping discharge and total efficiency. However, further work is necessary to study the performance of hydraulic ram pump which is equipped with non-return snifter-valve model on variation of orifice diameter in order to get the design reference of the snifter-valve sizing on various dimensions of hydraulic ram pump.

Acknowledgement

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Use of fuel Using Arak Bali Alternatives on Performance and Emission in Various Types of Moving Machines

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Abstract. Lots of research results on alternative energy from ethanol fuel. The development of ethanol fuel is currently many progressing. Especially in Bali, there are excellent products, namely Balinese wine which has 50% of ethanol content. With the purification process at the right temperature. Bali's aromatic ethanol content can reach above 90%. So I am interested in continuing the research on how the characteristics of Balinese wine combustion on engine combustion models and change in engine combustion chamber characteristics. The method used in an effort to achieve the objectives of this study is: experimental method that is carrying out Balinese wine testing in the combustion chamber model of the drive engine to analyze its effect on the combustion characteristics and characteristics of engine combustion chamber. Analysis of the effect of fuel use engine speed varies with engine performance such as torque, power and specific fuel consumption can be deduced: The lower the engine speed in certain condition the greater the torque produced, while the higher the engine speed until the 3006 rpm power rotation condition is generated, the greater the engine speed while the specific consumption of fuel needed is also increasing. The use of the best Balinese wine fuel at compression ratio of 9,8 : 1 using concentration of 90% Balinese wine product torque, power greater and the brake specific fuel consumption decreases compare to gasoline fuel.

Keywords: Balinese wine, Alternative fuel, engines, performance, characteristics.

1. Introduction

1.1. Background

Indonesia is included in the world oil-producing organization, which in 1989 ranked the top 10 as a producer of petroleum. Along with the development of technology, oil needs continue to increase. There is a need for savings in the use of fuel oil. The use of fossil fuels is increasingly limited and can also damage the environment because it causes air pollution.

The continuous use of fuel oil will result in a scarcity of fuel. The government's recommendation to use alternative fuels that are environmentally friendly. The government issued a policy on national energy management, specifically the use of ethanol, biodiesel and gasohol as alternative energy. The use of alternative energy aims to protect the environment from pollution, primarily as an effort to utilize natural resources derived from animals and plants. One alternative energy, especially in Bali, is Bali wine. Balinese arak has a greater quality 90% will have an octane number of around 108.6. Whereas premium has an octane number of 88. Balinese arak is non-toxic and environmentally friendly. Balinese wine can be combined with premium fuel with a certain percentage, can increase the octane number of premium fuel. The increase in octane value can improve the quality of combustion, the remaining gas produced from combustion is better, and engine performance is increasing.

1.2. Research

Balinese wine is a substance obtained from plants that contain carbohydrates, with the help of the bacterium *Saccharomyces cereviceae* for permentation and with a destilator to distill into wine. Materials that contain carbohydrates are coconut juice, palm sugar, palm oil and all agricultural products. The fruit yield of the farmers is very abundant, in Abang Subdistrict, Kubu Subdistrict, Karangasem Regency, the community has the activity of making sap. The juice produced then processed traditionally into wine has a quality of <40%. The policy of the regional government of Bali prohibits the circulation of wine and abuse as liquor, will lead to the threat of livelihoods of the farmers of the sap producers. Research Urgency

The development of research on Balinese wine fuel has progressed a lot. The results of research on Balinese wine as a fuel have also been many. In Bali there are beverage products known as Balinese wine with ethanol levels can reach above 50%. The results of research that has been carried out with a purification process at a heating temperature of 60 to 70 degrees Celsius Balinese wine can reach ethanol levels above 90%. Where ethanol has an octane value of 111, it is very suitable to be used as fuel on a machine that has a large compression ratio.

The Indonesian government issued a policy in national energy management, specifically regarding the use of ethanol, biodiesel and gasohol as alternative energy in 2022. Alternative fuel utilization also aims to protect the environment from pollution, as well as an effort to better utilize natural resources, especially those from animals and plants.

2. Literature Review

2.1. State Of The Art Bidang Penelitian

Research that has been carried out in the past five years and has been published in national or international journals, among others: Sukadana, Tenaya 2011, conduct technical studies continuous distilator column-type to the capacity and quality production. The results from this study that: capacity and quality of the wine production is influenced by many number of levels distillation. The greater level number influence to the lower of distillate production capacity, the higher quality of production and production efficiency are lower.

Sukadana, Tenaya 2013, doing research "Improving the quality of arak Bali production as an alternative fuel with Continuous distillation method". In this research conducted a variable number of levels distillation of one level, two levels and three levels. With each variable has a setting different tempratures. Showed that the more level of distillation in used can be produced quality wine production higher but lower production capacity.

Tenaya, Sukadana 2014, conducts research to increase production capacity of alternative fuels arak Bali used forced fluid flow method. From research conducted showed that more level of continuous distillation influence to temperature distribution pattern, lower evaporation, lower production rate and the quality of production is increases.

Sukadana 2015 has been carrying out research application the method of forced condensation - type crossflow on alternative fuel of arak Bali to quality and capacity production process. The bigger cooling fluid flow rate to results the greater cooling rate to affect the rate of condensation is greater, the rate of production is increases. But the greater cooling fluid flow rate to affects the quality of production is low. Arak Bali for testing as a fuel in the carburator type engine gived the result is to increased

concentration of arak Bali affects the specific fuel consumption is increasing, decreasing torque and engine power.

Sukadana and Tenaya in 2016, have carried out a study on the Influence of Forced Flow from Cooling Fluids Against Arak Bali Alternative Fuels Production Performance, from the research carried out, the results showed that the greater the Reynolds number the cooling fluid flow resulted in the greater cooling rate, affecting the rate of condensation the greater the rate of production, the greater. Inversely proportional to the quality of production. Balinese wine as a fuel for the carburetor type engine resulted in an increase in Balinese wine concentration affecting the greater the level of engine specific fuel consumption, the engine torque decreased and the engine power also decreased.

Sukadana and Tenaya in 2017, are conducting research on the use of Balinese wine as a fuel for various types of propulsion engines. With the aim of analyzing the impact on engine performance, emissions and combustion characteristics.

The most recent research has been published in international journals namely International Organization Scientific and Research (Journal of Mechanical and Civil Engineering) on the study of flame characteristics, flame patterns, and the speed of flame propagation using Balinese wine in a steam condition as fuel in the helle show cell type combustor. The results obtained were: The gas content of the basic ingredients of Balinese wine consists of 40% methane and 60% ethanol. For Bali AFA gas fuel stoichiometry occurs in 30: 1. The closer the AFR stoichiometry is, the color of the flame changes from reddish to faded red, reddish blue, blue, and finally bright blue. The maximum flame propagation velocity occurs in AFR stoichiometry which is 328.33 cm / sec.

3. Research Methods

3.1. Stages of Research

Research and results of research activities that have been carried out with indicators of achievement of each research activity, namely the use of Balinese wine as a fuel for vehicle engines. Less satisfactory results were obtained, so in this first year study, the characteristics of Balinese wine from various sources of Balinese wine will be tested.

3.2. Testing Combustion Characteristics.



Figure 2. Test Machine

The equipment that will be used in conducting research is as follows: The test machine used is a four-step machine with standard conditions, with the following specifications: 2014 Assembly Year, single cylinder, 800 slope, OHC injection engine 4 step type, volume Step 97.1 Cm³, 50 mm diameter, step 49.5 mm, compression ratio 8.8: 1, venture diameter 16 mm, The tools used in the study: Gas analyzer is a device used to measure the content of exhaust gases resulting from combustion that comes out through the exhaust.



Figure 3. Gas analyzer



Figure 4. Dynamometer

Step Testing, preparation of equipment and equipment used, inspection of test machines. Air filter cleaning. Cleaning the fuel filter (fuel filter). Cleaning and adjustment of spark plug gap (0.7 ± 1 mm). Turn the engine up to its working temperature or reach idle conditions (engine speed between 1000-1500 rpm). Preparation Dynamometer, infrared gas analyzer. Turn on infrared analyzed gas and wait until the automatic calibration is complete. Tests are carried out when the vehicle is stationary and in the standard double (two) so that the rear tire is positioned on the rool bar dynamometer. Enter the exhaust sample pick-up at the exhaust end. Set the engine speed at 2500 rpm then position the transmission on the tooth 1. Read and record the reading on the infrared gas analyzer in the form of exhaust gas levels of CO, CO₂, HC, O₂. And dynamometer in the form of Torque, Power and BSFC data. Repeat the tests on 2, 3 and 4 percentages.

4. Results And Discussion

5.

Table 5.5. Premium calculation data on a 4-step machine.

4 Stroke Engine			
Fuel	N Rpm	Variabel	
		T (Nm)	BHP (hp)
Gasoline	1053	0.7900	0.116714
	1532	0.6500	0.139711
	2021	0.5100	0.144631
	2552	0.4100	0.146815
	3006	0.3500	0.147611

Table 5.6. Premium calculation data on a 2-step engine.

2-Stroke Engine			
Fuel	N Rpm	Variabel	
		T (Nm)	BHP (hp)
Gasoline	1053	0,683333	0,1009556
	153	0,513544	0,1103816
	202	0,382083	0,1083556
	255	0,313606	0,1122976
	300	0,259216	0,1093233

Table 5.7. Data from the calculation of Balinese wine on a 2-step machine.

2-Stroke Engine			
Fuel	N Rpm	Variabel	
		T (Nm)	BHP (hp)
Arak Bali 90 %	1053	1 01261	0 149604
	1532	0 86744	0 186449
	2021	0 74700	0 211843
	2552	0 61953	0 221846
	3006	0 53245	0,224558

Table 5.8. Data calculated from Balinese wine on a 4-step machine.

4-Stroke Engine			
Fuel	N Rpm	Variabel	
		T (Nm)	BHP (hp)
Arak Bali 90 %	103	0.46	0.0674130
	154	0.31	0.0675387
	204	0.24	0.0694792
	251	0.20	0.0722924
	300	0.17	0.0738935

5.1. Discussion of the Effect of Round Variations on Torque.

The 4-stroke engine uses premium fuel from 1053 rpm to 3006 rpm, resulting in torque of 0.79 Nm to 0.35 Nm. Using Balinese wine fuel produces torque of 0.465 Nm to 0.175 Nm. The overall 4 stroke engine torque will decrease when using Balinese wine as a premium substitute fuel.

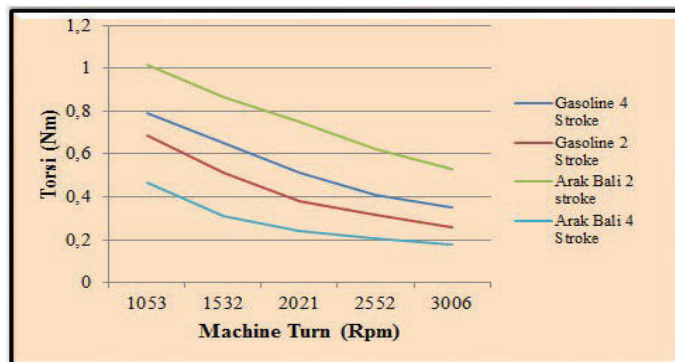


Figure 5. Graph of the effect of engine rotation variation on torque.

The 2-step engine uses Balinese wine at a rotation from 1053 rpm to 3006 rpm resulting in a torque of 1.013 Nm to 0.532 Nm. Using premium fuel produces torque of 0.68 Nm to 0.259 Nm. Using Balinese wine fuel 2-stroke engine torque on average is greater than using premium fuel. From Figure 5. Shows the relationship between engine speed to torque on a two-step engine which has a compression ratio of 9.8 and four steps with a compression ratio of 8.9 engines using premium fuel and Balinese wine fuel. It is known that for all types of engines and types of fuel, the higher the torque engine speed, the smaller. In this graph also seen the biggest torque produced by 90% Balinese wine on a two-step engine compared to gasoline. Because Balinese wine has an octane value greater than premium so it is more appropriate to use on a machine with a greater compression ratio. Knocking that occurs will be smaller in a higher compression ratio engine using a fuel that has a greater octane value. The relationship of engine speed to torque in gasoline and Balak fuel that with the higher torque engine rotation, the smaller. The lower the engine speed, the more torque produced is due to the magnitude of the tangential force resulting from the energy conversion in the combustion process reduced by the frictional force between the ring cylinder and the cylinder wall.

5.2. Effect of Variations in Machine Turns Influence to Power (BHP).

From figure 6. False variations in engine speed to power (BHP) on a two-step and four-step engine using premium fuel and Balinese wine. It shows that the higher the engine rotation there is also an increase in the power produced, and it can be seen in the 90% Bali arak fuel usage on the 2 stroke engine at engine speed from 1053 rpm to 3006 rpm experiencing an increase in power from 0.14960428379931 Hp to 0.224558836610813 Hp . While for premium fuel as a comparison there is also an increase from 0.10095563002681 Hp to 0.109323344681192 Hp, the increase in power produced is not as much as the power produced in Balinese wine. Each variation of the engine rotation also affects the power, where there will be an increase in power (BHP) generated at the greater engine speed. Seen in 90% Balinese wine use with engine speed from 1053 rpm to 3006 rpm, it has increased power by 50%.

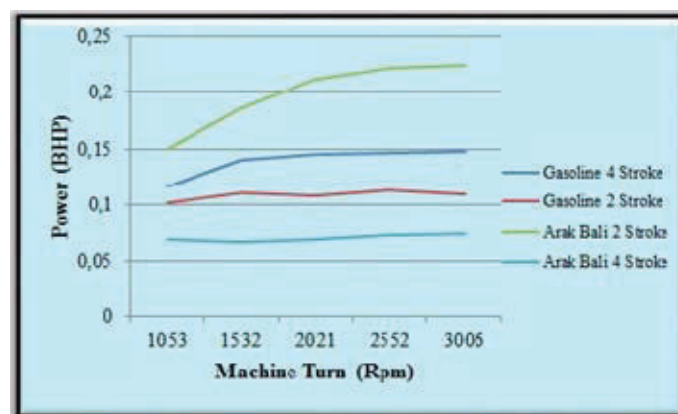


Figure 6. Graph of the effect of engine rotation variation on power (BHP)

Power increase (BHP) resulting from the use of premium fuel on a 4-step engine with rotation varies from 1053 rpm to 3006 rpm. The generated power is 0.116714557640751 Hp to 0.147611217605004 Hp. While the power produced by the 4- step engine uses Balinese wine as a fuel of 0.0687373780160858 Hp to

0.0687373780160858 Hp. The use of premium fuel with the same engine speed, the power produced is smaller than that of Balinese wine. Where is Balinese wine fuel with a higher octane value than premium, but the use of fuel with higher octane value requires a large compression ratio as well. Because there was a detonation in the cylindrical chamber which caused a tingling sound that caused the power produced was smaller than gasoline.

5.3. The Influence of the Engine Turn on the Specific Fuel Consumption Brake (BSFC).

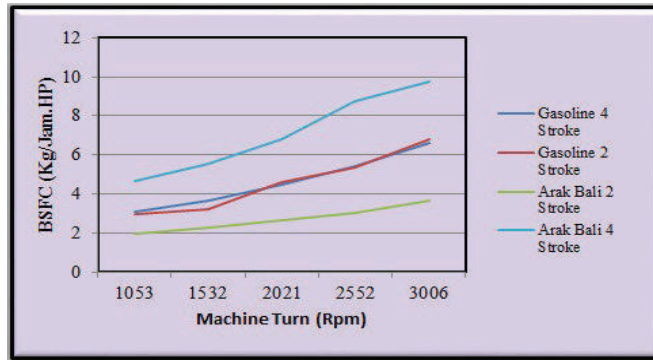


Figure 7. Graph of the effect of engine rotation variations on the Brake Specific Fuel Consumption (BSFC)

From Figure 7 the comparison graph of engine rotation to specific fuel consumption, shows the higher the engine speed the specific fuel consumption rate is higher. At low engine speed, from the engine speed of 1053 to 3006 rpm for premium fuel on a four-stroke engine the specific fuel requirements required increase by 3,09409182206906 kg / hp.hours to 6,59498194544196 kg / hp. . On the graph also seen in Bali arak fuel on 4 stroke engine specific fuel requirements of 4,69264322032091 kg / hp. Hour reached 9,78869867368166 kg / hp. Hours. The increase is almost the same as gasoline from 108.5%.

90% of Bali arak fuel has an increase in specific fuel consumption which is very large, ie at engine speed from 1033 rpm to 3006 rpm requires each of 1.994669438476589 kg / hp.hours to 3.68056055757601 kg / hp. Hours. While premium fuel requires specific fuel consumption of 2.93677368459502 kg / hp. Hours up to 6.77099681422933 kg / hp. Hours.

Variation of engine speed in each fuel to the Brake Specific Fuel Consumption (BSFC) where from this phenomenon there is also an increase in the specific fuel requirements for the braking process at increased engine speed. This is because the specific brake fuel consumption (BSFC) is affected by the amount of power produced by each fuel. So that the lower the power generated at the engine speed where the maximum condition of this test is 3006 rpm, the more the specific material consumption rate increases. Seen on the graph the higher the engine speed, the lower fuel consumption, which means that the combustion is getting better.

6. Conclusion

Analysis of the effect of fuel usage on engine speed varies with engine performance such as torque, power and specific fuel requirements can be deduced, namely: The lower the engine speed in certain conditions the torque produced is greater, while the higher the

engine speed to 3006 rpm power (BHP) produced is also getting bigger, while the specific consumption of fuel needed is also increasing. The use of the best Balinese wine fuel at a compression ratio of 9.8: 1 using concentration of 90% Balinese wine produces torque, power (BHP) greater and the Brake Specific Fuel Consumption (BSFC) decreases compared to gasoline fuel.

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Investigation on Reducer Ratio of Delivery Valve Body of a Hydraulic Ram Performance

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Abstract. The hydraulic ram consists of two moving parts, waste valve and delivery valve. In its working cycle, the waste valve generates an impulse force that generates high pressure due to the sudden closure of the valve at acceleration phase. Next, at the compression phase of the cycle, the delivery valve is opened to transfer a small fraction of the source water into air chamber, then delivered up to higher elevation. The waste valve characteristic has been extensively studied. On the other hand, the investigation of the delivery valve design is lack conducted. Furthermore, the delivery valve design affects the valve opening time period and the water flow rate. The conventional design of the delivery valve bodies has been in the form of a flat plate with holes. For this reason, this study investigated a new design of the valve on variations the reducer of the delivery valve body. The valves are tested in the hydraulic ram test model in the conversion energy laboratory. In this work, the hydraulic ram body has a diameter of 2.5 inch, therefore, variation of the reducer of the delivery valve body tested are 2.5 "x2.0"; 2.5 "x1.5"; 2.5 "x1.25" and 2.5 "x1.0" in accordance with the pipe accessories available on the market. The experiment results established that the 0.6 ratio of the reducer of the delivery valve body generates the best performance of the hydraulic ram system.

1. Introduction

A hydraulic ram is a renewable device to pump a fraction water that drives the system. Its mechanism operates two non-return valves. Therefore, it is theoretically adaptable for manufacture in developing countries and maintenance at village level [1]. In addition, the hydraulic pump system is very simple (Figure 1), consisting of drive and delivery pipe, pumping body, waste and delivery valve, and air vessel [2]. Therefore, ideally, the different combinations of head and discharge of the source water flow, the valve stroke and the weight of the valve, the ratio of length to the diameter of the driving pipe, and the volume of the air vessel are parameters of the hydraulic ram pump design [3]. However, waste and delivery valves are the moving parts that generate the pump cycle. Therefore, they are a key components of the hydraulic ram, which requires further focus and optimization to improve the overall efficiency of the pump [4, 5].

The waste valve is closed by the drag force induced by a high through water flow. The geometry of the valve is such that these drag forces increase rapidly as the valve moves towards its closed position, then inducing a rapid "sudden" closure. In addition, the sudden closure of the waste valve induces a pressure increase in the drive pipe that is proportional to the velocity of the fluid in the pipe immediately before the valve closure. This pressure is maintained while pressure waves propagate along the drive pipe. During this period in which the drive pipe sustains a high pressure, a small discharge occurs through the delivery valve into a vessel containing air at a pressure approximating to the delivery pressure of the pump. This discharge continues until such time as the pressure in the drive pipe diminishes, at which stage, the delivery valve closes, and the discharge terminated.

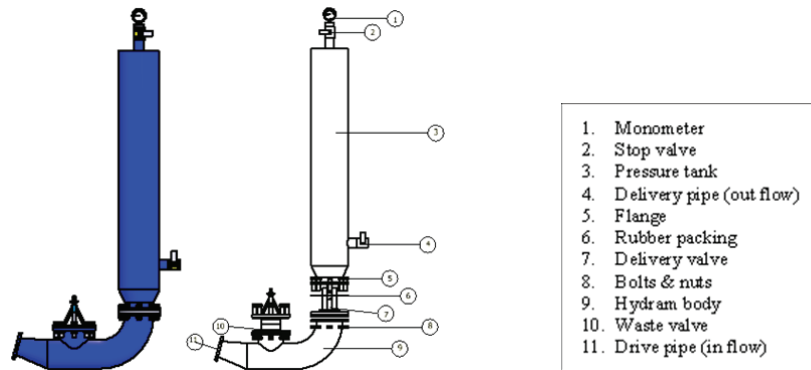


Figure 1. Components of a hydraulic ram.

In the latest of this decade, CFD (Computational Fluid Dynamics) simulation methods tends to be used [6]. They created hydraulic ram pump design then simulated the phenomenon of water flow through a waste valve with commercial CFD software that is Solid Work software. However, this paper only show the pressure distribution and velocity on the waste valve, and did not identify any waste valve design influence on the hydraulic ram pump performance. The simulation results show that the mass flow rate of water through the new design of the waste valve is smaller than the old model, and provide a better performance [7]. A Computer modelling and analysis can be conducted by considering several parameters design in determining the optimum solution [8]. Moreover, mathematical equations of the performance stream of a water ram with regard to the height of water delivery have been developed [9]. The main aim of this work is to define the mathematical relationship that allows determination of the impact of the height of water on the performance of water ram. The obtained mathematical dependence (regression equation) shows that by increasing the height of water delivery it will reduce the performance. Then, further study in determining the effect of improved design to significant effect on flow analysis and simulation study was conducted [10]. This study confirmed that the by adding control mechanism to the newly design component delivery and waste valve have enhance about 20% more efficiency than current design. In addition, modification design of the waste and delivery valve to the pump performance and the projection of velocity vector for every details case and pressure contour have been investigated [11].

However, report regarding experimental flow characterization in hydraulic ram has been inadequate. In purpose of flow pattern recognition it needs visualization method, such as Particle Tracking Velocimetry (PTV), Particle Image Velocimetry (PIV), Laser Doppler Anemometry (LDA) and smoke or dye injection [12]. In addition, a closed-loop OHP is experimental inspection method to visualize an internal fluid flow pattern in pipe. The latest method, the working fluid uses a Pyrex glass with kerosene. Then, a high-speed video camera recorded the flow phenomena in the system [13].

Different strategies can be utilized within the primary considerations of arranging and application [14]. Performance of the hydraulic ram was mainly influenced by the waste and the delivery valve [15]. An algebraic analysis can be used to study the forces that strike on both valves for evaluating of the valve weight design [16]. The waste valve characterized by its orifice and disc diameter, mass and stroke. Altogether impact the performance of the hydraulic ram system. In addition, simple formula and procedure were proposed for estimating the optimal mass of the waste valve that providing the best performance [17]. In addition, a design of hydraulic ram was tested and observed that if the water in the tank decreased the time taken between strokes increased and the pump ceased to work. Shortening the stroke increased the frequency of strokes [18]. Thus, a certain amount of water has to be maintained in order to pump water via the ram pump satisfactorily. Further experiment work and numerical simulation have been developed on hydraulic ram model. The optimal efficiency and the largest delivery flow is achieved at delivery head not exceed 50 m [19].

Considering that hydraulic ram cycle as a results of waste and delivery valves mechanism, therefore the delivery valve design becoming significant beside of the waste valves. Hence, in this study, a new design of the delivery valve in hydraulic ram pump system needs to investigate as comparison to the old design that using flat plat the delivery valve housing.

2. Research Methods

Figure 2 is a research installation scheme of a hydraulic ram system, while Figure 3 is a hydraulic ram test model. In this study, a new design of the delivery valve (Figure 4) in hydraulic ram pump system needs to investigate as comparison to the old design that using flat plat the delivery valve housing (Figure 3). The model of the delivery valve that is examined is without and with a reducer. Because the hydraulic ram body has a dimension of 2.5 inches, the variation of the reducer of the delivery valve body tested is 2.5 "x2.0"; 2.5 "x1.5"; 2.5 "x1.25" and 2.5 "x1.0" in accordance with the pipe accessories available on the market. The investigation will be conducted experimentally on the hydraulic ram pump model that has been installed in the laboratory of the Energy Conversion of Mechanical Engineering Department of Udayana University.

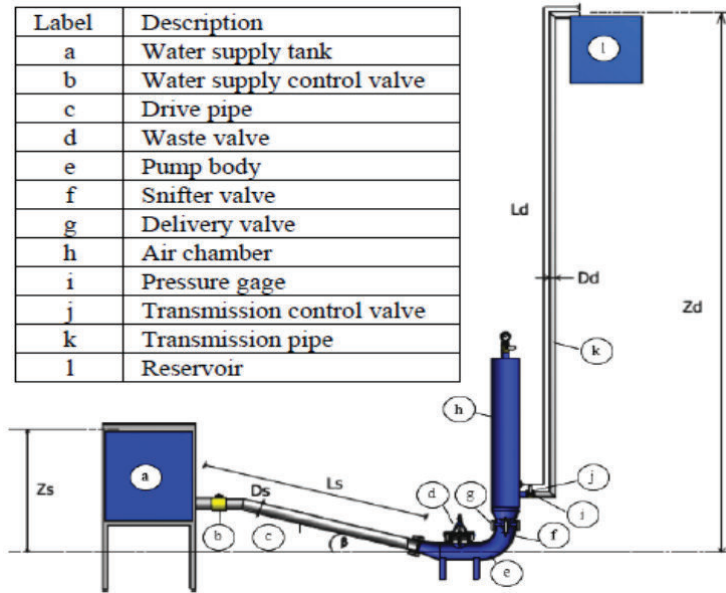


Figure 2. Installation of the experimental setup.

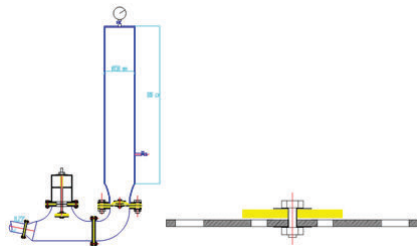


Figure 3. The test model of hydraulic ram pump.

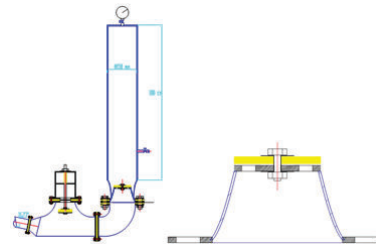


Figure 4. Delivery valve test models.

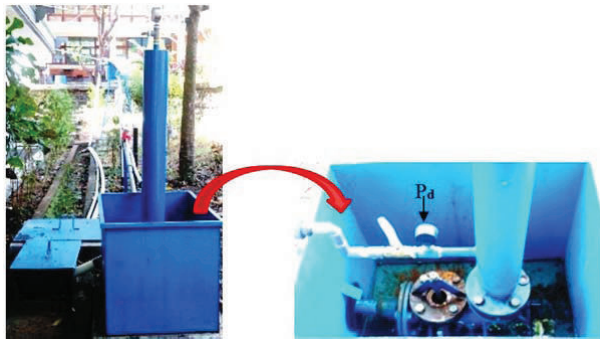


Figure 5. The test model of hydraulic ram.



Figure 6. Waste valve test models.

In this study, experimental tests were carried out on a hydram pump installation system such as Figure 5, moreover, several designs of the delivery valve model test as in Figure 6. This research was carried out on a hydraulic ram model with specifications: the water level is movable or drive head (Z_s) of 1.82 m; Static high pumping (Z_d) of 32 m; while the addition of the pumping pressure head is regulated by changing the position of the control valve openings in the pipeline; drive pipe diameter (D_s) of 36 mm with length (L_s) of 9 m; channel pipe diameter (D_d) of 18 mm with a length of 10 m; the length of the waste valve step (S) of 4 mm; cross-sectional area of the waste valve disk 1134 mm²; mass of the waste valve (moving parts) was 0.275 kg; and air vessel volume of 0.0083 m³.

3. Results and Discussions

Based on the results of testing the variation of the delivery valves model on the hydram pump test system, the results are as shown in Table 1, where D_1 is the base diameter (2.5 inch) of the delivery valve, and D_2 is the diameter of the delivery valve seat for its disk that is varied. The results are then presented in Figures 7 to 10.

Table 1. The Hydraulic ram performance at several design of the delivery valve.

Reducer Ratio of Waste Valve's Body (D_2/D_1)	Supply Capacity Q_s (lt/mnt)	Pumping Discharge Q_d (lt/mnt)	Pump Cycle F (cycles/min)	Efficiency η_o (%)
1	29.77	1.31	69	41.86
0.8	27.14	1.61	69	56.52
0.6	27.28	1.76	65	61.25
0.5	21.23	1.00	58	44.77
0.4	21.02	0.79	56	35.80

The smaller the ratio (D_2 / D_1) of the reducer of the delivery valve body, the smaller the water flow rate of the pump drive supply (Figure 7). This is because the smaller the cross-sectional area causes reduced water flow through the delivery valve orifice. However, the largest water pumping flow rate is produced at a diameter ratio of 0.6 (Figure 8). However, it should be noted that the ration is smaller than 0.6 the resulting pumping discharge decreases dramatically. Furthermore, the new design of the delivery valve body is conical with reducer ratio of 0.6 to 0.8 giving a large pumping result compared to the old design in the form of a flat plate (ratio of 1).

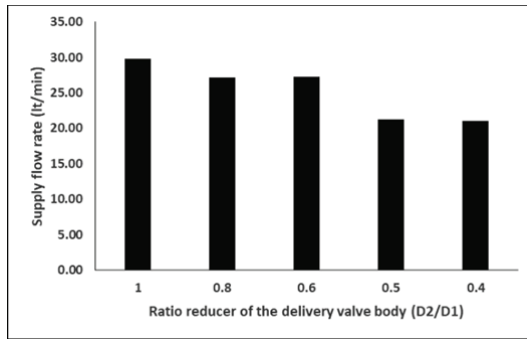


Figure 7. Water supply capacity.

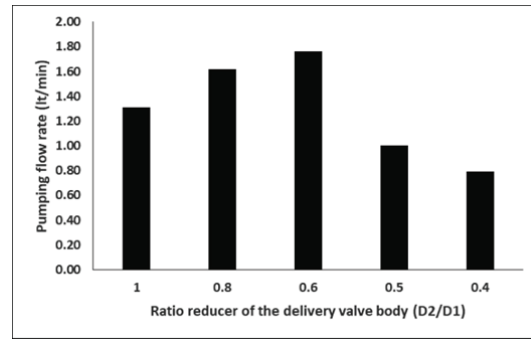


Figure 8. Pumping discharge.

Furthermore, the shrinking of the driving flow rate of the pump in the reducer ratio of the smaller delivery valve's body causes the pump cycles to also decrease (Figure 9). In line with the generated flow rate, the highest total efficiency of the hydraulic pump is also produced at 0.6 ratio (Figure 10). It caused by the flow of water in the delivery valve is more directed to the valve orifice at a ratio no smaller than 0.6.

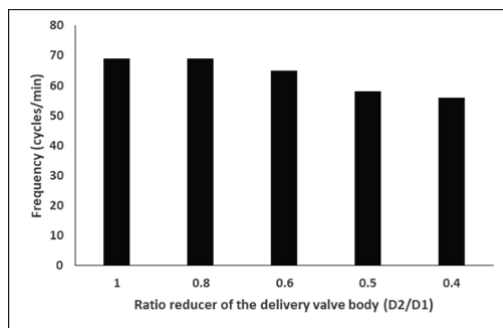


Figure 9. Hydraulic ram frequency.

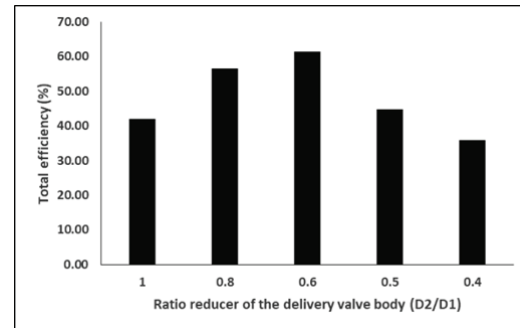


Figure 10. Total efficiency.

New design of the delivery valve in conical shaped of its body has proven that produces better performance of the hydraulic ram compare to the old model using flat plat. Considering of fluid flow indicators such as pressure and flow velocity and performance results, the experiment results show that the delivery valve housing with reducer ratio of 0.6 is the best design to produce the optimal hydraulic ram pump performance. The stagnation point of the flow through the delivery valve orifice is greatest focused in the design. Therefore, it is recommended that in its implementation to use the new design of the delivery valve with the design of the delivery valve body with ratio 0.6 replacing the conventional designs in the form of flat plates.

4. Conclusion

In view of performance results such as pumping discharge and total efficiency, the experiment results have confirmed that the delivery valve body with reducer ratio 0.6 is the best design to produce the optimal hydraulic ram performance.

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Study on thermophilic anaerobic digestion of organic fraction of tropical solid waste

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Abstract. The existing biogas plants in Indonesia such as Chinese and India's design are actually only fed with animal manure. To increase the biogas yield a new technology using various municipal organic wastes were evaluated as co-substrates for additional feeding to the biogas fermenters. The study aims to apply thermophilic condition to enhance the performance of organic fraction of tropical solid waste as substrates. The raw material waste as a substrate in this work was coconut hull which needed prior treatment to find the total solid and volatile solid. There are four variations of temperature regulation such as of 40°C (I), 45°C (II), 50°C (III) and normal temperature (IV). This investigation was performed for 40 days and it was measuring pressure in digesters, temperature and pH, which was conditioned once a week with NaOH or H₂SO₄. The best result was found at digester II with a specific volume accumulation as much as 7,5% L/kgTS with the percentage content of CH₄ of 56,348%.

Keywords: *biogas, thermophilic, co-substrat, coconut hull*

1. Introduction

More than 80% of the world's energy needs are today covered by fossil fuels. This demand is steadily rising due to the growing world population, as well as the rapid development of the economy in the emerging economies of China and India. By 2030, world energy demand will be about 45% higher than today. Fossil fuels are limited, however. In the near future, it will no longer be possible to meet the world's energy needs with fossil fuels and the development of new sources will be more expensive and more complex. Thus, it is foreseeable that e.g. Oil production, which accounts for the largest share of demand (34.4%), declines by 3 to 6% annually. The demand and thus the price of the oil will thereby become ever higher (Anonymous_1, 2018]

Another problem of fossil fuels is the greenhouse gas carbon dioxide, which is released when burning them. Through heating systems, airplanes and cars, it enters the atmosphere and prevents together with other gases the escape of solar radiation reflected by the earth. This protective layer of gases provides a moderate amount for the pleasant temperature on Earth. If this protective layer is too concentrated by the carbon dioxide, the average temperature on earth increases. The carbon monoxide also gets into the sea and lowers the pH value. This makes the sea acid and endangers the survival of certain animals. These events have disastrous consequences for humans, animals and nature on Earth. The polar ice caps are melting, deserts are spreading and the sea level is rising. Extinct marine animals disrupt food chains and endanger the ecosystem.

The expansion of renewable energy is not just taking place in industrialized countries. On the contrary, emerging economies such as Brazil, China, South Africa and India increased their renewable energies by an average of 19% between 2008 and 2013 (NilsVikto, 2014). In order to emphasize the

importance of renewable energy especially in emerging economies the need of renewable energy will be highlighted for the example Indonesia. The use of regenerative energy is rapidly gaining importance in Indonesia. The economy is growing continuously and an expansion of the power supply is urgently needed. The demand for electricity increases by 9.5 percent per year, which corresponds to a capacity of around 7 MW (Roland Rohde, 2017). The government's ambitions of reducing CO_2 emissions by one quarter by 2020 while reducing reliance on imported fossil fuels illustrate the importance of renewable energy. Overall, by 2020, 17 percent of energy production shall be covered by renewable energies. Due to the limited reach of the electricity network, which currently only reaches 56 percent of the population and the geographical conditions of Indonesia as an archipelago with more than 17,000 islands, decentralized solutions are urgently needed (Wikanya P., 2016).

According to PT PLN, several private companies want to build power plants based on palm oil residues, rice husks and bagasse. Experts estimate that twelve major cities in Indonesia have the potential to produce 566 MW of electricity using municipal waste. One option is the production of biofuels such as biogas or ethanol from various raw materials, such as palm oil, sugar and cassava. In particular, the rise in oil prices and the subsequent cuts in fuel subsidies have made the topic so urgent in Indonesia (Nett et. al., 2014).

This study aims to utilize young coconut waste by varying the temperature digester to determine the rate of biogas formation and the rate of heating. Increasing in temperature affects the ability of bacteria to produce more methane gas (CH_4). The formation of biogas was carried out by thermophilic bacteria during the day, because it can approximately survive to a temperature of 60 °C. At night the formation of biogas is carried out by mesophilic bacteria with an optimal biogas formation temperature at temperature 36.7 °C (Odedina M.J., 2017). By using the help of heating devices, the formation of biogas with thermophilic conditions can be quickly achieved and the temperature of the heating temperature is more awake. To investigate the temperature variation, three thermophilic boxes were designed and the treatment of substrat of young coconut wastes and digester were conditioned under anaerobic condition.

2. Materials And Method

2.1 Materials

In the first step of this study, the sampling materials and in the characterization of young coconut waste samples used in this study were fresh in order to minimize the impurities digester. The characteristics of the sample were done by calculating the total solid and volatile solid obtained proximate analysis results using a TGA 701. Total Solid is the dry weight content found in organic matter during the anaerobic fermentation process and affects the decomposition of organic waste material. The calculation used to search for % TS is $TS = (100\% - \text{moisture})$. Solid volatile is the amount of solids of organic material that can be degraded or evaporated by heating where % VS results

Table 1. The content of moisture, TS and VS of coconut young (CY) hull

Sampel	Moisture (%)	TS(%)	VS (%)
CY (1)	74,26	25,74	19,86
CY (2)	73,16	26,84	20,36
Average	73,71	26,29	20,12

To determine the amount of raw material per variation of the sample until it reaches a mixture of 300 ml (substrate and water) is simplified by means of dividing the variation of TS with their percentage. In the same way it can be determined the amount of raw material needed for other variations, from

digester I to IV digester, with substrate details: 5 grams of TS + 100 ml of inoculum + 200 ml of water. For heating variations in each digester are as follows: Digester I by heating 40°C, Digester II with 45°C, Digester III with 50°C heating and Digester IV without heating

2.2 Methods

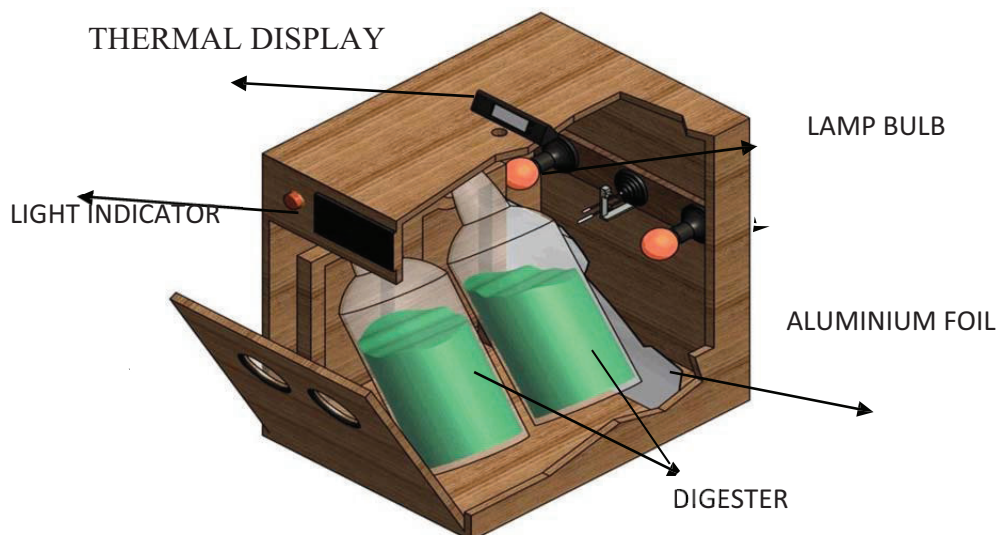


Figure. 1. Schematic of thermophilic digester

The schematic of thermophilic digester is shown on Figure 1. Digester without heating is placed on the table at room temperature, while the digester warms up using a device to a condition of the temperature digester at a constant temperature of each of the three digester 40 ° C, 45 ° C and 50 ° C by using three thermophilic boxes with a length, a width and a height of 30, 30 and 40 cm respectively. To maintain the heating temperature in the three thermophilic boxes, the thermostat capsule is set first by adjusting the heater temperature and turning the support bolt through the ventilation hole above the box, then giving two incandescent light bulbs to each of the three thermophilic boxes to get heat. Based on the trial, to get a constant temperature of 50 ° C in the first thermophilic box, two incandescent light bulbs can be used each of 60 watts and 5 watts and to get a temperature of 45 watts in the second thermophilic box, two incandescent light bulbs are 40 watts and 10 watts respectively, while to get a constant temperature in the third thermophilic box of 40 ° C, two incandescent bulbs can be used with 40 watts and 5 watts. If the temperature exceeds the set temperature then to regulate it by lowering the position of the thermostat capsule by turning the support bolt through the ventilation hole. In order for bacteria to survive, the incandescent lamp is covered with aluminum foil to be light-resistant and without reducing heating from the incandescent lamp.

3. Result And Discussion

From Figure 2 above it can be seen that there is an increase in pressure on all digester every day. From the variation of I digester with heating 40 ° C, digester II 45 ° C, digester III 50 ° C and up to IV digester without heating. It can be seen that the accumulation of daily gas pressure generated in the digester II with a heating temperature of 45°C, with a mixture of 5 grams TS at 300 ml of the substrate mixture is the highest and the accumulation of daily gas pressure generated in the IV digester without heating with the same substrate mixture produces the lowest pressure. This is because in the IV digester the thermophilic bacteria are not able to work optimally in producing gas due to the absence of heat treatment in the IV digester.

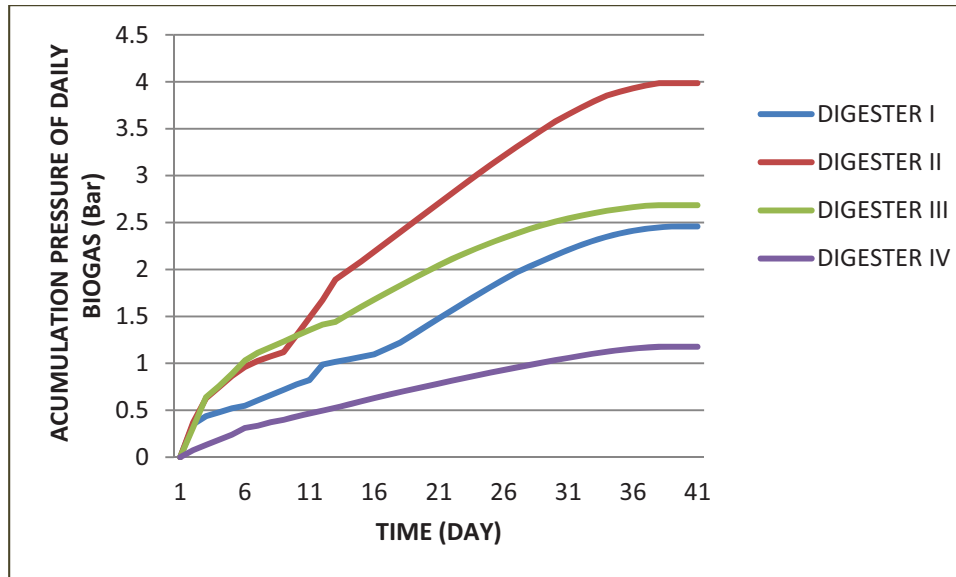


Figure 2. Accumulation pressure of biogas during experiment

From Figure 3 belows it can be seen that there is an increase in the accumulation volume of biogas every day in all biogas digesters. The highest increase can be seen in the second digester by heating 45 ° C, where the thermophilic bacteria that work at a temperature of 45 ° C can produce gas to the maximum, compared to other heating variations. And the lowest biogas accumulation volume is shown on the IV digester chart without heating. This is because the thermophilic bacteria are not able to work optimally to produce gas, the low gas pressure is due to the lack of bacterial fermentation in the IV digester, because the temperature is not suitable for the activity of thermophilic bacteria.

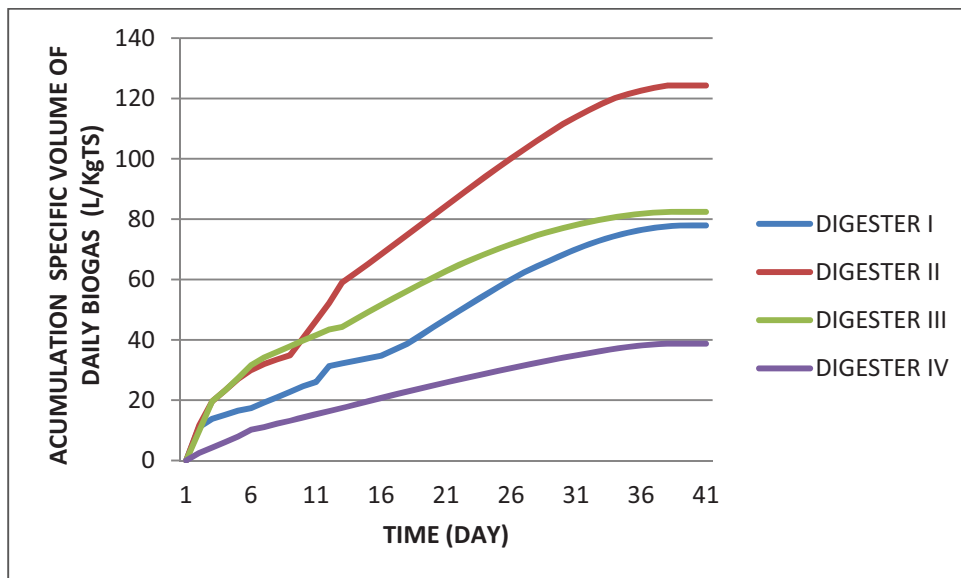


Figure 3. Accumulation specific volume of daily biogas during experiment

From Figure 4 belows it can be seen that there is an increase in the specific volume of biogas accumulation every day in all biogas digesters. There is an increase in the specific volume of biogas accumulation every day in all biogas digesters. The fact that can be seen from all the digester with different heating temperature variations is the specific volume of biogas accumulation with different biogas specific volume results. This is shown in the IV digester without heating, where the specific volume of the digester is the lowest, while in the 40 ° C digester I, the second digester 45 ° C, 50 ° C digester III with variations in heating, the specific volume of daily biogas accumulation increases further than the IV digester. With the highest specific biogas volume shown in digester II with a heating temperature of 45 ° C. This happens, because in the second digester with a heating temperature of 45 ° C the thermophilic bacteria as a starter producing biogas are able to move optimally in producing biogas, this proves that at a temperature of 45 ° C the thermophilic bacteria are able to reproduce well.

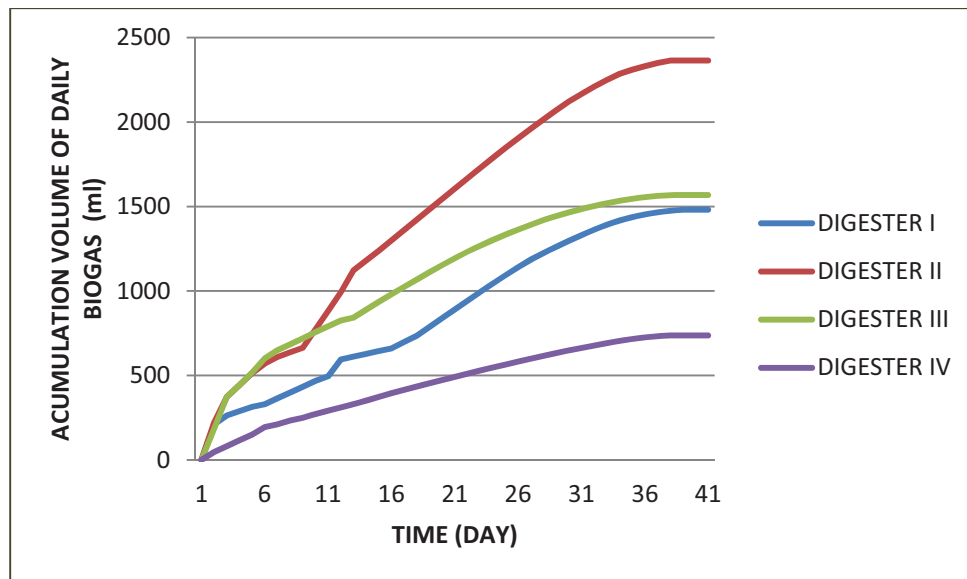


Figure 4. Accumulation volume of daily biogas during experiment

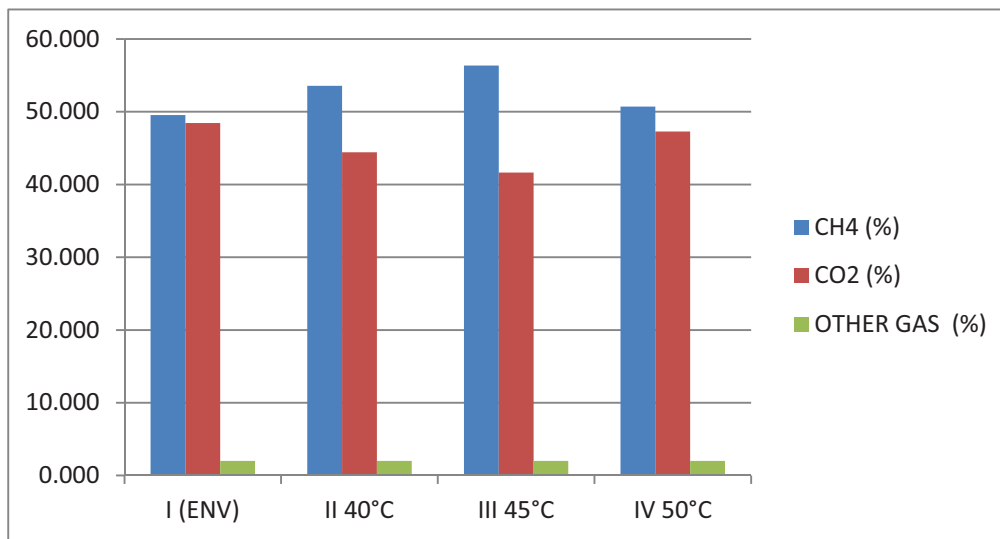


Figure 5. Percentage of biogas composition for different thermophilic condition

In the Figure 5 above it can be seen that the composition of methane contained in all biogas digesters has different contents. This is caused by variations in heating temperature in each of the different digester. In the third digester with a heating of 45 ° C has a CH₄ content of 56,348% with a CO₂ content of 41,652%. The lowest CH₄ content was shown in digester I without variations in heating with a variation of 5 grams of TS on 300 ml of substrate mixture which has a CH₄ content of 49,551% and CO₂ of 48,449% which without heating variation

5. CONCLUSION

- Of the four digesters, digester II with a heating variation of 45°C produces the highest biogas accumulation pressure and methane gas content (CH₄) which is equal to 56,348%.
- Of the four digester, the IV digester which is not thermophilic, is the least digester that produces methane gas (CH₄), which is 49,551% and carbon dioxide (CO₂) of 48,449% where the gas that plays an important role in the production of biogas is methane gas (CH₄).

Acknowledgement

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Investigation on Flow Pattern in a Hydraulic Ram at Variation of Its Waste Valve Disk

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Abstract. A hydraulic ram has simple structure. It consists of two moving parts, the waste valve and the delivery valve. The waste valve mainly affects the magnitude of the impulse force generated. On the other hand, the delivery valve affects the flow rate of the pumping water. Therefore, the waste valve is the critical design of hydraulic ram system. However, the flow pattern around the valve has been lack considering. In order to get a comprehensive design of the valve, it needs to recognize comprehensively the water flow phenomenon that pass through the valve. Therefore, visualization of the water flow characteristic around the valve is conducted by constructing a hydraulic ram pump model using a transparent material that is acrylic. Then, the flow patterns are cached using a low speed video-camera, Sony RX100-IV with 960 frames/second. The characteristics of the waste valve are affected by parameters such as the orifice diameter of the valve, the diameter of the valve disk, the step length, and the valve weight. Therefore, in this experiment, experimental testing was conducted in the laboratory on hydraulic ram model with variation of the waste valve disk diameter. The results showed that the diameter of disk of the waste valve have significantly influencing the flow pattern in the body of hydraulic ram and its stroke period of the cycle. The greater the diameter the disk of the waste valve the velocity of water that has vortex more and more, so the speed of water flow in the body of the pump also decreases. Furthermore, the larger the diameter of the waste valve disk the shorter the interval of the hydraulic ram pump valve movements, then, the frequency of the hydraulic ram valve movement increases.

1. Introduction

Hydraulic ram pumps are devices that utilize the waterfall flow energy to pump some of the water to a higher elevation without using conventional energy such as electricity or fuel oil [1]. The first hydraulic ram pump that named "pulsation engine" was in 1771 designed in England by John Whitehurst. Then, Joseph Michel Montgolfier designed the next generation hydraulic ram pump and patented in 1797. In its development of the hydraulic ram pumps, they are mostly used as irrigation equipment to provide water at rural area where area facing problem in electrical energy accessibility. The most interesting of the hydraulic ram pumps that are their simple structure, using renewable and can be manufactured locally [2].

The main components of hydraulic ram pump are water supply tank, drive and delivery pipes, pump body, waste and delivery valves, snifter valve, and air chamber [3]. Waste and delivery valve are the moving parts of hydraulic ram pump [4,5]. The sudden closure of the waste valve generate a high pressure of water hammer phenomenon. This high wave pressure energy is utilized in the hydraulic ram pump cycle to move a small part of the source water into higher elevation [6]. The moment of momentum of water outflow through the waste valve generates an impulse force to drive the valve's mechanism [7].

Until the end of the 18th century, development design of hydraulic ram pumps were very slow. The first American patent for hydraulic ram pump was issued to J. Cerneau and S. S. Hallet in 1809 in New York [8]. Although the hydraulic ram pump has spread widely in the world, however, until that decade there had been no any theoretical study competent for explaining the performance of hydraulic ram pumps. Zhukovsky (1989) presented the first theoretical explanation of the water hammer concept that was used in the work of hydraulic ram pumps [9]. The pumping phase take laces when the waste valve of the hydraulic ram pump is closed and the delivery valve is open. After the water hammer occur, a flow shock wave come to pass inside the drive pipe. Najm et al. offered the numerical model for the analysis of water hammer pressure waves inside the hydraulic

ram pump, and the effect of such pressure waves on the hydraulic ram component of the pump [10]. Moreover, O'Brien and Gosline presented the first rational theoretical analysis of the characteristics of hydraulic ram pumps [11]. They explored the hydraulic ram cycle into four time sections. However, Lansford and Dugan modified O'Brien and Gosline theories by experimenting on hydraulic ram pump and then presumed six phases in the hydraulic ram pump cycle [12]. Instead, Krol assumes seven phases in the hydraulic ram cycle and provides complex analysis [13].

Furthermore, Calvert explicitly analyzed the drive pipe dimensions of the hydraulic ram pump [14]. He offered that the ratio of length to diameter of the drive pipe is between 150 and 1000. Iverson used the time-dependent variable value in the investigation of one-dimensional unsteady flow based on the Rankine equation [15]. Next, Rennie and Bunt studied the operation of hydraulic ram pump, that is, by examining the experimental variation in the diameter of the waste valve and pipe [16]. Basfeld and Muller presented the simple theory developed from the Newton motion equation by considering the loss of energy and boundary conditions [17]. The results of this theory are compared with the measurement of the hydraulic ram flexi-glass pump model. Particularly, they have been determined experimentally the flow velocity in the drive pipe, the volume per pumping cycle and efficiency as a function of various parameters. In view of hydraulic ram pump consists of only two moving parts, that are the waste and the delivery valve, whose design determines the performance of the hydraulic ram pump. Hence, Suarda [18] has analyzed the forces that take place on both valves with algebraic analysis. Generally, methods that can be used in the main thoughts of planning and application in various ways have been suggested by Balguda [19]. On the other hand, according to Nambiar et al. [20] the waste valve is a key element in the hydraulic ram pump, therefore, it is requiring consideration in the development and further optimization in enhancing the total efficiency of the hydraulic ram pump system. The working phases of the hydraulic ram pump involves four steps: acceleration, compression, delivery, and recoil. Due to the head from the water source, the water in the drive pipe will accelerate and flow out through the waste valve. The valve closes if the drag force and pressure force in the water are more than the weight of the waste valve.

In an application, the adjustment of the waste valve takes a long time, because there is no adequate references in making the design of the waste valve. Currently, the practitioners just recognize that the disk diameter of the waste valve is correspondent to the diameter of the drive pipe and the length of its stroke is approximately two fingers. Even though the waste valve characteristics are affected by several parameters for instance the valve orifice diameter, the valve disc diameter, the stroke length, the valve weight, the discharge and head of the water flow into the hydraulic ram pump. Moreover, all of these parameters affect each other. In view of that, a comprehensive research involving all parameters of the valve waste design is required to obtain a reference in designing of the waste valve that offers an optimum performance.

2. Research Methods

2.1. Experimental Setup

Study on the waste valve model with numerous sizes of parameters are conducted experimentally on hydraulic ram pump model which has been set up in the energy conversion laboratory of Mechanical Engineering Department of Udayana University (Figure 2). In addition, the model of the waste valve is as in Figure 3.

The orifice diameter of the waste valve is recommended to be equal to or greater than the diameter of the pipe in order to avoid strangulation of the water flow. Therefore, the waste valve investigated which has disk diameter (DWV) variation of 42 mm, 47 mm, 52 mm, 57 mm, and 62 mm, with the valve orifice diameter of 32 mm equal to diameter of the drive pipe (Table 1). The model of the waste valve is as in Figure 2.

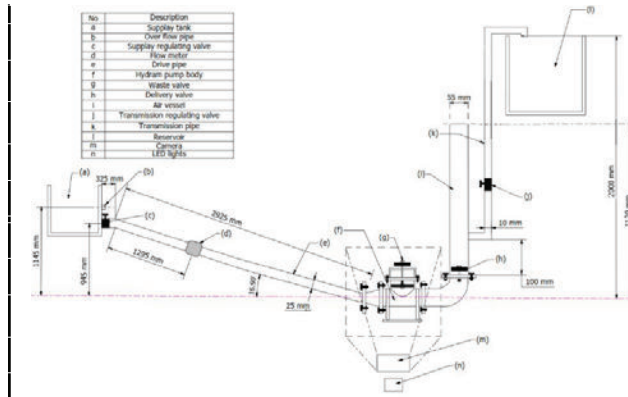


Figure 1. The test model of hydraulic ram pump.

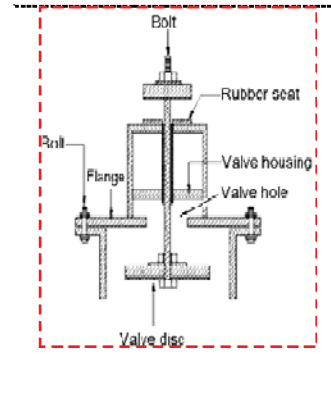


Figure 2. Waste valve test models.

Table 1. Variation of the disk diameter of the waste valve models

Model	Orifice Diameter	Disc Diameter	Waste Valve Mass
I	32	40	100
II	32	41	100
III	32	42	100
-	32	43	100

2.2. Experimental Procedure

To observe the fluid flow phenomenon in the hydraulic ram working cycle, visualization techniques are used by taking video recordings using a digital camera Sony RX100IV. Water mixed with glitter will be observed with the camera. Naturally the flow that occurs in the hydraulic ram pipeline is three dimensional. For simplification, observations are made on one side for a vertical plane and from the top of a horizontal plane. Lighting is used by one piece that is placed transversely that is right in front of the hydraulic ram, lighting support is used by two 50 Watt LED lights as much as possible so that the video is recorded more clearly.

The initial observations were in the form of video, which had been taken using a Sony RX100IV Digital camera. The video will first be processed or changed into images. So the technique used in this research is image processing techniques because the data that is processed is data in the form of images. Videos that have become images will be processed to create a flow pattern and frequency of movement of the hydraulic ram valve. Flow velocity measurement is done by measuring the trace length of particles that have been passed using ImageJ software, then the length of the particle movement traces divided by the speed of taking the video camera (shutter speed), in this study using a shutter speed of 0.001 seconds.

3. Results and Discussions

Describing the flow pattern following the direction of particle movement is carried out at four steps of the hydraulic ram work cycle, the recorded video is 2.07 seconds then the video is split into 2070 images,

then the selection is carried out. Four images that have been selected in each variation of the diameter

of the waste valve plate represent the conditions of each hydraulic ram working cycle, namely from the acceleration, compression, delivery and recoil cycles.

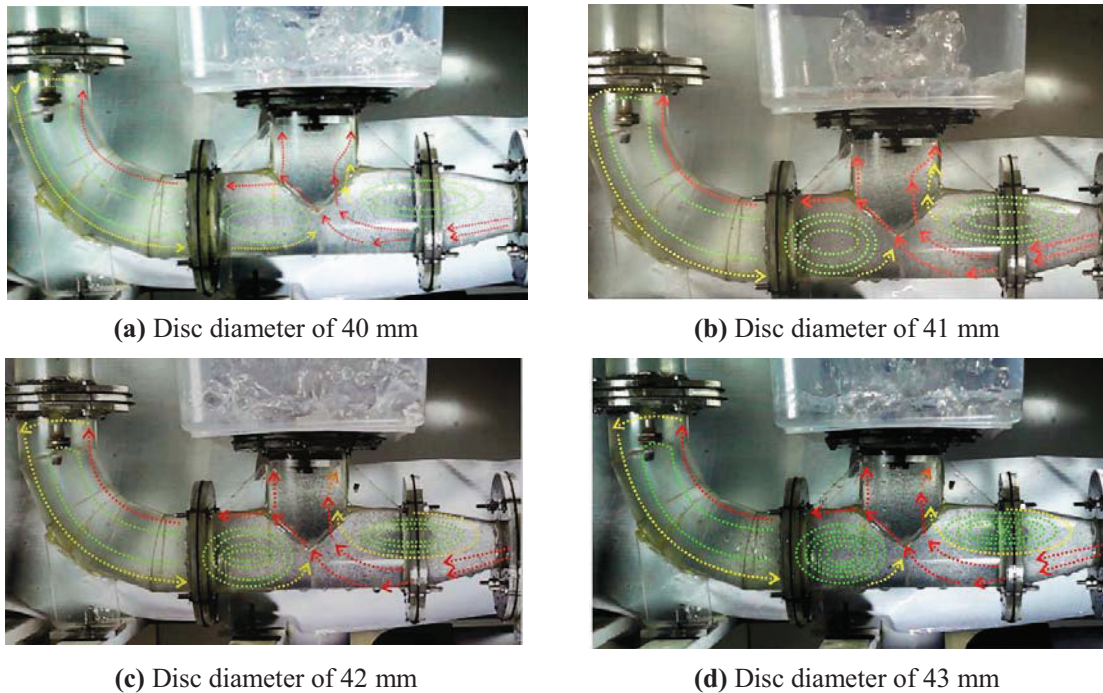
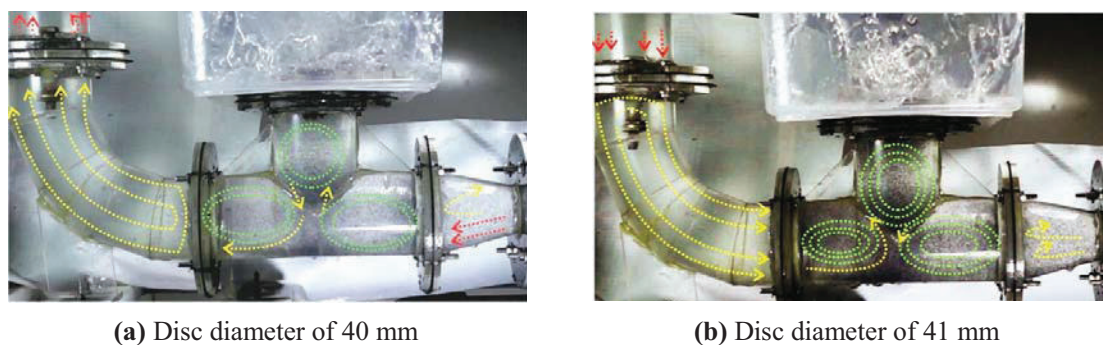


Figure 3. Acceleration step of hydraulic ram

The first stage is the acceleration step is where the water starts entering the hydraulic pump body, the condition of the waste valve is open and the pressure valve is closed. The incoming water will start to come out of the waste valve. As in Figure 3 the red dots show the direction of movement of water entering from the drive pipe, the incoming water partially exits the waste valve and some goes to the pressure valve and turns again towards the waste valve. A line of green circular dots shows a rotating flow (vortex), and the yellow one shows the direction of turning water.

Based on Figure 3 the number of circles of green dots on the diameter of the 40 mm dish in Figure 3(a) is seen at least when compared to Figure 3(b), (c) and (d), while the number of circles of the most dotted green lines is seen in the diameter 43 mm disc in Figure 3(d). So that it can be concluded that the greater the diameter of the waste valve plate, the number of rounds of water flow experiencing vortex will be more and more, because the gap for fluid discharge is less, so the water in the hydraulic ram body is under pressure.



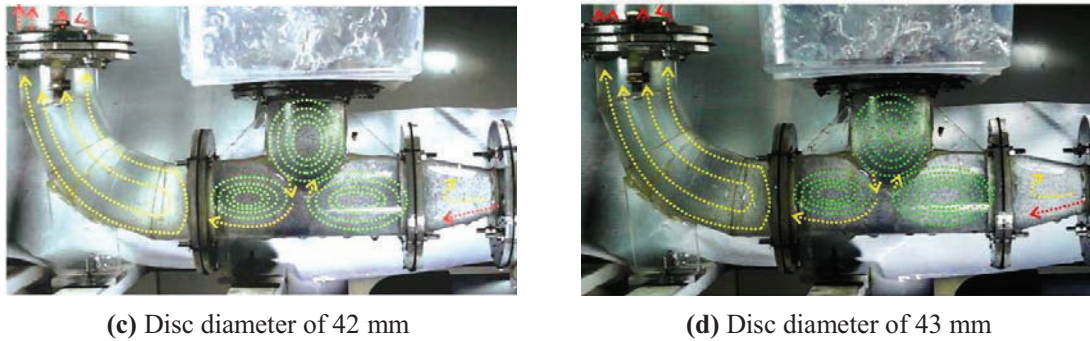


Figure 4. Compression step of hydraulic ram

The second stage is the compression step. In the compression step the pressure valve opens while the waste valve is closed. When the water acceleration step will come out of the waste as well as the water valve starts to press up on the waste valve and the pressure valve due to the pressure, the compression step occurs. Water travel to the air tube experiences several vortices as shown in the green dots in Figure 4, while the yellow dots on the reducer of the driving pipe experience back pressure but do not enter the drive pipe, then the yellow dots the vector direction to the air tube is made like that because water flows by rotating into the air tube. Based on Figure 4 there is a difference in the number of rounds when viewed from the lines of green circular points in parts (a), (b), (c) and (d), the larger the diameter of the waste valve plate the number of rounds of flow of water experiencing vortices increases.

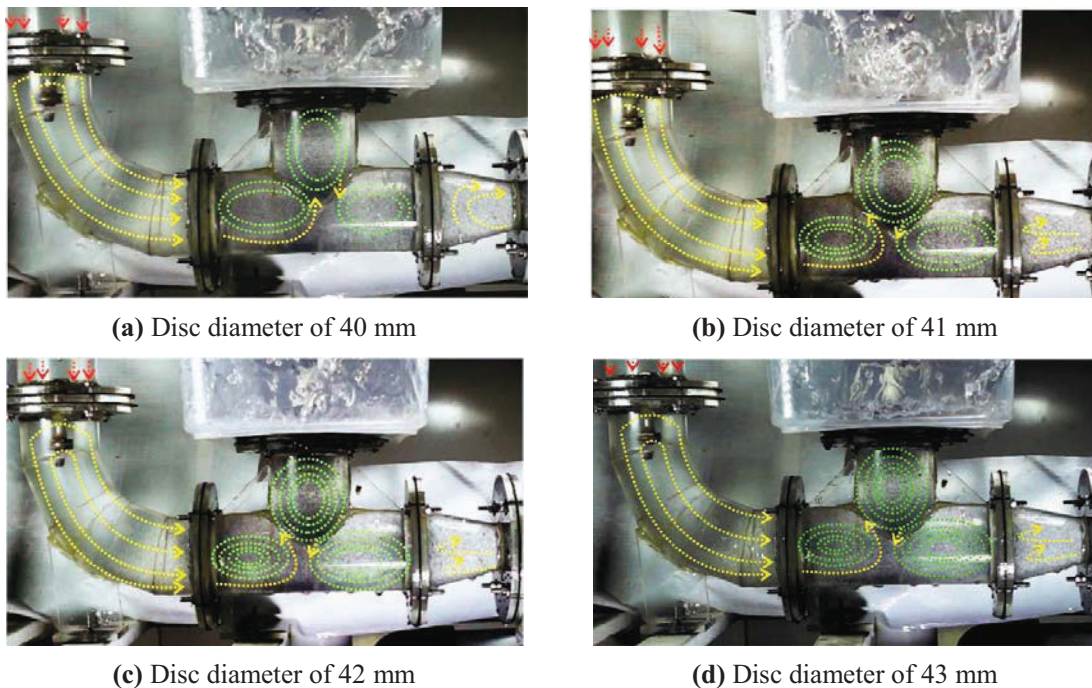


Figure 5. Delivery step of hydraulic ram

The third stage is the delivery step in this step, all valves are closed, and the air in the air chamber presses the water down so that the water goes out into the reservoir. As a result of all closed valves there is a back pressure to the drive pipe, the water that is already in the hydraulic ram body will move back towards the drive pipe, as shown in Figure 5 the red arrow moves down pressing the pressure valve and at the same time the water goes out into the reservoir. Based on Figure 5 sections

a, b, c and d show the difference in the amount of rotation of the flow of water experiencing a vortex, the larger the diameter of the waste valve disk, the number of rounds of flow of water experiencing vortex also increases.

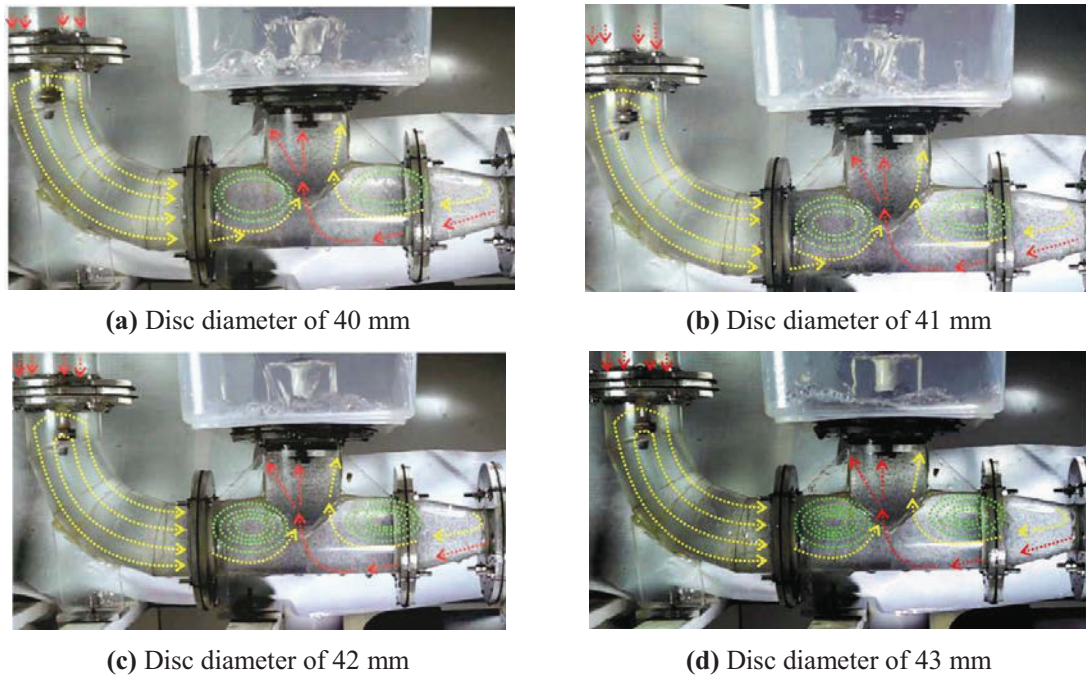


Figure 6. Recoil step of hydraulic ram

The last step is the recoil step, in this step the condition of the pressure valve remains closed while the waste valve is open, the water experiencing back pressure (pressure back) turns back towards the waste valve and exits the waste valve, as in Figure 6. When compared to part a, b, c and d in Figure 6, there are differences in flow patterns that are almost the same as the steps of acceleration, compression and delivery, namely the number of rotations of rotating water flow, the larger the diameter of the waste valve used, the more rounds that occur in the flow of water experiencing vortex.

The more rounds of water flow experiencing vortex, of course the closer and closer the particle distance is, because the distance has to do with speed, it is necessary to measure the movement distance of paint particles (glitter) then later used to determine the velocity of water flow that occurs in the hydraulic ram body. Speed measurements are carried out at four points as shown in Figure 7.

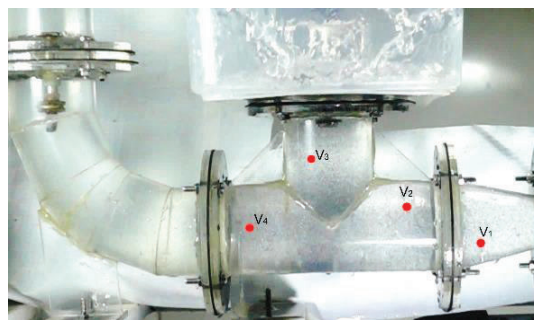


Figure 7. Velocity measurement point

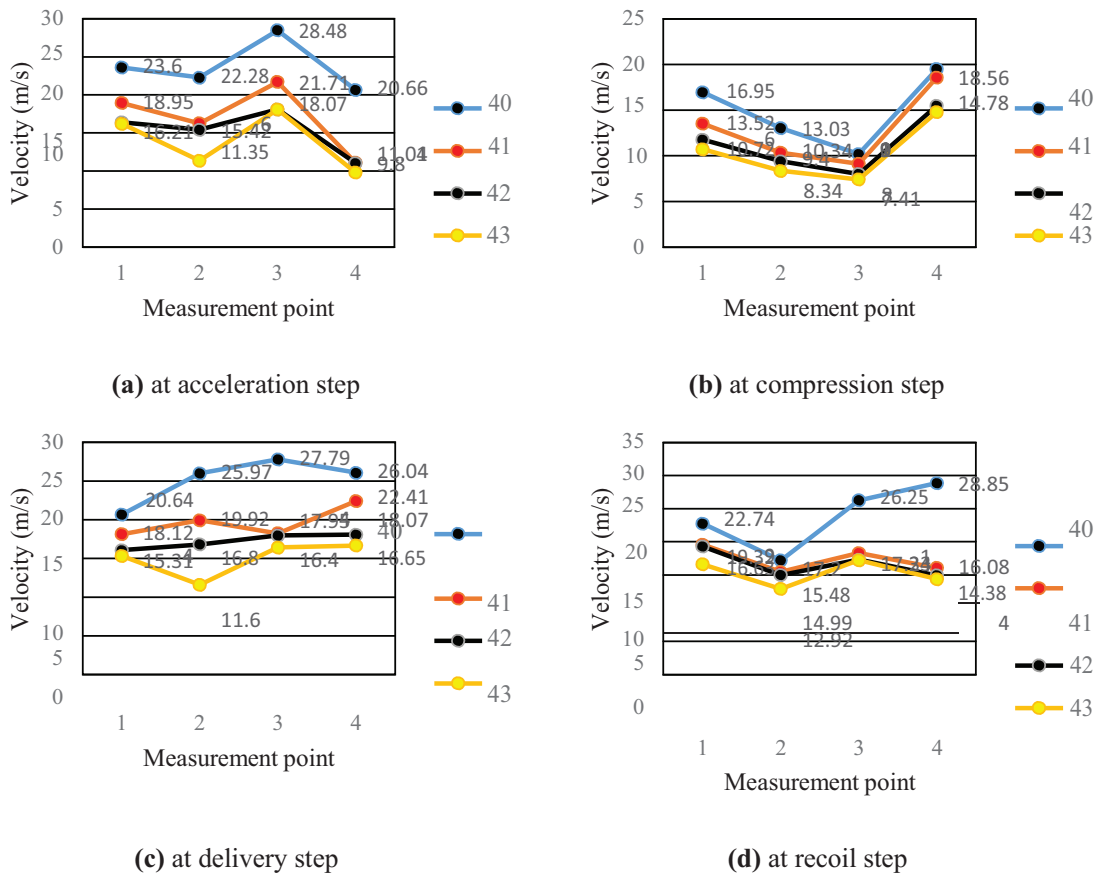


Figure 8. Influence of the disk diameter of the waste valve disk to the water flow velocity

Based on Figure 8(a) it can be seen that the speed increase occurs at point 3 which is right below the waste valve plate, because at this time only the waste valve is open so that the water experiences pressure from the reducer pipe or point 1 and from the T pipe after the reducer or point 2 and also driven from the return flow from the pressure valve that is at point 4 in the T pipe after the waste valve. The greater the diameter of the waste valve plate, the speed of the water will decrease due to the narrowing of the water outlet. In addition, based on Figure 8(b) it can be seen that there is a decrease in speed at point 3 which is just below the disc valve, because at this time the waste valve is closed and the pressure valve is open, so that the water is circling before going to the pressure valve, while at point 4 that is in the T pipe after the waste valve the velocity of the water flow increases because there is pressure from the reducer pipe or point 1, from the T pipe after the reducer or point 2 and from point 3 which is right under the disc valve. The larger the diameter of the waste valve dish, the speed of the water flow decreases. Moreover, based on Figure 8(c), the same differences are seen in Figure 8(a) and 8(b). The larger the diameter of the waste valve plate, the speed of the water flow also decreases. Furthermore, Based on Figure 8(d) the smallest speed occurs at point 4 which is in the tee of pipe after the waste valve, because at point 4 in the recoil step there is a collision flow from the air tube and from the reducer or point 1. The greater the diameter of the waste valve disk speed water flow decreases.

Based on the results of visualization data processing and speed of water flow it can be concluded that the larger the diameter of the waste valve disk, the more round the water experiencing vortex. Differences in dimensions and flow patterns cause differences in speed, the larger the diameter of the waste valve plate, the speed of the flow of water in the hydraulic ram body decreases because the gap of water out through the waste valve is less, so that the fluid is under pressure.

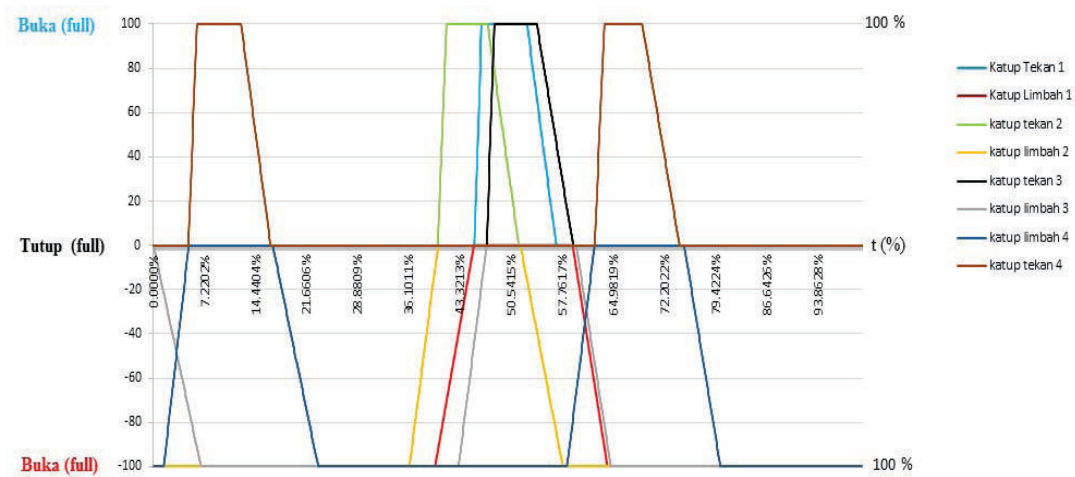


Figure 9. Waste and delivery valve movement in the hydraulic ram

The frequency of movement of the waste valve is obtained from the video that has been described into an image, the video recorded for 2.07 seconds is broken down into 2070 images then the image is identified according to the characteristics of each working cycle of the hydraulic ram (Figure 9). Four hydraulic ram work cycles are acceleration, compression, delivery, and recoil consisting of 1385 images (frames). Number 1, 2, 3 and 4 in the line colour description in Figure 9 mean that 1 shows the diameter of the 40 mm waste valve disk, number 2 shows the diameter of the 41 mm waste valve plate, number 3 shows the diameter of the 42 mm waste valve plate and number 4 shows diameter of 43 mm waste valve disc. The greater the diameter of the waste valve plate, the faster the frequency of movement of the hydraulic ram valve, if the time is getting faster, then, the beat also increases. Furthermore, the greater the diameter of the waste valve plate, the frequency of the waste valve will increase, because the larger diameter of the waste valve plate makes the water wider pressing the waste valve plate so that the movement of the valve increases and consequently the water coming out through the waste valve decreases.

4. Conclusion

The larger disk diameter of the waste valve, the more round the water experiencing vortex, so that the speed of the water flow in the pump body also decreases. In addition, the larger the diameter of the waste valve disk, the shorter the interval for the hydraulic ram valve movement, so that the frequency of the hydraulic ram valve movement increases.

Acknowledgment

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Application Of Dry Activation In Manufacturing Of Activated Carbon From Swat Bamboo

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Abstract. Activated carbon is a porous material that has many applications. Various active carbon precursors have been studied in order to anticipate limitation in availability of activated carbon sources from coal. Biomasses are promising source due to their huge availability and some of them have great chemical composition, such as bamboo. The purpose of this study is to investigate the characteristics of activated carbon made from swat bamboo (*Gigantochloa verticillata*) by applying dry activation with different activation times. Carbonization was carried out at 550°C and held for 1.5 hour. The samples were then activated by heating to 800 °C, held for 60, 90 and 120 minutes with N₂ flowing at a 150 mL / minute rate. The results show that activated carbon activated during 90 minutes produces the highest fix carbon (75.17%) and C (76.56%). Morphology of microstructure shows that there is a microstructure change from char to activated carbon. Activated carbons manufactured have more porous structure then porous structure of char.

Keywords: Dry activation, carbonization, activation time, characteristics

1. Introduction

Activated carbon is an adsorbent which has a high surface area and porosity (Patil, B.S. et al, 2012; Ahmadpour, A, et al, 2013) and can be produced from a variety of carbon-containing materials (Patil and Kulkarni, 2012). This large surface area is caused by porous structures that have good absorption ability (Sudibandriyo, M, 2003). The wider use of activated carbon causes their need also increase. Various active carbon sources are developed to anticipate activated carbon sources from non-renewable sources such as coal. Biomass is a promising active carbon source because of its abundant amount, such as from agricultural waste (Ademiluyi, F.T. and Braide, O., 2012), from coconut shell (Diana, et al, 2007), from sugarcane stems [Sreńscek-Nazzal, et al, 2013] and from bamboo (Koo, W.K., et al., 2015; Huang, T, .dk, 2015; Ma, X., et al, 2015; Cheung, W.K, et al, 2012; Mahamin, S., et al, 2011)

According to Cheremisinoff, M., 1978, the process of making activated carbon includes three stages of the process; dehydration, carbonization and activation. Dehydration is the process of removing the water content contained in raw materials through the drying process. The carbonization process is a heating process carried out to a certain temperature until no more smoke comes out with the aim of enriching the carbon content in the carbon material by eliminating non-carbon elements using thermal decomposition (Nor, NM, et al. 2013) and producing initial porosity in charcoal (Daud, et al, 200).

The activation process is a further process of carbonization with the aim of opening the pores which are covered by hydrocarbons, tar and other components such as ash, water, nitrogen, and sulfur during the carbonization process. The activation process in principle can be done in two ways, namely chemical and physical activation. The purpose of the activation process is to develop further porosity and produce a regular structure that eventually forms activated carbon with high solid porosity (Guo,

2009). Physical activation process, known as dry activation, is begun by flowing light gases, such as water vapor, CO₂, or air into the retort that contains charcoal and is heated at a temperature of 800-1000 ° C (Plate, 2014). In this process there are formations of pores and vessels (paths, paths) due to the entry of oxidation gases into char and the removal of reaction products (Cuhadaroglu, 2008). The first gasification process will eliminate more reactive carbon atoms to produce porosity. Further gasification will eventually produce activated carbon with high porosity (Rodriguez-Reinoso, 1992).

In chemical activation, activation is done by mixing charcoal with certain chemical compounds (such as H₃PO₄, KOH,) before being heated. Soaking is done in an activating solution, then drained and heated at a certain temperature for 1-2 hours. At high temperatures the activating material will enter between the sidelines of the hexagonal layer and then open a closed surface (Lempang, M., 2012). Compared to chemical activation, dry activation is more simple and more environments friendly. This paper discusses the effect of activation time on the characteristics of activated carbon from bamboo swat using dry activation process

2. Research Method

Preparation of activated carbon is started by cutting swat bamboo into small pieces, drying in the electric furnace and carbonizing at temperature of 550⁰C until no smoke comes out. Carbonized charcoal is converted into powder with a maximum grain size of 250 μm, drying activated at a temperature of 800⁰C, held for 60, 90 and 120 minutes under N₂ 150 mL / min. Activated carbons was then signed as AC60, AC90 and AC120 for activation time of 60, 90 and 120 minutes respectively. Proximate analysis (TGA 701 ASTM D7582 MVA), ultimate analysis (CHN628 Series Elemental Determinator) and SEM (JSM-651OLA) were then undertaken to characterize of activated carbons produced.

3. Result

The results of research are presented in table 1, table 2, figure 1 until figure 4.

Table 1. Proximate analysis of samples

Samples	Compositions (%)			
	Moisture	Volatile	Ash	Fix carbon
Swat bamboo	7.85	88.31	1.86	1.98
Char	5.4	14.92	12.51	67.17
AC60	2.86	8.36	14.33	74.45
AC90	2.05	8.34	14.44	75.17
AC120	1.8	8.46	15.33	74.41

Table 2. Ultimate analysis of samples

Samples	Compositions (%)		
	C	H	N
Swat bamboo	43.42	6.14	1.70
Char	71.48	2.51	1.19
AC60	74.70	0.56	1.09
AC90	76.56	0.31	1.22
AC120	75.98	0.21	1.23

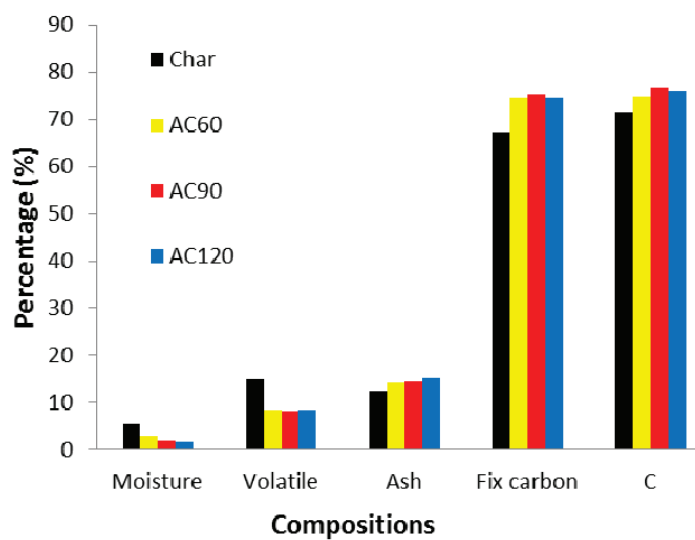


Figure 1. Comparison compositions of samples

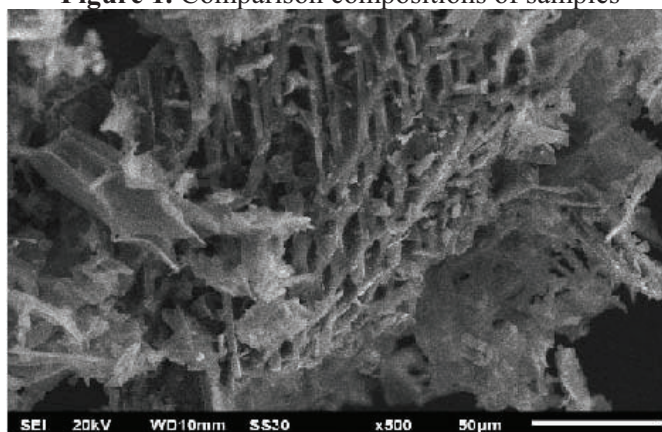


Figure 2. SEM image of activated carbon AC60

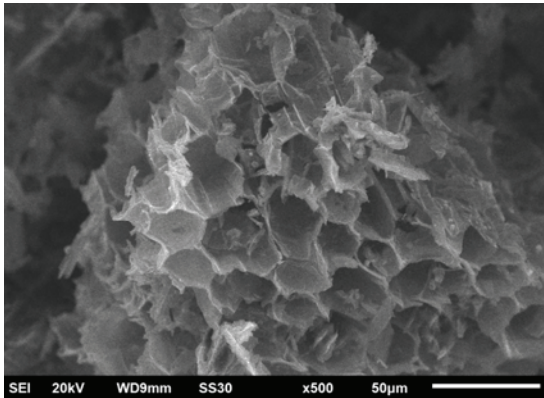


Figure 3. SEM image of activated carbon AC60

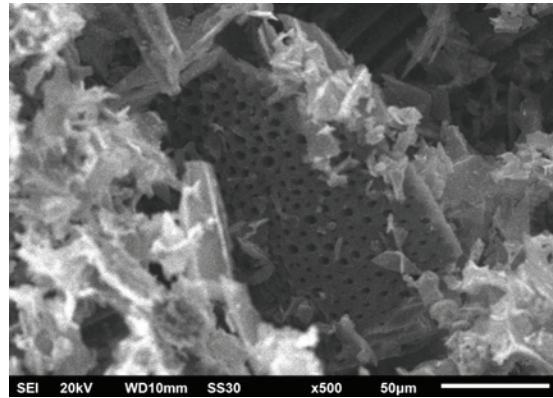


Figure 4. SEM image of activated carbon AC60

4. Discussions

4.1. Proximate analysis

The elements composition of proximate analysis is shown in table 1. It can be seen that there has been a change in composition from raw materials to charcoal and into activated carbon after thermal decomposition through the carbonization process and activation process. After carbonization there was an increase in fix carbon about 97.05% from 1.98% to 67.17%. Moisture and volatile content decreased while ash content actually increased. After activation, fix carbon has increased for all three activations time. Fluctuations in the content of fix carbon occur with increasing of activation time. Fix carbon increased from activation time of 60 minutes to 90 minutes, however, when activation time of 120 minutes was applied the fix carbon decreased. According to Festi Irmayani et al, 2013, the higher the ash content, the lower the absorption capacity because ash is an impurity, while the higher the content of fix carbon, the more carbon molecules that can absorb. Based on the ash content, the activated carbon AC60 has the lowest ash content, while the activated carbon ACF90 has the highest fix carbon content.

4.2. Ultimate analysis

The ultimate analysis results are shown in table 2. It is presented that there is an increase in the content of C from raw materials to charcoal and to activated carbon. The higher C content and the lower H and N, the greater adsorption potency of activated carbon may be possessed. However, further characterization (adsorption isotherm test) is needed to obtain quantitative data about the absorption capacity of activated carbon made. Figure 1 shows the proximate contents and C from precursor, char and activated carbons made. It can be seen that the content of C is proportional to the content of fix carbon. The ultimate analysis shows those 90 minutes of activation results in the highest C content. Further characterization is needed to determine which type of activated carbon has the best absorption, namely the N_2 adsorption isotherm test.

4.3. SEM image

SEM images of activated carbons are shown in Figures 2, 3 and 4. From figures 2, 3 and 4 can be seen that the formation of pores on activated carbon has been formed, however, these SEM images show the quantitative data so that cannot be clearly distinguished the difference in activated carbon surface morphology under difference activation time. Further characterization is required in order to know clearly the effect of activation time on the adsorption capacity of activated carbons.

Parameters such as surface area, pore volume, pore diameter and adsorption/desorption can be used as reference in order to know the relationship between activation effect and characteristics of activated carbon.

5. Conclusion

Based on the fixed carbon content, activated carbon which is activated during 90 minutes (AC90) is the best activated carbon because it produces the highest fix carbon (75.17%). Based on ash content, activated carbon which was activated for 60 minutes produced the lowest ash (14.33%). To ensure which activated carbon produces the highest absorption, further characterization is required, namely the adsorption isotherm test. With this test, besides absorption, it can also be known the pore surface area, pore volume, pore diameter and pore distribution.

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Strategy for Preventing Cultural Based Juvenile Delinquency in Denpasar-Bali City

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Abstract. Juvenile delinquency is also referred to as deviant behavior. The problem of juvenile delinquency is a complex phenomenon with various forms and causes, so that understanding the shape, and the causes of juvenile delinquency is very important to overcome the problem. To overcome juvenile delinquency in the community, studies need to be held to obtain empirical data and an overview of juvenile delinquency in Denpasar City. Important aspects studied were: 1) forms of juvenile delinquency in Denpasar City, 2) things that underlie juvenile delinquency in Denpasar City, and 3) methods taken as a coping strategy for juvenile delinquency problems in Denpasar City. This research was conducted using qualitative methods through data collection techniques with observation and interviews. Data analysis uses interpretative descriptive analysis. The results showed that juvenile delinquency in Denpasar City was divided into two, namely index violations, namely criminal behavior that violates the law, and status violations are the behavior of teenagers who violate their rights and obligations in their status as children, students, community members and other statuses. Index violations include: theft, mugging, extortion, persecution, carrying weapons, drug use, and escaping girls. While status violations include: skipping school, violating school rules, damaging school infrastructure, speeding up, speeding up, smoking and drinking. The factors that underlie this juvenile delinquency are: internal factors are factors that originate within the teenager himself, namely the identity crisis, and external factors external factors are factors or things that come from outside the individual or adolescent, such as a family that is less harmonious, religious education, and miscommunication. Things to do to overcome juvenile delinquency, including: 1) teenagers must get good figures, 2) motivation from family, teachers, peers to run the first point, 3) parents' willingness to improve family conditions so as to create a harmonious family, communicative and comfortable for adolescents, 4) good at choosing friends, and 5) adolescents must form self-defense so that they are not easily affected if friends or community are not in line with expectations.

Keywords: *life, adolescence, behavior, and diversite*

1. Introduction

Dealing with juvenile delinquency problems. of course it can be done in various ways. The usual way to do it officially is to try it in accordance with the applicable rules of positive law. But in reality such methods have not brought optimal results. In the city of Denpasar, based on data reported by South Denpasar Police, East Denpasar Police, West and North Denpasar Police, and data obtained from 15 junior high schools and 14 high schools in Denpasar, up to 2015 adolescents who commit juvenile delinquency reached 3,583 people. The figures on juvenile delinquency problems are certainly not optimal when compared to what actually happened and was not reported. Because juvenile delinquency is still considered taboo to be opened in the public sphere. This fact is quite alarming and very important to be studied more deeply.

It seems important to understand the socio-cultural angle first, especially regarding how juvenile delinquency occurs. In this context, there are psychological anthropology theories that are interesting to observe. The theory was put forward by Margaret Mead as quoted by Danandjaja (1988: 70-71),

asserting that human personality or character is a trait in the intra-psychic organization of individual members of a particular society, which is obtained by experiencing the same way of parenting, inside the culture of the community concerned. Based on this theory, it can be assumed that juvenile delinquency is not only caused by problems that occur when the teenager in question behaves in violation of the rules. It is probable that juvenile delinquency is rooted in his personality which is basically a socio-cultural product in society, both within the household and in the wider social sphere, such as in school and in the wider community. If the theory of personality or character is still acceptable, then handling juvenile delinquency problems can also be done through more planned child care, both in the household and in the school and the wider community. Through parenting that is done planting cultural values that are considered relevant to shape the personality or character of children in accordance with expectations.

Based on the above phenomenon, the purpose of this study is to identify and understand several things, namely: Forms of juvenile delinquency, things that underlie the occurrence of juvenile delinquency, and strategies to overcome juvenile delinquency in the city of Denpasar.

2. Methodology

This research was conducted using a qualitative research approach that relied more on observation techniques, in-depth interviews, and document studies. In an effort to collect data and information carried out through steps: determining the location of research, determining informants, observing, in-depth interviews, and exploring related documents. Data analysis techniques are carried out by interpretive descriptive analysis techniques.

3. Discussion

3.1 Forms of Juvenile Delinquency

Juvenile delinquency is an act that violates the norms, rules, or laws in society that are carried out in adolescence or the transition of childhood to adulthood. According to Philip Rice and Gale Dolgin, author of *The Adolescence*, it is said that according to applicable legal restrictions, there are two categories of violations committed by adolescents, namely index violations, and status violations (https://id.wikipedia.org/wiki/Kenakalan_remaja).

First, violation of the index, namely the emergence of criminal acts committed by teenagers. The behaviors included in this category include theft, assault, rape and murder. In Denpasar City for the past 2 years (2016-2017) adolescents belonging to this group are those who take action: (1) theft with all forms, namely: ordinary theft / cusa as many as 20 people, violent theft / curas (16 people), theft with weight / stolen (30 people), theft of motorized vehicles / motorized vehicle (6 people), (2) persecution (21 people), beatings, threats and extortion (6 people), (3) mugging and carrying sharp weapons (6 people), (4) run away girls (1 person), and (5) drug users (1 person).

Second, violations of status, including escaping from home, skipping school, drinking alcoholic beverages, sexual behavior, and behavior that does not follow school rules or regulations given by parents. Juvenile delinquency included in this group during 2016-2017, are: (1) skipping school (more than five times 10 people), (2) violating school rules (30 people), (3) smoking in the school environment and outside school environment (150 people), 4) using karas / alcoholic beverages using drugs and free sex (5 people), and (5) speeding / tramping and breaking curfew (15 people).

3.2 Factors That Cause Juvenile Delinquency

Adolescence is a transition period, which is usually called an unpleasant age, where there is also a change in him both physically, psychologically, and socially (Hurlock, 1973). During the transition period it is possible to cause a period of crisis, which is characterized by a tendency to appear deviant behavior. Under certain conditions these deviant behaviors will become disturbing behaviors (Ekowarni, 1993). Seeing this condition if it is supported by an unfavorable environment

and unfavorable personality traits will trigger various behavioral deviations and negative actions that violate the rules and norms in society which are usually referred to as juvenile delinquency.

In general, the things that underlie the emergence of juvenile delinquency phenomena in Denpasar City can be grouped into two. First, internal factors are factors that originate within the teenager himself, namely the identity crisis: Biological and sociological changes in adolescents allow two forms of integration to occur, namely: 1) the formation of feelings of consistency in life, 2) achievement of role identity. Ramadan delinquency occurs because teenagers fail to reach the second integration period. Some of these are weak self-control in which adolescents who cannot learn and distinguish acceptable behavior from unacceptable ones will be dragged into 'naughty' behavior. Likewise for those who have known the difference in these two behaviors, but cannot develop self control to behave according to their knowledge.

Second, external factors are factors or things that come from outside the individual or teenager. The things set are: 1) family and parental divorce, 2) lack of communication between family members, 3) disputes between family members can trigger negative behavior in adolescents. In addition, even the wrong education in the family, such as over-indulging the child, does not provide religious education, or rejects the existence of children, can also be a cause of juvenile delinquency.

3.3 Impact of Juvenile Delinquency

The impact of juvenile delinquency will affect the adolescent itself, the family or the surrounding environment. The effects of juvenile delinquency include: first, they will be avoided or ostracized by many people, with the exclusion causing it, the teenager will experience psychiatric disorders, but not crazy but he will feel isolated in social matters, feel sad or hate others.

Second, juvenile delinquency cases result in teenagers being more daring to commit criminal acts. Not only for juvenile delinquents, families will also be affected by juvenile delinquency because they have to bear the burden of shame due to acts committed by juvenile delinquents.

3.4 Prevention of Juvenile Delinquency in the City of Denpasar

Overcoming juvenile delinquency problems is not an easy job, but this requires patience and expertise in approaching teenagers who behave naughty. Overall prevention of juvenile delinquency can be grouped into two.

3.4.1 General countermeasures

First, the effort to personally develop adolescents since they were still in the womb through their mothers. This magedong-gedongan ceremony has meaning; give thanks and thank you to God for all his gifts. In addition, also praying for a fetus that is born safe and perfect, is also one element of prenatal education to the fetus who is still in the womb with this ceremony spiritually he will later be born into a religiously devout child and is a follow-up of the second marriage ceremony. The purpose of this ceremony is that children who will be born will become useful people in the community and can meet the expectations of their parents. This hope is characterized by the symbols of upakara that are used, all of which are meaningful to obtain safety and welfare so that children born later become children who are good (suputra) physically and mentally healthy.

Second, children need to be nurtured and educated in a stable, joyful and optimistic atmosphere. Parenting is the attitude of parents in interacting with children which includes providing rules and attention that takes place during the parenting process (Gunarsa, 2002). Parents can apply one of the three types of parenting styles, namely authoritarian parenting, permissive upbringing, and authoritative parenting. Various forms of parenting received by adolescents will affect their growth and development. In Balinese adolescents with characteristics of Balinese culture, the daily environment of Balinese teenagers will certainly be more specific than other teenagers. One of them is the family system in Bali which is still influenced by the extended family. Most Balinese families still live with extended families in one yard area where more than one family head lives. This condition raises diverse interactions and parenting during the process of growth and development of adolescents. Parenting is no longer only coming from parents but also

from grandparents, uncles, uncles, and aunts who live in the area of the family's yard. Various forms of parenting received by Balinese adolescents will certainly influence shaping their social maturity.

Third, education in the school environment. Schools as places for forming students play an important role in fostering mental, religious knowledge and skills of students. Errors and shortcomings in school institutions as a place to educate, can lead to opportunities for juvenile delinquency. As a place to gain knowledge, in addition to family and the environment, school is an institution that should be able to guarantee that students can pass the stages of development smoothly and optimally. His students are continuously supported if they have shortcomings and will be encouraged to develop if they have potential. School is an institution that treats all human beings who are in need or in excess as equal human beings. This is what makes schools the right social institutions to assist children at every stage of their development. The school also provides a level division that is in accordance with the stages of development and developmental objectives. This makes even though schools provide equal treatment, but between individuals of different ages and learning needs will be distinguished fairly. This equal and fair treatment will not be found in other educational institutions such as families and the environment.

Fourth, education outside schools and households. In order to prevent or reduce the incidence of juvenile delinquency due to the wrong use of leisure time, education outside the two institutions mentioned above absolutely needs to be improved. Improvement of the environment and social conditions. "Education is not only carried out in schools because it can be done at home especially in the family environment. and also in the wider community. The family provides character building from children to adults. The family also has a role in the formation of personality, which is often rather difficult to form in the school environment. Learning children about the kinds of norms that apply in home is used as a guideline by parents in educating children. Education obtained in schools and families is then applied in the social environment as well as to develop what is learned in schools in accordance with the existing social context. The social environment teaches the meaning of tolerance in the life of the community. r various forms of social learning for adolescents towards social maturity can also be obtained through various traditional institutions.

The results of the research conducted by Wiasti et al. in Denpasar City (2012 and 2013) it was shown that the role of banjar and various sekaa, among others: sekuna teruna, sekaa art, all kites, all the ogoh-ogoh in each community turned out to have a positive impact on youth. It is said that because through this organization teenagers can channel their talents and hobbies, so as to be able to suppress their desire to do bad things.

3.4.2 Special prevention

To ensure public order, especially among adolescents, special and direct prevention activities must be sought, in three ways.

First, supervision. Attempts to prevent juvenile delinquency are specifically carried out by educators against adolescent behavioral abnormalities. Mental education at home is certainly the responsibility of the master and other family members. Also other educational facilities that take an important role in the formation of a reasonable person with a healthy and strong mentality, for example by the Student Council in each school.

Second, feedback and extension. Guidance and intensive counseling for parents and adolescents so parents can guide and educate their children seriously and appropriately so that teenagers continue to behave naturally.

Third, for adolescents who have shown symptoms of delinquency, it should be done as early as possible. While repressive actions against juvenile juveniles need to be carried out at certain times by the R.I Police agency with the existing Judiciary. But this action must be imbued with educating affection towards them, because the misbehavior that they do is a result, the products of various internal and external factors of adolescents that are not realized can harm their own personal and community. So this repressive action must be pedagogical, not "offense" or

"crime". All these countermeasures should be based on the attitude and view that adolescents are still in the process of development / growth towards their personal maturity which requires guidance from responsible adults.

4. Conclusion

- The forms of juvenile delinquency that occur in Denpasar City can be grouped into 2 categories, namely index violations, and status violations. Types of delinquency which include index violations are violations of law, and status violations are denial of status as students, children and community members.
- Factors that influence the occurrence of juvenile delinquency in the city of Denpasar, are: low expectations of education and values in school, family role, influence of peer groups, media influence.
- Juvenile delinquency prevention strategies, general and specific. General, including: the effort of personal development of adolescents since they were still in the womb through their mothers, patterns of child care after birth, education in the school environment, and education outside of school and household. Special in nature, including: supervision, guidance and counseling, and repressive action as early as possible for adolescents who have shown symptoms of delinquency.

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The Community And Local Wisdom-Based *Using* Cultural Tourist Attractions In The Globalization Era

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Abstract. Cultural tourism, as an important issue in the globalized tourism industry, as far as the globalization context is concerned, is claimed to distort the local wisdom and tradition. The problems which are intended to answer in this current study are (1) what are the community-based *Using* cultural tourist attractions like, (2) how is the globalized tourism market managed, and (3) what strategy is used to develop globalized competition? The study is aimed at understanding what the *Using* cultural tourist attractions are like, the technique of managing them, and the strategy used to develop them. The qualitative method was used to answer the problems and aim of the study, involving a number of informants. The data were collected through in-depth interview, participatory observation, and documentary study. The qualitative data were analyzed through reduction, categorization, determination of the theme, and conclusion drawing. The focus of analysis in the study includes the theoretical framework of cultural tourism as a part of ecotourism, the community-based cultural tourism, and the management of the cultural tourism. The result of the study showed that there were two forms of the *Using* cultural tourist attractions; they are *tangible* and *intangible* tourist attractions. The tangible tourist attractions include: the architecture of the *Using* traditional house, the *Using* tourist park, the rice fields, the *Balai Pesabehan* of *Buyut Cili*, and the *Using* culinary. The intangible tourist attractions include the *Using* customs and traditions, the traditional ceremony of the life cycle, and the *Using* arts.

All the tourist attractions are managed by three components of the *Using* tourism; they are the *Using* traditional institution, the *Using Kelompok Sadar Wisata* (*Pokwardis*), and the private party. They synergize with one another to maintain the tourist attractions they have. The *Using* Traditional Institution represents the *Using* local people, the *Pokwardis* represents the government, and the private party represents the investor. The strategy used to develop the cultural tourist attractions includes accessibility and amenity pioneered by the government, the customs and traditions, and the *Using* arts, the synergy between the local people and the government, marketing, the synergy of the tourism human resources and the local people, and the synergy of the government and the private party. The participation of the government and the local people dominates the development. As well, internet and social media also support the development especially the marketing, promotion, image and services. However, no attention has been paid to the matters pertaining to conservation, preservation, and sustainability of the human resources in the *Using* tourism as the current target is the economic aspect. In the future attention should be paid to the matters of pertaining to conservation, preservation, and sustainability of human resources to enable the community and local wisdom-based *Using* cultural tourism to be dynamic in the globalization era.

Keywords: *Cultural Tourism, Using* and *Globalization*

I. Introduction

Cultural tourism is one form of alternative tourism referred to as ecotourism (Woods in Nugroho, 2011). According to the note issued by the World Travel Tourism Council (WTTC), in 2000 ecotourism grew by 20 per cent per year, exceeding the 6.4 per cent growth of massive tourism (WTTC, 2000 in Nugroho, 2011). In several countries, which have tourist destinations, a similar growth also took place. As an illustration, in European countries and Latin America ecotourism grew by 40 per cent and in Pacific Asia it grew 25 per cent (Nugroho, 2011).

Apart from that, the scope of cultural tourism (ecotourism) has expanded. Cultural tourism does not only include the activities of visiting tangible cultural objects but also the other local wisdom practices such as the traditional activities, art and religious activities, language and culinary, and many other forms of cultural activities. The contribution made by tourists is significant enough as they intend to actively participate in them and obtain knowledge from every touristic activity.

In cultural tourism, tourist attractions, accommodation and facilities are integrated with the tradition and the life structure of its supporting community. Therefore, what is unique, what is specific, and different local wisdoms are frequently offered as the points of difference.

The globalization current has significantly contributed to the growth of the *Using* cultural tourism. Globalization, which cannot be separated from the fast mobility of people, products, capital, technologies and information, has inspired the appearance of forms of instrumental culture which causes the values of the *Using* culture to shift (Held et al., 1999 in Boli and Frank J. Lencher, 2012). This fact has led to the matters pertaining to the forms of cultural tourism developed and the strategy used to manage cultural tourism. The matters pertaining to the planning, the local people's participation, the maintenance of tourist attractions, conservation and sustainability of tourism resources and the contribution of cultural tourism to the local people are the matters which should be adjusted to the market's demand and the globalized needs.

This current study focuses on the aspect of the maintenance of cultural tourism by the *Using* community, which is frequently referred to as the community-based cultural tourism/CBCT. In this context, the study was intended to explore the forms of cultural tourism, its management and the strategy used to develop it. It is the focus of the problems which is intended to be comprehended through the study.

II. Research Methods

This current study was conducted at Kemiren Village, Glagah District, Banyuwangi Regency, East Java Province. The village is well-known as the *Using* Village, as most the villagers still maintain the *Using* culture as their way of life. It is 7 kilometers from the center of Banyuwangi city, or it is about 9.7 kilometers from Mount Ijen. The village is densely enough populated; it is occupied by 2,529 heads of population with an area of 2.4 kilometers.

Since 1996 the village with its *Using* culture has been promoted as one of the tourist destinations. Since then improvements have been made to make it adjusted to the developing tourism market. Being promoted as a tourist destination, it has been known as a national and international tourist destination.

The data were collected through in-depth observation, participatory observation and documentary study. The in-depth interview involved 10 informants purposively selected; what was observed included the geographic, topographic, and demographic conditions as well as the tangible cultural tourist attractions, and the attitude and behavior of the local people.

The data obtained through the documentary study were used to complete the data obtained through the in-depth interview and observation. The documentary study focused on the development of the cultural tourism at Kemiren Village, the studies on ecotourism, tourism management, the forms of the policy of cultural tourism, and the forms of the strategy used to plan and develop cultural tourism. The documents were traced through different publications of studies (books), scientific journals (research articles), and the published mass media.

The data were qualitatively analyzed, involving three steps of analysis; they are data reduction, data categorization and classification, the determination of basic themes based on the problems of the study, and the drawing of findings and conclusions. In the stage when the data

were reduced, all the data obtained from the field were sorted and simplified based on the problems and objectives of the study. The objective was finding out the specific themes which are in accordance with the problems and objectives of the study. Then the themes were abstracted in order to obtain the temporary finding and context in each problem. The temporary finding was estimated and interpreted to be compared to the other themes in all the problems of the study. The result of the comparison was interpreted again in order to find out the findings of the whole study and to answer all the problems and objectives of the study. Then the results of analysis were descriptively presented completed with several tables, matrices and the informants' views to clarify and ease the whole description.

III. Results.

The result of the study showed that there were two forms of the *Using* cultural tourism; they are the tangible and intangible tourist objects. A tangible tourist object is the one which can be directly seen, touched, felt and enjoyed by a tourist without having to prepare it before. In the *Using* cultural tourism, the tangible tourist attractions are the *Using* house architecture, the *Using* tourist Park, the rice fields, the *Buyut Lali Balai Paseban* and culinary.

The architecture of the *Using* traditional house is known to have four forms referred to as *tikel*, *tikel balung*, *cerocogan*, and *baresan*. The *Using* tourist park is a commercial tourist park adopting the miniature of the *Using* traditional house completed with several attractions such as accommodation, swimming pool, and several places where people can play games. The *Using* cultural heritage is a *Using* housing complex in which specific traditional *Using* houses showing the *Using* traditional way of life can be found.

The rice fields of the *Using* people show an expanse of agricultural land which belongs to the *Using* people which is semi-modernly processed and managed where different types of crops, vegetables, second crops, and the other consumed crops are planted. The *Balai Paseban of Buyut Cili* is the tomb where the village protecting ancestors reside. It is believed that they still participate in protecting the *Using* people so they can do their activities comfortably. The *Using* culinary shows the *Using* people's specific foods presented as tourist attractions. They include *pecel pitik*, *rujak soto*, *cucur*, fried banana, and many other traditional cakes which are specific to the *Using* people.

The intangible tourist attractions include the ones which are specific to the *Using* people, cannot be seen, touched and felt. In addition, they should be prepared before in order to be able to be accessed and enjoyed. They include the *Using* customs and traditions, the ceremony of life cycle and the *Using* arts and culture. The attractions which are related to the *Using* customs and traditions include: *slametan buyut cili*, *tumpeng sewu*, *barong ider bumi*, *mocoan lontar*, and the ceremony of life cycle performed by the *Using* people.

Slametan Buyut Cili is a ritual attraction performed at the grave of the *paseban agung Buyut Cili* so that the souls of the ancestors of *Buyut Cili* will always protect and secure the local people, causing them to live safely and peacefully. *Tumpeng sewu* is a tourist attraction which is specific to the *Using* people. It is the form of a mass ceremonial meal 'slametan' performed in the middle of the main road of the village. In this ceremonial activity, 1000 *tumpengs* (cone-shaped rice) are offered. It is performed to propose for safety, protection and easy fortune.

Barong ider bumi is a village cleansing ritual in which *barong* is carried around the village followed by the local people; it is a kind of procession performed around the village. It is intended to free the village from the bad spirits which possibly disturb the local people's peaceful life. It is performed once a year on the second day after Idul Fitri. *Mocoan lontar* is an activity in which the local people read what is referred to as 'lontar yusuf' one after another on special days. It is intended to conserve tradition, appreciate the stories of Prophet Yusuf and to maintain harmonious relationship and togetherness among the local people. The ceremony of life cycle is a ritual which is performed by the *Using* people starting from before they are born to the time when they are dead. The forms of this ceremony are *miloni*, *procotan*, *cuplak puser*, *selapanan*, *mudun lemah*, *sunatan* (circumcision), *nikahan* (marriage), and death.

All the forms of tourist attractions described above are three components of the *Using* tourism; they are the *Using* traditional institution, the group of the *Using Sadar Wisata*

(*pokdarwis*), and the private party. They synergize with one another. The *Using* traditional institution is a traditional organization whose members are the traditional leaders of the *Using* people. *Pokdarwis* is a group of the *Using* young people for whom space and freedom are given to manage the types of the *Using* tourist attractions at the village.

The private party refers to the third party or frequently referred to as the investor that takes part in and maximizes the *Using* tourist attractions. It develops and accumulates the capital needed to develop the tourism industry. It can be stated that the *Using* traditional institution represents the *Using* local people, *Pokwardis* represents the government, and the private party represents the investor.

All the tourist attractions are developed through three pillars; they are the government, the private organization, and the local people. They work with one another to develop the accessibility and amenity prepared by the government, the *Using* customs and traditions and the *Using* arts and culture. They synergize with one another to develop the marketing and human resources.

The role played by the government and local people can be clearly seen in developing the *Using* cultural tourism. The roles played by the internet technology and social media significantly contribute to the development of the *Using* cultural tourism in general and its promotion, marketing, image and services in particular. The capital given by the government to fund, maintain and renovate the tangible tourist objects seems to be big enough, intensive and sustainable. The local people's participation in maintaining, managing and making use of the business opportunities in the tourism industry at the village is also significant. Many tourism supporting business activities such as culinary, souvenir, homestay, restaurant and craft are run by the local people.

However, no attention has been paid to the matters pertaining to conservation, preservation and sustainability of the *Using* tourism resources as the development is still oriented towards the economic aspect. No attention has been paid to the development of human resources either. The quality and quantity of human resources are still low. In the future it is necessary to pay attention to these aspects to make the community and local wisdom-based tourism dynamic in the globalization era.

IV. Conclusions.

Based on what was described above, several conclusions can be drawn from the study; they are:

1. The *Using* cultural tourism is one form of the rural tourism managed by the *Using* local people involving three pillars; they are the *Using* local people, the government and the private party.
2. There are two types of tourist attraction; they are the tangible tourist attraction and the intangible tourist attraction. The tangible tourist attraction includes the architecture of the *Using* traditional house, the *Using* tourist park, the *Using* cultural heritage, the rice fields, the *Balai Paseban Buyut Cili*, and culinary. The intangible attraction includes the *Using* customs and traditions, the traditional ceremony of life cycle and the *Using* art and culture. The attractions which are related to the *Using* customs and traditions include *slametan Biyut Cili*, *barong ider bumi*, *mocoan lontar*, and the ceremony of life cycle performed by the *Using* local people.
3. All the attractions are managed and developed by involving the participation of the local people, the government and the private party. They give their supports proportionally, although the support given by one party overlaps with that given by the others, and they fight over influence.

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Penerimaan Masyarakat Hukum Adat Atas Keluarnya Keputusan Mudp Bali Nomor 01/Kep/Psm-3/Mdp Bali/X/2010 (Studi Empiris Di Kabupaten Gianyar, Bangli Dan Klungkung)

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Abstract. Dalam hukum adat, dimaksud dengan pewarisan adalah proses pengoperan/penerusan harta materiil maupun immateriil dari suatu generasi kepada generasi berikutnya. Definisi sebagaimana dikemukakan di atas dapat diterjemahkan lagi sebagai penerusan kewajiban dan hak dari suatu keluarga kepada penerusnya. Dengan demikian maka dapat disimpulkan bahwa siap yang menerima kewajiban maka dialah yang mendapatkan hak. Masyarakat hukum adat Bali adalah masyarakat yang menganut sistem kekeluargaan patrilineal (menurut garis laki-laki) dimana keluarga atau penerusan keturunan adalah dilacak menurut garis laki-laki. Oleh karenanya yang berhak untuk mewaris adalah hanya pada anak laki-laki saja yang berkedudukan sebagai purusa. Sedang anak perempuan oleh karena berstatus predana yang nantinya akan kawin keluar mengikuti keluarga suaminya tidak dapat hak untuk mewaris.

Kata Kunci : Kesatuan Masyarakat Hukum Adat, Hak Mewaris Perempuan

1. Introduction

Hukum adat waris adalah aturan-aturan hukum adat yang mengatur tentang bagaimana harta peninggalan atau harta warisan diteruskan atau dibagi dari pewaris kepada ahli waris dari suatu generasi ke generasi berikutnya (H. Hilman Hadikusuma, 1992:211). Hukum adat waris di Indonesia tidak terlepas dari pengaruh susunan masyarakatan yang berbeda dalam arti kepada siapa harta warisan adalah sangat tergantung dari sistem kekeluargaan dari masyarakat yang bersangkutan. Ada tiga sistem kekeluargaan yang dikenal dalam hukum adat, yakni (1) sistem kekeluargaan patrilineal (dengan melacak garis keturunan dari pihak bapak); (2) sistem kekeluargaan matrilineal (dengan melacak garis keturunan ibu); dan (3) sistem kekeluargaan parental (kedudukan keluarga bapak dan ibu adalah sama)

Konsekuensi dari dianutnya sistem ini adalah bahwa keturunan dari suatu keluarga adalah ditarik dari garis laki-laki. Dengan garis keturunan laki-laki, maka keturunan sebagai pelanjut generasi adalah ada pada anak laki-laki saja yang dalam hukum adat Bali dikenal sebagai garis *purusa*. Oleh karenanya bagi suatu keluarga yang tidak memiliki anak laki-laki, maka ia akan melakukan pengangkatan anak (*meras pianak*) untuk didudukkan sama seperti anak kandung sendiri. Jalan lain yang bisa ditempuh adalah dengan mengangkat seorang anak perempuannya sebagai seorang *sentana rajeg*, dimana perkawinannya dilakukan dengan perkawinan nyeburin. Dengan bentuk perkawinan nyeburin ini maka anak perempuan tersebut berkedudukan sebagai *purusa* (berstatus laki-laki) dan suaminya sebagai *predana* (berstatus perempuan). Dengan kedudukannya sebagai *sentana rajeg* yang berstatus *purusa*, maka anak perempuan ini berkedudukan sebagai pelanjut/penerus generasi dari orang tuanya.

Dalam perkembangan selanjutnya, suatu keluarga pada masyarakat hukum adat dalam memperlakukan anak-anaknya biasanya tidak membedakan lagi bahwa apakah anak itu anak laki-laki

ataupun anak perempuan. Pada masa sekarang, perlakuan terhadap anak laki-laki ataupun anak perempuan adalah sama, seperti dalam pemeliharaan maupun pendidikannya. Keadaan ini diperkuat dengan berkembangnya isue HAM dan isue gender, persamaan kedudukan anak laki-laki dan anak perempuan semakin kuat dan ini juga berpengaruh kepada masyarakat hukum adat dalam memperlakukan anaknya. Isue HAM dan gender ini juga dapat diterima oleh sebagian besar masyarakat hukum adat (Dominikus Rato, 2015:199) Pada masyarakat hukum adat Bali hal ini ternyata juga diikuti, dalam hal mana dapat dilihat dari perkembangan dewasa ini dimana telah berkembang tradisi untuk memberikan *jiwa dana* atau *bekel* kepada anak perempuan yang kawin keluar sebagai modal dalam membentuk keluarga baru bersama suaminya.

Sehubungan dalam perkembangan ini, Majelis Utama Desa Pakraman (MUDP) mengeluarkan keputusan Nomor: 01/Kep/Psm-3/MDP Bali/X/2010 tertanggal 15 Oktober 2010 tentang hak waris bagi perempuan. Ketentuan yang berbeda dalam kebiasaan yang ada dan berlaku dalam hukum adat bagi masyarakat hukum adat Bali adalah ketentuan yang memberlakukan kedudukan yang sama bagi anak laki-laki dan anak perempuan sebagai ahli waris atas harta *gunakaya* setelah dipotong sepertiga bagian sebagai *due tengah*. Dalam keputusan tersebut disebutkan bahwa anak laki-laki dan anak perempuan mendapatkan hak waris dengan perbandingan 2 : 1, yakni *ategen* (sepikul/dua bagian) untuk anak laki-laki dan *asuun* (sejung/satu bagian) untuk anak perempuan.

Atas keputusan ini, dilakukan penelitian hukum empiris dengan mengajukan permasalahan: (1) apakah masyarakat hukum adat Bali dapat menerima atau tidak menerima keputusan MUDP yang memberikan hak waris kepada anak perempuan; dan (2) apakah dasar atau alasan dari masyarakat hukum adat Bali itu untuk menerima ataupun tidak menerima keputusan MUDP tersebut.

2. Research Methods

Soerjono Soekanto (Bambang Sunggono, 2015 : 41), berpendapat bahwa penelitian hukum dibagi dalam pertama, *Penelitian Hukum Normatif*, yang terdiri dari: a. penelitian terhadap asas-asas hukum; b. penelitian terhadap sistematika hukum; dan c. penelitian terhadap taraf sinkronisasi hukum. Kedua, *Penelitian Hukum Sosiologis* atau *Empiris*, yang terdiri dari: a. penelitian terhadap identifikasi hukum; dan b. penelitian terhadap efektivitas hukum.

Selanjutnya Soetandyo Wignjosoebroto (Ibid.), membagi penelitian hukum dalam: pertama, *Penelitian Doktrinal*, yang terdiri dari: a. penelitian yang berupa usaha inventarisasi hukum positif; b. penelitian yang berupa usaha penemuan asas-asas dan dasar-dasar falsafah (dogma atau doktrin) hukum positif; dan c. penelitian yang berupa usaha penemuan hukum *in concreto* yang layak diterapkan untuk menyelenggarakan suatu perkara hukum tertentu. Kedua, *Penelitian Non Doktrinal*, yaitu penelitian berupa studi-studi empiris untuk menemukan teori-teori mengenai proses terjadinya dan mengenai proses bekerjanya hukum di dalam masyarakat. Tipologi penelitian ini sering disebut sebagai *Socio Legal Research*.

Penelitian yang dilakukan sekarang ini adalah penelitian hukum empiris. Dimaksud dengan penelitian empiris ini adalah penelitian yang mengkaji pelaksanaan atau implementasi hukum positif (perundang-undangan) dan kontrak secara faktual pada setiap peristiwa hukum tertentu yang terjadi dalam masyarakat guna mencapai tujuan yang telah ditentukan. (Abdulkadir Muhammad, tt. : 53). Oleh Soerjono Soekanto, dikatakan bahwa penelitian hukum empiris ini memfokuskan pada 2 (dua) hal, yakni *pertama*, meneliti untuk melakukan identifikasi hukum, dan *kedua* untuk meneliti apakah hukum yang dimaksud itu dapat berlaku efektif. Dalam penelitian ini akan dicoba untuk menemukan apakah Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010 dapat diidentifikasi sebagai hukum; dan kedua, meneliti apakah Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010 dapat berlaku efektif dalam arti dapat diterima oleh masyarakat hukum adat Bali.

Bila melihat pada pandangan Soetandyo Wignjosoebroto, maka penelitian yang dilakukan sekarang ini adalah penelitian *non doktrinal* yaitu penelitian berupa studi empiris untuk melihat proses bekerjanya hukum di dalam masyarakat, dalam hal ini apakah masyarakat hukum adat Bali dapat

menerima Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010. Tipologi penelitian ini sering disebut sebagai *Socio Legal Research*.

Topik utama dari penelitian ini adalah melihat keadaan pada masyarakat hukum adat Bali, dalam menyikapi Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010 yang pada intinya memberikan hak waris kepada anak perempuan, walaupun hanya untuk harta gunakaya saja dari kedua orang tuanya. Untuk mencari jawaban tentang apakah ketentuan hukum (Keputusan MUDP) sebagaimana dimaksud dapat berlaku efektif ataupun tidak di dalam masyarakat, pada umumnya dimulai dengan pertanyaan bagaimana (*how*), sedangkan dalam mencari jawaban tentang alasan dari hasil yang diperoleh dalam penelitian (mengapa efektif atau mengapa tidak efektif) pada umumnya akan dimulai dengan menggunakan pertanyaan apa (*what*).

Penelitian yang dilakukan sekarang ini adalah dilakukan untuk mengetahui apakah Keputusan MUDP tersebut telah berlaku efektif di masyarakat, dengan harapan untuk mendapatkan jawaban bahwa Keputusan MUDP tersebut dapat berlaku efektif atau tidak efektif. Selanjutnya setelah mendapatkan jawaban tersebut, akan dianalisis lagi untuk mendapatkan jawaban, tentang alasan mengapa Keputusan MUDP tersebut dapat berlaku efektif ataukah tidak dapat dapat berlaku efektif.

Dalam penelitian hukum umumnya dikenal adanya 6 (enam) pendekatan, yaitu: (1) pendekatan kasus (*the case Approach*); (2) pendekatan perundang-undangan (*the statute approach*); (3) pendekatan fakta (*the fact approach*); (4) pendekatan analisis konsep hukum (*analitical & conseptual approach*); (5) pendekatan sejarah (*historical approach*); dan (6) pendekatan perbandingan (*comparative approach*) (Peter Mahmud Marzuki, 2005 : 94).

Dalam penelitian ini digunakan 3 pendekatan, yakni: Pendekatan Fakta (*The Fact Approach*) dan Pendekatan Analisis Konsep Hukum (*Analitical and Conseptual Approach*) dan Pendekatan Perbandingan (*Comparative Approach*).

Pendekatan Fakta digunakan dalam melihat bagaimana senyatanya yang ada di dalam masyarakat, dalam artian apakah Keputusan MUDP itu dapat dilaksanakan ataukah tidak dapat dilaksanakan. Melalui pendekatan ini sekaligus diharapkan akan dapat ditemukan tentang jawaban, mengapa Keputusan MUDP itu dapat berlaku efektif ataukah mengapa tidak dapat diberlakukan dengan efektif. Pendekatan Analisis Konsep Hukum digunakan untuk mengetahui pemahaman para responden ataupun informan tentang konsep “waris”, oleh karena dalam kepustakaan yang ada, konsep waris menurut hukum adat adalah berbeda dengan konsep waris sebagaimana yang dikenal dalam sistem Hukum Barat (KUH Perdata) maupun konsep waris di dalam Hukum Islam. Pendekatan Analisis Konsep Hukum ini, akan disandingkan dengan Pendekatan Perbandingan, yakni membandingkan bagaimana konsep “waris” menurut hukum adat dibandingkan dengan konsep waris dalam hukum Barat (BW/KUH Perdata) dan konsep waris dalam hukum Islam.

Penelitian yang dilakukan sekarang ini adalah penelitian hukum empiris yang menurut sifatnya dibedakan menjadi: (1) penelitian eksploratif (penjajakan atau penjelajahan), (2) Penelitian Deskriptif, (3) Penelitian eksplanatoris, dan (4) penelitian verifikatif.

Penelitian yang dilakukan sekarang ini adalah penelitian yang bersifat eksplanatoris. Dalam penelitian ini diharapkan akan dapat menjelaskan tentang: *pertama*, tentang maksud dari ditetapkannya Keputusan MUDP Bali tentang pemberian hak waris untuk anak perempuan, *kedua* untuk mengetahui apakah Keputusan MUDP Nomor 01/Kep/Psm-3/X/2010 ini dapat diterima oleh masyarakat hukum adat Bali, dan *ketiga*, adalah untuk mengetahui apakah alasan untuk menerima ataupun tidak menerimaan Keputusan MUDP Nomor 01/Kep/Psm-3/X/2010 oleh masyarakat hukum adat Bali.

Oleh karena penelitian yang dilakukan sekarang ini adalah penelitian empiris, data yang diperlukan adalah data primer, yakni data yang diperoleh langsung dari sumber data, jadi bukan hasil olahan orang lain. Sedangkan sebagai pendukung dari data primer ini adalah data skunder yang diperoleh melalui bahan-bahan hukum berupa literatur-literatur yang menyangkut hal yang akan

diteliti, dalam hal ini bahan-bahan hukum yang digunakan adalah buku literatur-literatur yang menyangkut hukum adat, khususnya yang berkenaan dengan hukum adat waris Bali.

Dalam penelitian hukum empiris, dikenal adanya 4 (empat) cara dalam melakukan pengumpulan data. Keempat cara tersebut, adalah: studi dokumen, wawancara, observasi, dan penyebaran kuisioner/angket. Penelitian yang dilakukan sekarang ini, dalam pengumpulan data yang dilakukan adalah melalui studi dokumen, wawancara, dan penyebaran kuisioner/angket.

Teknik pengambilan sampel atas populasi, penelitian yang digunakan dalam penelitian ini adalah dengan teknik *non probability sampling*. Penggunaan teknik *non probability sampling* ini dilakukan oleh karena penelitian yang dilakukan saat sekarang ini tidak digunakan untuk membuat generalisasi tentang populasinya, karena sesuai dengan ciri umum dari *non probability sampling* ini adalah bahwa tidak semua elemen dalam populasi mendapat kesempatan yang sama untuk menjadi sampel, karena pengambilan data dilakukan dengan cara *purposive*. Sesuai dengan judul penelitian yang diajukan, lokasi penelitian adalah mengambil 3 (tiga) tempat, yakni di Kabupaten Karangasem, Kabupaten Tabanan, dan Kabupaten Buleleng.

3. Result

3.1. Hukum Adat dan Hukum Waris Adat

Soepomo tulisan beliau “Beberapa Catatan Mengenai Kedudukan Hukum Adat”, memberikan pengertian hukum adat sebagai hukum yang tidak tertulis di dalam peraturan-peraturan legislatif (*unstatutory law*) meliputi peraturan-peraturan hidup yang meskipun tidak ditetapkan oleh yang berwajib, toh ditaati dan didukung oleh rakyat berdasarkan atas keyakinan bahwasanya peraturan-peraturan tersebut mempunyai kekuatan hukum (Djaren Saragih, 1996:13).

Dalam Seminar Hukum Adat dan Pembinaan Hukum Nasional di Yogyakarta yang diadakan pada tanggal 15-17 Januari 1975 yang diselenggarakan oleh BPHN bekerjasama dengan Universitas Gajah Mada, dengan kesimpulan mengenai hukum adat: “Hukum adat adalah hukum Indonesia yang tidak tertulis dalam bentuk perundang-undangan Republik Indonesia yang di sana-sini mengandung unsur agama” (Tolib Setiady, 2013:29). Hukum adat adalah hukum non statutar yang sebagian besar adalah hukum kebiasaan dan sebagian kecil saja hukum Islam. Hukum adat inipun melingkupi hukum yang berdasarkan keputusan-keputusan hakim yang berisi asas-asas hukum dalam lingkungan di mana ia memutus perkara. Hukum pidana ini berurat berakar pada kebudayaan tradisional yang hidup karena ia masih menjelmakan perasaan hukum yang nyata dari rakyat. Sesuai dengan fitrahnya sendiri hukum adat ada dalam keadaan tumbuh dan berkembang seperti hidup itu sendiri.

Perlunya dijelaskan tentang hal ini adalah untuk dapat dipahami bahwa, apakah keputusan MUDP Nomor: 01/Kep/Psm-3/MDP Bali/X/2010 ini adalah merupakan bagian dari hukum adat yang harus ditaati masyarakat hukum adat Bali, sehingga memerlukan kajian tentang keharusan akan pentaatannya ataupun hanya sebagai pedoman saja yang perlu dipertimbangkan apabila terjadi sengketa di dalam pembagian harta warisan.

Hukum waris dalam suasana hukum adat adalah suatu kompleks kaidah-kaidah yang mengatur proses penerusan dan pengoperan harta baik materiil maupun immateriil dari suatu generasi kepada generasi berikutnya. Proses ini tidak selalu aktual dengan adanya kematian, atau walaupun tidak ada kematian proses pewarisan itu tetap berjalan, yakni berupa penerusan harta materiil dan harta immateriil itu tetap berjalan berupa penerusan dari generasi ke generasi berikutnya. Dalam hukum adat Bali, penerusan generasi ke generasi berikutnya adalah berupa penerusan kewajiban dan hak dari orang tua (generasi awal) kepada anak sebagai generasi berikutnya. Dengan demikian ketentuan yang biasa berjalan dan masih diikuti oleh sebagian besar masyarakat hukum adat Bali adalah bahwa siapa yang menjalankan kewajiban maka dialah yang akan mendapatkan hak. Masyarakat hukum

adat Bali adalah masyarakat yang besistem kekeluargaan patrilineal, maka kewajiban dan hak sebagai penerus generasi itu akan diteruskan kepada anak laki-laki saja.

3.2. Keputusan MUDP Nomor: 01/Kep/Psm-3/MDP Bali/X/2010

Melihat pada Keputusan MUDP Nomor: 01/Kep/Psm-3/MDP Bali/X/2010 ternyata ada hal-hal baru yang berbeda dengan hukum adat yang biasanya berlaku pada masyarakat hukum adat Bali. Dari tujuh point Keputusan MUDP tersebut, ada hal yang sama dan ada pula yang berbeda dengan apa yang biasa berlaku di Bali sebagai hukum adat yang sehari-harinya diberlakukan oleh masyarakat hukum adat Bali. Hal-hal sebagaimana dimaksud adalah sebagai berikut:

Pertama: *Suami dan istrinya serta saudara laki-laki suami dan istrinya, mempunyai kedudukan yang sama dalam usaha untuk menjamin bahwa harta pusaka dapat diteruskan kepada anak dan cucunya untuk memelihara atau melestarikan warisan immateriil.* Ketentuan ini dapat dikatakan masih sejalan dengan hukum adat Bali yang umumnya berlaku.

Kedua: *Selama dalam perkawinan, suami dan istrinya mempunyai kedudukan yang sama terhadap harta guna kayanya (harta yang diperoleh selama status perkawinan).* Ketentuan ini dapat dikatakan masih sejalan dengan hukum adat Bali yang umumnya berlaku.

Ketiga: *Anak kandung (laki-laki dan perempuan) serta anak angkat (laki-laki dan perempuan) yang belum kawin pada dasarnya mempunyai kedudukan yang sama terhadap harta guna kaya orang tuanya.* Ketentuan ini **ada perbedaan** dengan hukum adat Bali yang umumnya berlaku.

Keempat: Anak kandung (laki-laki dan perempuan) serta anak angkat (laki-laki dan perempuan) berhak atas harta guna kaya orang tuanya, sesudah dikurangi sepertiga sebagai *due tengah* (harta bersama), yang dikuasai (bukan dimiliki) oleh anak yang *nguwubang* (melanjutkan *swadharma* atau tanggung jawab) orang tuanya. Ketentuan ini **ada perbedaan** dengan hukum adat Bali yang umumnya berlaku.

Kelima: Anak yang berstatus *purusa* berhak atas satu bagian harta warisan, sedangkan yang berstatus *predana* atau *ninggalin kedaton* terbatas berhak atas sebagian atau setengah dari harta warisan yang diterima oleh anak yang berstatus *purusa*. Ketentuan ini **ada perbedaan** dengan hukum adat Bali yang umumnya berlaku.

Keenam: Dalam hal pembagian warisan, anak yang masih dalam kandungan mempunyai hak yang sama dengan anak yang sudah lahir, sepanjang dia yang akan dilahirkan hidup. Dapat dikatakan masih sejalan dengan hukum adat Bali yang umumnya masih diberlakukan oleh masyarakat hukum adat Bali.

Ketujuh: Anak yang ninggalin kedaton penuh tidak berhak atas warisan, tetapi dapat diberi bekal oleh orang tuanya dari harta guna kaya tanpa merugikan ahli warisnya. Dapat dikatakan masih sejalan dengan hukum adat Bali yang umumnya masih diberlakukan. Dapat dikatakan masih sejalan dengan hukum adat Bali yang umumnya masih diberlakukan oleh masyarakat hukum adat Bali.

Perbedaan-perbedaan inilah yang selanjutnya diteliti untuk mendapatkan jawaban apakah Keputusan MUDP ini dapat diterima oleh masyarakat hukum adat ataukah tidak diterima. Selanjutnya diteliti tentang mengapa atau atas dasar alasan apa masyarakat hukum adat menerima ataupun tidak menerima keputusan MUDP tersebut.

Dalam mazhab Sosiological Jurisprudence, dapat dikemukakan pandangan Eugen Ehrlich dan Roscoe Pound. Oleh Ehrlich dikatakan bahwa hukum yang baik adalah hukum yang sesuai dengan hukum yang hidup (*Living Law*) dalam masyarakat (Lili Rasjidi dan Ira Rasjidi, 2001:66). Roscoe Pound dengan teorinya *law as a tool social engineering* mengatakan bahwa hukum adalah alat untuk memperbaharui (merekayasa) masyarakat (Sukarno Aburaera, 2014:127). Bila masyarakat hukum adat menerima keputusan MUDP ini berarti keputusan MUDP ini telah sesuai dengan hukum yang hidup dalam masyarakat, dan apabila masyarakat hukum adat tidak menyetujui maka ini berarti keputusan MUDP ini belum sesuai dengan hukum yang hidup dalam masyarakat. Begitu pula halnya, apabila masyarakat hukum adat menerima keputusan MUDP yang sesungguhnya keputusan

tersebut tidak berkesesuaian dengan hukum yang hidup dalam masyarakat, maka dapat dikatakan bahwa keputusan MUDP ini telah berhasil menggiring masyarakat kearah pembaharuan.

3.3. Pemberian Waris Kepada Anak Perempuan

Dalam hukum adat Bali seorang anak laki-laki berkedudukan sebagai *purusa* dan anak perempuan sebagai *predana*. Kedudukan sebagai *purusa* ini adalah wajib untuk meneruskan kewajiban dari orang tuanya sebagai pelanjut generasi. Kewajiban ini adalah *kewajiban ke luhur* maupun *kewajiban ke teben*. Dimaksud dengan *kewajiban ke luhur* adalah kewajiban sebagai penerus generasi dalam penyelenggaraan penerusan hubungan kepada Ida sang Hyang Widhi Wasa/Tuhan Yang Maha Esa seta para leluhur sebagai generasi awal yang diteruskan pada saat sekarang. Bentuk kewajiban ini antara lain adalah berupa memelihara sanggah, merajan, dadia, dan tempat-tempat pemujaan lainnya. Penyelenggaraan *kewajiban keteben* adalah kewajiban kepada persekutuan dalam hal ini desa sebagai suatu tempat untuk bernaung dalam menjalani kehidupan.

Kewajiban dan hak itu pada dasarnya adalah jatuh kepada anak laki-laki dan bukan kepada anak perempuan. Anak perempuan dapat berkedudukan sebagai *purusa* yakni dengan mengangkatnya sebagai seorang *sentana rajeg* yang selanjutnya kawin dalam bentuk *perkawinan nyeburin*. Dengan diangkatnya sebagai *sentana rajeg*, maka anak perempuan berkedudukan sama seperti anak laki-laki dan suami dari si perempuan itu berkedudukan sebagai *predana* (tidak dibebani kewajiban). Laki-laki suami dari perempuan yang berstatus sebagai *sentana rajeg* ini keluar/putus hubungan dengan orang tuanya. Di tempat orang tuanya, laki-laki suami dari *sentana rajeg* ini adalah tidak mewaris.

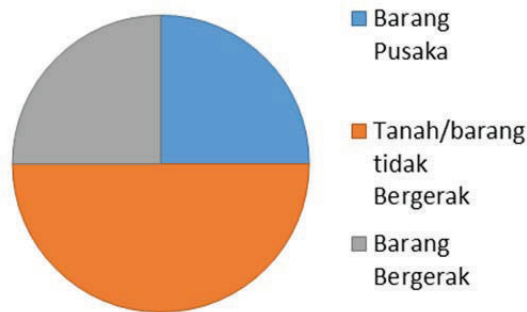
Di beberapa daerah di Karangasem, ada kebiasaan memberikan warisan kepada anak perempuan dengan perbandingan ategen asuun dengan saudara laki-lakinya. Namun yang mendapatkan warisan ini adalah anak perempuan yang tidak kawin keluar, dalam arti ia ikut dalam menjalankan kewajiban dan hak di rumah orang tuanya sebagaimana saudara laki-lakinya, yakni terkena *ayahan luh* (kewajiban perempuan). Selanjutnya apabila perempuan itu kawin keluar, maka harta warisan yang telah ia dapatkan itu harus dikembalikan kepada saudara laki-lakinya yang berkedudukan sebagai pelanjut generasi orang tuanya. Jadi tampak di sini bila perolehan harta warisan ini sangat terkait dengan penerusan pelaksanaan kewajiban dari orang tuanya.

Dalam kebiasaan yang berlaku dalam masyarakat hukum adat Bali, walaupun anak perempuan tidak mendapatkan waris, kepada anak perempuan juga diberikan harta yang diistilahkan sebagai *bekel*, *tadtadan*, *pebaang*, *jiwa dana* dan istilah-istilah lainnya). Dimaksudkan dengan bekel ini adalah berupa pemberian harta benda materiil yang diberikan oleh orang tua kepada anak perempuannya ketika ia melakukan perkawinan. Pemberian ini diberikan secara sukarela tanpa adanya ikatan kewajiban kepadanya. Maksud dari pemberian ini adalah sebagai bekal dari orang tua kepada anak perempuannya yang melakukan perkawinan keluar, yakni agar nantinya dapat digunakan sebagai modal awal dalam menjalani hidup rumah tangga membangun keluarga baru yang terlepas dari orang tuanya untuk hidup bersama dan merupakan bagian dari keluarga suaminya.

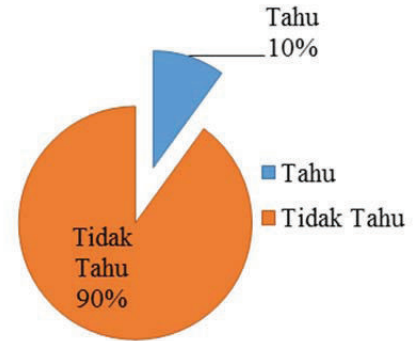
4. Hasil Penelitian

Dari penelitian yang dilakukan terhadap penerimaan masyarakat hukum adat atas keluarnya Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010 untuk Kabupaten Gianyar melalui sampling pada 50 responden dari seluruh Desa Pakraman yang terpilih, didapati bahwa 5 responden menyatakan tahu adanya Putusan MUDP terkait perubahan hak mewaris perempuan masyarakat Hindu di Bali yakni melalui adanya perkembangan informasi pada media sosial sedangkan sisanya yakni 45 responden menyatakan tidak mengetahui adanya Putusan MUDP tersebut dikarenakan belum tersosialisasinya informasi tersebut pada lingkungan tiap Desa Pakraman yang ada dan juga bergantung pada kesepakatan didalam keluarga pewaris yang akan mewariskan pada ahli waris terkait pula dengan sistem kekerabatan dan sistem kekeluargaan yang belum dapat menerima pemikiran progresif dari Putusan MUDP ini.

Proporsi Warisan yang Sepatutnya diberikan bagi Kaum Perempuan (Seluruh Responden Setuju)

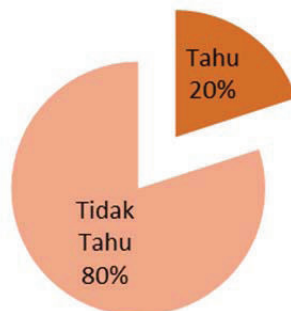


Derajat Mengetahui dari KMHA (Desa Pakraman) di Gianyar terhadap Perubahan Hak Mewaris Perempuan di Bali

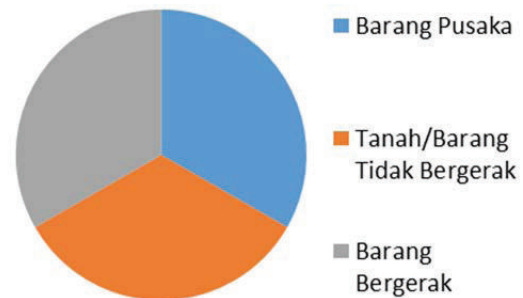


Dari data tersebut, didapati bahwa seluruhnya atau 50 responden dari Desa Pakraman yang terpilih menyatakan setuju terhadap pemberian hak mewaris bagi kaum perempuan Hindu di Bali hal ini mengingat perlunya kesetaraan gender, saat ini juga merupakan era perlawanan dan pencegahan terhadap segala bentuk diskriminasi terhadap seluruh kaum yang rentan (vulnerable groups), serta pertimbangan Hak Asasi Manusia antara pria dengan wanita sebagai insan yang sama derajat dan harkat martabatnya. Dalam hal ini, warisan yang diberikan terdapat kesepahaman pada seluruh responden tersebut, proporsional 25% dari porsi warisan merupakan barang pusaka, 50% berupa tanah atau barang tidak bergerak serta 25% sisanya merupakan barang bergerak.

Derajat Mengetahui dari KMHA (Desa Pakraman) di Kabupaten Bangli terhadap Perubahan Hak Mewaris Perempuan di Bali



Proporsi Warisan yang Sepatutnya diberikan bagi Kaum Perempuan (Seluruh Responden Setuju)



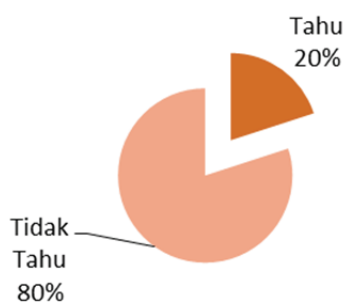
Sedangkan, untuk Kabupaten Bangli melalui sampling pada 50 responden dari seluruh Desa Pakraman yang terpilih, didapati bahwa 10 responden menyatakan tahu adanya Putusan MUDP terkait perubahan hak mewaris perempuan masyarakat Hindu di Bali dan memiliki alasan yang

serupa dengan KMHA pada Kabupaten Gianyar, yakni melalui sumber perkembangan informasi pada media sosial sedangkan sisanya yakni 40 responden menyatakan tidak mengetahui adanya Putusan MUDP tersebut dikarenakan belum tersosialisasinya informasi tersebut pada lingkungan tiap Desa Pakraman yang ada dan juga bergantung pada kesepakatan didalam keluarga pewaris yang akan mewariskan pada ahli waris terkait pula dengan sistem kekerabatan dan sistem kekeluargaan yang belum dapat menerima pemikiran progresif dari Putusan MUDP ini.

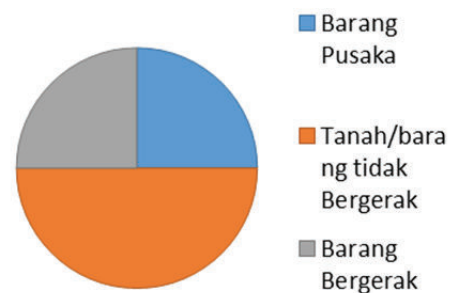
Dari data tersebut, didapati bahwa seluruhnya atau 50 responden dari Desa Pakraman yang terpilih menyatakan setuju terhadap pemberian hak mewaris bagi kaum perempuan Hindu di Bali hal ini mengingat perlunya kesetaraan gender antara kaum pria dengan kaum perempuan tanpa pembedaan dan batasan dalam bentuk apapun. Dalam hal ini, warisan yang diberikan terdapat kesepahaman pada seluruh responden tersebut, proporsional 33,3% dari porsi warisan merupakan barang pusaka, 33,4% berupa tanah atau barang tidak bergerak serta 33,3% sisanya merupakan barang bergerak.

Serta pada Kabupaten Klungkung melalui sampling pada 50 responden dari seluruh Desa Pakraman yang terpilih, didapati bahwa 10 responden menyatakan tahu adanya Putusan MUDP terkait perubahan hak mewaris perempuan masyarakat Hindu di Bali dan memiliki alasan yang serupa dengan KMHA pada Kabupaten Gianyar, yakni melalui sumber perkembangan informasi pada media sosial sedangkan sisanya yakni 40 responden menyatakan tidak mengetahui adanya Putusan MUDP tersebut dikarenakan belum tersosialisasinya informasi tersebut pada lingkungan tiap Desa Pakraman yang ada dan juga bergantung pada kesepakatan didalam keluarga pewaris yang akan mewariskan pada ahli waris terkait pula dengan sistem kekerabatan dan sistem kekeluargaan yang belum dapat menerima pemikiran progresif dari Putusan MUDP ini.

Derajat Mengetahui dari KMHA (Desa Pakraman) di Kabupaten Bangli terhadap Perubahan Hak Mewaris Perempuan di Bali



Proporsi Warisan yang Sepatutnya diberikan bagi Kaum Perempuan (Seluruh Responden Setuju)



Dari data tersebut, didapati bahwa seluruhnya atau 50 responden dari Desa Pakraman yang terpilih menyatakan setuju terhadap pemberian hak mewaris bagi kaum perempuan Hindu di Bali hal ini mengingat perlunya kesetaraan gender, saat ini juga merupakan era perlawanan dan pencegahan terhadap segala bentuk diskriminasi terhadap seluruh kaum yang rentan (vulnerable groups), serta pertimbangan Hak Asasi Manusia antara pria dengan wanita sebagai insan yang sama derajat dan harkat martabatnya. Dalam hal ini, warisan yang diberikan terdapat kesepahaman pada seluruh responden tersebut, proporsional 25% dari porsi warisan merupakan barang pusaka, 50% berupa tanah atau barang tidak bergerak serta 25% sisanya merupakan barang bergerak.

Dan dalam hal ini, dari keseluruhan hasil yang diteliti tersebut didapati dua arus besar yakni sisi menerima dan sisi menolak Keputusan MUDP terkait perubahan hak mewaris perempuan Hindu Bali, yang dapat dijabarkan sebagai berikut:

1. Sebagian dari pandangan masyarakat dapat menerima bila anak perempuan diberikan bagian dari harta warisan atau dapat menerima ketentuan sebagaimana yang disebutkan dalam Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010. Penerimaan ini adalah dilandasi atas: (a) untuk kepentingan bagi si anak perempuan nantinya setelah berumah tangga; (b) sesuai dengan Hak Asasi Manusia, bahwa tidak ada pembedaan antara laki-laki dengan perempuan; (c) adanya kepastian anak perempuan mendapatkan bagian harta dari orang tuanya, dan (d) harta yang diberikan adalah harta guna kaya.
2. Bagian lain dari pandangan masyarakat belum menerima atau tidak sepaham untuk memberikan warisan kepada anak perempuan sebagaimana disebutkan dalam Keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010. Adapun hal yang melandasi pandangan ini adalah: (a) sebagai penerus generasi/keturunan adalah hanya anak laki-laki; (b) kata waris itu berkait (tidak dapat lepas) dengan adanya kewajiban; (c) anak perempuan telah diberikan bekel; dan (d) ketidak cukupan sepertiga dari harta gunakaya untuk kepentingan *pesidikan*.
3. Selain kedua simpulan yang didapatkan, dalam penelitian ini juga ditemukan pandangan-pandangan kedepan terhadap bagaimana hukum adat Bali itu akan diberlakukan dalam menghadapi perkembangan masyarakat yang secara tidak langsung akan merubah perasaan hukumnya dalam pelaksanaan hukum adat itu sendiri dikarenakan hal-hal sebagai berikut: (a) Hukum Adat adalah hukum yang tidak tertulis; (b) makin menguatnya ikatan somah dan menipisnya ikatan kerabat; (c) makin menipisnya ikatan terhadap persekutuan hukumnya; dan (d) adanya pemikiran praktis yang meninggalkan kebiasaan-kebiasaan lama.

5. Conclusion

Sebagai ahir dari tulisan ini yang disingkat dari penelitian yang dilakukan, maka dapat dikemukakan hal-hal sebagai berikut berkaitan dengan keputusan MUDP Nomor 01/Kep/Psm-3/MDP Bali/X/2010, maka dapat dikemukakan bahwasanya dalam mengarahkan masyarakat ke arah mempersamakan kedudukan anak laki-laki dan perempuan kiranya tidak diperlukan adanya pengaturan khusus seperti dibuatnya Keputusan MUDP Nomor: 01/Kep/Psm-3/MDP Bali/X/2010 ini. Hal ini disebabkan karena hukum adat itu adalah hukum yang tidak tertulis yang mempunyai karakter yang berbeda dengan hukum positif yang ditetapkan oleh negara. Hukum adat itu akan berkembang, berubah, atau tidak diikuti lagi oleh masyarakatnya akan berlangsung dengan sendirinya sesuai dengan perkembangan perasaan hukum masyarakat pendukungnya melihat kepada tempat, situasi, dan keadaan mengikuti perkembangan jaman itu sendiri. Apabila ingin menegaskan bahwa anak perempuan juga harus diberikan bagian dari harta guna kaya dari orang tuanya, maka tidak perlu diatur dalam keharusan memberikan warisan dengan cara memberikan bagian yang pasti menurut ilmu hitung. Hal ini disebabkan karena pandangan masyarakat juga sudah berubah, di mana kebanyakan orang tua telah memberikan bagian harta gunakayanya kepada anak perempuannya dalam bentuk jiwa dana dan bekel. Akan tetapi pemberian itu tentu atas dasar kemampuan finansial yang ada pada orang tua yang akan memberikan bagian dari harta gunakayanya tersebut. Perlu kesadaran bersama bahwa hukum adat itu adalah hukum adat itu adalah hukum yang tidak tertulis, karrenanya hukum adat itu akan berubah dengan sendirinya sesuai dengan perkembangan masyarakat pendukungnya. Pemaksaan perubahan ataupun penyeragaman dalam pengaturran dalam bidang-bidang adat tentu sulit dilakukan oleh karena setiap masyarakat mempunyai *folks geist*/jiwa bangsanya sendiri.

Acknowledgement

Ucapan terimakasih penulis ucapkan kepada seluruh responden maupun para peneliti yang telah berjerih lelah dan sepenuhnya mendukung penulisan makalah hingga selesai tepat pada waktunya. Penulis juga tidak lupa mengucapkan terimakasih kepada UNUD atas dana penelitian yang diberikan pada skim Hibah Riset Inovasi atas penelitian terkait Masyarakat Hukum Adat Atas Keluarnya Keputusan MUDP Bali Nomor 01/Kep/Psm-3/Mdp Bali/X/2010 (Studi Empiris Di Kabupaten Gianyar, Bangli dan Klungkung) ini.

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Effect of Service Quality and Social Media on Volunteer Intentions For Blood Donors at Indonesia Red Cross Blood Donor Unit Gianyar Regency

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Abstract: This study aims to determine and analyze how much influence the Quality of Service and Social Media to intention of blood donor volunteers at at Indonesia Red Cross Blood Donor Unit Gianyar Regency. The sample used in this study is the total number of registered donor populations at last three years with total of 12.257 donors volunteer. The sample used in this study as many as 100 people / respondents with error rate set 10%. Sampling method in this research is accidental sampling (respondent encountered during research). Results of data processing with SPSS For Windows Version 24 obtained the results of multiple linear regression results obtained results of multiple linear regression analysis The result of the analysis of multiple correlation is 0,730, located between 0.60 to 0.799 which means there is a positive and strong correlation. Based on the result of determination analysis, the value of R SQUARE (R^2) stated that 55,1% of blood donor volunteer interest is influenced by both variables, service quality and Social Media, the rest volunteer donor blood Intentions influenced by other variables outside of research. Simultaneously the Quality of Service and Social Media influence on the real Intentions of blood donor at Indonesia Red Cross Blood Donor Unit Gianyar Regency. Partially, the Service Quality and Social Media have positive and significant effect on Intention of blood donor volunteer in Indonesia Red Cross Blood Donor Unit Gianyar Regency. Thus the Quality of Service and Social Media is not only important for the company or profit organization but for non profit organization both of them give a positive effect. Especially Indonesia Red Cross Blood Donor Unit Gianyar Regency, engaged in community services, especially blood transfusion.

Keywords: *service Quality, Social Media and Volunteer Intentions for Blood Donors*

1. Introduction

In the midst of tight industry competition, public or nonprofit organizations must also compete by prioritizing the quality of service, while in nonprofit organizations promotion is very rare, but now they also have to do promotions to further increase public awareness of the public services offered. Public awareness will be sustainable when they find a quality of public service, because the survival of an organization is largely determined by the quality of its services. According to Kotler (2013) service is any action or activity that can be offered by a party to another party, which is basically intangible and does not result in any ownership. The Indonesian Red Cross (PMI) which we know as a social humanitarian organization is also required to provide satisfying services, especially in blood transfusion services because PMI is the only organization that has the authority to provide blood transfusion services based on Government Regulation No. 18 of 1980 concerning Blood Transfusion, but in its implementation the responsibility for providing blood for the needs of the community was entrusted to the PMI Blood Donor Unit (UDD). In 2017 the number of donors in Gianyar Regency was only 1,762 people out of a total population of 528,974 and the number of blood requests reached 8,755 blood bags. Of the total population, the Gianyar community still lacks interest in donating blood. UDD PMI Gianyar Regency wants to improve the quality of service to the community and donor volunteers, such as Suwitri said (Suwitri in Angga 2017: 29) the Quality of Service is the quality of services provided to customers, both internal customers and external customers based on service standards.

To be able to improve the quality of service, there is a need for communication and interaction between users and service providers, one of which is through social media. One of the quality improvements made by UDD PMI Gianyar increases interest in blood donors, is to provide information on blood donor activities, blood stock, and where blood donors are held, is through Social Media, because social media is now very common and familiar in the community. Submission of marketing communication through social media is assessed through 4C, namely context, communication, collaboration and connection (Hauer in Arief and Millianyani, 2015).

Motivational strengths towards donor satisfaction and loyalty have increased over a five-year period due to the positive influence of social marketing (Jolanta Žemgulienė, 2016. Kotler and Keller (2016: 642) define social media as a tool or method used by consumers to share information in the form of text, images , audio and video to others and the company or vice versa. Like Deru R. Indika and Cindy Jovita, (2017) said, Instagram Social Media as a means of promotion to increase consumer buying interest. Other previous studies focused on how social media marketing through Instagram affect consumer buying interest (Giri Maulana Arief, Heppy Miliyani, 2017), striking charitable behaviors and social media influence retention of donors (Chell, Kathleen & Mortimer, Gary (2014) The following are blood request data and blood donations at UDD PMI Gianyar Regency

Tabel 1
Data on Number of Blood Requests and Number of Donors
UDD PMI Gianyar Regency
Year 2015 - 2017

Year	BLOOD REQUESTS	DONORS		Total
		Vocational Donors	Substitute Donors	
2015	6.471	1.876	1.378	3.254
2016	8.274	2.598	1.314	3.912
2017	8.755	3.680	1.411	5.091
TOTAL	23.500	8.154	4.103	12.257

Source: PMI Gianyar Regency Blood Donor Unit

From the above data can be seen a comparison between blood demand and number of donors. Where the amount of blood demand is higher than the number of people who are donors, due to the low interest of donors in Gianyar Regency. This research is to provide more in-depth knowledge about how Social Media and Service Quality can influence the interest of donors, Blood at the Gianyar Regency PMI Blood Donor Unit. The purpose of this study was to determine the effect of partial and simultaneous Service Quality and Social Media on the Intention of blood donor volunteers at the PMI District Blood Donation Unit in Gianyar Regency.

• **Conceptual Framework and Hypotheses Research**

Thinking Framework for the Effect of Service Quality and Social Media on Intention in Blood Donor Volunteers at the PMI District Blood Donation Unit in Gianyar Regency

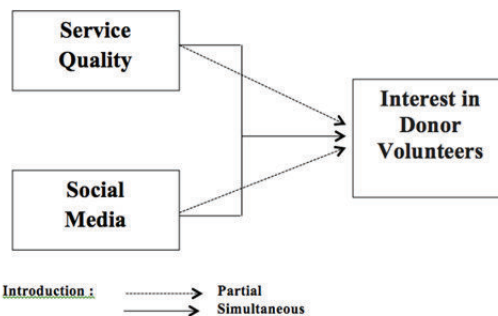


Figure 1.: Conceptual Model Effect of Service Quality and Social Media on Volunteer Intentions For Blood Donors

- **Hypothesis**

The hypothesis is a proportion, condition or principle that is considered true so that a logical consequence can be drawn, in this way a test of the truth is carried out using facts about the relationship of Service Quality, Social Media and Intention of blood donors in the Blood Donation Unit, PMI of Gianyar Regency

- a. Hypothesis 1: Partially positive and significant influence between Service Quality on Intention of blood donor volunteers
- b. Hypothesis 2: Partially positive and significant influence between Social Media on the Intention of blood donor volunteers
- c. Hypothesis 3: Simultaneous positive and significant influence between Service Quality and Social Media on the Intention of blood donor volunteers.

2. Research Method

In this study the population to be studied was blood donor volunteers in Gianyar Regency PMI Blood Donor Unit in 2015 - 2017 totaling 12,257 people with the number of samples in this study $N = 100$. This study uses data collection through, observation methods, interview methods, and literature studies are also conducted using a questionnaire to see the variables of Service Quality, Social Media and Intention in blood donor volunteers. Questionnaires use a Likert scale, with a statement of one's attitude towards something, such as agreeing, disagreeing, happy, not happy, good, not good. Parasuraman, et al in Fendy Tjiptono (2012) said that in providing good services to customers, there are five determinants or indicators of Service Quality, including: Tangibles, Reliability, Assurance, Responsiveness and Emphaty.

Data analysis used is Multiple Linear Regression Analysis, in this analysis can be seen how the independent variables namely Service Quality (X_1) and Social Media (X_2) can affect (positively or negatively) the dependent variable namely Interest of Blood Donor Volunteers (Y), and Multiple Correlation Analysis, this analysis is used to determine the relationship between Service Quality and Social Media with the Intention of blood donor volunteers.

3. Result

The data recapitulation of respondents' characteristics shows that blood donor volunteers aged between 18 years to 30 years are 54 people or 54%, aged between 31 years to 40 years as many as 29 people or 29%, aged between 41 years to 50 years as much 12 people or 12% and those aged between 51 years and 60 years are 5 people or 5%. Analysis of Multiple Linear Regression in this study, obtained the results of accurate multiple regression analysis with a significant level of $\alpha = 0.05$ or 5%. Based on the output in the table below, the multiple linear line equation can be obtained as follows:

$$Y = 4,982 + 0,088X_1 + 0,439X_2$$

Information :

Y = Intention in Blood Donor Volunteers

X_1 = Service Quality

X_2 = Social Media

The results of multiple calculation analysis can be seen in the following table:

Table 2
Multiple Linear Regression Results

Variable	Regression Coefficient	t_{hitung}	<u>Significant</u>	Information
Constant	4,982	1,972	0,051	<u>Significant</u>
Service Quality (X_1)	0,088	1,989	0,049	<u>Significant</u>
Social Media (X_2)	0,439	7,917	0,000	<u>Significant</u>

Source: Primary Data Processed, 2018

The results of the research that have been done and processed to determine the Effect of Service Quality and Social Media on Intention of Blood Donor Volunteers in the regression equation are $Y = 4.982 + 0.088X_1 + 0.439X_2$. This means that both service quality and social media variables have a positive effect on interest variables of blood donor volunteers. If the variables of service quality and Social Media are good, the interest variable of volunteer blood donors will increase. It can be said that the quality of service has a determination value of 55.1%, meaning that the quality of Service and Social Media together influence the interest of blood donor volunteers by 55.1%, while the remaining 44.9% is influenced by other factors not examined. From the data above it can be seen that the value of $F_{count} = 59.538$ is greater than the value of $F_{table} = 3.09$. Therefore H_0 is rejected and H_a is accepted. As well as with a significance level of 0,000, the value is 0,000 which is smaller than the significant criteria of $\alpha = 0.05$.

This shows that there is a positive and significant influence between Service Quality and Social Media simultaneously on the Intention of blood donor volunteers. The T Quality Test of Service Quality is partially explained that if the value of $t_{count} = 1.989$ and the value of $t_{table} = 1.661$, then the value of t_{count} is greater than the value of t_{table} and a significant value of $0.049 < 0.05$ and t_{count} is in the rejection area H_0 , meaning statistically the quality of service partially positive and significant effect on the Intention of blood donor volunteers. Whereas for the Social Media T_{test} results obtained that if the value of $t_{count} = 7.917$ and the value of $t_{table} = 1.661$, then the value of t_{count} is greater than the value of t_{table} and a significant value of $0.000 < 0.05$ and t_{count} is in the rejection region H_0 , therefore H_0 is rejected and H_a was received, it can be concluded that Social Media had a positive and significant effect partially on the Intention of blood donor volunteers at the PMI Blood Donor Unit in Gianyar Regency.

Social Media correlated strongly with the Interest of blood donor volunteers and a correlation value of 0.730, meaning that the Quality of Services and Social Media correlated strongly with the Intention of blood donor volunteers at the PMI Gianyar Regency Blood Donor Unit. Simultaneously (together) the quality of service and social media influence the Interest of blood donor realists with $F_{count} 59.538$ greater than the value of $F_{table} = 3.09$ with a significance level of 0.000 whose value is smaller than the significant criteria $\alpha = 0.05$. This shows that there is a positive and significant influence between Service Quality and Social Media simultaneously on the Intention of blood donor volunteers. So the first hypothesis which states that Service Quality and Social Media have a positive and significant effect on the Intention of proven donor volunteers.

Partially the quality of service (X_1) and social media (X_2) have a positive and significant effect on Intention. For the quality of service obtained the value of $t_{count} = 1.989$ and the value of $t_{table} = 1.661$ where the value of t_{count} is greater than the value of t_{table} , with a significance value of $0.049 < 0.05$. And for Social Media the value of $t_{count} = 7.917$ is more than the value of $t_{table} = 1.661$ with a significance level of $0.000 < 0.05$.

4. Conclusions

The results of this study confirm that Service Quality and Social Media have a strong influence of 55.1% on the Interest of blood donors in the PMI Blood Donor Unit in Gianyar Regency while the remaining 44.9% are influenced by other factors not examined. The recommendation for the Gianyar PMI Blood Donor Unit is that the Institution must identify the right strategies to improve Service Quality, and the institution must further promote Social Media because the communication needed by volunteers is information on Social Media, this promotion is in addition to very low costs, proved effective and efficient can be absorbed and responded quickly by volunteers.

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Causative And Applicative Construction In Bimanese

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Abstract. Jonkers has begun a research on bimanese in 1896. then, since 1966 bimanese has attracted a lot of linguists to study it in more detail. some aspects of bimanese linguistics have been studied, such as phonology, morphology, syntax, and morphosyntax as well. bimanese is one of the languages existing in west nusa tenggara. bimanese constructions are alike most of other languages in indonesia, that is svo(c) *nahumaweliweabaju* 'sayamembelibaju'. bimanese belongs to a unique language as it has lots of markers for various constructions, such as applicative and causative construction. the markers frequently have double functions, i.e. *ena-* which functions as aspect, cross reference, and possessive marker as well.

this study aims at describing the causative and applicative construction in bimanese. in the prior analysis on the data collected from the language, the both constructions are considered to have morphological and syntactical markers. data was collected through elicitation method (mithum, 2007). then, the data was analyzed based on equality and distributional method completed with some techniques, such as substitution and ellipsis.

key words: causative, applicative, bimanese, marker.

1. Introduction

The distinction of a language with another ones becomes a distinctive feature of those languages. The uniqueness is obtained based on the observation of a language that can not be separated from grammatical philosophy, namely the function, form, and meaning so that it is implied that each language will have similarities and differences with other languages.

The phenomenon of special constructions in a language as a result of the grammatical relations of course occurs in all languages in the world. However, each language has a different strategy that becomes a specific feature of each language. The strategies that language uses in describing constructions are morphological and syntactic strategies. Both strategies can be possessed by a language and can also be just one strategy possessed by a language. The languages in West Nusa Tenggara are the languages that have two types of strategies, namely morphological and syntactic strategies. What is the causative and applicative construction constructed in Bimanese? Does it use a morphological or syntactic strategy?

From some reviews on Bimanese it was found that new research on Bimanese was conducted by several experts, such as Jonker, Soepardi, Ahmad, Indra, Sudiati, Owens, Wouk, Jauhari, and Arafik. The studies examined agreement, morphological structure, passive sentences, nouns, causative and applicative constructions of Bimanese. Although there have been many studies conducted, these studies still use the assumption that the valence in Bimanese is determined by the marker of affixes so that the studies are still doubtful results. The Owens' study did not examine the markers attached to the verbs so that the study only looked at the constituents functioning to mark the verbs. The causative and applicative research done by Arafik was a research that needs to be observed in depth because the concept of marker as an affix leads to confusion in the determination of applicative and causative type and construction. Is it included in the causative or applicative? Is it including applicative and causative in morphological, syntactic, or lexical.

2. Methodology

According to Van Valin and La Polla (1997: 3), the purpose of linguistic research is to explain the phenomenon of language. The explanation of the linguistic phenomenon is the explanation of a language as an individual language or explanation of a variety of language that lead to the universality of language. From the linguistic phenomenon, it can be seen how a language is different from other languages.

This Bimanese research is a research that seeks to describe and explain the phenomenon of Bimanese, especially related to Bimanese valence and syntactic relation. Data descriptions through the description and explanation of the state or reality of the language as it is, characterize this Bimanese research into a descriptive research referring to qualitative, explanatory, and synchronic. Beside a descriptive research, the Bimanese research is also called a field linguistic research because natural data is obtained directly from speakers. Furthermore, Hyman (2001) explains that many studies do not involve human participation outside the researcher himself, but in his opinion, field linguistic research involves not only the first person (researcher) but must involve the second person in the interest of elicitation, and the third person for the observation so that the data collected is really accurate and fundamental data so that the quality and quantity of data collection is highly dependent on (1) the researcher and (2) the time and skills of the speakers.

The research located in Bima uses two kinds of data, namely primary data (data obtained through interview) and secondary data (text data). Data were analyzed descriptively-analytically through deductive and inductive approach. To obtain data, the informants were selected by purposive sampling, and based on some criteria.

3. Analysis

Based on findings of Satyawati (2017), it is known that Bimanese has markers to mark verbs and nouns. The marking is closely related between verbs and nouns (Owens, 2000). These markers in other conditions may also serve as valence markers, although in Bimanese the valence marker is more played by the prepositions. How is the causativity and applicativity found in Bimanese? It will be described below.

Applicative and causative constructions are a result of the valence change process in the form of valence raising. Valence raising is the addition of one constituent or argument in a construction. In causative construction, a constituent added in the construction is the argument of ACTOR, whereas in the applicative construction, constituents added are arguments of UNDERGOER that play as benefactive, comitative, instrumental, and theme. The benefactive argument appears with {-wea} marker, while the comitative, instrumental, and theme appear with {-labo} and {-kai} marker.

Table of Valence Change
Non-Causative Base Verbs become Causative Verbs

Clause	Dasar	Kausatif
Intransitive	SUBJ	SUBJ DO
Monotransitive	SUBJ DO	SUBJ DO OBL
Ditransitive	SUBJ DO IO	SUBJ DO IO OBL

This hierarchical approach is appropriately used in this study to determine causative constructions. The election is also supported by the statement of Comrie (1976: 1985) which says that the hierarchy can be applied to most languages of the world, from different genetic, geographical and typological groups so that this hierarchy may be found in all languages.

Based on the data analysis, it is known that Bimanese has three ways in causativity, namely (1) lexical, (2) morphological, and (3) additional a constituent (analytic). The lexical causative occurs when the constituent of PRED is a verb with causative meaning. It means, without causativity process, such as the addition of marker, the PRED has been declared by the causative meaning verbs, like *gili* 'to grind' and *dunggi* 'to push'. The morphological causative is done by adding the causative marker {ka-} to the verb. This causative marker is also possible to be affixed to adjectives, such as *makarasona* 'to clean', to nouns, such as *makacina* 'to make brothers', to numeralia, as *kaduana* 'to become two', and to verbs, such as *makapaliponga* 'to become rolling'. The analytic causative is done with the addition of the verb *ndawi* and *kau* both in intransitive and transitive constructions. Bimanese also has a causative construction with semantic parameters, i.e (1) true causative and permissive causative and (2) direct causative and indirect causative. Here is an example of causative construction.

- (1) *Ama nahu gili-na fare-na.*
father 1T grind -3/PERF rice-3POS
'My father grand his rice' (he)
- (2) *Ari sia dunggi-na La Habibah.*
Younger brother/sister 3T push -3/PERF Ks Nd 'His
younger brother/sister pushed Habibah.'
- (3) *Kama aka raso.* room
DEM clean 'The
room is clean.'
- (4) *La Imran ma- ka- raso kama aka.*
Ks Nd REL/Pn-KAUS-clean room DEM
'Imran is cleaning this room.'
- (5) *Ina Saroa rawa-na.*
mother Nd sing-3/PERF
'Madam Soreta sung.'
- (6) *Ari nahu ndawi ka- rawa-na Ina Saroa*
Younger brother/sister 1T make KAUS-sing-3 mother Nd
'My younger brother/sister made Ina Saroa sing.'

Bimanese applicative is done by prepositions (1) {-labo}, {-kai}, and the {-wea} marker. The position of preposition *labo* and *kai* is behind the verb and may be marked by the cross reference marker or not. Both prepositions construct complex verbs, such as *nika labo* 'to marry with' and *doho kai* 'to sit in'. Applicative construction by using the {-wea} marker can be done by putting the {-wea} marker behind the verb, like *ndawi wea* 'to make for'. Similar to the above two prepositions, the complex verbs with {-wea} marker may also be marked by the cross reference marker. Here is an example of applicative in Bimanese.

- (7) *La Samsul weha-wea-na ari-na oi.*
Ks Nd take-BEN-3 younger brother/sister-3POS water
'Samsul took water for his younger brother/sister.'
- b. *La Samsul weha-wea-na oi ari-na.*
Ks Nd take-BEN-3 water younger brother/sister-3POS
'Samsul took water for his younger brother/sister.'
- c. *La Samsul weha-na oi.*

- Ks Nd take-3/PERF water
 ‘Samsul took water.’
- d. **La Samsul weha-wea-na arina.*
 e. **La Samsul weha-wea-na oi.*
 f. **La Samsul weha-na ari-na oi.*
 g. **La Samsul weha-wea-na.*

4. Conclusion

Based on the results of data analysis, it is known that in Bimanese there are causative and applicative construction. Causative construction is done in three ways, namely lexical, morphological, and analytic. Applicative construction is carried out with the addition of prepositions, such as *labo*, *kai*, and *wea*. The markers attached to the causative and applicative construction have different functions. In addition to the valence raising marker (causative and applicative), the markers also serve to mark aspects and prepositions.

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Misuse of Multiple Linear Regression Analysis in Articles published in the OJS UNUD Journal

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Abstract. The purpose of this research is to identify the mistake of using multiple linear regression analysis contained in the article in the OJS UNUD journal. The research population is all articles contained in the OJS UNUD journal published in 2017. As a sample taken journals: E-Jurnal Manajemen Unud, Jurnal Kepariwisata dan Hospitalitas, Jurnal Piramida, E-Jurnal Akuntansi Universitas Udayana. The selection of journals was carried out by purposive sampling with consideration of articles in these journals often using linear regression analysis as a data analysis tool. The results showed that 65 articles were reviewed 34 articles using multiple linear regression analysis. The misuse of multiple linear regression analysis that we found include: response variable with ordinal measurement scale, multiple linear regression analysis was also found to be used to find the relationship between respon variable with independent variables that still use indicators.

Keywords: Jurnal OJS UNUD, Misuse, Multiple linier regression, Statistics

1. Introduction

Regression Analysis is statistical techniques that utilizes the relation between two or more quantitative variables so that a response or dependent variable can be predicted from several predictor or independent variables (X). Regression model with one response variable and more than one predictor variables are called multiple linear regression (MLR). Generally regression analysis serves three major purposes that are: (1) description, (2) control, and (3) prediction. (Kutner, M.H, et al, 2005). In multiple linear regression dependent variable must be continuous while independent variables can be continuous or categorical (dummy coded as appropriate). Relationship between Y and X is expressed as an equation

$$Y_i = a_0 + a_1 X_{i1} + a_2 X_{i2} + \dots + a_k X_{ik} + e_i \quad 1)$$

Where : Y_i dependent variable, $\frac{X_1}{X}, \frac{2}{k}, \dots$, X : independent variables whose value are known $a_0, a_1, a_2, \dots, a_k$ are regression coefficients, and e_i residuals

To estimate parameters in multiple linear regression analysis used ordinary least square (OLS) (Montgomery, D. C. and Peck, E. A., 1992). Estimating parameters with the OLS method must fulfill the following assumptions: residuals must be normally distributed, The residuals are homoscedastic, and there is no multicollinearity. Regression Analysis is widely used in business, management, the social and behavioral sciences, biomedical studies, the biological sciences, and many other disciplines.

According to (Tarafder, 2018) applying multiple linear regression does require special

attention from analysts. Each step of the process - from model specifications and data collection, to modeling and model validation, to interpreting the model being developed - needs to be carefully examined and executed. There should be no violations of any assumptions. A small mistake in one of these steps can cause the wrong model. Computers and statistical software packages have increased the complexity of data that can be analyzed, making it easier for someone to process data and the use of statistics in research also increases. One statistical technique that is often used is MLR, but MLR is very sensitive to assumptions consequently which there are often misuse of MLR in research. This study aims to see misuse of multiple linier regression in the articles in the OJS UNUD journal.

2. Research Method

The research population is all articles contained in the OJS UNUD journal published in 2017. As a sample taken journals: E-Jurnal Manajemen Unud, Jurnal Kepariwisata dan Hospitalitas, Jurnal Piramida, E-Jurnal Akuntansi Universitas Udayana. The selection of journals was carried out by purposive sampling with consideration of articles in these journals often using linear regression analysis as a data analysis tool

This research is a descriptive study, while the steps of the research are as follows:

1. From these journals each journal will be chosen randomly as a sample and record the articles selected as samples
2. Sorting out articles that use linear regression analysis in analyzing data.
3. Identify the misuse of the linear regression analysis conducted and provide solutions to the correct statistical techniques

3. Result

Most articles published in the OJS UNUD Journal are publications of research results of Udayana University students, although there are several journals that also accept manuscripts from outside the Udayana University institution. The publication of each OJS UNUD journal in a year varies. There are journals published every month, some of which are published 4 times a year, there are also those that are published only twice a year. Likewise, the number of articles contained in each number is not the same. For more details, Overview of Research Objects can be seen in the following table

Table 1. Overview of Research Objects

Journals	Number of journals published in 2017	Number of articles
Jurnal Piramida (Volume 13)	2	12
E-Jurnal Manajemen UNUD (Volume 6)	12	240
Jurnal Kepariwisata dan Hospitalitas (Volume 1)	2	27
E-Jurnal Akuntansi Universitas Udayana (Volume 20)	12	
		240
Total		519

Because the total number of articles obtained is a lot, so to make it easier for observations it is decided to take the first step randomly one volume from each journal. The selected journal will be used as the research sample to identify the use of multiple linear regression in analyzing the data. The following table shows the journals selected as research samples. Furthermore, the articles in the journals were sorted using multiple linear regression in analyzing the data.

Table 2. The Journals That Are The Research Samples

Journals	Volume	Number of articles
Jurnal Piramida	XIII No 2	6
	6 No 2	20
E-Jurnal Manajemen		
UNUD	1 No 2	10
Jurnal Kepariwisata dan Hospitalitas		
E-Jurnal Akuntansi Universitas Udayana.	20 No 2	29
Total		65

Of the 65 articles reviewed, 34(52%) used multiple linear regression as an analysis tool. Multiple linear regression is a very familiar method used to find relationships between response variables with several predictor variables.

4. Discussion

From the articles that were observed we found misuse multiple linear regression that are: (1) Using multiple linear regression analysis for response variables with ordinal measurement scales (for example: very dissatisfied, dissatisfied, satisfied, very satisfied), (2) The use of multiple linear regression for response variables with a nominal scale (for example: disagree, agree, strongly agree) in this case "disagree" cannot be declared lower than "agree" so it is categorized as a nominal scale, (3) The use of multiple linear regression on the response variable and predictor variable is still measured in the form of indicators with a Likert scale, or the use of linear regression analysis for predictor variables and response variables in categorical form. The use of multiple linear regression analysis for the above cases is not appropriate because the terms of multiple linear regression analysis according to (Draper, N.R. and Smith, H., 1998) linear regression is used with continuous response variables. As well to (Jeon, 2015) linear regression is used with continuous dependent variables, while logistic regression is used with dichotomous variables. The following is a statistical method that can be used as a substitute for misuse of multiple linear regression analysis

Table 3. The Recommended Method to Replace of Misuse Multiple Linear Regression

Misuse Multiple Linear Regression	Recommended method
Response variable and predictor variables are categorical	Log Linier Model
Dichotomous response Variable , predictor variables are combine categorical and continuous variables	Binary Logistic Regression or Logit Model
(>2 categories) respon variable, predictor variables are combine categorical and continuous variables	Multinomial Logistic Regression
Ordinal response variable, predictor variables are combine categorical and continuous variables	Ordinal Logistic Regression
Response variable and predictor variables are still expressed by several indicators	canonical correlation

5. Conclusion

Still found the misuse of multiple linear regression analysis in articles published in the OJS UNUD journal. These misuse include: use of multiple linear regression analysis on ordinal scale response variables, on the dichotomous response variables, on nominal scale response variables, on the response variable and predictor variables are still expressed in several indicators.

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KULINER BALI DALAM NASKAH LONTAR

**I Wayan Ardika, I Nyoman Wardi, IGN Tara Wiguna, Putu Eka Guna Yasa,
dan Putu Widi Kurniawan**

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Abstrak. Sejumlah lontar koleksi Fakultas Ilmu Budaya memuat tentang kuliner Bali. Lontar tersebut adalah Tuttur Dharma Caruban, Lontar Tatwa Brata, Kakawin Dharma Sawita, Kakawin Ramayana, dan Kakawin Siwa Ratri Kalpa. Dalam kajian ini digunakan pula naskah transkripsi Lontar Dharma Caruban milik Nyoman Wahyu Angga dari Desa Kedisan, dan Lontar Purincining Ebatan milik Bapak I Wayan Turun, serta buku Dharma Caruban karya Bapak Wayan Budha Gautama. Buku Dharma Caruban karya Bapak Wayan Budha Gautama merupakan sari pati dari sejumlah lontar Dharma Caruban yang digunakan sebagai acuan. Pemahaman tentang kuliner Bali yang tersurat dalam lontar akan dapat meningkatkan pengetahuan mengenai berbagai jenis kuliner, fungsi, dan maknanya. Penelitian ini bertujuan untuk menjawab masalah penelitian yang terfokus pada masalah bentuk, fungsi, dan makna kuliner Bali. Data diperoleh dengan mendeskripsikan, mengkaji, dan membandingkan (inter teks) isi lontar yang memuat kuliner Bali. Selain itu, data yang diperoleh melalui kajian teks juga dikonfirmasi di lapangan dengan melakukan observasi dan wawancara mendalam dengan para praktisi atau pembuat kuliner Bali seperti penjual kuliner dan penjual nasi dengan olahan kuliner Bali. Wawancara mendalam juga dilakukan dengan penulis buku Dharma Caruban. Selain itu, kajian terhadap bumbu Bali (*basa gede*) juga dilakukan di laboratorium Fakultas Pertanian, Universitas Udayana untuk mengetahui keamanan pangan dari bumbu yang digunakan untuk kuliner Bali. Data yang diperoleh melalui kajian teks selanjutnya disintesakan dengan data lapangan untuk membuat simpulan. Sesuai dengan rumusan masalah maka teori yang digunakan dalam penelitian adalah teori Struktural fungsional dan teori Simbol. Bentuk dan fungsi kuliner dikaji dengan menggunakan teori struktural fungsional, dan makna kuliner ditelaah dengan mengaplikasikan teori simbol. Hasil penelitian menunjukkan bahwa bentuk dan jenis kuliner Bali sangat beragam yang dapat dibedakan menjadi empat kelompok yakni kuliner *beteg* (agak berair contohnya lawar, tum, anyang dll), kuliner kering (urutan dan gorengan), kuliner cair (*enceh* misalnya kekomoh, dan jukut ares), serta kuliner lain seperti babi guling, betutu dan lain-lain. Secara fungsional kuliner Bali dibedakan untuk tujuan religious dan sosial. Untuk tujuan religious atau keagamaan kuliner Bali digunakan untuk *ulam suci* yang dipersembahkan kepada para dewa atau alam atas, kuliner sebagai *babangkit* dan gayah untuk alam tengah, dan kuliner untuk *ulam caru* dipersembahkan kepada para Bhuta atau alam bawah dalam kaitannya dengan Bhuta yadnya. Selain fungsi religious atau keagamaan, kuliner Bali juga berfungsi sosial yang didasarkan atas *linggih/tegak* sesuai dengan status dan kedudukan seseorang. Untuk fungsi sosial kuliner Bali dapat dibedakan menjadi tiga kelompok yakni *pamijian* dihidangkan untuk pejabat rendah atau pejabat tingkat desa, *kawisan* ialah hidangan yang disuguhkan untuk pejabat tingkat menengah setingkat Camat dan yang setara, dan *pajeg* adalah hidangan kuliner yang disuguhkan kepada pejabat tinggi yang meliputi pejabat tingkat kabupaten, provinsi, dan tingkat pusat. Perlu juga disampaikan bahwa kuliner Bali bernuansa gender. Istri/suami pejabat tadi diberi hidangan kuliner yang jumlah dan jenisnya tidak sama atau biasanya kurang daripada yang disuguhkan kepada suami/istri pejabat tersebut. Selain berfungsi dan bermakna sosial, kuliner Bali juga bermakna religious. Bentuk dan jenis kuliner Bali dibuat sedemikian rupa yang melambangkan senjata *dewata nawa sanga* atau sembilan dewa penjaga mata angin. Misalnya sate *lembat* sebagai simbol gada yang merepresentasikan Dewa Brahma penguasa selatan, dan sate *kuung* (kekuung) atau sate cempaka simbol padma merepresentasikan Dewa Siwa penguasa tengah dalam *dewata nawa sanga*. Lontar Dharma Caruban juga berisi tentang bahan-bahan dan jenis-jenis bumbu

untuk kuliner Bali. Dijelaskan pula tentang perimbangan bahan-bahan untuk bumbu lengkap atau *basa gede*. Bumbu lengkap atau *basa gede* sesungguhnya dapat digunakan untuk hampir semua jenis kuliner Bali. Untuk memenuhi selera konsumen biasanya pedagang kuliner menambahkan sambal agar rasanya menjadi lebih pedas.

Kata Kunci: Kuliner Bali, Naskah Lontar, Bentuk, Fungsi, dan Makna

1. Latar Belakang Masalah

Masyarakat Bali mewarisi sejumlah naskah lontar yang memuat tentang beberapa jenis kuliner. Naskah-naskah tersebut antara lain: *Tutur Darmacaruban*, *Tutur Brata Tatwa*, *Kakawin Darmasawita*, *Kakawin Ramayana*, dan *Kakawin Siwaratrikalpa*. Tutur Darmacaruban berisi tentang berbagai jenis bumbu dan olahan untuk sesajen. Kakawin Darmasawita memuat tentang bumbu-bumbuan dan rasanya, percampuran bumbu, kenikmatan batin dalam menyantap makanan atau kuliner. Kakawin Ramayana memuat tentang jenis tumbuh-tumbuhan yang menjadi santapan para yogi, dan pantangan terhadap makanan. Tutur Brata Tatwa berisi tentang filosofi dan pengendalian diri terhadap makanan atau pantangan mengonsumsi makanan tertentu. Naskah Kakawin Siwaratrikalpa berisi tentang jenis bahan makanan terutama yang berasal dari biji-bijian seperti kacang ijo.

Kearifan lokal tentang berbagai jenis makanan, pantangan, kasiat dan makna makanan pada masa lampau tampaknya perlu dideskripsikan, dipahami dan dikaji relevansinya pada masa kini. Berbagai jenis makanan yang disebutkan dalam naskah lontar mungkin sangat bermanfaat dalam pengayaan dan pengembangan diversitas pangan. Demikian pula halnya dengan fungsi, kasiat, pantangan dan makna makanan menjadi sangat penting diketahui untuk meningkatkan kesehatan pada masa kini maupun di masa depan.

Bali sebagai salah satu destinasi pariwisata dunia sangat berpeluang untuk dapat menyajikan kuliner khas Bali kepada wisatawan. Berbagai jenis makanan, terutama kuliner yang tersurat dalam naskah lontar dapat dikatakan sebagai suatu keunikan kebudayaan Bali sehingga dapat diperkenalkan dan disajikan kepada wisatawan

Kuliner khas Bali yang tersurat dalam naskah lontar belum banyak dikaji. Kajian ini menjadi sangat penting untuk mendeskripsikan, memahami dan menelaah berbagai jenis kuliner Bali. Kajian tentang kuliner atau makanan juga disebut dengan istilah Gastronomi. Gastronomi adalah studi dan apresiasi terhadap semua jenis makanan dan minuman. Di samping itu, Gastronomi juga mencakup pengetahuan yang rinci tentang makanan dan minuman nasional dari berbagai negara di seluruh dunia. Peran gastronomi adalah sebagai landasan untuk memahami bagaimana makanan dan minuman digunakan dalam situasi-situasi tertentu. Sumber lain menyebutkan bahwa gastronomi adalah studi mengenai hubungan antara budaya dan makanan. Hubungan budaya dan gastronomi terbentuk karena gastronomi adalah produk budidaya pada kegiatan pertanian sehingga pengejawantahan warna, aroma, dan cita rasa suatu makanan dapat ditelusuri asal-usulnya, dan lingkungan tempat bahan bakunya dihasilkan (Ardika, 2011: 18-19).

Hasil penelitian mahasiswa Program Magister Kajian Pariwisata Unud pada tahun 2002 menunjukkan bahwa makanan lokal adalah salah satu komponen budaya Bali sebagai daya tarik wisata (Ardika, 2003: 42-53). Komponen atau unsur budaya yang juga menjadi daya tarik wisata antara lain: kerajinan, bahasa, tradisi gastronomi, kesenian/musik, sejarah, pekerjaan arsitektur, agama, pendidikan, mode/costum, dan waktu luang (Spillane, 2003: 24; Ardika, 2003: 52-53). Pitanatri dan Putra (2016) menyatakan bahwa makanan lokal atau wisata kuliner menjadi atribut baru destinasi Ubud. Selain keindahan alam dan seni, Ubud juga dikenal sebagai pusat kuliner seperti babi guling, ayam betutu, dan bebek goreng.

Levi Strauss (dalam Koentjaraningrat, 1987: 212) terkenal dengan metode segi tiga kulinernya membedakan makanan menjadi tiga kategori yakni makanan mentah atau tanpa diolah, makanan yang diolah dengan api atau melalui proses dimasak, dan makanan yang melalui proses fermentasi. Lebih lanjut Levi Strauss menyatakan bahwa makanan secara universal merupakan kebutuhan pokok manusia, dan mempunyai arti sosial, keagamaan dan simbolik. Dengan demikian makanan juga dapat menjadi identitas suatu komunitas atau bangsa.

Pola makan terkait dengan gaya hidup seseorang atau sekelompok orang. Jenis makanan dan

minuman yang dikonsumsi oleh seseorang atau sekelompok orang sangat terkait dengan jenis pekerjaan, umur, status atau kedudukan seseorang (Chaney, 2003: 74, table 3.3 an 3.4). Belakangan ini ada kecenderungan bahwa masyarakat memilih diet yang lebih bermanfaat untuk kesehatan mereka. Barang-barang konsumsi menjadi materi dan sumber simbolis penting bagi orang-orang yang biasa memproduksi kehidupan dan pola-pola kehidupan mereka (Lee, 2006: 85). Dengan kata lain barang-barang konsumsi dapat dikaitkan dengan status sosial yang diperjuangkan dan diartikulasikan dalam kehidupan sehari-hari (Lee, 2006: 95).

Berdasarkan latar belakang penelitian tersebut di atas maka masalah penelitian ini dapat dirumuskan sebagai berikut: (1) Bagaimanakah jenis atau bentuk-bentuk kuliner Bali, (2) Apakah fungsi kuliner Bali, dan (3) Apakah makna kuliner Bali. Tujuan umum penelitian ini adalah untuk memahami dan mengungkapkan bagaimana makanan sebagai unsur pokok dalam kehidupan manusia, dibuat, dikonsumsi, dan dimaknai oleh masyarakat Bali. Selain itu, penelitian ini secara umum juga bertujuan untuk mendeskripsikan tentang proses, bahan, dan jenis bumbu yang digunakan untuk pembuatan kuliner Bali. Secara khusus penelitian ini bertujuan untuk memahami berbagai jenis atau bentuk kuliner Bali, fungsi, dan makna kuliner Bali yang berbasis naskah lontar di masyarakat. Secara praktis, penelitian ini bermanfaat untuk meningkatkan pemahaman tentang proses pembuatan, bahan, bumbu, jenis atau bentuk kuliner Bali, fungsi, dan makna sosial ataupun religious kuliner Bali. Secara keseluruhan penelitian ini meliputi empat tahapan kerja yaitu (1) tahap pengumpulan data, (2) tahap pengolahan data, (3) tahap sintesa, dan (4) tahap penulisan laporan hasil penelitian. Studi kepustakaan dan dokumen merupakan kegiatan utama dalam pengumpulan data untuk penelitian ini. Data kuliner Bali yang tersurat dalam lontar koleksi Perpustakaan Lontar Fakultas Ilmu Budaya Unud ditransliterasikan dan diterjemahkan sehingga jenis, fungsi, dan maknanya dapat dipahami. Selain itu, sumber lain yang memuat kuliner Bali juga distudikan untuk melengkapi data primer yang diperoleh dari lontar tersebut.

Survey dan observasi lapangan dilakukan pada sentra-sentra kuliner Bali seperti Denpasar, dan Gianyar. Kegiatan ini dimaksudkan untuk mengidentifikasi berbagai jenis kuliner yang tersurat di dalam lontar dan masih eksis sampai saat ini di Bali. Data etnografi ini juga dimaksudkan untuk memahami bentuk, fungsi, dan makna kuliner Bali yang hingga kini masih eksis di masyarakat. Observasi tentang bahan, bumbu, dan bentuk-bentuk kuliner sangat penting untuk menambah pemahaman tentang kuliner Bali.

Pengumpulan data juga dilakukan dengan melakukan wawancara mendalam dengan sejumlah informan yang diyakini memiliki pengetahuan tentang kuliner Bali. Wawancara mendalam dilakukan dengan penulis buku kuliner Bali yakni Bapak Wayan Budha Gautama di Canthigrahasrama, Desa Petak Kaja, Gianyar pada tanggal 14 Juni 2018. Wawancara juga dilakukan dengan Bapak I Made Tedja, pedagang lawar dan sate Bali di Banjar Tatasan Kaja, Denpasar pada tanggal 12 Juni 2018. Hasil wawancara mendalam sangat bermanfaat untuk melengkapi pemahaman tentang kuliner Bali yang tertulis dalam naskah lontar ataupun buku.

Data yang diperoleh dari studi kepustakaan dan dokumen dikumpulkan, dideskripsikan, dipilah-pilah sesuai dengan tujuan penelitian dan diinterpretasikan. Data lapangan juga dimanfaatkan untuk menunjang data kepustakaan dan dokumen.

Dalam pengolahan data dilakukan pula tahapan sebagai berikut: pengumpulan, reduksi, dan interpretasi data. Berbagai jenis kuliner yang tersurat dalam lontar Bali diinterpretasikan secara terus menerus (hermeneutik) sehingga dapat dipahami fungsi, kasiat dan makna kuliner atau makanan tradisional Bali tersebut. Bentuk dan modifikasi kuliner Bali sedapat mungkin dilakukan sehingga dapat dikonsumsi oleh wisatawan yang pada gilirannya dapat dijadikan daya tarik wisata, khususnya wisata kuliner. Data yang terkumpul selanjutnya dikelompokkan atau dipilah-pilah, dikomparasi, dan disintesakan sesuai dengan konsep ataupun teori yang terkait dengan kuliner.

2 Proses Pembuatan Kuliner Bali

Proses pembuatan kuliner Bali diawali dengan penyembelihan hewan yang dijadikan sebagai bahan baku kuliner tersebut. Penyembelihan hewan bahan baku kuliner diawali dengan mengucapkan mantra agar tidak menyebabkan papa sengsara terhadap orang yang

menyembelih hewan tersebut. Mantra dibedakan berdasarkan jenis hewan yang dijadikan bahan baku kuliner. Mantra hewan yang berkaki dua berbeda dengan hewan yang berkaki empat. Contoh mantra untuk menyembelih hewan berkaki dua adalah sebagai berikut: *Om Swasti-swasti sarwa dewa buta, suka pradana purusa sang yoga yan namah. Om Sang namah swaha. Om yang namah swaha. Atmanya mulih maring purwa, dewatanya Sang Hyang Iswara* (Gautama, 2003: 3). Demikian pula halnya untuk hewan berkaki empat (*catur pada*) disebutkan mantranya sebagai berikut: *Om Swasti-swasti sarwa dewa buta suka pradana purusa sang yoga ya namah, Om bang nama swaha. Atmanya mulih maring daksina, dewanya Hyang Brahma* (Gautama, 2003: 3). Mantra untuk hewan berkaki enam (*sad pada*, jenis serangga), dan hewan berkaki delapan (*asta pada*, seperti kepiting dan udang), serta hewan melata (*alaku laku pada*) juga ada mantranya. Mantra itu dimaksudkan agar hewan yang disembelih untuk bahan kuliner tidak salah pati dan atmanya/rohnya dikembalikan sesuai dengan mata angin dan dewata penguasa arah (dewata nawa sanga) tersebut. Mantra untuk menyembelih hewan untuk bahan kuliner tersurat pada naskah Dharma Caruban milik Pustaka Lontar, Fakultas Ilmu Budaya, Universitas Udayana dan naskah Dharma Caruban koleksi keluarga I Nyoman Wahyu Angga dari Desa Kedisan.

Berdasarkan informasi yang tersurat pada sejumlah naskah Dharma Caruban dapat diketahui bahwa penyembelihan hewan bahan kuliner tidak dimaksudkan untuk menyakiti hewan tersebut, tetapi mengembalikan rohnya sesuai dengan letak mata angin dan dewa penguasa arah tersebut, misalnya arah timur Dewa Iswara, arah selatan Dewa Brahma. Selain itu, mantra penyembelihan hewan bahan kuliner ini dimaksudkan agar hewan tersebut dapat lahir kembali menjadi manusia yakni makhluk utama yang lebih tinggi kedudukannya dari hewan. Fenomena ini tampaknya terkait dengan fungsi kuliner/olahan Bali yang juga dipersembahkan kepada para dewa/Tuhan Yang Maha Esa dan roh leluhur, dan dikonsumsi/dihidangkan kepada tamu/manusia. Dalam lontar Dharma Caruban mantra untuk penyembelihan hewan bahan baku kuliner Bali dapat dicermati seperti berikut.

3 Klasifikasi Kuliner/Olahan Bali

Naskah Dharma Caruban milik Nyoman Wahyu Angga dari Desa Kedisan dan buku yang berjudul Dharma Caruban. Tuntunan Membuat Olahan Banten karya Wayan Budha Gautama (2003:6) mengklasifikasikan olahan atau kuliner Bali menjadi empat kelompok yakni a) Olahan Kering, b) Jenis Olahan *Beteg* (lembab), c) Olahan *Enceh* (Cair), dan d) Jenis Olahan yang lain. Sumber naskah lontar yang menjadi sumber data primer penelitian ini milik Pusat Kajian Lontar milik Fakultas Ilmu Budaya, Universitas Udayana tidak secara rinci memilah-milah jenis kuliner/olahan Bali seperti itu. Klasifikasi kuliner Bali dalam penelitian ini selanjutnya mengikuti pengklasifikasian berdasarkan naskah Dharma Caruban milik Nyoman Wahyu Angga dan buku karya Bapak Wayan Budha Gautama, yang juga didasarkan atas sejumlah naskah Dharma Caruban. Berikut adalah klasifikasi kuliner/olahan Bali .

a. Olahan Kering

Dalam naskah Dharma Caruban milik keluarga Nyoman Wahyu Angga dari Kedisan dan buku Dharma caruban karya Bapak Wayan Budha Gautama (2003: 6-12), olahan kering meliputi: Sate, Urutan, Gorengan, Brengkes, dan Teboan atau Gubah. Sate lebih lanjut dipilah-pilah lagi menjadi beberapa jenis antara lain sebagai berikut: sate lembat, sate asem, sate kekuung, sate sepit gunting, sate jepit babi, sate jepit iga/balung, serapah, sate letlet, sate suduk Ro, sate empol, sate pusut, sate kablet, sate kebek. Jenis sate tersebut bahan bakunya dari itik dan/atau babi. Sate tersebut dapat dihidangkan dalam pesta atau dijadikan bagian dari sesajen untuk dihaturkan kepada para dewa penjaga mata angin (*dewata nawa sanga*) atau Tuhan Yang Maha Esa. Selain sate, olahan kering termasuk juga gorengan, *brengkes*, urutan, pesan, *teboan* atau *gubah*. Bahannya dari daging babi, itik, dan ayam.

b. Jenis Olahan *Beteg* (Lembab)

Yang tergolong olahan *beteg* (lembab) antara lain: Lawar, Timbungan (Gulai), Be Nyatnyat, Oret, Be Genyol, dan Sembuuk. Jenis-jenis lawar antara lain: Lawar anyang (lawar tulen), Lawar buah-buahan, Lawar putih, dan Lawar pepahit. Bahan-bahannya adalah

daging babi, kulit babi, dan bumbu. Setelah bahannya lengkap kemudian diadonkan. Selain berbahan daging (babi, ayam, itik), lawar juga dapat dibuat dengan menggunakan buah-buahan seperti nangka muda, pepaya muda, buah kacang panjang, dan pare. Buah-buahan tersebut direbus dan dicampur dengan *lempet* (*ketekan, rames*) dan bumbu secukupnya.

c. Olahan Enceh (Cair)

Olahan yang bentuknya *enceh* (cair) antara lain: Kekomoh yang juga disebut dengan cecobor dan jangan (sayur) ares, Dalam bahasa Bali dikenal dengan jukut ares/gedebong. Kekomoh terbuat dari antara lain: Ati atau serat daging (isi dumi) yang dipanggang, Ketekan daging yang masih mentah diisi bumbu yang juga serba mentah, kencur bakar, bawang putih bakar, kelapa bakar, Rames dari kulit, yakni bagian dari hidung, telinga babi, Ati atau serat daging panggang, diiris-iris kecil untuk campuran adonan kekomoh (cerobor) tersebut, yang disebut dengan kekambang. Darah (yang dicampur dengan adonan rames atau ketekan itu). Asam dari limau, dan bumbu secukupnya dengan menambahkan *emba* (bawang goreng). Sebaiknya agak pedas. *Jangan Ares (Jukut Gedebong)* bahannya terdiri atas daging (serat daging atau *isin dumi*). *Gedebong* (batang pisang muda), yang belum pernah berbuah, atau yang baru setinggi +/- satu meter. Batang pisang ini diiris-iris kecil, dan dicampur dengan bumbu yang lengkap (*basa gede*) secukupnya

d. Olahan Lain

- Be Tutu

Bahannya bebek atau ayam yang cukup dewasa, tetapi yang belum pernah bertelur, apabila itu bebek atau ayam betina. Bagi bebek atau ayam jantan diutamakan yang belum membuahi betinanya.

- Panggang Bahannya bebek atau ayam

Ayam atau bebek disembelih, kemudian dibersihkan, dan bagian jeroannya dibuang Untuk bebek panggang dibumbui dulu lalu direbus. Setelah matang direbus ditusuk pada alat panggangnya. Lalu dipanggang pada api yang menyala pelan tetapi mantap Kalau panggang ayam, sebelum dipanggang dilumasi bumbu terlebih dahulu. Apabila bebek atau ayam panggang yang akan digunakan untuk sarana upacara/upacara sebaiknya disemprot dengan arak atau seprit agar bebek atau ayam yang dipanggang itu dapat bertahan lebih dari dua hari, dan untuk menghindari lalat yang akan mencari bagian bebek atau ayam itu yang kian membusuk.

- Guling

Hewan-hewan yang akan dijadikan guling yaitu babi kecil betina (kucit) dan bebek. Untuk guling bebek hampir sama proses pembuatannya dengan bebek panggang. Guling babi: mula-mula babi dibersihkan dan diambil jeroannya. Selanjutnya babi yang sudah bersih itu disiram dengan air hangat berkali-kali, kemudian ditusuk dengan alat penggulingan yang terbuat dari bambu atau cabang kayu, yang telah disesuaikan dengan besar atau kecilnya babi bahan guling tersebut. Setelah babi guling itu ditusukkan pada alat penggulingannya, maka diisi dengan bumbu yang dicampur dengan daun singkong. Bumbu babi guling itu adalah bumbu yang lengkap dan sempurna. Diisi sedikit kemenyan agar daging babi guling cepat matang dengan baik (dagingnya lembut). Kemudian perut babi yang sudah diisi bumbu dengan perlengkapan lainnya lalu dijahit. Kulit luar babi itu dilumasi bumbu gilal yang terbuat dari bawang putih serta kencur dan diisi minyak kelapa. Selanjutnya dipanggang. Memanggang babi guling tersebut tidak boleh tergesa-gesa, dengan kata lain harus sabar.

4 Fungsi Kuliner Bali

Mengacu pada pemikiran Levi-Strauss bahwa makanan mempunyai fungsi sosial dan keagamaan atau simbolik (Koentjaraningrat, 2014: 212). Fenomena ini tampaknya juga berlaku untuk makanan atau kuliner Bali. Makanan atau kuliner Bali juga digunakan untuk persembahan kepada Tuhan Yang Maha Esa dan terkait dengan *linggih/ tegak* atau kedudukan dan status sosial

seseorang. Sebagaimana telah dipaparkan di depan bahwa makanan atau jenis dan bentuk kuliner Bali, terutama sate melambangkan senjata atau simbol *dewata nawa sanga* atau kesembilan dewa sebagai penjaga sembilan penjuru mata angin. Dalam konteks ini dapat dikatakan bahwa jenis dan bentuk kuliner Bali juga berfungsi simbolis yakni melambangkan dewa penjaga mata angin. Selain

itu, jenis dan jumlah kuliner Bali juga dikaitkan dengan *linggih/tegak* atau kedudukan dan status sosial seseorang. Jenis hidangan yang disajikan untuk para tamu dalam suatu upacara di Bali dikaitkan dengan *linggih/tegak* atau kedudukan dan status sosial seseorang.

Seorang perbekel atau kepala desa disuguhi hidangan dengan *katik* sembilan yakni hidangan dengan sate dan serapah jumlahnya sembilan tusuk/batang/*katik* disertai lawar dan gorengan lainnya. Demikian selanjutnya untuk Camat disuguhi hidangan *katik* enam belas (16 batang/tusuk sate), dan seorang bupati misalnya akan disuguhi hidangan *katik* 32. Dengan kata lain, semakin tinggi jabatan seseorang akan disuguhi hidangan kuliner Bali yang semakin banyak pula jumlahnya. Selain itu, kuliner Bali juga dikaitkan dengan gender. Hidangan untuk istri/suami pejabat biasanya jumlahnya lebih sedikit daripada hidangan untuk suami/istrinya. Misalnya untuk seorang istri perbekel adalah *katik* tujuh (7 batang/tusuk), sedangkan untuk suaminya disuguhi hidangan *katik* sembilan (9 batang/tusuk). Fenomena ini mengindikasikan bahwa kuliner Bali terkait dengan *linggih/tegak* atau kedudukan dan/atau status sosial seseorang, serta hubungannya dengan gender bahwa laki-laki mendapat suguhan kuliner lebih banyak dari wanita/perempuan karena kedudukan laki-laki dianggap lebih tinggi dari perempuan Bali. Hasil wawancara dengan informan pada tanggal 14 Juni 2018 membenarkan bahwa ketentuan *linggih/tegak* dan kedudukan suami lebih tinggi daripada istrinya dalam pemberian hidangan kuliner masih berlaku pada beberapa desa di Bali.

Dalam pemikiran Bourdieu (Fashri, 2014: 20-21) terkait dengan simbol dinyatakan bahwa sistem simbol merupakan medium yang menjadi perantara dalam memaknai sesuatu, memproduksi dan mengubah makna. Sistem simbol mampu melakukan semua ini karena ia beroperasi sebagai sistem representasi. Lewat simbol-simbol (bahasa, wacana, gambar dan semacamnya) dapat diungkap tentang pikiran, konsep, dan ide-ide tentang sesuatu. Lebih lanjut dinyatakan bahwa simbol bukan saja dipahami sebagai instrumen komunikasi dan integrasi sosial, melainkan juga berperan sebagai instrumen dominasi di mana kelas dominan mengambilalih penggunaan tata simbol menurut selera dan kepentingan mereka.

4.1 Fungsi Kuliner Bali dalam Upacara

Dalam naskah Dharma Caruba milik keluarga I Nyoman Wahyu Angga (tt, hal, 10) disebutkan bahwa kuliner atau *ulam* untuk upacara dapat dibedakan menjadi tiga bagian yakni: 1). Ulam Suci (*selam*), 2). Ulam Bebangkit, dan 3). Ulam Caru. *Ulam* atau kuliner suci menggunakan itik, penyu, dan ayam. Itik dikategorikan sebagai ulam suci karena: itik dapat memilih makanan yang terdapat dalam lumpur, itik hidup di darat dan air, dan itik dapat hidup rukun satu dengan lainnya. Penyu dianggap suci karena tangan dan kakinya dapat dimasukkan ke badannya. Kepala penyu juga ditaruh/ditempatkan pada banten catur beralaskan beras yang ditempatkan di atas bokor merepresentasikan badawang nala yang dapat menyangga gunung mahameru dalam mitos pemutaran gunung mahameru yang digunakan sebagai alat untuk mengaduk/lautan susu guna menemukan amerta. Berdasarkan alasan di atas maka daging itik dan daging penyu dapat dipersembahkan untuk Tuhan Yang Maha Esa, dan biasanya ditempatkan di *sanggar tawang*.

Ulam *bebangkit* biasanya berupa babi guling dan *gayah*. Ulam atau kuliner ini disebut kapor, karena bahannya dari babi. Ulam caru dibuat dari daging ayam, babi, kambing, kerbau, angsa, anjing dan lain-lain. Olahan/kuliner untuk caru dipersembahkan kepada Bhuta sebagai sarana Bhuta yadnya penguasa alam bawah. Berikut adalah gambar sebagai representasi persembahan kuliner Bali kepada Tuhan Yang Maha Esa sebagai bagian dari sesajen atau lazim di Bali dikenal sebagai *ben banten* (kuliner yang dijadikan sebagai bagian dari sesajen).



Gambar 4.1. Itik/bebek sebagai Ulam suci



Gambar 4.2 *Gayah* dan babi guling yang dipersembahkan sebagai *bebangkit* dalam upacara odalan di pura Bale Agung di Desa Buah, Tabanan



Gambar 4.3 Sate lebat dan serapah, serta lawar disajikan sebagai persembahan pada hari Raya Penampahan Galungan

4.2 Kuliner untuk Hidangan Kepada Tamu dan/atau Pejabat

Selain untuk dipersembahkan kepada Ida Sanghyang Widi Wasa/Tuhan Yang Maha Esa dengan segala manifestasinya, kuliner Bali juga dihidangkan untuk tamu dalam suatu upacara atau pesta. Hidangan yang disuguhkan untuk tamu dikaitkan dengan kedudukan dan fungsinya di masyarakat. Dalam konteks ini, kuliner Bali juga menunjukkan fungsi sosial sesuai dengan

status sosial seseorang yang di Bali dikenal dengan *linggih* atau *tegak*. Mengacu kepada sistem sosial di Bali maka hidangan disesuaikan dengan *linggih/tegak* atau kedudukan dan status sosial seseorang yang dapat dibedakan menjadi dua kategori yaitu hidangan untuk anggota banjar disebut dengan *linggih* banjar dan hidangan untuk pejabat di tingkat banjar, desa, dan jabatan kedinasan yang dikenal dengan *pamijian* (Gautama, 2003: 28-29).

4.2.1 Tata hidangan untuk pejabat tingkat desa adalah sebagai berikut.

- 1) Untuk pejabat tingkat desa hidangan yang disuguhkan untuk laki-laki/pria terdiri atas tujuh batang sate atau *katik pitu* yang terdiri atas satu batang sate empol, satu batang sate pusut, satu batang sate kebek, satu batang sate kablet serta dua batang sate asem dan satu batang sate lambat. Olahan atau kuliner lain yang disuguhkan adalah lawar anyang, lawar putih, lawar daun belimbing, teboan, gorengan, tum, pesan, dan urutan serta sambel emba dan kekomoh
- 2) Untuk istri/suami pejabat, suguhan disebut *katik lima* yang terdiri atas tiga (3) sate asem dan dua (2) sate lambat, dengan kelengkapannya lawar anyang, lawar putih, daun belimbing, disertai dengan balung, teboan dan tum.
- 3) Suguhan untuk pengiring pejabat yakni tukang junjung bawaan pejabat tersebut disuguhi *katik telu* (3) terdiri atas dua (2) sate asem dan satu (1) batang sate lambat dengan olahan kuliner lain: anyang, lawar putih, olahan daun belimbing, balung serta tum

4.2.2 Tata hidangan untuk pejabat

Menengah

Yang dimaksud dengan pejabat menengah adalah pejabat tingkat kecamatan yang meliputi Camat, Ramil, Kapolsek, dan pejabat keagamaan seperti BPPLA Kecamatan dan PHDI Kecamatan dan organisasi lain yang sangat erat kaitannya dengan pelaksanaan upacara Agama Hindu.

- 1) Tata hidangan untuk Pejabat Menengah seperti Camat, Ramil, dan Kapolsek serta pejabat Sejenisnya meliputi *japit* atau *katik sia* (9 batang/tusuk) Tata hidangannya hampir sama dengan hidangan untuk pejabat rendah, hanya jumlah satenya yang berbeda. Jumlah sate untuk pejabat menengah meliputi: satu batang sate empol, satu batang sate pusut, satu batang sate kablet, satu batang sate kebek, tiga (3) batang sate asem, dua (2) batang sate lambat. Hidangan lain atau pelengkapannya seperti lawar anyang, lawar putih, lawar daun belimbing, teboan, gorengan, tum, pesan, dan urutan serta sambel emba dan kekomoh sama dengan hidangan untuk pejabat rendah.
- 2) Untuk istri/suami pejabat menengah ialah *katik pitu* (7 batang) atau *pamijian*, ketentuan hidangan *katik pitu* sama seperti yang telah diuraikan di depan.
- 3) Untuk pengiring pejabat disuguhi *katik lima* (5 batang/tusuk) atau *linggih banjar*, ketentuannya seperti yang telah diuraikan di depan

4.2.3 Tata Hidangan untuk Pejabat Tinggi

pejabat tingkat kabupaten hingga tingkat Pusat baik pejabat sipil maupun keagamaan. Yang termasuk pejabat tinggi meliputi bupati/wali kota, gubernur, Ketua DPRD Kabupaten/Provinsi, Kodim, Korem, Kapolres, Kapolda, Kejaksaan Negeri, Kejaksaan Tinggi, Kepala Dinas Kabupaten, Kepala Dinas Provinsi, PHDI Provinsi, Majelis Pembia Lembaga Adat dll.

- 1) Tata hidangan untuk pejabat tingkat tinggi tersebut di atas adalah *katik enaem belas* (16 batang/tusuk) yang disebut *pajeg*. Tata hidangan *pajeg* meliputi: dua batang sate empol, dua batang sate pusut, dua batang sate kablet, dua batang sate kebek, tiga batang sate lambat, dan lima batang sate asem. Selain itu, masih ditambah dengan satu potong urutan bertangkai, satu potong daging babi yang berisi kulit yang ditoreh kecil-kecil, serta sebuah teboan bertangkai yang digoreng matang.
- 2) Hidangan untuk istri/suami pejabat tinggi adalah *japit* (katik 9). Tatanan hidangannya sama dengan *japit* yang disuguhkan kepada pejabat menengah, sebagaimana telah diuraikan di depan.
- 3) Hidangan untuk pengiring/ajudan pejabat tinggi adalah *katik pitu* (7 batang/tusuk sate) seperti hidangan yang disuguhkan untuk pejabat rendah tersebut di depan (Gautama,

2003: 30-32)

- 4) Hidangan untuk Para Pendeta dan Pinandita. Hidangan untuk kedua jenis rohaniawan adalah berbahan daging itik. Hidangan untuk sang pendeta (Pedanda, Begawan, Resi, Pandita Empu, Sri Empu, Jero Dukuh) adalah *Pajeg* itik/bebek. Hidangan yang disuguhkan untuk Pianandita (Pemangku) adalah *Japit* bebek/itik (Gautama, 2003: 29-33).

katik atau batang/tusuk sate yang disuguhkan kepada yang bersangkutan atau sebaliknya. Berdasarkan uraian di depan dapat diketahui bahwa kuliner Bali berfungsi sosial yang dikaitkan dengan *linggih* atau *tegak* dan kedudukan serta status sosial seseorang. Dengan kata lain, semakin tinggi status sosial dan kedudukan seseorang maka semakin banyak pula jumlah

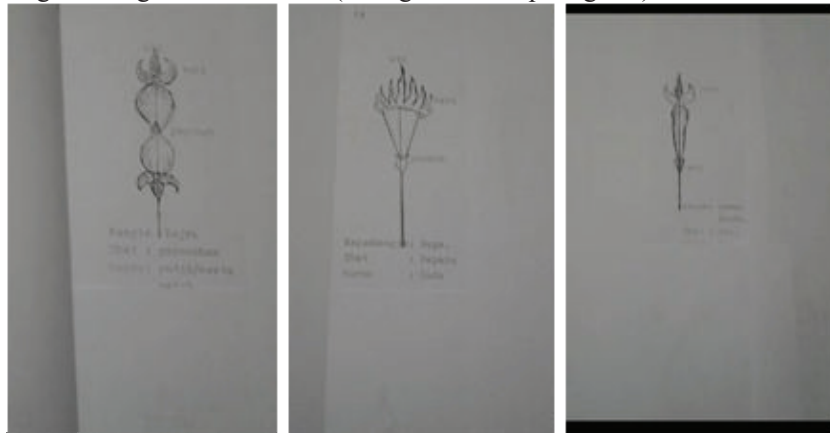
5 Makna Kuliner Bali

Bentuk dan jenis kuliner Bali juga dipersembahkan kepada Tuhan Yang Maha Esa, terutamanya para dewa penjaga mata angin yang lebih dikenal dengan sebutan *dewata nawa sanga* (Sembilan dewa penjaga mata angin). Selain itu, jenis/bentuk dan jumlah kuliner Bali yang disuguhkan kepada seseorang pada saat upacara .terkait dengan *linggih/tegak* atau kedudukan dan status sosial seseorang. Dengan demikian kuliner Bali bermakna religious dan sosial.

5.1 Makna Religious Kuliner Bali

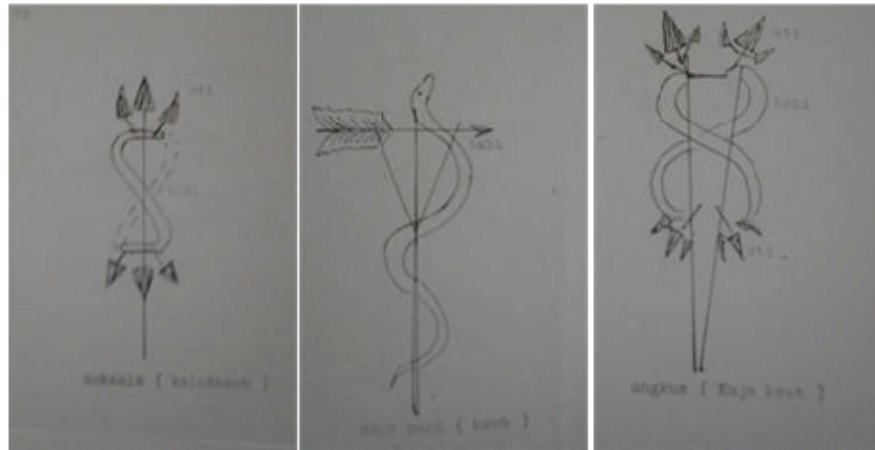
Jenis dan bentuk kuliner Bali berupa simbol-simbol atau senjata yang melambangkan para dewa penjaga mata angin atau dikenal dengan sebutan *dewata nawa sanga*. Berger (2010: 28) menyatakan bahwa simbol adalah semacam tanda untuk membangkitkan respon tentang berbagai hal. Berikut bentuk dan jenis kuliner Bali sebagai simbol yang dikaitkan dengan *dewata nawa sanga* (sembilan dewa penjaga mata angin) yang berfungsi sebagai hiasan gayah adalah sebagai berikut.

- 1) *Bajra magenah ring purwa* artinya hiasan gayah berbetuk *bajra* letaknya di timur dihubungkan dengan Dewa Iswara (lihat gambar 6.1 paling kiri)



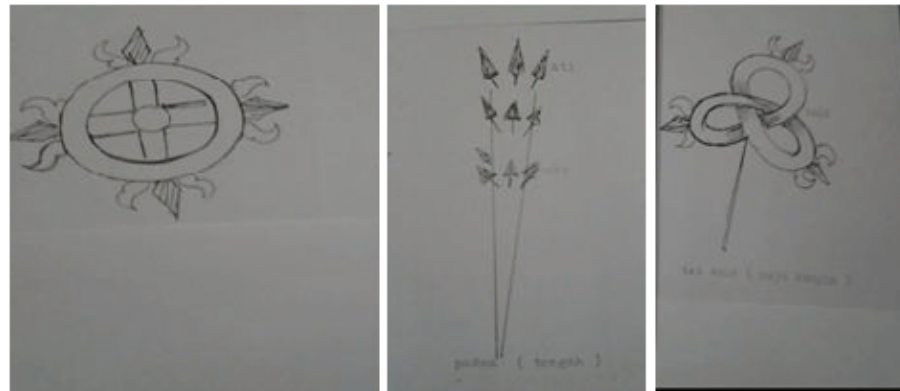
Gambar 5.1 *Bajra* (timur/Dewa Iswara), *Dupa* (tenggara/Dewa Maheswara), *Gada* (selatan/Dewa Brahma) (sumber: Wayan Wahyu Angga: hal 24)

- 2) *Dupa magenah ring geniyen* atau *dupa* bertempat/terletak di tenggara dihubungkan dengan Dewa Maheswara (lihat gambar 6.1 tengah)
- 3) *Gada ring daksina* artinya senjata gada tempatnya di selatan dikaitkan dengan Dewa Brahma (lihat gambar 6.1 paling kanan)
- 4) *Moksala ring neriti* artinya *danda* tempatnya di barat daya dikaitkan dengan Dewa Rudra (lihat gambar 6.1 paling kiri).



Gambar 6.2 Moksala simbol untuk Dewa Rudra tempatnya barat daya dan nagapasa simbol Dewa Mahadewa penguasa barat (sumber: Wayan Wahyu Angga: 24).

- 5) *Nagapasa magenah ring pascima* artinya *nagapasa* bertempat di barat dikaitkan dengan Dewa Mahadewa (lihat gambar 6.2 tengah). *Angkus ring wayabya* artinya *angkus* terletak di barat laut dihubungkan dengan Dewa Sangkara (lihat gambar 6.2 paling kanan)
- 6) *Cakra magenah ring utara* artinya cakra bertempat di utara dikaitkan dengan Dewa Wisnu (lihat gambar 6.3 paling kiri).



Gambar 6.3 *Cakra* (utara/Dewa Wisnu), *Trisula* (timur laut/Dewa Sambhu), dan *Padma* (tengah/Dewa Siwa) (sumber: Wayan Wahyu Angga: 40).

- 7) *Trisula ring ersanya* artinya *trisula* ditempatkan di timur laut dihubungkan dengan Dewa Sambhu (lihat gambar 6.3 tengah).
- 8) *Padma magenah ring madya* artinya *padma* ditempatkan di tengah sebagai simbol Dewa Siwa (lihat gambar 6.3 paling kanan) (I Nyoman Wahyu Angga, tt, 19).

Berdasarkan paparan di atas dapat dipahami bahwa bentuk atau hiasan kuliner Bali untuk *gayah* dikaitkan dengan simbol-simbol dewa penjaga mata angin. Dengan kata lain, bentuk/jenis sate dan hiasan *gayah* dalam kuliner Bali bermakna religius karena dikaitkan dengan simbol dewa tertentu dalam sistem kepercayaan Hindu.

5.2 Makna Sosial

Dalam Bab V di depan telah diuraikan bahwa kuliner Bali berfungsi sosial. Kuliner Bali ternyata memiliki hubungan fungsional dengan struktur masyarakat. Jumlah dan bentuk kuliner yang dihidangkan atau disuguhkan kepada seseorang dalam sebuah pesta atau upacara di Bali disesuaikan dengan *linggih/tegak* atau kedudukan/status sosial seseorang. Seorang gubernur

atau bupati akan diberi hidangan kuliner Bali yang jumlahnya lebih banyak dari seorang camat. Demikian pula halnya seorang camat akan disugahi hidangan kuliner Bali yang jumlah dan bentuknya lebih banyak dari hidangan untuk seorang kepala desa/perbekel. Lebih lanjut juga terungkap bahwa istri/suami pejabat diberikan hidangan kuliner yang jumlahnya kurang dari hidangan yang diberikan kepada suami/istri pejabat bersangkutan. Selain itu, wanita/perempuan biasanya diberi hidangan kuliner Bali berbeda atau lebih sedikit daripada yang diterima laki-laki. Dalam konteks ini kuliner Bali juga dapat dikatakan bermakna gender.

Sesuai dengan teori fungsional struktural bahwa perbedaan-perbedaan dalam struktur organisasi di masyarakat juga diejawantahkan/diwujudnyatakan dalam kuliner. Jumlah kuliner yang diberikan/dihidangkan kepada pejabat/undangan disesuaikan dengan hirarki jabatan yang bersangkutan. Dengan kata lain jumlah dan jenis kuliner yang diberikan atau diterima seseorang sesuai dengan tinggi-rendahnya jabatan yang bersangkutan. Dengan demikian maka kuliner Bali juga dapat dikatakan bermakna sosial.

6. Conclusion

6.1 Simpulan

Sejumlah lontar atau manuskrip memuat tentang kuliner Bali. Naskah lontar tersebut antara lain: Dharma Caruban, Tatwa Brata, Kakawin Siwa Ratri Kalpa, Kakawin Dharma Sawita, dan Kakawin Ramayana. Secara umum lontar tersebut memuat tentang bahan kuliner dan bumbu yang digunakan, manfaat secara fisik maupun mental bahan bumbu kuliner, manfaat atau dampak positif dan negatif makanan terhadap tubuh, pikiran dan jiwa seseorang, dan pengendalian diri atau pantangan terhadap makanan tertentu agar terhindar dari penyakit/kesengsaraan. Di antara lontar tersebut, Lontar Dharma Caruban menguraikan secara lengkap tentang berbagai jenis kuliner, bahan dan bumbu yang digunakan, serta peruntukannya baik secara sosial maupun keagamaan. Data dalam penelitian ini diperoleh melalui kajian teks berupa penerjemahan dan pendeskripsian isi lontar atau manuskrip, kajian dokumen, observasi dan wawancara mendalam terhadap sejumlah informan yang menekuni kuliner Bali seperti penulis buku kuliner Bali, dan pedagang kuliner/makanan Bali. Teori yang digunakan adalah teori struktural fungsional, dan teori semiotika. Hasil penelitian mengindikasikan bahwa berdasarkan manfaat atau fungsinya maka kuliner Bali juga bermakna religious dan sosial. Dikatakan berfungsi dan bermakna religious dan sosial karena bentuk, jenis, dan simbol kuliner Bali juga dikaitkan dengan simbol atau warna *dewata nawa sanga* (dewata penjaga kesembilan arah/penjuru mata angin). Dalam konteks ini kuliner Bali juga berfungsi dan bermakna religious/keagamaan. Kuliner Bali juga dipersembahkan sebagai *ulam suci* atau banten/sesajen yang dipersembahkan untuk alam atas (*Swah loka*) atau para dewa, *bebangkit* adalah kuliner Bali berupa babi guling dan *gayah* untuk alam bawah berupa caru (*Bhur*), dan kuliner sebagai bahan caru dihaturkan untuk alam bawah (*Bhur*) dalam kaitannya dengan Butha yadnya.

Kuliner Bali berfungsi dan bermakna sosial dikaitkan dengan jumlah dan bentuk kuliner yang dihidangkan atau disuguhkan berdasarkan *linggih/tegak* atau status dan kedudukan seseorang. Bentuk dan jumlah kuliner Bali yang dihidangkan atau disuguhkan kepada seseorang sesuai dengan kedudukan dan jabatannya di masyarakat. Semakin tinggi status dan kedudukan seseorang maka semakin banyak pula jenis kuliner terutama sate yang diberikan atau disuguhkan kepada yang bersangkutan. Kuliner Bali juga bermakna gender, karena ada perbedaan jumlah hidangan atau suguhan yang diberikan kepada laki-laki senantiasa lebih banyak dibandingkan dengan yang diberikan kepada wanita atau perempuan.

6.2 Saran

Pemahaman terhadap isi lontar atau manuskrip yang terkait dengan kuliner Bali perlu ditingkatkan dan disebarluaskan kepada masyarakat karena memuat tentang berbagai jenis kuliner, bahannya, bumbu, fungsi, dan maknanya baik secara sosial maupun religious. Anjuran terhadap pantangan mengonsumsi jenis makanan tertentu yang dapat menimbulkan dampak negatif berupa kesengsaraan atau penyakit perlu diinformasikan kepada masyarakat atau halayak luas agar dapat hidup sejahtera dan berbahagia.

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Kingdom And Existence Of *Puri* In Bali As Architecture Form Of Nobility House

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Abstrak. "Puri" is one of the architectural form of traditional house in Bali, in the form of complex of building which function as center of government and residence of king and its family. 'Puri' represents an architectural quality that uniquely corresponds to a particular function, form and time. Its representation embraces the grandeur of scale and aesthetic and decorative elements. Along the way of history, this form of living, which specifically accommodates the activities of noble families / empires and its components, is struggling to meet the high cost of regular maintenance. As a result, there has been a change of spatial and architectural formation of various 'puri'. The developments that occur are certainly not limited to physical changes, but also to the philosophical meaning of spaces and buildings. The research is aimed to reveal the various aspects that change the existence of the architectural form of the castle. Assessments are conducted by observing progress / progressive changes of a form through adjustment efforts that are restricted to both external and internal factors. Research is qualitative, with the approach of 'historical materialism'. The conclusions of the research are 'puri' in Bali currently does not function as the center of government and is no longer supported by the community. Thus, the prevailing general view is that the physical building of 'puri' is only a historical heritage of the past. Currently the Balinese people have not much to know the meaning attached to the complex of 'puri'.

Keywords: Kingdom in Bali, Puri, Change, Spatial Formation.

1. Introduction

Puri is one form of architecture in Bali, in the form of a building complex that functions as the center of government and the residence of the king and his family. By the Balinese people, the castle is defined as the place of the *ksatrya* or the group that holds the government, or the noble's house that is respected in an area (Gelebet, 1986). As a palace, the *puri* is a complete architectural work, because it contains concepts about spatial planning and buildings which include: *parhyangan* buildings (places of worship), *pawongan* buildings (residential places) and *palemahan* buildings (general functions) which are present in one order harmonious (Rumawan Salain, 1993).

Puri, like the palace of the kings of the world (pallace, castle) has specific and unique features, evolves and changes evolution in accordance with the times. The castles that still stand on the island of Bali now live a little, some have been damaged, moved locations and were not repaired, some are still well maintained.

Puri-puri and the important buildings in Bali generally date from the 17-19th century AD. At that time many small kingdoms ruled, and there were often wars between the local kingdoms. In addition to destroying various kingdoms, it also caused the castles to be destroyed by warring forces. In the late 19th century AD a number of kingdoms collapsed, both because of the war between them and the Dutch. Destruction continued when the Dutch conquered a large part of Bali at the beginning of the 20th century AD. Many *puri* from the kingdom were

subdued as well as from kingdoms that were still free, destroyed and burned down (Ketut Agung, 1991).

As a result of various wars and the deterioration of the powers of the kingdoms, there are now only a small number of *puri* complexes in Bali that are still intact. Among them are Puri Gianyar and Puri Karangasem, Puri Amlapura in Karangasem and Puri Ubud. The last two *puri*'s, a small castle that was once inhabited by a king. While Puri Klungkung leaves only the front, which is now known as the *Taman Kertagosa*. The phenomenon of evolution and the long historical journey of the royal / *puri* authority system, due to internal factors (transfer of power / rebellion) and external (conquest / colonization), have an effect on the form of architecture *puri* in Bali. A dilemma that also affects the changes that occur, namely factors such as the increase in users, the economy, and changes in people's views on the existence of the *puri*. From several studies and research can be parsed at least two things that become the background to the research problem; 1) *puri* in Bali currently does not function as a center of government and is no longer supported by people living in the royal system. Thus, the general view that develops is that the physical buildings of the *puri* are only historical legacies of the past; 2) Balinese people now do not know the meaning that might be attached to a *puri*'s complex.

The main focus of this research is on changing the form of architecture, as well as what kind of study and how the development of the philosophical meaning behind it can adapt to the changes that occur. Research on the *puri* and architecture *puri* in Bali may already exist, but no one has reviewed the existence of the *puri* with all the transformations of the form of its architecture, from the point of view of historical development and related in it about the system of authority. Assessment is traced through a form that has referred to a particular concept, and basically is a review of the layout, functions, and other physical elements. The focus of the next research is to unravel various aspects both directly and indirectly, influence or influence the evolution of the form of the architecture of *puri* that occurs.

This research is qualitative research, with a historical materialism approach. The discussion is carried out with a natural qualitative model approach, where conditions contained in objects are left in their natural state, or without manipulation treatment. The study of the existence of architectural forms is carried out by observing the progressive changes of a form through adjustment steps which are limited by external and internal factors. The development of the philosophical meaning of the *puri* is reviewed against the system of authority and socio-cultural society, through tracking activities of changes from a certain time.

This research is very urgent to be carried out to find out the existence / existence of the physical form and philosophical meaning of the castle architecture that occurred, due to the historical development and the system of royal muscles, and to unravel the aspects that led to change. While its contribution is to position the policy framework to control the *puri* from destruction (itself). Strategic efforts are built through the learning process of best practices at the global level by not neglecting the internal values and local conditions, especially traditional Balinese architecture. The results of the study may not be directly applicable, but the findings of the recommendations can be input for solving similar research problems but more deeply.

2. Research Method

2.1. Literature Review

Overview of the History of Royal Development in Bali

The castle in Bali is a form of the royal palace building that developed during the kingdom. Kingdoms in Indonesia in the past, are evidence of cultural heritage. The formation process is influenced by concepts and cosmic-magical phenomena, numbers (symbols), sacred objects, leaders and so on.

During the kingdom in Bali, the *puri* was the residence of a ruler of the kingdom and at the same time as a facility for government administration. Therefore, the *puri* for the position of a king is more than just a place to live. *Puri* as the center of power must be in the center of the kingdom. In the Hindu concept, the kingdom (*jagad*) was built as a miniature universe, while the king was the incarnation or vice deity. The royal center is the royal capital and as the center of the capital is *Catuspatha* which is also the magical center of the kingdom (Heine Geldern, 1982 in Munandar, 2005). *Catuspatha* as a pattern of central government administration in one kingdom country does not all have four city center facilities as mentioned above. This is related to the power status of the ruler who lives in *puri* in the environment (area) of a *Catuspatha*. There is as the center of government of a country, and there is a which is the center of government of the subordinate region of the country.

Form Architecture of Puri

Puri is not only a place for the king's house, but the residence of the king and his family. Physically *puri* is a collection of buildings surrounded by walls. The encircled land is partitioned again with a dividing wall that is equipped with a gap in the door, as a connecting road between the spaces insulated by the wall. As one of the most diverse architectures in Bali, the *puri* complex also follows the rules of the housing or village development rules that have been handed down for generations by the Balinese people. This pattern is based on the *Pempatan Agung* or also called *Nyatur Muka/Nyatur Desa*. The point is that there are two main roads that cross from east-west and north-south intersect each other to form crossroad crossings. In the castle building, according to information from several sources, there is a special concept that must be followed by planners or builders (*Undagi*), the rule is called *Sanga Mandala*. A land that is destined for the construction of the *puri*, should be rectangular or square. The land is then divided into nine plots of land that are bounded by a perimeter wall. Each coral with one another is connected with a door gap (*pemedal*) or a door equipped with *kori / angkul-angkul* (Putra Agung, 1985). Referring Gelebet, (1986), in the architectural layout of the *puri*, each coral is also often called *palebahan* which has its own function. In the division of *Sanga Mandala* there are nine *palebahan*, namely: 1) *Ancaksaji* is the front (first *palebahan*), its function as an area to prepare itself if visitors will enter the *puri*. *Ancaksaji* is usually located in the southwest corner.; 2) *Sumanggen* is a place for carrying out death (*pitra yadnya*) for the family of the king of the *puri* inhabitants. On the *palebahan* there is a building called *Bale Sumanggen*. Generally located in the southern area of a *puri*; 3) *Rangki* is a *palebahan* and also the name of the building to check guests, hold hearings, and inspect; 4) *Pewaregan* is the kitchen area of the king (*paon raja*), a place to store food that is ready to be cooked. Generally located in the southeast corner; 5) *Lumbung* is a *palebahan* and building name for storing rice, usually located in the northwest area of the *puri* complex; 6) *Saren Kaja* is a *palebahan* where buildings are built to house the king's wife, generally located in the northern area; 7) *Saren Kangin* or also referred to as *Saren Agung* is the core area of *puri*, because in *palebahan* that is the king's daily residence; 8) *Paseban* is a *palebahan* as a place for royal officials to wait for the king's exit, it can also be used as a royal court; 9) *Pamerajan Agung* is a *palebahan* where sacred buildings were erected to glorify the ancestors of the royal family. Because of the *puri's* possession, generally the great teachings are quite extensive, almost matching the temple itself. Usually a *Pamerajan Agung* on a *puri* complex is located in the northeastern region (*kaja kangin*). In the implementation of the distribution of *Sanga Mandala* then adjusted to the environment and land conditions for the *puri*, each *puri* has its own creations and differences according to the abilities of the *undagi* the view of the king who will reside in the *puri*.

2.2. Methods

This research will be more related to quality, therefore the approach taken in this study is a qualitative approach, is natural, contextual, prioritizes an emic perspective, is descriptive and process-oriented, prioritizes direct data and purposives, with inductive analysis that takes place during the research process, where the researcher acts as the main tool. holistic, interpretive and subjective which is broken down with words or narratives and deep. The results of the qualitative approach provide guidance that is very specific to the results of research (Ibrahim, 2005).

Thus in this study, the research approach method that will be used is historical materialism. With this method, research only needs to describe the reality of the castle which is studied well, intact, clear, in accordance with the facts that appear (seen and heard), not making it up, let alone manipulating it. The purpose of the research results but more on the desire to obtain in-depth information, is not generalization, but the disclosure of phenomena that have a depth of meaning. What is possible is a theoretical generalization. The required sampling is relatively small (less), but is expected to describe and represent complex realities. For this study, the sample will be taken by random purposive sampling which is considered representative.

This research can be classified in studies or 'single case' studies, it is necessary to have a research location that is able to show the diversity of typology of transformation / change in the form of castle architecture, as well as the development of functions, the meaning behind it. In determining the location / choice of castle objects, it is likely to find phenomena and problems that deviate from existing theories, so that the possibility of the theory built in this research is expected to be able to improve, complete or perfect.

Determined the location of the object of the castle research in the regional / Province of Bali. Considering that the scope is not broad, the object of the architecture of *puri* is limited to the *puri-puri* that still have the concept of *Sanga Mandala* on their *palebahan*, even though the buildings above have experienced physical visual changes referring to Gelebet (1986).

The types of data that will be collected simply can be calcified two, namely primary data and secondary data. The main data types will be in the form of field observations or surveys, in the form of observation of *puri's* objects, physical data collection or mapping and physical degradation of the *puri* complex and its current / present buildings. The interview was conducted by the researcher himself, and initially with an open interview to get preliminary information about the problems that existed in the form of the architecture of *puri*, as well as its function / philosophy. Next, to get a more complete picture of the problem, interviews were conducted with other resource persons who represented capability and competency levels such as *undagi, sulinggih*, and architects.

The instruments in this study, namely: a). Main instrument; the researcher himself, closely related to the personal qualities of the researcher, relates to theoretical sensitivity; b). Other complete standard instruments of research. Considering data, data sources and determining the sample / object under study, and referring to Bungin (2013: 173), the data collection techniques used in this study are as follows: a) Observation; b) Interview; c) Documentation; d) Focus Group Discussion (FGD). In general, data analysis in the research will be conducted with grounded theory. It is intended that data analysis is carried out more than just to get a picture or understanding of a reality or social phenomenon under study, with the aim of finding/ completing or at least perfecting the theory. The method of presenting the results of the data analysis uses the incorporation of formal and informal methods with descriptive methods with narratives interpreted on the basis of the fact facts obtained.

3. Results

Puri The shape and function of the buildings in each *palebahan puri* have experienced development / change. This is indicated by the existence of typologies of building forms in

several chateaux, for example; *Bale Bengong* and *Gedong Loji* buildings in Puri Agung Gianyar; the form of the *Kori Agung* in Puri Agung Ubud; also *Kori Agung*, *Bale Maskerdam*, and *Bale Kambang* at Puri Agung Karangasem, a combination of typologies of Balinese architecture and modern architecture (Dutch / Colonial) or their combination with Chinese architecture.

Changes in the status and position of the families of the nobles / kings in their society, as well as the form of government caused some *puri* families, seeking other alternatives to maintain the existence of the *puri's* authority. Some *puri* began to use the surrounding buildings as a means of accommodation for tourists such as Puri Agung Ubud-Gianyar, Puri Agung Pemecutan-Denpasar.

Furthermore, various aspects regarding the change of the *puri* in Bali will be discussed. For this purpose several study cases were chosen, which were distinguished by location, namely: a) *Puri* in the area / city center; Puri Agung Pemecutan – Denpasar; b) *Puri* in a transition area; Puri Agung Ubud – Gianyar; c) *Puri* in rural areas; Puri Agung Kendran, Kecamatan Tegalalang – Gianyar.

1. Agung Pemecutan - Denpasar

Puri Pemecutan is one of the castles located in the center of Denpasar City. besides several other castles such as: Puri Kesiman, Puri Jro Kuta and Puri Satria. The *puri* were built after the main castle called Puri Denpasar. This main castle has disappeared due to the war between the Kingdom of Denpasar and the Dutch East Indies government in 1906 (the event of *Puputan* - all-out war). The location of the castle is located right in the middle of the city of Denpasar which has now changed its function to the office of the Governor / Governor of Bali Province.

Puri Pemecutan is located at a crossroads in the city of Denpasar, where the surrounding environment now has developed into a commercial area in the form of shops, inns and private offices.

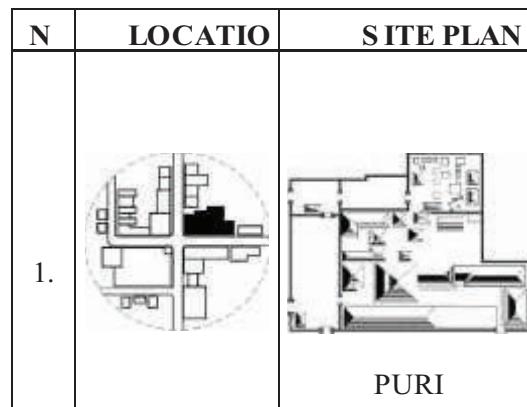


Figure 1. Location and Site Plan of Puri Agung Pemecutan Denpasar

This development also affected Puri Pemecutan. Most of the *puri* area has been converted into hotels, with new buildings that are different from the original form of the building. The *palebahan Ancaksaji* has changed its function to a parking area. *Bale Bengong* building serves as a place to wait for taxi drivers and tourist buses. The

part that can still be said to be intact is in the *palebahan Pemerajan Agung* which is divided into three parts: *jaba side*, *jaba tengah* and *jeroan Pamerajan*.

The hotel building has a modern form that is given a touch of Balinese architecture. The basic shape of the building is in the form of a long rectangle consisting of 2 floors or 1

floor, with the arrangement of rooms arranged in a row. The structure and construction of buildings are reinforced concrete frames that are finished with brick. The inside of the walls of the rooms is finished with wall paint. The original courtyard divider wall is made of red brick that is very thick and high, giving rise to the impression of resembling fortress walls.

Table 1. Changes and Visual Summary of Puri Agung Pemecutan

	CHAN			VISUALS
	A.	S	P.	
FUNC				
FOR				
S				
CONS				
MATE				

MILD
 MODERATE
 SUBSTANSIAL

2. Puri Agung Ubud - Gianyar

Puri Ubud is located on *Kaja Kangin*, at the crossroads of village roads. The market is located in front of it, *Wantilan* and *Bale Kul-kul* on the right and some other parts are neighborhoods of housing that most of them have started to develop into business places. The trend of development that occurs is as a result of the development of tourism. Several types of developing facilities can be mentioned such as: shops, restaurants, pubs, art shops, galleries, inns, home stays and so on.

N	LOCATIO	SITE PLAN
1.		<p style="text-align: center;">PURI</p>

Figure 2. Location and Site Plan of Puri Agung Ubud-Gianyar

The spatial pattern of Puri Agung Ubud still fulfills the pattern of division nine (*Nawa Sanga*), with a grand exhibition located on the *kaja* part as the most sacred area. Overall the basis of buildings is rectangular. Until now there have never been changes in the size of the basic shapes of buildings, except the replacement of floor, wall and roof materials with new building materials. Changes to these materials are due to the age of the building, ease of maintenance, and the demands of the function of being a home stay in the building units in the *palebahan Saren*, except *Saren Agung*. The addition of bathroom space and toilet for completeness of lodging facilities is carried out following the original building.

Table 2. Changes and Visual Summary of Puri Agung Ubud- Gianyar

	CHANGE			VISUALS
	A.	S	P.	
EUN				
FO				
S				
CON				
MAT				

MILD
 MODERATE
 SUBSTANSIAL

Changes in the function of the Puri Agung Ubud from the residence of the king's descendants to lodging facilities can provide a number of income which is beneficial for the maintenance of buildings. The entire building in each *palebahan* in Puri Ubud is one example of a *puri* that utilizes tourism to maintain its existence.

The building uses the construction of supporting poles with wood material. In certain parts decorated with carvings to add aesthetics. Some roofs use tile material and some reeds. The elements of outer space are solved by setting the types of grass plants, shrubs and flower trees with footpaths from concrete rebate material.

3. Puri Kendran – Tegalalang, Gianyar

The location of Puri Kendran is in the *kaja kangin* area missing the crossroads in Kendran Village. In the neighborhood around the *puri* there are yards, *Bale Banjar Kendran* and residential housing.

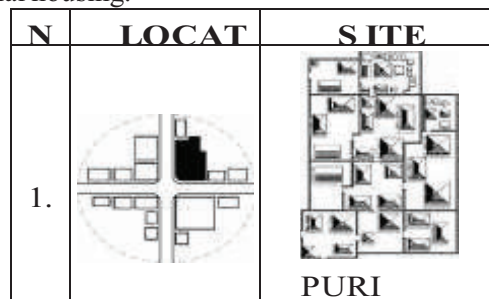
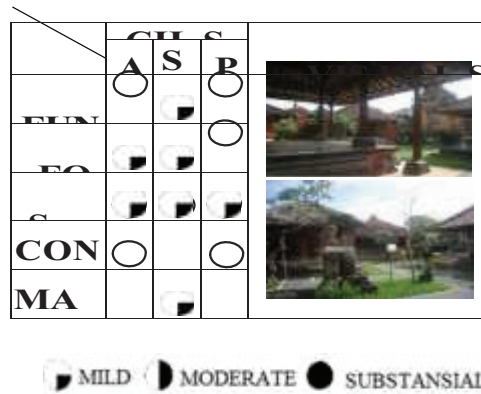


Figure 3. Location and Site Plan of Puri Kendran-Tegalalang, Gianyar

Kendran village is located in a hilly area about 10 km north of Ubud. Administratively, Kendran is included in the Tegalalang District, Gianyar Regency. The inner courtyard of the *puri* is divided into *palebahan* which form a composition of building masses with central orientation (*natah*). The *Saren* units are now occupied by families who have the right to inherit them.

Seen the efforts of the families as heirs to maintain their existence. This can be seen in the condition of the buildings that are well maintained, even some of the buildings are seen to have been repaired using new materials such as: ceramics, paint, tiles and so on. The shape and size of the basic building still retains its authenticity, without a meaningful change. All existing buildings are Balinese architectural style, with the completion using rubbed brick. Structure and construction of buildings using wood materials, including roof construction. In some buildings there is an addition of Balinese carvings which can add to the aesthetic value of the building.

Table 3. Changes and Visual Summary of Puri Kendran- Tegalalang Gianyar



4. Discussions

Unraveling about the *puri* in Bali is essentially inseparable from learning about the concepts of classical countries (kingdoms) that once existed in Southeast Asia and Indonesia. The concept of a classical state in Indonesia is generally influenced by two centers of civilization, namely India and China. More specifically about cosmic-magical influences, numbers, symbols, sacred objects, leaders, geography, positions and so on.

In traditional classical societies, it is understood that the concept of power is related to the belief system, because the values that function to maintain society are derived from the system. The King is the leader and at the same time a ruler has authority over dualistic powers, namely worldly and spiritually. The royal palace is considered a civilized and stable space, as a result of meditation from spiritual forces (Rai Mirsa, et al. 1986; Ardana, 1988 in Ardika, 2012).

Based on historical data, the development of traditional Balinese architecture can be classified in the following periodization: the period of Ancient Bali (Bali Aga); period of arrival and influence of the Majapahit Kingdom; period of arrival of foreigners to Bali; and the period of independence (Ngurah, 1983). The existence of *puri-puri* in Bali began since the arrival of the influence of the major kingdoms in Java between the years 900 BC to ± 1350 BC. The influence of the Majapahit Kingdom from East Java is very large on the development of religion, fine arts, literature, architecture, and others. In particular the role of Hinduism as the majority religion of Balinese people, has become a way of life and implemented in the joints of everyday life until now (Budihardjo, 1995).

The development of the roles and position of kings in Bali can be parsed in accordance with the periodization of the history of the government system which began with the period of

the kingdom, the period of Dutch colonial rule and the reign of the Republic of Indonesia (NKRI). Before 1906 the royal family (nobility) became the central point (center) of the surrounding community. The royal family has the right to request labor and military assistance to the people and they also have juridical power. During the Dutch colonial period, personal service ties between nobles as rulers and people as subordinates were removed and replaced by regional government relations. With the formation of the NKRI, the role and position of the king became even weaker, with the opening of opportunities for political positions of government for talented / educated and educated people even though not from the aristocracy (Ngurah 1983).

Since the opening of Bali on ± 1930 by the Dutch East Indies colonial government, has aroused the interest of tourists and cultural researchers to carry out activities of travel and or study (Ktut Agung, 1991). The development of tourism in Bali then brings the consequences of changing order in various social, economic, cultural aspects, including spatial planning and so on. This change can also be observed in the existence of the *puri* in Bali.

Thus, over the course of time the traditional Balinese architecture experienced development and change, the *puri-puri* in Bali were also inseparable from this, in line with the development of the Balinese socio-culture. Changes to the *puri* in Bali are basically caused by 2 (two) main factors, namely external; such as tourism, technological development, etc., as well as internal; such as changes in family structure, changes in the system of government and power, development of social, cultural and economic systems (Budihardjo, 1995).

From this simple description, it can be concluded that the role and position of kings in Bali are diminishing (weakening). With conditions that are unfavorable for the royal family as at the present time, various efforts have been carried out as an alternative to maintain the independence of authority and the continuity of their offspring. Part of the *puri's* family in Bali began to open up opportunities for tourism development by utilizing several *puri* buildings for new functions, as a means of tourist accommodation (a type of homestay).

Based on the study findings can be identified various forms of changes that occur in the *puri* in Bali with the tendency to change into a means of accommodation and or objects of tourism observation. This relates to the regeneration of financial income for the purpose of maintenance and continuity of the existence of the *puri*. Efforts that need to be appreciated and deemed appropriate to be continued as one of the development of tourist attraction with the *puri* as a cultural object. The process of change that occurs in most of the *puri* at this time, shows that there have been efforts made for maintenance by improving the quality of buildings, through repairs (reconstruction and renovation) of old buildings.

From the results of observations of *puri-puri* which were designated as study cases; Puri Agung Pemecutan-Badung/Denpasar; Puri Ubud-Gianyar and Puri Kendran-Tegalalang, Gianyar, seen changes in function and layout. Changes occur mostly in the yard / area (*palebahan*); *Ancaksaji*, *Sumanggan*, *Saren / Rangki*. Changes in function and spatial planning occur because of the use of buildings in the *palebahan Saren / Rangki* with accommodation functions that can be found at Puri Agung Pemecutan, Puri Agung Ubud, Puri Kendran does open up opportunities for tourism development, but is limited only as an object of observation (sight seeing) only.

5. Conclusions

The shape and function of the *puri's* architectur (complex and building) has undergone changes and developments since a long time ago. This is due to the influence of Chinese and Dutch culture which is indicated by the existence of several building typologies, especially in the *saren / rangki* court which is not normally the Balinese building typology. Both cultures only affect a small part of the entire castle structure. Chinese culture entered Bali through trade and Dutch contacts through political and colonial contacts.

Changes in the status and position of the king since the abolition of the royal

government in Indonesia influenced the authority of the king in the midst of his society. The change in status and position began when the Dutch colonial government came to power in Bali. The power of the king is under the control of the Kingdom of the Netherlands. Then in the early days of independence with the establishment of the Republic of Indonesia, the position of the king was still maintained as the regent of the regional authority in the regencies of Bali. In the later years the position of the descendants of the king (nobility) as regent was gradually replaced by people who were more capable and capable by the central government.

With conditions that are unfavorable for the king's family at this time, various attempts are made as an alternative to maintain the existence of authority and continuity. *Puri-puri* in Bali, changes in functions and spatial use that are used as a means of tourist accommodation are examples of many businesses that are carried out. The existence of these new functions, in part of the *puri* does not affect the changes in dimensions and shape of the building. Changes that occur are only limited to improving the quality of the building by replacing old materials with new materials and adding bathroom space. In another *puri*, for example Puri Agung Pemecutan Denpasar, in addition to most of the area being converted into a hotel, the shape and dimensions of the building have also changed from its original form. Puri Kendran's family made repairs while maintaining the original function even though the castle's daily conditions were not inhabited.

Changes that occur are certainly not limited to changes concerning physical aspects but also to the role of the royal family. If during the reign of the kingdom, king, and his family had the highest position that ruled a number of people with power, now this position shifted to become an entrepreneur who offered various assets that the kingdom still owned. The role of the entrepreneur during the kingdom was only carried out by those who were the descendants of *Kasta Weisya*. The role as an entrepreneur is recognized by noble families (kings) as a compulsion that needs to be done to maintain its existence given the position of a leader that is beginning to shift which is determined based on the political order of the Republic of Indonesia.

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The Existence Of Subaks Inside The Northern Kuta Tourism Area, Bali

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Abstract. Subak recognized as traditional Balinese agricultural institution based on local water management. The existence of subak determines the sustainability of tourism development in Bali. However, there are concerns that the development of the tourism would have an impact on the subak particularly located in the tourism area. The objective of this article is to understand the existence of subak in Northern Kuta Tourism Area. The spatial approach adopted to determine the spatial change that occurs from agriculture to tourism. Based on the spatial analysis with GIS application, interview, and observation can be addressed the spatial change caused by the penetration of accommodation development, tourism amenity, accessibility, and communal facility. Such circumstances occur due to the increasingly limited tourism space in the center of the tourism area or tourism business district (TBD) such as Kuta Beach and Legian. That spatial change indicates the tendency of socio-cultural shifting of the local community around Northern Kuta Tourism Area from agriculture to sub-urban characteristic, thus affecting the existence of subak as the last bastion of the sustainable cultural tourism development in Bali.

Keywords: subak, tourism area, spatial change, sustainability

1. Introduction

Bali Province has 16 tourism areas that have been defined in the regional spatial plan in 2009 - 2029. One of the tourism areas that have very strong allures is Kuta. The Kuta Tourism Area is notable for its products based on coastal and the way of life of local community. Administratively the tourism area covers two districts, which is Kuta District on the Southern side and North Kuta District in the Northern part. The center of tourism areas or referred to the term of tourism business district (TBD) is located at Kuta Beach and Legian, that situated in the southern part of the area. Whilst the area around the center of tourism, which is predominantly located in the north, is a buffer for tourism with land use domination in the form of agriculture. As a buffer zone, the northern part of the area or hereinafter appoint to as the Northern Kuta Tourism Area cannot be separated from the impact of tourism development, particularly related to spatial changes of agricultural cultivation area into tourism industry. These changes have a significant impact on the existence of subak as a noble cultural heritage.

Subak as a Balinese water management based agricultural institution has uniqueness because it is not solely profane but also sacred (symbol of harmonization). The uniqueness of subak constitutes the main capital for cultural tourism development in Bali thus far. But ironically, when tourism has grown into the economic base of the Balinese people, the preservation of subak has become a huge challenge (Windia et al., 2017).

Such a phenomenon as well observed in the Northern Kuta Tourism Area. The development of tourism in this area tends to be a threat to the continuation of subak.

Challenges to the sustainability of subak in the tourism area, have a high level of distress, considering the tourism area is an area that has urban character. Areas within urban character have high aggressiveness related to changes in the physical, social, cultural and economic circumstances of the subak landscape. Various changes those emerge due to the increasingly diverse interests of urban society. Based on the preliminary evidence available, the objective of this article is to address the existence of subaks in the Northern Kuta Tourism Area

2. Research Method

The research approach is qualitatively and spatially. The qualitative approach to describe and explain the phenomena and relationships between phenomena systematically. While the spatial approach is applied to understand the tendency of spatial changes of agricultural area. There are three methods of data collection that is the interpretation of subak area spatial data, observation, and interviews with subak leader (pekaseh) and the representative of villages (kelian adat and kelian dinas). The area of subak that has been calculated and projected for land degradation is spread in six villages in the North Kuta Tourism Area. After the spatial change in subak area was identified, afterward it was analysed descriptively qualitative to explain the cause of spatial transformation of agricultural area.

3. Result

Tourism area is a place with the main function of tourism and relatively self-contained (Inskeep, 1991). Under the specialization of the function, the tourism area is always supported by various types of amenities and accessibility to meet the needs of tourism product providers and the tourism market. (Page and Hall, 2003) and (Law, 2002) state that areas that have special functions and there are various supporting facilities and services are spaces with urban character. Kuta Tourism Area, located in Badung Regency, Bali has been reputable as a world-class tourism destination. The development of tourism products such as attractions, amenities, and accessibility spread to the outskirts of the tourism center or suburban areas. This occurs due to the increasingly limited land in the center of Kuta Tourism Area. Moreover, the penetration of the development of tourism products to the periphery as well caused by an incident of the Bali Bombing in 2002 and 2005. The bomb terror influences the development of tourism and makes tourism providers prefers the locations product component in suburban areas to obtain a comfort and safety.

Through present, the development of any type of accommodation especially homestays and villas, restaurants and souvenir shops, is quite massive in the Northern Kuta Tourism Area which is a suburban area. Not only that, this area is also the location of housing development, where most of the residents are tourism workers or indirectly related to tourism industry. Penetration of the development of tourism products and housing to the Northern Kuta Tourism Area lead the high conversion of agricultural cultivation land into a component of tourism products and communal or public facilities. The transformation the spatial function, exhibit the reduction of subak in the Northern Kuta Tourism Area.

In the Northern Kuta Tourism Area there are 19 subaks: Basangkasa, Kedampang, Petitenget, Sebuah, Muding, Tegal, Banjarsari, Bantan, Daksina, Dawas, Perancak, Semat, Cangu, Lipip, Umaalas, Umadesa, Bernasi, Gaji, and Saih, which figured in six villages: Kerobokan Kelod, Kerobokan, Kerobokan Kaja, Tibubeneng, Cangu, and Dalung. Based on the interpretation of data spatial of subak in the year 2012 and 2017 and confirmed by the observations and interviews with some pekaseh, kelian adat, and kelian dinas, ascertained that the whole subak in the North Kuta Tourism Area has degradation of the

area an average of 34% over the past five years (Table 1).

In 2012 the total area of subaks in the Northern Kuta Tourism Area was 1,500.26 Ha. After five years, the Subak area decreased by 508.56 Ha or if divided equally every year, the reduction occurred around 102 Ha/year. The subak with the most changes in spatial function until 2017 were Petitenget (49%), Muding (51%), Banjarsari (48%), Perancak (51%), Semat (40%), Canggu (51%), Umaalas (60%), Gaji (42%), and Saih (37%). The spatial functions of subaks include Petitenget.

Banjarsari, Perancak, Semat, Canggu, Umaalas, which tend to change to the development of tourism products. While subak Muding, Gaji, and Saih, the changes are inclined to housing development along with allocating the public facilities.

Subaks that have a trend in changing their spatial functions into tourism is mostly located in the villages of Kerobokan Kelod, Tibubeneng, and Canggu. The three villages are relatively close to Kuta and Legian as the center of the tourism area and also that three villages have beaches as essential tourism capital. Whereas subaks which tend to turn into housing is found in Kerobokan Kaja Village and Dalung Village. The preferences of the two villages as housing development locations are because the distance is quite far from the tourism center, so the land prices are relatively more affordable compared to other villages in the Northern Kuta Tourism Area. Even though quite far but the level of accessibility to the center of tourism and other land use is fairly high

Table 1. Degradation of Subak Area (Spatial data interpretation, 2018)

Village	Subak	Area (Ha)		Change (Ha)
		2017	2012	
Kerobokan Kelod	Basangkasa	72.63	101.74	-29.11
	Kedampang	76.48	101.98	-25.51
Tibubeneng	Banjarsari	31.42	60.34	-28.92
	Bantan	47.61	57.93	-10.32
	Daksina	45.85	58.95	-13.10
	Dawas	22.13	26.52	-4.39
	Perancak	35.38	72.66	-37.28
Canggu	Canggu	74.64	152.99	-78.35
	Liplip	25.57	29.22	-3.65
	Umaalas	13.34	33.51	-20.17
Dalung	Bernasi	71.74	88.45	-16.72
	Gaji	28.27	48.86	-20.59

4. Discussion

Corresponding with the spatial changes pattern of subaks in the North Kuta Tourism Area indicate that the closer subak to the tourism center and own the presence of tourism resources, the existing agricultural area tends to turn into tourism products. And vice versa the more away, the tendency is the agricultural area massively transform into housing with all the public facilities.

Figure 1. represent the spatial division in the Northern Kuta Region that formed a concentric pattern, with in general land use is for tourism, housing, and a mixture of tourism and housing The concentric pattern follows to the suburbanization process from the center of tourism development to the periphery. The spatial transformations in the Northern Kuta Tourism Area progressively to marginalize the subak. Eventually, if there is no synergized with tourism as a suburbanization force, accordingly that subaks in the Northern Kuta Tourism Area are increasingly weakened and further disappeared.

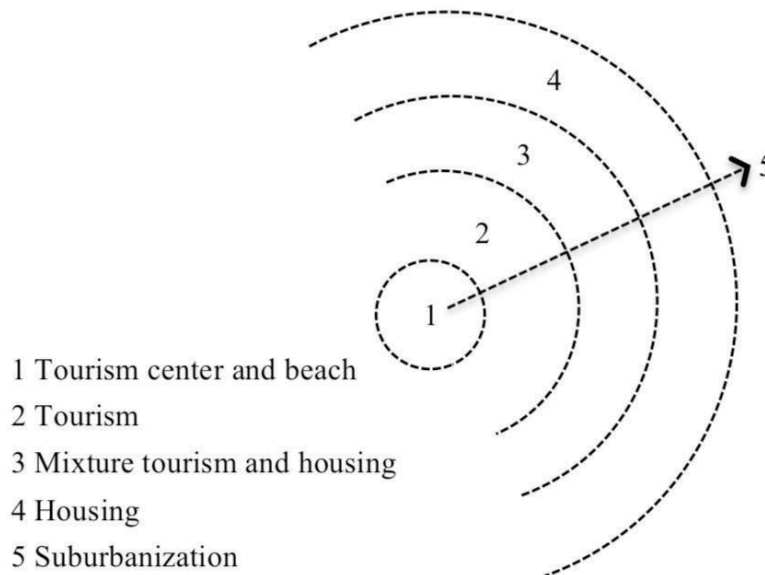


Figure 1. Currently Land-used Pattern In Northern Kuta Tourism Area

5. Conclusion

This study aims to understand the existence of subaks in the Northern Kuta Tourism Area, Bali. The land use in this area was for agriculture cultivation. In accordance with tradition, agriculture in Bali in general and included in this area is managed by subak institutions. Since UNESCO recognizes subak as a world cultural heritage landscape, the uniqueness of the Balinese agricultural management is increasingly being developed as a basis for tourism attractions, especially in rural areas. But it is different from the development of tourism in urban areas and even suburbs. The existence of subak in this area is progressively threatened due to the development of tourism and its supporting facilities. Likewise in the North Kuta Tourism Area as a suburban area, subak in this area more and more is shrinking very significant. Over the past five years, most of the spatial changes in agricultural have been used for the development of tourism products and housing. Such transformation takes place due to the suburbanization process specifically penetration of the tourism development in the center of tourism area i.e. Kuta and Legian to the buffer area or suburban. The suburbs are the locations of the growth of tourism products tend to be closer to

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the center of the tourism area. While more away from the center, the changes that appear are dominated by the housing development. The tendency of spatial changes in forms of the concentric pattern that follows the suburbanization process through the path of tourism movement as its medium. Finally concluded that the suburbanization with tourism as its driving force resulting in the weakening of the existence of subaks and predicted to be lost in the future.

In order to strengthen the existence of subak in the suburban area, a strategy to synergize between agriculture and tourism is needed. The capable recommendations to build agricultural synergy with tourism include: maintaining the tradition and implementation of agricultural rituals in the Subak Temple as a form of ennoblement of subaks; creating agrotourism products (agriculturally-based leisure attractions) to be able to develop agricultural value chains; involve subak leader (pekaseh) in the planning and development of tourism products and housing; limitation of visits by creating small-scale tourism development; and provide reward and punishment for spatial development.

Acknowledgement

We would like to thank the faculty of tourism and the Institute for Research and Community Services of Udayana University for the research assignments. We also thank the people of Kuta Utara District for the informations and kindness. We hope this publication beneficial for the parties concerned.

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A Model For Developing Local Community-Based Rural Tourism Products

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Abstract. The local community always receives the establishment of a tourist village as a rural tourism product. Likewise prevailed in Pingge Tourism Village, Tabanan Regency, Bali. In the context of developing rural tourism products in the Pingge Tourism Village, the participation of local communities is required to ensure the sustainability of tourism in rural areas. This paper aims to build a model for developing local community-based rural tourism products in Pingge Tourism Village. Community-based tourism approaches are used to formulate models for rural tourism product development. The required data is collected through observation and interviews and then analyzed descriptively. The results of the analysis indicate local community-based rural tourism products are tourist pull factors in rural areas in the form of environmental characteristics and the practice of rural communities. The uniqueness of rural character and rural community routines are tourism capital possessed by local communities. In addition to physical and socio-cultural uniqueness, rural tourism products are also determined by conformity with the target market. The existence of this rural tourism product model can increase local community participation in decision making and sharing of tourism benefits.

Keywords: tourism product, rural, local community, target market, Pingge Tourism Village

1. Introduction

The participation of local people in the development of tourism products in rural areas is the main requirement to ensure the sustainability of rural tourism (Bramwell, 2010; Byrd et al., 2009; Zou et al., 2014). This study aims to formulate a local community based rural tourism product development program in Pingge Tourism Village. This tourist village has been established by the regional government in 2004, but until established it still has problems in providing quality rural tourism products. To achieve the objectives of the study, several research questions have been set up as the target of research, specifically: what rural tourism resources do local communities have? and what are the actual and potential markets for rural tourism

2. Research Method

The community-based tourism (CBT) approach is utilized to answer several research questions. Reid, et al. (2009) stated that community-based rural tourism products were identified based on tourism resources or the uniqueness of local communities and the compatibility to the targeted markets.

Based on this approach, figured two research variables that are the variety of tourism resources and market characteristics in Pingge Tourism Village. Data related to research indicators were collected in primary and secondary to obtain qualitative and quantitative data. Data requirements gathered through a variety of techniques, namely observation, tourist surveys, in-depth interviews, and focus group discussions. The collected data will be

grouped and translated according to the research target, then analyzed and synthesized descriptively to achieve the research objectives.

3. Result

3.1. Tourism Resources

Pinge Tourism Village has a variety of resources that can be developed as rural tourism products based on local communities. Ranging from physical environmental resources to a variety of social and cultural elements.

1. Environment resources

Administratively, Pinge Tourism Village is located in Marga District, Tabanan Regency, Bali Province. This tourist village has a unique form of territory that is linear extending along the road with an area of 240.75 Ha. Most of the land is used as agricultural land, while the remainder is for housing and communal facilities. The area of rice fields in Pinge Tourism Village is 105 Ha or around 44% of the total village area. In addition to rice that is always planted every year local people also cultivate horticulture plants: vegetables and flowers. The results of these fields are mostly to meet the daily needs of the local community (subsistence). Apart from the results of rice fields, local communities also fulfill their needs from the results of the fields and yards. Space utilized for moors and yards is usually in the area behind or around the residence. The moors and yards in Pinge Tourism Village are mostly planted with fruits.

2. Socio-cultural resources

Social-cultural resources in tourism are social systems, cultural systems, and systems of work that are produced and implemented in the form of people's daily activities (Feighery, 2008). Based on that comprehension, socio-cultural resources in the Pinge Tourism Village can be created into tourism village products in the form of temples and archaeological remains, village patterns, the spatial design of residence, arts, and *banjar* as traditional organizations.

3.2. Tourism Market

The number of visitors to the Pinge Tourism Village in the period from 2011 to 2017 fluctuated with positive trends. The average number of visits per year is 1,210 visitors. Visitors to the Pinge Tourism Village based on length of stay can be classified into two types, specifically, overnight visitor and one-day visitors.

Table 1. Number of Visitation to Pinge Tourism Village

No.	Year	Visitor		
		Overnight	One-day	Total
1	2011	219	847	1.066
2	2012	229	912	1.141
3	2013	186	673	859
4	2014	242	910	1.152
5	2015	354	1.280	1.634
6	2016	806	1.016	1.822
7	2017	435	363	798
	Total	2.471	6.001	8.472

Source : Pokdarwis Desa Pinge, 2018

Most visitors or tourists that staying in Pinge Tourism Village are from Europe, especially those who have French and German citizenship. In addition to Europe, tourists stay also from the Asia Pacific Region such as Japan and China. The tourists stayed in several houses that were also used as homestays.

4. Discussion

Accordance with the mapping of tourism resources, it can be stated that the Pinge Tourism Village has a uniqueness which is the basis for the development of tourism village products created by the local community. The uniqueness is the unity of the physical environment and also daily activities or referred to as the social, cultural and economic routines of the local community:

1. Villages that have many shrines and various religious rituals. This makes Pinge Tourism Village rich in religious activities. This uniqueness is called spiritual routine.
2. Rice fields and moor dominate Land use. The majority of the livelihoods of local community are farmers. This condition raises the theme of agricultural routine.
3. Local food and beverages (FB) are processed from self-produced ingredients.

The process of taking food ingredients, cooking, serving, and enjoying food is part of the daily life of the local community. The daily life of the local community is termed a FB routine.

4. *Banjar* as a media to meet and gather local communities in order to share various information and art. These various communal routines are concentrated in the *Bale Banjar*.

Based on actual demand for tourism in Pinge Village, it can be stated that the market target for products in Pinge Tourism Village is tourists from France and Germany as the main markets. In addition to the main market, there are several countries that can be targeted as potential markets, namely tourists from Japan, China and the domestic market. The main and potential markets, especially Japan, are very relevant to rural tourism development. This is caused by tourists from these countries having a strong interest in some of the following indicators: experience local culture, experience natural environment, quiet and tranquil, experience local gastronomy, meet new people, experience the outback, stay in local village, adventure

activities, visit a heritage area, and to learn about culture and nature. In addition, market sources from China and the domestic can also be used as alternative targets for the rural tourism market, given the strategic value of these two market sources. Tourists from China are Bali's largest market in the past five years and are expected to continue to grow in the future. While the domestic market is currently pushed to move to rural areas for the purpose of learning and strengthening Indonesian culture.

Community Based Rural Tourism Products

Rural tourism products are the development of values contained in physical, social, and authentic cultural objects in rural areas to provide new experiences for tourists (Idziak et al., 2015). Tourists who visit rural areas are motivated to experience life directly or do daily activities in rural communities (George et al., 2009; Roberts and Hall, 2001).

In the context of Pinge Tourism Village, the determination of rural tourism products in the tourist village is based on the values of the physical, social, and cultural environment that appear in the daily activities or routine of the local community. Some of the products of Pinge Tourism Village that can be offered to market or tourist targets include:

1. Spiritual Tourism; tourists who choose this attraction will get experience and learning

about ritual and spiritual processes, especially in Hindu religious ceremonies. Various experiences and learning are obtained starting from the stages of preparation, making ceremonial facilities, to conducting religious ceremonies.

2. Agricultural tourism; tourists can take part in the whole process of agricultural cultivation, to gain experience and learning of agricultural based on the subak system which has been established as a world cultural heritage.
3. Culinary tourism; the experience and learning of processing food and beverage (FB) ingredients and enjoying fresh and healthy culinary was only found in Pinge Tourism Village. The types of food and beverage in Pinge Tourism Village are very typical because most of the raw materials are produced in the village itself. Tourists will be able to take food and beverage ingredients and then cooking together with the local community.
4. Educational Tourism; one of the purposes for tourism is to study the tourist attractions visited in the interim period. Pinge Tourism Village has a unique cultural heritage in the form of old village characters, traditions, and natural attributes that can be informed to tourists to enrich their experience and knowledge.
5. Rural-nightlife tourism; the activities carried out are interacting with the local community after the community has worked all day in the fields and moor, enjoying the art displayed, and learning to do art by dancing or playing one type of traditional musical instrument located in *bale banjar*.

5. Conclusion

Through the mapping of tourism resources, it can be determined the themes of the development of rural tourism products based on local communities. There are four themes that can be taken into consideration for the development of rural tourism products based on local communities in Pinge Tourism Village: spiritual routines, agricultural routines, FB routines, and communal routines. The four themes then become the basis for determining rural tourism products or special interest tourism activities in traditional Balinese villages in Pinge Tourism Village. In addition to the theme, the construction of rural tourism products is also adjusted to the targeted market. Based on an actual visitation to Pinge Tourism Village, it can be stated that the market target for the product is a tourist from France and Germany as the main markets. In addition to the main market, there are several countries that can be targeted to become potential markets, that is tourists from Japan, China, and the domestic market.

Some of the local community-based rural tourism products that can be built in Pinge Tourism Village include spiritual tourism, agricultural tourism, culinary tourism, educational tourism, and rural-nightlife tourism. This tourism product initiated will be able to increase the participation of local people in rural tourism development and be able to provide experience and learning about heritage inheritance and noble traditions for tourists. In addition to the expected increase in the type of community participation, the existence of tourism products that are in accordance with local community resources can also arouse the awareness and pride of the local community towards their resources, so as to strengthen awareness and efforts to preserve tourism resources or capital

Acknowledgement

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Forecasting Japan Tourist Arrivals In Bali Using State-Space Method

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Abstract. One of the goals in tourism development in Indonesia is to increase the number of tourist visits. This means that information about prediction of tourist arrivals play important role in tourism policy. The aims of this research are to forecast the number of Japan tourist arrivals in Bali using state-space method and to compare this forecast with other forecasting methods such as exponential smoothing and autoregressive integrated moving average. The state-space modelling deployed methods such the local level, local trend level, and local level with seasonal. Diagnostic model suggests that the local level with seasonal satisfy all the requirements needed in state-space modelling framework whereas the former two methods fail to satisfy independence assumption. Forecasts using the local level with seasonal suggests that the tourist arrivals fluctuate throughout the 2018. We also compared the forecasts results from Holt-Winters exponential smoothing and autoregressive integrated moving average and found that the state-space model works better than the latter methods based on criteria such as mean error, root mean squared error, mean absolute error, mean percentage error, and mean absolute percentage error.

Keywords: forecasting, tourist arrivals, state-space method, time series analysis

1. Introduction

One of the goals in tourism development in Indonesia is to increase the number of tourist visits both foreign and domestic. This means that information about tourist arrivals prediction plays an important role in tourism policy that includes tourism marketing and accommodation.

Bali, a province of Indonesia, has been one of Indonesia's foremost tourist destinations. Tourists from Japan are rank amongst the big five countries that visit Bali in the last five years. These five countries are Australia, China, India, Japan and the UK.

Tourist arrivals, in general, follow a pronounced seasonal pattern throughout the year. For example the highest number of Japan tourist arrivals to Bali is around August while the lowest arrivals around April and May. This fluctuation can be seen from a time-series plot of Japan tourist arrivals. In order to make prediction of these arrivals a time series analysis can be conducted.

The aims of this research are to forecast the number of Japan tourist arrivals in Bali using state-space method and to compare this forecast with forecast from other forecasting methods such as exponential smoothing and autoregressive integrated moving average.

The article is organized as follows. The first section introduces the motivation for forecasting the Japan tourist arrivals. Section two discusses the state-space methodology and its benefits. This section also discusses the way we split the data into training dataset and validation dataset. The third section discusses results obtain from analysis in section two. Discussion about the results can be seen in the fourth section. The last section concludes the article.

2. Research Method

In this section we briefly review the state-space methodology. Suppose that x_1, \dots, x_n be n dimensional observation sequence, α_t be a state vector, ε_t and η_t be disturbance vectors, Z_t , T_t , R_t , H_t , and Q_t be system matrices that are fixed and known but a selection elements that may depend on an unknown parameter vector. The general linear Gaussian state-space model (Koopman and Commandeur, 2015) can be written as

$$\begin{aligned} x_t &= Z_t \alpha_t + \varepsilon_t, \quad \varepsilon_t \sim \text{NID}(0, H_t), \\ \alpha_t &= T_t \alpha_t + R_t \eta_t, \quad \eta_t \sim \text{NID}(0, Q_t), \\ t &= 1, \dots, n. \end{aligned} \quad (1)$$

The objective of state-space modelling is to study the behaviour of the state vector α_t . This behaviour can be studied by either allowing the state to vary over time or fixed. In addition to this we can also add trend or seasonal components. Refer to Commandeur and Koopman (2007) and Durbin and Koopman (2012) for monograph length treatment of the state-space methodology. Several recent articles about state-space methodology can be found in Petris and Petrone (2009a, 2009b), Commandeur et al. (2011), Tusell (2011), Koopman and Commandeur (2015), and Helske (2017).

In this research we consider several special cases of state-space model in (1) and adopt notation in Commandeur and Koopman (2007) and Koopman and Commandeur (2015). The first is the local level model which is formulated as

$$\begin{aligned} x_t &= \mu_t + \varepsilon_t, \quad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \\ \mu_{t+1} &= \mu_t + \xi_t, \quad \xi_t \sim \text{NID}(0, \xi_t), \\ t &= 1, \dots, n. \end{aligned} \quad (2)$$

The local level model (2) further can be classified into local level model with deterministic level and local level model with stochastic level. The former model refers to the model of the form $x_t = \mu_t + \varepsilon_t$ whereas the latter allows μ_t to vary over time.

The second special case of (1) is the local linear trend model of the form

$$\begin{aligned} x_t &= \mu_t + \varepsilon_t, \quad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \\ \mu_{t+1} &= \mu_t + v_t + \xi_t, \quad \xi_t \sim \text{NID}(0, \xi_t), \\ v_{t+1} &= v_t + \zeta_t, \quad \zeta_t \sim \text{NID}(0, \sigma_\zeta^2), \\ t &= 1, \dots, n. \end{aligned} \quad (3)$$

The local linear trend model has two state equations. The state μ_t models the level while the state v_t models the slope. If all state disturbances ξ_t and ζ_t are zeros, the model (3) simplifies to $x_t = \mu_1 + v_1(t-1) + \varepsilon_t$ which is the local linear trend model with deterministic level and slope. Of course, if the level and the slope are vary over time then we have the local linear trend model with stochastic level and slope. However, we may also allow the level to vary over time whereas the slope is treated deterministically, i.e.,

$$\begin{aligned} x_t &= \mu_t + \varepsilon_t, \quad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \\ \mu_{t+1} &= \mu_t + v_1 + \xi_t, \quad \xi_t \sim \text{NID}(0, \xi_t), \end{aligned} \quad (4)$$

In addition to the above special cases, we can add additional components such as seasonal dummy to reflect our belief about the seasonal fluctuation to the series. In this research we consider a particular form of (1) where the observed time series consist of monthly data. More specifically, we formulate our model as follows

$$\begin{aligned}x_t &= \mu_t + \gamma_{1,t} + \varepsilon_t, \quad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \\ \mu_{t+1} &= \mu_t + \xi_t, \quad \xi_t \sim \text{NID}(0, \sigma_\xi^2), \\ \gamma_{1,t+1} &= -\sum_{j=1}^{11} \gamma_{j,t} + \omega_t, \quad \omega_t \sim \text{NID}(0, \sigma_\omega^2),\end{aligned}\tag{5}$$

with $\gamma_{j,t+1} = \gamma_{j-1,t}$ for $j = 2, \dots, 11$ and $t = 1, \dots, n$. If we fix both ξ_t and ω_t we will have the local level model with deterministic level and seasonal. See further discussion about this in Commandeur and Koopman (2007) and Koopman and Commandeur (2015).

The general linear Gaussian state-space model in (1), and in particular (2), relies on the following three assumptions (in order of importance): independence, homoscedasticity, and normality. All these three assumptions need to be checked in state-space analysis. First, to test independence we can use the Box-Ljung test up to certain lags, say $h = \min(2m, T/5)$ where m is the period of seasonality and T is the number of observation (see Hyndman, 2014). Next, homoscedasticity can be checked by observing the autocorrelation of the squared residuals and see if the residuals are highly correlated or not. Finally, the normality of the residuals can be tested by standard test for normality such as Shapiro-Wilk test. See Durbin and Koopman (2012) and Koopman and Commandeur (2015) for further detail about this assumption and alternative statistical tests.

3. Result

The first step in analyzing time series data is plotting the data. Figure 1 shows log of monthly Japan tourist arrivals during the year 2010—2017. This data was used as training data while data from January to May 2018 was used for validating data. As can be seen from the figure, the number of tourist arrivals was fluctuated and was decreased markedly during 2010—2012. From 2012 to 2017 the tourist arrivals increased gradually albeit fluctuation throughout the period. This fluctuation suggests that the series are highly affected by the seasonality.

In this research we modelled the tourist arrivals iteratively, that is, we started from the simplest model and then continue to the more complex model once the simpler model is rejected or not suitable for our purpose.

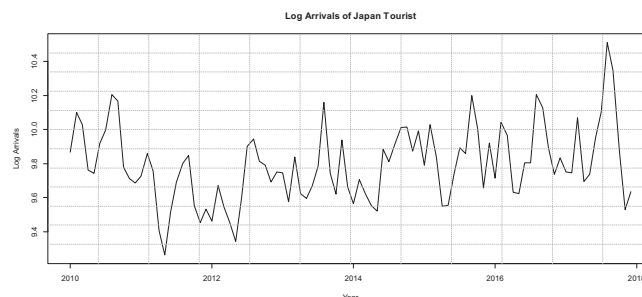


Figure 1. Plot of log arrivals of Japan tourists during 2010—2017.

We use the R package dlm (see Petris, 2010) in our state-space modelling. Our first attempt was to model these log arrivals using the local level model with deterministic model. We obtained the following estimate $\hat{\mu} = 9.793237$. Independence test using Box-Ljung test up to 20 lags suggests that the residual was not independent. Normality test using the Shapiro-Wilk test produced p-value equals 0.4853 which suggests that the residual was normally distributed. Since the independence assumption was violated, we did not accept the local level model with deterministic level. Now, allowing the level to vary over time we obtain $\hat{\mu} = 9.866927$. However, we obtained similar result as with the local level model with deterministic level. The independence test using Box-Ljung test was not significant up to 20 lags albeit the normality assumption was satisfied.

Our next step was to model the series with local linear trend model since the local level model was clearly rejected. First we modelled the local linear trend with deterministic level. We obtained $\hat{\mu} = 9.7002$ and $\hat{\nu} = 0.0019$. Independence test using Box-Ljung up to 20 lags was rejected although the normality was confirmed. Similar result was also obtained if we allowed the level and the slope to vary over time. Finally, we fitted the state space model by incorporating seasonal effect. Independence test using Box-Ljung test was significant up to 20 lags. The normality assumption using Shapiro-Wilk test and homoscedasticity of residuals were also satisfied. Refer to Figure 2 for plot squared residuals and absolute residuals. Furthermore, the plot suggests homoscedasticity of the residuals.

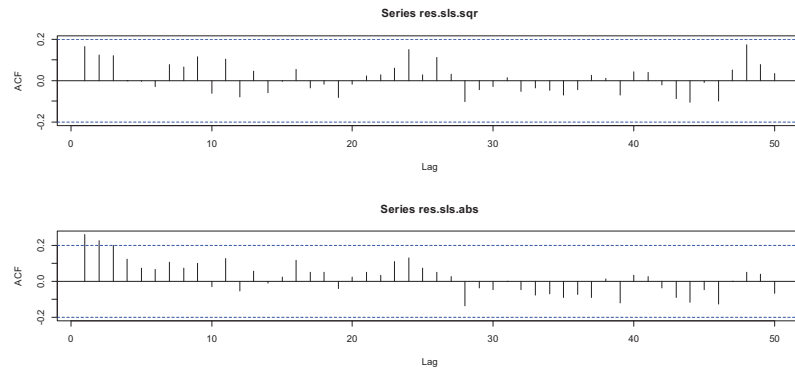


Figure 2. Plot of squared residuals (top) and absolute (bottom) residuals.

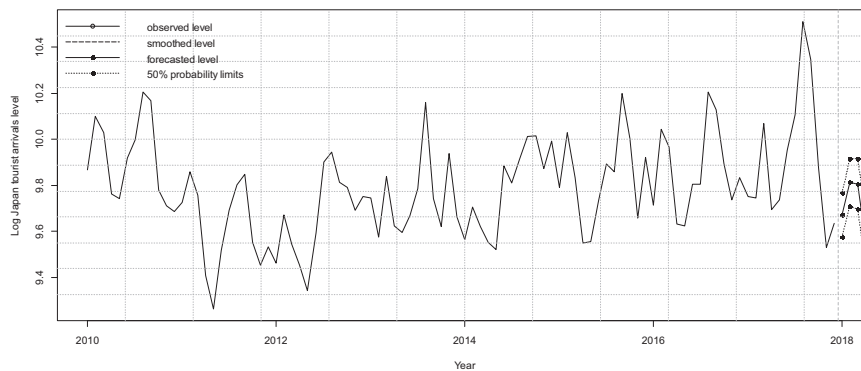


Figure 3. Plot of forecast of Japan tourists for 2018.

Since that all assumptions in state-space modelling were satisfied, we then continued to forecast the series. We compared the performance of the state-space method with exponential smoothing

(Holt-Winters) and autoregressive and integrated moving average (ARIMA) method. Table 1 shows the performance of four time series methods: state-space (SS), additive Holt-Winters (AHW), multiplicative Holt-Winters (MHW), and ARIMA. For exponential smoothing method (both additive and multiplicative Holt-Winters) and ARIMA method we used the forecast package (see Hyndman et al, 2018).

To measure the forecast accuracy we use the following measures: mean error (ME), root mean squared error (RMSE), mean absolute error (MAE), mean percentage error (MPE), and mean absolute percentage error (MAPE). The smaller the number means the better.

Table 1. Forecast accuracy measures

	ME	RMSE	MAE	MPE	MAPE
SS	3009.800	3969.635	3676.600	13.97317	18.66961
AHW	3439.607	4252.216	3938.547	16.53363	20.04779
MHW	3426.849	4241.916	3930.964	16.46112	20.01173
ARIMA	19038.428	19376.886	19038.428	99.94799	99.94799

4. Discussions

As can be seen from Tabel 1, forecasting using state-space method outperforms the other three competing models. This can be seen from the values of forecast accuracy measures. Note that in Tabel 1, the smaller the value the better the performance of the forecasting method.

5. Conclusions

In conclusion, forecasts using the stochastic level and seasonal, i.e. model (5) suggests that the Japan tourist arrivals fluctuate throughout the 2018. In terms of forecasting performance the state-space method performs better than the other three methods.

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The Instant Simple House With The Structural System Of Light Steel, Brace And Ergonomic Local Wooden Wall

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Abstract. The instant simple house with the light steel, brace and ergonomic local wooden wall after a disaster needs to be constructed. The reasons are that it does not take a long time to construct it; it does not cost a lot of money to construct it; it is environmentally friendly, and it is secure and comfortable. It is constructed based on the six criteria of what is referred to as the Efficient Technology (technical, economic, socio-cultural, energy saving and environmentally friendly) and the systemic, holistic, interdisciplinary, and participatory (SHIP) approach starting from when it is designed, when it is construction to when it is maintained. The conclusions which can be drawn from this current study are: 1) the building materials needed for the structural system of the simple house are light steel, brace, and local wooden wall, 2) technically, the utilization of the structural system of light steel, brace and local wooden wall to the instant simple house is technically secure, and 3) fulfilling what is required in order to be healthy and secure, which contributes to the living quality of its dwellers.

Keywords: *instant simple house, light steel, brace, local wood, ergonomic*

1. Introduction

As a densely-populated island, Bali is highly risky with natural disasters such as earthquake, hurricane, landslide and so forth. The earthquake taking in Bali in 1815, referred to as Gejer Bali, caused 15000 people to die; the earthquake which destroyed Buleleng in 1862 is referred to as the Buleleng earthquake; the earthquake which destroyed Negara in 1890 is referred to the Negara earthquake; another earthquake which destroyed Bali in 1917, which is also referred to as Gejer Bali, caused 1,500 people to die; the earthquake which destroyed Seririt in 1976 is referred to as the Seririt Earthquake; the earth which destroyed Karangasem in 1979, which is referred to as the Karangasem earthquake, caused 24 people to die. Several other earthquakes also led to material loss. The earthquakes taking place outside Bali can also be felt in Bali. As an illustration, the earthquake with 6.4 SR taking place in Lombok on 29 July 2018 and the other one with 7 SR taking place in Lombok on 5 August 2018 also destroyed many buildings in Bali.

Therefore, the ergonomic instant simple houses need to be constructed for those whose areas are seriously destroyed by the earthquake. The simple houses with the structural system of light steel, brace and local wooden wall, which are secure but resistant to earthquake and hurricane but comfortable, are needed. The reasons are that they can be constructed within a short period of time; they do not cost a lot of money; they are environmentally friendly, and they are secure, comfortable and accessible.

2. Research Method

How the instant and simple houses are constructed refer to the application of six criteria of the Efficient Technology (technical, ergonomic, socio-cultural, energy saving and environmentally friendly) with the SHIP approach (systemic, holistic, interdisciplinary and participatory) since they are designed, when they are constructed to when they are maintained. The instant and simple houses with the structural system of light steel and brace were analyzed within three dimensions to determine the level of their security. The physical comfort of the houses, which included the temperature, humidity,

noise, the speed of the wind and lighting, were directly measured. The people's perception of the security, subjective comfort, and satisfaction were measured using questionnaire.

3. Results And Discussion

3.1 Results

3.1.1 The Characteristics of the House Used as the Sample

The sample house was completely constructed at Selemadeg Village, Selemadeg District, Tabanan Regency. The instant simple house was constructed with the structural system of light steel, brace and local wooden wall. Its characteristics are specified in Table 1 below.

Table 1, the Characteristics of the Instant Simple House

No.	Specification	Volume	Unit
1	The length of the building	6	m
2	The width of the building	3	m
3	The height of the building/ceiling	4.2	m
4	The structural system of light steel	8 x5	m ²
5	Metal tile roof	2 x (3.2 x 8)	m ²
6	Local wooden walls	23.5	m ²
7	Concrete wall covered with plaster	18	m ²
8	Door	1	unit
9	window	1	unit
10	Ceramic floor	20	m ²
11	Concrete foundation	18	m

Picture 1, the Stages of the construction of the instant simple house with the structural system of light steel, brace and local wooden walls



a. The area when the house was planned to constructed (0%)



b. The foundation was being constructed be using concrete brick



c. The structural system of light steel and brace were being constructed

d. The ergonomic instant simple house (100%)

Figure 1, the Stages of the construction of the instant simple house with the structural system of light steel, brace and local wooden walls

3.1.2 The Performance of the building structure

The performance of the structure is defined as the ratio of the maximum derivational deviation of the peak to the height of the building. The building was analyzed from the three dimensions resulting from the working earthquake weight before the maximum horizontal deviation was determined.

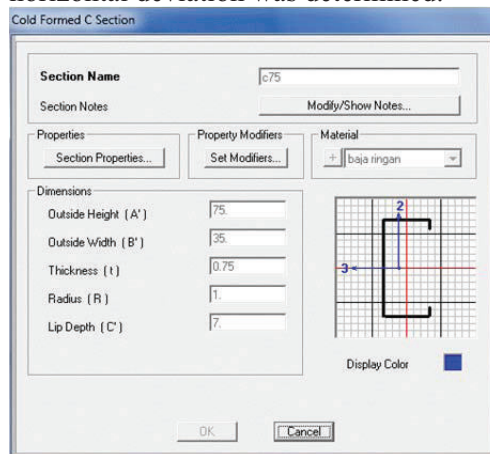
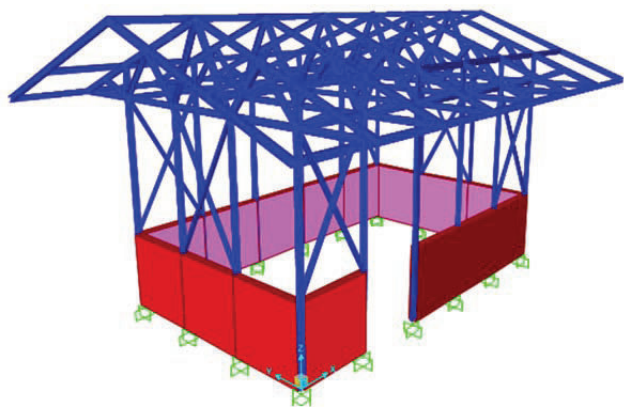
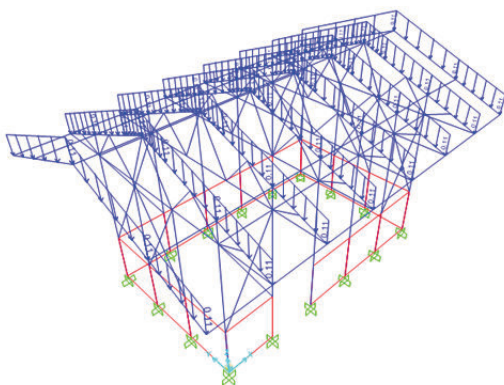


Figure 2, Dimensional Modeling of the Structural System of the House



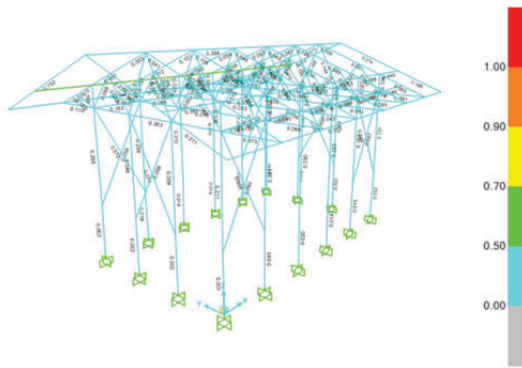


Figure 3, Pure Load and Life Load

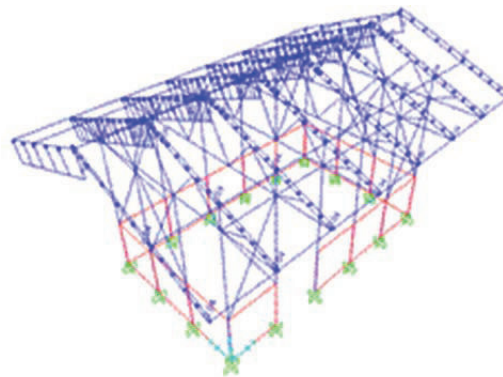
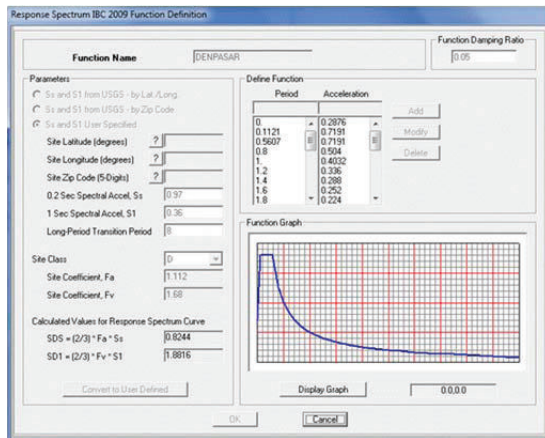
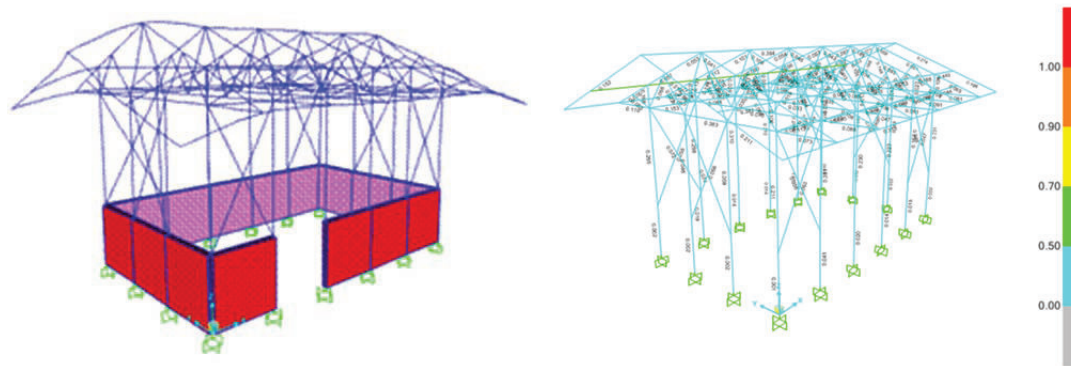


Figure 4, Earthquake Load and Wind Load

From the three dimensional analysis, it could be obtained that the maximum horizontal deviation of the building was 21 mm in the transverse direction (x) and 15 mm in the longitudinal direction (y), and the height of the building was 4,200 mm. The performance of the structural system was good as the deviation was less than what was allowed ($0.02 \times H_{sx}$), namely 0.02 multiplied by 4,200, which comes to 84 mm. The ratio taking place in all the structural components resulting from the combination of the peak load, wind load and earthquake load, which was less than 70%.



Picture 5, The Result of Analysis (Deviation and the Ratio of Tension)

3.1.3 The Physical Comfort of the Body

The physical comfort of the body which was measured included the temperature, humidity, noise and natural illumination. They were measured at 6, 8, 12 am, 2 pm, 4 pm and 6 pm. The results are displayed in Table 2 as follows.

Table 2, the Physical Comfort of the House

No.	Description	The time when it was measured (Central Indonesia time)						
		6 am	8 am	10 am	12 am	2 pm	4 pm	6 pm
1	Temperature (°C)	15.2	26.8	28.8	30.6	31.5	29.5	29.2
2	Humidity (%)	82.1	84.1	75.6	63.2	68.5	72.8	77.6
3	Noise (dBA)	44	41	43	38	45	43	44
4	Natural Illumination (Lux)	150	185	230	260	255	225	135
5	The wind speed (m/second)	0.1	0.15	0.1	0.2	0.2	0.1	0.1

3.1.4 The People’s Perception

The information on the people’s perception of the instant simple house with the structural system of light steel, brace and local wooden walls was obtained through questionnaire. The perception which was measured included the security, subjective comfort, adaptive comfort, and satisfaction. The results of the analysis of the information obtained through questionnaire are displayed in Table 3.

Table 3, the People's Perception

No.	the Number of Samples	Description of Perception	People's Perception
1	11	security	secure
2	11	subjective comfort	comfortable
3	11	thermal comfort	comfortable and acceptable
4	11	satisfaction	highly satisfied

3.2 Discussion

3.2.1 Performance and security of the structural system

The structural system showed a highly good performance based on the ratio of the deviation to the height of the building towards both the width and length of the house. Yosafat (2006) suggested that the performance of the structural system when designing the houses resistant to earthquake in Indonesia is highly importantly evaluated as the earthquake intensity of most parts of its territory ranges from being moderate to being highly high. The Indonesian National Standard-based combination of weighting caused the ratio of tension to be smaller, namely 0.7, meaning that the house fulfilled what is required.

3.2.2 The Physical Comfort

The physical comfort of the house's environment is affected by the temperature, relative humidity, wind speed, lighting and noise. Table 2 shows that the temperature within the house ranged from 25.2°C to 31.5°C, meaning that the temperature averaged 28.8°C and it was within what is required, namely the comfort in the areas located in the equator ranges from 22.5°C to 29.5°C (Lippsmeier, 1994), from 21.37°C to 28.37°C (ASHRAE), and from 22.8°C to 30.2°C (Sujatmiko, 2007). The relative humidity (RH) within and outside the room was almost the same, namely between 62.3% and 84.1%. It will be better if the RH is higher than 20% all the year round, 60% during the dry season, and under 80% in the winter (Lechner, 2007). The high RH, that is, more than 80% can form water favor on the human skin, causing the body to feel less comfortable (Satwiko, 2009, Rahman, 2010), and the dweller's health to be disturbed, and fungus to grow on the skin. The wind speed within the room ranged from 0.1m/second to 0.2 m/second during day time. At night it was 0 m/second as the ventilation and window were closed. The wind movement can affect the speed of the lost heat through convection and evaporation. Therefore, the wind speed ranging from 0.1 to 0.3 m/second satisfies what is required for comfort (Lechner, 2007 and Mangunwijaya, 1981). It would be better if the wind speed is higher than 0.2 m/second (Kroemer and Grandjean, 2000). As the weather movement satisfied what is required by several experts mentioned above, the weather within the room circulated highly well, causing the dweller's health to be better, and the eyes to be less irritated. The window installed in the front wall and the ventilation installed in the back wall caused the weather to move and cross circulate. This is supported by the study conducted by Nitiyasa (2009), who stated that the weather cross circulation can increase the comfort of the dwellers of the simple houses at Cemara Giri housing complex at Dalung Bali. The natural illumination within the room during day time ranged from 135 Lux to 260 Lux, meaning that the natural illumination with the room during day time is required, namely 115 Lux (Wibisono, 2010). The intensity of the natural illumination within the room was highly dependent on the width and type of the window and ventilation, and on the extent to which they are open. One window and ventilation were installed at the front side and another one window and ventilation were installed the back side, causing the fresh air to get in from the front and get out from the back. According to Hindarto (2011), the natural illumination made through the window more evenly spreads and the cross ventilation through which the weather circulates make the dwellers feel comfortable and cause them to be able to save electric power. The use of the natural light does not only

optimally positively contribute to the dwellers' health, but it can also reduce the use of the electric power. Before the house was redesigned the electric lamp was always on. The good natural illumination makes the room brighter and healthier. According to Indra (2011), the maximum penetration of the sunlight into the house reduces the use of the lamp, causing the cost needed to maintain the house to be reduced. It is also proven that the sunlight can kill any germ or bacteria which can grow well in the humid environment. Apart from that, Vitamin D, which the sunlight contains, is useful to the bone and skin (Wibisono, 2010). The maximum noise within a room during daytime is 45 dBA, which is still under the limit determined by the government of Bali Province, that is, 50 dBA during day time and 45 dBA at night.

3.2.3 People's Perception

The people's perception of the instant small house which was already constructed was that they were made to feel secure by the structure of the house; the environmental condition, which includes the temperature, humidity, noise, natural lighting and the wind speed with the house, made them feel comfortable. They were also satisfied with the building materials used, the construction process, and the final result of the house construction. The construction of the instant simple house satisfied what is required in order to be healthy, secure and ergonomic. This contributes to the living quality of its dwellers. In line with what is stated by Hartatik and Nastiti (2010), if a house can satisfy what is needed and expected by its dwellers, it will function as a facility which can improve the living quality of its dwellers.

4. Conclusions And Suggestions

4.1 Conclusions

Based on the analysis and discussion, several conclusions can be drawn as follows:

1. The instant simple house with the structural system of light steel, brace and local wooden wall has satisfied the requirement of being technically secure;
2. The instant simple house with the structural system of light steel, brace and local wooden wall has satisfied the requirement of being physically comfortable;
3. The people's perception of the instant simple house with the structural system of light steel, brace and local wooden wall is that the house is secure, comfortable and they are satisfied.
4. The instant simple house with the structural system of light steel, brace and local wooden wall is ergonomic as it has satisfied the requirements of being healthy and secure.

4.2 Suggestions

The study which explores the comfort provided by the instant simple house with the structural system of light steel, brace and local wooden wall needs to be conducted all the year round as Indonesia has two seasons.

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Recent Invasion Of The Endemic Banggai Cardinalfish, *Pterapogon Kauderni* At The Strait Of Bali: Assessment Of The Habitat Types And Population Structure

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Abstract. To date, the demands of living marine organisms for the aquarium trade are remain high and seems continue to increase. Consequently, lots of marine organisms has been spread out from its natural distribution as in the case of endemic Banggai cardinalfish, *Pterapogon kauderni* that have been invaded “new” habitat since it being trade in 1995. In recent years, a small populations of *P. kauderni* is known to be exist in a narrow bay near the Gilimanuk harbor, Bali. An underwater visual fish census survey was conducted during June 2018 to estimate the habitat types and densities of *P. kauderni*. In addition, 23 specimens of *P. kauderni* were collected randomly in order to assess biological parameters such as the length-weight relationship. During the survey, we successfully recorded 30 groups of *P. kauderni* that inhabit a shallow areas with a depth range between 0.5 m to 2 m. Of these, more than 90% of the groups were found to be associated with sea urchin (*Diadema sp.*) and the rest were found to live together with branching coral (*Acropora sp.*) and branching sponge (*Ptylocaulis sp.*). Total number of fish observed during the survey were 381 individuals and fish density of 0.76 ind./m². Length weight-relationship showed that *P. kauderni* exhibit a negative allometry ($b < 3$) which mean that the increase in length is faster than the weight gain. Interestingly, of the 23 specimens collected, none of these were sexually mature (SL < 41 mm) which may indicated that the population of *P. kauderni* in Bali are under serious threats.

Keywords: Bali, Banggai cardinalfish, endemic, introduced, invasion

1. Introduction

The Banggai cardinalfish, *Pterapogon kauderni* is an endemic species limited to the Banggai Islands, Central Sulawesi. The limited natural distribution of this species is thought to be due to short pelagic larval phases and limited egg production (Allen, 2000). Since being traded in an aquarium in 1995, demand for *P. kauderni* continues to increase and this species has been heavily collected from the wild. Moreau (2004) revealed that approximately 118,000 Banggai cardinalfish are sold on the market every month due to the weakness of the trade monitoring system of this species. Based on data from IUCN RedList, the *P. kauderni* population is continue to decreased, leading to calls for inclusion of this species as an endangered species (Allen and Donaldson, 2007). Another impact arising from aquarium trade is the spread of marine biota beyond its natural habitat.

Introduction of marine species beyond its natural distribution has been widely documented as in macroalgae (Mineur et al., 2008), seagrasses (Williams, 2007; Short et al., 2010), crustaceans (Hänfling et al., 2011), and reef fishes (Butterfield et al., 2015; Albins and Hixon, 2008). In aquatic systems, ballast-water transfer by oceangoing vessels has been identified as a leading invasion pathway (Carlton & Geller 1993). Other vector that has received little attention is the introduction of ornamental species through aquarium trade (Semmens et al., 2004; Weigle et al., 2005; Rhyne et al., 2017). As one of the world's largest ornamental fish exporting countries, Indonesia exported about 1,284 fish species with the number of more than 6 million individuals and 413 species of invertebrates with the number of more than 1.8 million individuals (Rhyne et al., 2017). Unfortunately, despite the growing number of species exported, management trade of these ornamental species are not regularly monitored (Moreau and Lunn, 2004) and the frequency of fish

rejection remain high especially for village-based fisheries (Militz et al., 2016). The release of any rejected fish could lead to the introduction of species beyond their natural distribution as in the case of invasion of the *P. kauderni* in Lembah Strait, North Sulawesi (Erdmann and Vagelli, 2001); Luwuk, Central Sulawesi (Vagelli and Erdmann, 2002); Palu Bay, Central Sulawesi (Moore and Ndobe, 2007) and Bali (Allen and Erdmann, 2012).

The introduction of alien species has a serious impact on local species communities and reduced biodiversity from over-extraction (Albins and Hixon, 2008). The introduction of carnivorous fish generally has a negative impact on the ecosystem because the fish are likely to prey on local fish and invertebrates or become competitors to local predators (Albins and Hixon, 2008). Other impacts arising from the invasion of alien species are changes in ecosystem functions (Hänfling et al., 2011). But other studies suggest that invasions could be accelerating the material cycle and increasing habitat availability (see Thomsen, 2010). Although studies of the mechanisms, impacts, and factors that triggered the invasion have been studied quite extensively, the invasion by endemic fish seems to be unusual and least information is known about it.

The endemic *P. kauderni* is known to have invaded Bali Strait around the Secret Bay, Gilimanuk. Secret Bay area is a narrow bay with a depth of about 10 meters which is ecologically quite unique compared to other areas in Bali (Allen and Erdmann, 2012). This region consists of various ecosystems such as seagrasses, corals, mangroves, and estuaries. Present data of the *P. kauderni* population in Secret Bay are based only on a brief survey conducted in 2012 that show the number of these species is about 1,000 individuals and found to be associated with sea urchins (Allen and Erdmann, 2012). In their natural home range, *P. kauderni* is known to be associated with various biota such as sea urchins, corals, sea stars, anemones, fishes and mangroves (Vagelli and Erdmann, 2002). Since being introduced, population of the *P. kauderni* in Gilimanuk seem to continue to flourish even though this species is regularly collected by the local fisherman. Therefore, this study aimed to delineate current habitat and population structure of the *P. kauderni* at the Bali Strait.

2. Research Methods

2.1. Underwater visual census fish survey

The underwater fish visual census surveys were conducted during June 2018 in two sites, geographically located on 8.16491 114.44025 (Site 1) and 8.16951, 114.44699 (Site 2) (Fig. 1). At each site, transect was set in shallow water at a depth between 0.5 m to 2 m. All transects were 50 meters long and it is assumed that the diver can observe fish up to 5 meters along transect (2.5 meters to each side) (English et al., 1997). The location of transect at each site was set in the main areas of the *P. kauderni* identified by local fishermen. At each site the following data were recorded: the number of fish groups, the number of fish in each group, and the habitat types along transect.

2.2. Sample collection

The regulation of the Ministry of Marine Affairs and Fisheries Republic of Indonesia number 49/KEPMEN-KP/2018 has protected *P. kauderni* around their natural distribution in Banggai Islands. Based on this regulation, the introduced population are not protected yet, thus no special collection or research permits were necessary. *P. kauderni* were collected randomly from two sites around Secret Bay, Gilimanuk (shown in Fig. 1) with a small fyke net used by the local ornamental fishermen. The specimens were preserved in 70% alcohol for transportation and storage.

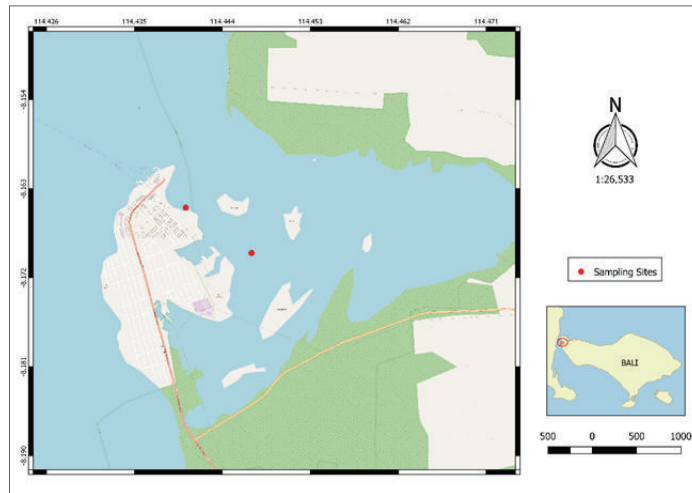


Figure 1. Fish survey located at a semi- enclosed bay near the Gilimanuk Port.

2.3. Population density

Fish population density at each transect was calculated using the formula:

$$D = \frac{n}{w} \quad [1]$$

Where: D is the fish population density (ind./m²), n is the number of individual and w is coverage area.

2.4. Length-Weight Relationship

Length-weight relationship can be used to predict weight at a given length. Mathematically, this relationship is described by the formula:

$$W = a.L^b \quad [2]$$

Where: W is the wet weight in gram, “ a ” and “ b ” are the parameters of the function and L is the standard length (SL) in millimeter.

3. Results

3.1. Habitat types

During the survey, *P. kauderni* was found inhabiting a shallow area with a depth range between 0.5 m and 2 m. The bottom substrates where this species usually found were composed of sands, coral rubbles, and rocks. *P. kauderni* was found to be associated with various biota such sea urchin (*Diadema sp.*), coral (*Acropora sp.*), and sponge (*Ptylocaulis sp.*) (Fig.2). More than 90% of the colonies (28 of 30 colonies) were associated with *Diadema sp.* (Fig.3). Within the spine of *Diadema sp.*, *P. kauderni* usually live together with other cardinalfishes (Fig.2).

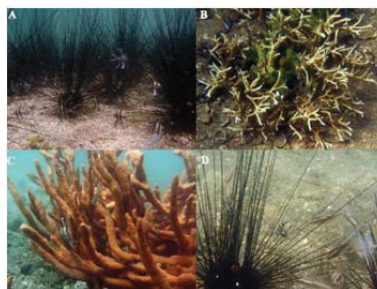


Figure 2. Association between *P. kauderni* and other biota such as sea urchin (A), coral (B), sponge (C) and cardinalfishes (D)

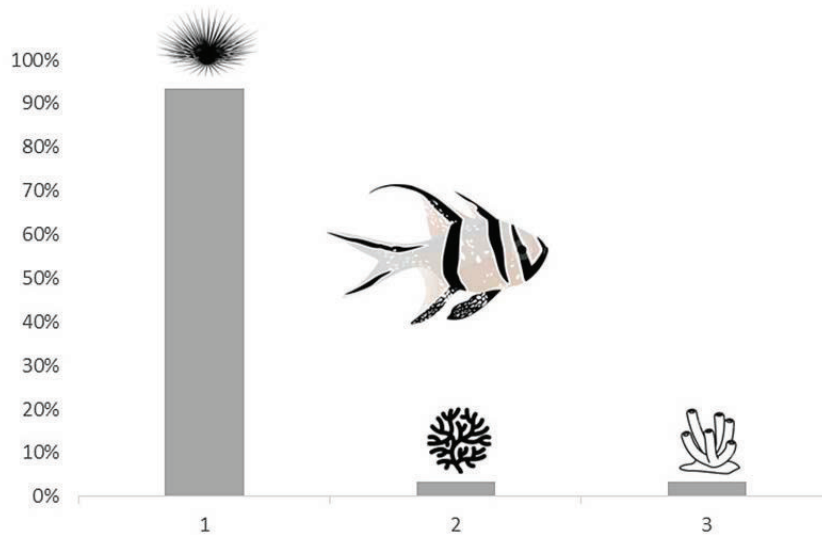


Figure 3. Current proportion of the association between *P. kauderni* and other biota such as sea urchin (1), coral (2), and sponge (3).

3.2. Densities and population structure

The underwater visual census fish surveys showed that the number of group found in Site 1 was 20 groups with the number of individual per group ranging from 3-133 individuals (Table 1). The total number of individuals found in this site were 344 individuals with a density of 1.4 individuals/m². In contrast, population size of *P. kauderni* at site 2 is seems to be lower than the previous site. At this site, we only found 10 groups with the number of individual per group ranging from 2-6 individuals. The total number of individuals were 36 individuals with a density of 0.1 individuals/m². Overall, we found 30 groups with the mean group size 12.7 individuals/groups and the average densities of 0.76 individuals m⁻² (Table 1).

Table 1. Population size and densities of *P. kauderni* in each sites

No.	Observed parameter	Site 1	Site 2	Mean
1	Number of groups	20	10	15
2	Number of individual in each groups	3-133	2-6	12.7
3	Total number of individual recorded	344	36	190.5
4	Species density (ind./m ²)	1.4	0.1	0.76

The measurements of the length frequency of the 23 specimens collected randomly during the survey showed that *P. kauderni* in Bali can be categorized into six length classes. The length were ranged from 12.9 mm SL to 29.7 mm SL with majority classes were found at length between 19.1 mm to 22.1 mm and between 25.3 mm to 28.3 mm (Fig.4) while the latest length classes (28.4 mm – 31.4 mm) contain the lowest number of individual.

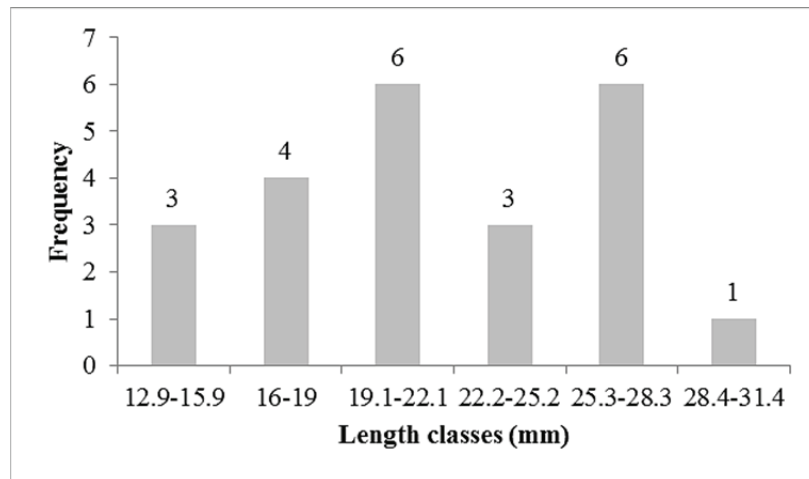


Figure 4. Length frequency of *P. kauderni* collected in Bali strait

3.3. Length-weight relationship

The Length-weight relationship equation of *P. kauderni* is $W = 0.0002L^{2.5269}$ with the coefficient of determination value (R^2) = 0.8778 (Fig. 5). Thus, the value of b obtained from the equation is 2.5269. The t-test at a significant level of 95% showed that the value of $b < 3$ (negative allometry) which means that the increase in length is faster than the weight gain.

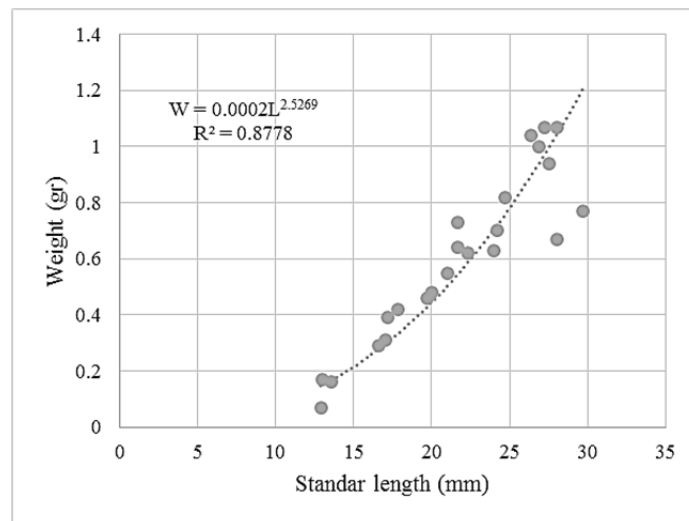


Figure 5. The Length Weight Relationship of *P. kauderni* in Bali Strait

4. Discussions

4.1. Habitat types

As reported previously by (Allen, 2000), *P. kauderni* was commonly found in protected bays on shallow area. In addition, a comprehensive survey conducted to determine the geographical distribution of *P. kauderni* revealed that this species was found at depth range between 0.5 m and 4.5 m, with an average depth recorded of 1.66 m (Vagelli and Erdmann, 2002). Thus, *P. kauderni* populations in Bali Strait seems to have a similar habitat characteristics compared to their natural habitat in Banggai Islands although the newly established population shows some interesting differences. (Vagelli and Erdmann, 2002) reported that *P. kauderni* was found to be associated with

several species of corals (*Acropora sp.*, *Anacropora sp.*, *Porites sp.*, *Goniopora sp.*, *Echinopora horrida*, *Heliofungia actiniformis*, *Montipora digitata*, *Seriotopora hystrix*, and *Nephtea sp.*); anemones (*Actinodendron sp.*, *Entacmaea quadricolor*, *Heteractis crispa*, *Macroactyla dorensis*, *Stichodactyla haddoni* and *Stichodactyla mertensensis*); sea urchins (*Diadema setosum*, *Tripneustes sp.*); sea stars (*Proteaster nodosus*); hydrozoans (*Millepora sp.*); seagrasses (*Enhalus acoroides*); and mangroves (*Rhizophora sp.*). Further, this research also revealed that *P. kauderni* was mostly found to be associated with branching corals. In contrast to previous one, present study found that more than 90% of the *P. kauderni* in Bali were associated with sea urchin (*Diadema sp.*). A different condition was also observed in Palu Bay, where this species occupies an area totally lacking of *Diadema sp.* (Moore and Ndobe, 2007). In addition, given the high number of associate species of the *P. kauderni* in their natural geographic distribution (Vagelli and Erdmann, 2002), population in Bali Straits seem possessed a less associate species.

As a species with an extremely limited natural distribution, *P. kauderni* have been succeed to develop outside their natural geographic distribution, including Lembah Strait, North Sulawesi (Erdmann and Vagelli, 2001); Luwuk, Central Sulawesi (Vagelli and Erdmann, 2002); and Palu Bay, Central Sulawesi (Moore and Ndobe, 2007). Those areas were possibly have a different environmental condition compared to their natural habitat but *P. kauderni* appears quite tolerant to environmental changes and pollution (Vagelli and Erdmann, 2002). For instance, this species have been found inhabiting an area with a high risk of contamination derived from human activities (Vagelli and Erdmann, 2002) while a small population of *P. kauderni* in Palu Bay were known to living in a lower salinity compared to those in Banggai Islands (Moore and Ndobe, 2007). Meanwhile, habitats of *P. kauderni* in Bali Strait which is located near the Gilimanuk port are potentially contaminated by the human activities. Heavy metal contamination have been recorded in fish species capturing around this area (Ruaeny et al., 2015).

4.2. Densities and population structure

Within its natural geographic range *P. kauderni* formed groups with a mean of 21.28 individuals, although the majority of them were composed of fewer individuals (Vagelli and Erdmann, 2002). Meanwhile, an introduced population of *P. kauderni* found in Lembah Strait has smaller average group size of 5.8 individuals (Erdmann and Vagelli, 2001). Number of individual between groups recorded at this present study ranged from 2 – 133 individuals/groups. An introduced population of *P. kauderni* in Palu Bay also showed nearly similar groups size that ranged from 2-200 individuals/groups (Moore and Ndobe, 2007) but the native population in Banggai Islands has larger group size that ranged from 2 – 500 individuals/groups (Vagelli and Erdmann, 2002). The largest group size recorded in Bali (133 individuals) and Banggai (500 individuals) were similar in corresponds to their associate biota which both were associate with *Diadema* sea urchin. Thus, the introduced population including Bali Strait populations were seem to characterized by a lower number of individual and group size compared to native home range of *P. kauderni* in Banggai Islands. Further, the density of Bali Strait population also lower than the native population. For instance, the densities of *P. kauderni* in Banggai Islands were ranged from 0.5 – 3 individual m⁻² (Yahya et al., 2012).

Alien population of *P. kauderni* in Lembah Strait, Luwuk, Palu Bay, and Bali Strait may have established since few years ago following trading activities which have been started in 1995. The release or escape of adult individuals fish from the holding cages of an aquarium fish exporter should be consist of a small number individuals and first they have to adapt to their new environments. Therefore, those may responsible for the lower number of fish, fish density, and fish group size observed at the introduced sites including Bali Strait. Collection of this species by local fisherman might also contribute to the lower number of individuals observed (Yahya et al., 2012; Moore and Ndobe, 2007). Fishing activities, degradation of microhabitat and collection of the associate biota such as sea urchin and anemone also cause a decline in *P. kauderni* densities (Kasim et al., 2016).

The rate of decline for *P. kauderni* population reach 89% since the start of the aquarium fisheries (Allen and Donaldson, 2007). Major threats for this species were come from exploitation which has significantly decrease the population size (Yahya et al., 2012; Kasim et al., 2016). Overexploitation might also declining genetic diversity or in some cases totally erase a subpopulation (Madduppa et al., 2018). *P. kauderni* were potentially vulnerable to those event since this species occupied a restricted area and exhibit a highly genetic structure which mean the majority of the population are genetically isolated from one another (Bernardi and Vagelli, 2004; Hoffman et al., 2005). Therefore, recently Ministry of Marine Affairs and Fisheries Republic of Indonesia has been marked *P. kauderni* in Banggai Islands as protected species through regulation number 49/KEPMEN-KP/2018. Unfortunately, the regulation has not included the introduced population even though the later also exhibit major exploitation (Moore and Ndobe, 2007). *P. kauderni* in Bali Strait may also facing the same problem as the population mostly consist of small individuals (< 30 mm SL). This population appears to be exploited, as medium sized fish (30 – 40 mm SL), the size preferred by the trade, were periodically rare. According to Vagelli & Volpedo (2014), *P. kauderni* showing gonadal maturity was at 41 mm SL. Thus, *P. kauderni* collected in Bali Strait probably were not sexually mature yet. The length weight relationship revealed that *P. kauderni* population in Bali Strait exhibits a negative allometry ($b < 3$). The similar result also obtained by (Ndobe et al., 2013) that shows a negative allometry of the *P. kauderni* populations in Banggai Islands and Palu Bay.

5. Conclusion

Invasion of the endemic species with a very restricted distribution is a rare cases and interesting subjects to study in relation to their ability to adapt in the new environments. Here, we found that the introduced *P. kauderni* in Bali Straits possess some interesting differences compare their natural population in Banggai Islands regarding to their habitat and population structure. *P. kauderni* in Bali Straits is highly associated with *Diadema* sea urchin. Interestingly, the population of *P. kauderni* in Bali Strait is characterized low individual number within group and the majority of fishes recorded were a small fishes (< 30 mm SL) which may indicate this species are being heavily exploited.

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Relation of Carbon, Nitrogen And Bacteria In The Sediment of Mati And Badung River, Bali, Indonesia

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Abstract. The sediment properties of Mati and Badung River were observed in this study. This study was aimed to know the relation between carbon, nitrogen and total bacterial number in the sediment of those rivers. This study was carried out in Mati and Badung River located in Southern part of Bali, Indonesia. Total bacterial number, total carbon (TC), and total nitrogen (TN) were observed in this study. Slow stirring method was used to estimate the total bacterial number in sediment, based on their environmental DNA intensity after gel electrophoresis. TC of sediment was analyzed by using total carbon analyzer after combustion at 900°C, while TN was analyzed by using indophenol blue method after digested using Kjeldahl at 420°C for 1.5 hours. The result showed that total bacterial number in the Mati river was lower (4.8×10^8 sel/g) than that in the Badung river (3.8×10^8 sel/g). TC of sediment in the Mati and Badung River were 6,100 and 7,000 mg/kg, respectively. TN of sediment in the Mati and Badung River were 380 and 440 mg/kg, respectively. The high value of R^2 between total bacterial and TC (0.91), and between total bacterial number and TN (0.83), indicating the high influence of carbon and nitrogen on the number of bacteria in the sediment.

Keywords: carbon, nitrogen, bacterial number, Mati River, Badung River

1. Introduction

Badung and Mati river are located in the southern part of Bali Island, Indonesia. These rivers are highly affected by anthropogenic activities (Al Tanto *et al.*, 2017). Urbanization contributes to the ecological changes due to the increase of population (Harahap, 2013), including Badung and Mati River. Attraction of tourism activities in the southern part of Bali Island is potential to increase the pollution in the river ecosystem. The most influencing affect in the Badung and Mati rivers is river side society who sends their waste to the rivers, either processed or unprocessed waste. The urban resident in this area also influences the quality of this environment (Putra *et al.*, 2016). This society tends to transfer organic pollutant to the river through sanitation canals. The anthropogenic activities located around Badung and Mati River are: industries, office area, car and motorbike maintenance service, hospital, and domestic traditional market (Yasa, 2010). These activities transfer a great amount of pollutant to the river, such as organic materials and heavy metals.

Several factors are known to have influence on several pollutants decomposition in the aquatic environment. Environmental bacteria plays important role on the decomposition of organic materials existing in the aquatic environments, including water and sediment of river environment (Finlay, 2010). Ammonifying bacteria takes place on the conversion of organic materials to NH_4^+ through ammonification process (Ward and Jensen, 2014). The conversion of NH_4^+ to NO_3^- involves the nitrification bacteria, while NO_3^- conversion to N_2 was performed by denitrifying bacteria through several step of denitrification process (Hayasu *et al.*, 2008). These bacteria work regularly in a river ecosystem and create a self-purification mechanism to improve the ecological condition.

The environmental bacteria in river environments are highly influenced by the carbon and

nitrogen in this environment (Khatoon *et al.*, 2017). Nitrate ammonification tends to occur in a condition with high organic carbon/nitrate ratio and oxidized nitrogen materials are available for bacteria to use the electron acceptor during this process (Omnes *et al.*, 1996; Schaechter, 2004). Therefore, it is necessary to observe the relation of carbon, nitrogen, and bacteria in the sediment of Mati and Badung River, to represent the ecological condition on these river..

2. Research Methods

2.1. Site location and sediment sampling

This study was carried out in Badung and Mati River, Bali, from July to August 2018. Sediment samples were obtained from 3 sites in Badung River (BR1, BR2, and BR3), and 3 sites in mati River (MR1, MR2, and MR3) (Figure 1). Ekman grab was used to collect the sediment samples from the bottom of the river. The sediment samples were placed on plastic bag, and kept in refrigerator (4°C) until analysis.

2.2. Analysis of total carbon and total nitrogen

The measurement of total carbon was performed using combustion catalytic oxidation method in a total carbon analyzer (Adhikari *et al.*, 2016). Next, measurement of total nitrogen was performed using indophenol blue method (Donald Nicholas dan Nason, 1957). The sediment sample (0.5 g) was digested using concentrated sulfuric acid (10 mL) and hydrogen peroxide (10mL). Copper sulfate (0.5 g) was used as catalyst during the kjeldahl digestion. The digestion was carried out at 420°C for 1.5 hours to extract the total nitrogen from the soil. Next, the extract was filtered using a filter paper (ADVANTEC, No 6). Extract sample (1 mL) was mixed with 0.6 mL indophenol solution and 0.4 sodium hypochlorite solution. The solution was incubated at room temperature for 45 minutes until reach the color development. Next, the absorbance of the solution was measured using UV-visible spectrophotometer at 635 nm.

Calculation of total bacterial number

Total bacterial number in the sediment sample was calculated by using a slow stirring method (Aoshima *et al.*, 2006). Sediment (1 g) was mixed with 8 ml of eDNA extraction buffer and 1 ml of SDS solution in a rotary shaker at 1,500 rpm for 20 minutes. The obtained suspension was centrifuged at 6000×g for 10 minutes. After that, supernatant (0.7 ml) was mixed with an equal volume of chloroform-isoamylalcohol (24:1) solution and centrifuged at 18000×g for 10 menit. Next, DNA precipitation was carried out by centrifuging a mixture containing 0.5 ml of aqueous phase and 0.3 ml of isopropanol solution at 18000×g selama 20 minutes. DNA pellet was kept in a 1× TE Buffer after rinsed with 70% ethanol. Total bacterial number was quantified by calculating the mass of DNA in 1% gel agarose. The DNA marker used in this study was smartladder.

3. Results

3.1. Total carbon, total nitrogen and total bacterial number in the sediment

Badung river showed greater total carbon (7,000 mg/kg) compared to Mati river (6,100 mg/kg). Total nitrogen of sediment in the Badung River also showed greater value (440 mg/kg) than that of sediment in the Mati river (380 mg/kg). The total bacterial number in Mati River was slightly higher (4.8×10^8 cells/g) than that in the Badung River (3.8×10^8 cells/g) (Figure 1). There was no big difference in C/N ratio between Badung River and Mati River (Table 1).

Table 1. Composition of TC, TN, and total bacterial number in the sediment

Location	Total carbon (mg/kg)	Total nitrogen (mg/kg)	C/N ratio	Total bacterial number ($\times 10^8$ cells/g)
BR1	6,800	380	18	4.3
BR 2	6,700	420	16	6.4
BR 3	7,500	510	15	3.9
Mean	7,000	440	16	3.8

MR1	5,000	310	16	3.1
MR 2	6,300	340	19	3.5
MR 3	7,100	490	14	4.8
Mean	6,100	380	16	4.8

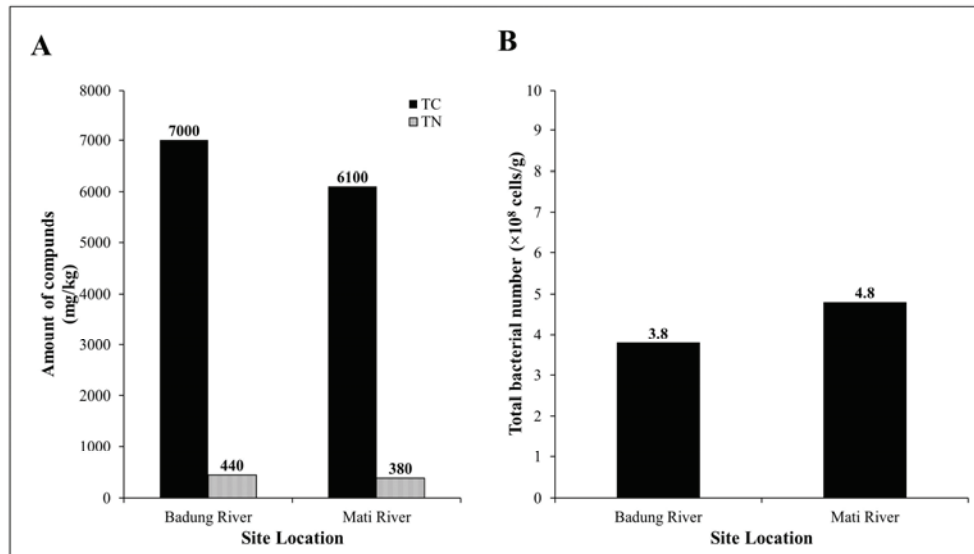


Figure 1. Comparison of TC, TN, and total bacterial number in sediment

3.2. Relation of total carbon and total bacterial number

The Pearson correlation analysis showed that there was high correlation between total bacterial number and total carbon in the sediment ($R^2 = 0.9116$) (Figure 2). This result indicates that there is relation between carbon and bacteria in the ecosystem of Badung and Mati River. Higher carbon content enhances the abundant of environmental bacteria in the sediment.

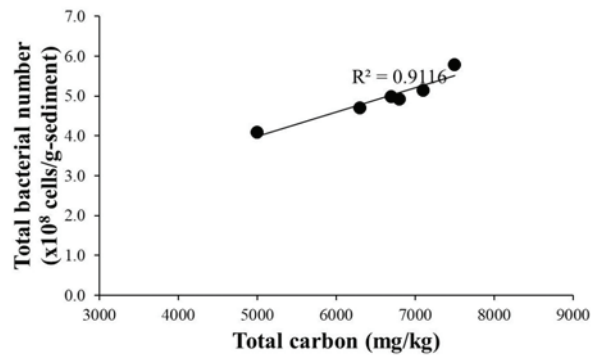


Figure 2. Relation of total carbon and total bacterial number in the sediment

3.3. Relation of total nitrogen and total bacterial number

Analysis of Pearson correlation in this study showed that there was high correlation between total nitrogen and total bacterial number ($R^2 = 0.8299$) (Figure 2). This result suggests that the amount of bacteria in the sediment of Badung and Mati River is strongly related with the abundant of nitrogen.

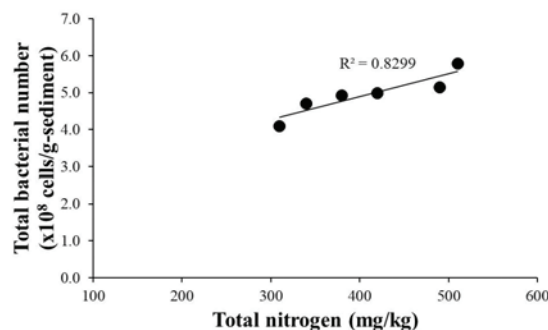


Figure 2. Relation of total nitrogen and total bacterial number in the sediment

4. Discussion

The ratio of carbon and nitrogen are known to have influence on decomposition of organic materials in the aquatic environment (Ågren et al., 2013). There is slight difference on the TC and TN of sediment between Badung and Mati River (Figure 1A), but the C/N ratio in both rivers showed similar values. The C/N ratio of sediment in the Badung and Mati River is lower than 20 (Table 1), indicate the high decomposition rate in that rivers (Priya et al, 2017). The low C/N ratio shows the high conversion of organic nitrogen to inorganic nitrogen. Ammonification and nitrification bacteria might takes place on this mechanism. The ammonification bacteria convert the organic materials to ammonia (NH₃), while nitrification bacteria convert the ammonia to nitrite (NO₂) and nitrate (NO₃) (Rodríguez et al., 2011; Pei et al., 2010). The higher bacterial number in the Mati River (Figure 1B) indicate the higher decomposition of organic materials than that in the Badung river.

There is high relation between carbon and bacteria in the sediment of Badung and Mati River (Figure 2). It is not surprisingly that carbon act as energy source for several bacteria in the nitrogen cycle (Wilkinson, 1963). Several forms of organic carbon are decomposed to CO₂ by the aerobic bacteria through respiration (Jonsson et al., 2001; Orji et al., 2016). The amount of nitrogen also related with the amount of bacteria in the sediment (Figure 3). Even the analysis of specific bacteria is not carried out in this study, but the low C/N ratio might indicate the high mineralization from organic materials to ammonia, nitrite and nitrate (Li *et al.*, 2015). The high nitrogen content of sediment in this study might be composed of inorganic nitrogen (Peterson *et al.*, 2001). High bacterial number enhances the organic material decomposition and decrease the C/N ratio in the sediment.

5. Conclusion

Analysis on the sediment of Badung and Mati River showed that there is no high difference on the TC and TN, and showed low decomposition rate with the value of C/N ratio lower than 20. Higher bacterial number in Mati River might indicate the higher conversion of organic nitrogen to inorganic nitrogen during nitrogen cycle. There is high correlation between carbon and nitron with the total bacterial number.

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Acute Toxicity Test of Ethanol Extract Salam Leaves (*Zysygun polianthum*) by Measuring Its LD₅₀ in Wistar White Mice Hyperglycemic

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Abstract. The acute toxicity test and anti hyperglycemic effect of ethanol extracts salam leaves have been studied. The results of phytochemical screening show that salam leaves (*Zysygun polianthum*) contains alkaloids, and flavonoid compound. Flavonoid and alkaloids extract can be found by extract salam leaves with ethanol. The acute toxicity test of ethanol been studied on rat Wistar mice with giving a single dose of samples. The aim of this work was to investigate the behavioral responses (pharmacological profile) because of the toxicity of Salam Leaves with the mortality rate in 14 days. The results of acute toxicity test after giving dose of 250 mg/kgbw, 500 mg/kgbw and 1000 mg/kgbw of ethanol extracts of leaves of *zysygun polyanthum* to males rat showed no animal died and significant toxic effect. In the study hyperglycemic effects in Wistar white rat induced by aloksan 1%, to decrease the glucosa in the blood. The test was done using rat hyperglycemic of Wistar white male rats. The treatments were carried out on seven groups, the positive control group was administered with Glibenclamide 5mg/kgbw per oral, the negative control group was administered with CMC 1%, and the extract groups were administered with 200 mg/kgbw and 400 mg/kgbw of ethanol extracts salam leaves. Obtained data were analyzed by Kruskal-Wallis test followed Mann-Whitney test with confident level was 95%. The result of this study indicate that salam leaves doesn't has toxicity effect for Wistar white Rat mice.

Keywords: acute toxicity, hyperglycemic, *Zysygun polyanthum* (salam leaves), Glibenclamide.

1. Introduction

Protective response is hyperglycemia caused by damage to the pancreas and reduce high glucose in the blood as a network of agents to injury it is. The signs of acute hyperglycemic is abnormally high level glucose in the blood, and damage the pancreas (Garcia, et al., 2009). To solve the problem people usually used medicines pharmasetic. For those who are away from the city to get the drug pharmasetic was not easy. Therefore, it is necessary to other medicines available in the form of traditional medicines that can provide the activity to decrease hyperglycemic state. It was reported that leaves salam leaves given orally gave the effect anti oxidant and can reduce hyperglycemic state in mice (Hermansyah., 2008).

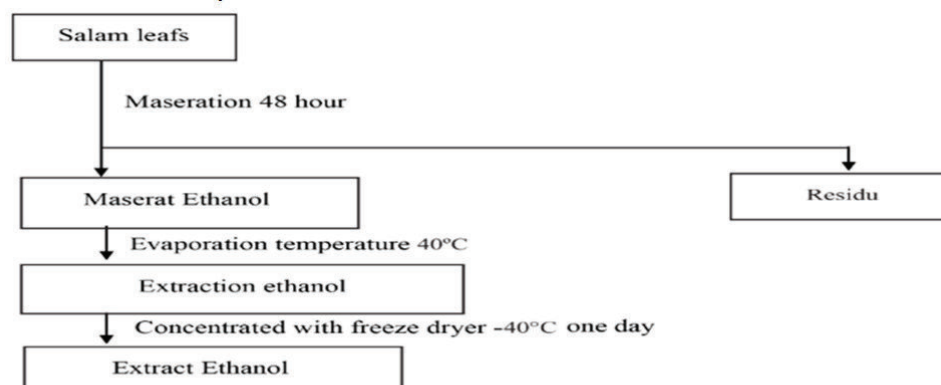
Salam leaves decreases hyperglycemic which one like effect of glibenclamide oral. Salam leaves (*Zysygun polyanthum*) have antioxidant activity (Lajuck et al, 2012). Antioxidant activity is the ability of compound to inhibit oxidation reaction which are expressed in percent inhibition. The salam leaves (*Zysygun polyanthum* leaves) were collected from the southern Batur village of Kintamani which has been determined at the Eka karya Bali Botanical Garden LIPI. Salam leaves with a moisture content of 10% maceration ethanol. Phytochemical test result showed that the ethanol fraction of *zysygun polyanthum* leaves contained flavonoid and alkaloid were in vivo testing acute toxicity test (Ma'rufah, 2007).

2. Research Methods

Picture 1. Diagram of the process of making ethanol extract *zysygun polyanthum* leaves (salam leaves). Negative control used is 1% CMC suspension. Acute toxicity test of material preparation in the form of suspension of ethanol Extracts salam leaves are used in acute toxicity tests are made in the form of a suspension using CMC 1% with a dose of administering 250, 500

and 1000 mg/Kg BW. Acute toxicity test is carried out using 35 white male rats. Mouse acclimatized during the week, given the CP551 of feed and drinking water. Furthermore weight rats weighed and grouped into seven groups, consisting of five tails. 24 hours before treatment, rats is fasting.

Porcelain bowls, mortar, oral, rat sputit sonde (size 1 ml and 2 ml), pletismometer mercury, cage of rats, heater, incubator are the tools used in this study. Materials used i.e., salam leaves, aquadest, aloksan, glibenclamide, ether, ethyl acetate, ethanol 95%, zinc powder, concentrated hydrochloric acid, magnesium powder, cerium sulphate 1%. Taking and processing the samples and then setup simplicia of salam leaves (*Zysygm polyanthum*) includes the identification, collection and processing of samples. Determination of plants carried out by the laboratory of Plant Taxonomy on Eka Raya Bali Bedugul. Samples used is fresh salam leaves taken from the gardens of Bedugul in Tabanan Bali. Salam leaves which have been collected as many as 15 kg, washed clean by running water, drained, then dried in the open air. Every three days, the weight of mice weighed. Observations on the behaviour of toxic symptoms, even the death of rats administered for fourteen days.



Picture 1. Process product extract ethanol salam leaves

Data analysis of ethanol extracts are analyzed by Kruskall-Wallis test. To test the existence of a meaningful difference between the test used Mann-Whitney test. The data is processed with SPSS 16.0 statistic test results which will be meaningful if $p < 0.05$. Acute toxicity test of observation data extract the ethanol salma leaves are used to evaluate the potential for acute toxicity in rats Wistar male. Data on toxic symptoms which appear on vital functions, used to evaluate a form of toxic effects arising.

Table 2. Skrining fitochemistry ethanol extract salam leafs

No	Diagnosis	Pereaction	Formed	Identification
1	Flavonoid	FeCl ₃	Black	+
2	Alkaloid	Wagner	Brown	+

3. Result

The results of the screening to find out the content of Phytochemical simplisia salam leaves, done screening phytochemicals. Preliminary examination results can be seen in tables 2 and 3. A single oral dosing of ethanol extracts salma leaves with doses of 250, 500 and 1000 mg/KgBB, does not affect the behavior of male rats during treatment. Behavior (pharmacological profiling), due to the single dosing showed no meaningful difference in the behavior of rats in comparison to the control. From the results of observations of physiological conditions, mice given extract as well as ethanol dose of 250 mg/Kg body weight, did not show physiological changes which

means visually (still normal and energetic, don't fall asleep, reactive or the occurrence of seizures), moves without any alteration of the breath. Rats are only experiencing diarrhea for two to three days. On the giving of extracts ethanol dosage of 500 mg/Kg, rat started having diarrhea longer i.e. four days. The rat has not shown any change physiologically. But in the giving of extracts ethanol dosage of 1000 mg/KgBB, diarrhea experienced mice longer i.e. six days accompanied by a change in color of urine as white (table 4). Diarrhea that occur from day to day to three to eight. However, there can be seen a meaningful mouse physiological changes. Table 4. Acute toxicity test on male wistar rats Of rat body weight measurement results in acute toxicity tests per three days, gained weight gain after the giving of the ethanol extracts a a dose of 250 mg/KgBW i.e. 5,7 to 6 grams. Gaining weight far under the control group rats that is 10 grams. The lower gaining weught is meassure in giving of the ethanol extract group 1000 mg/KgBW Whereas only gain 2,7 – 2,8 grams. In the granting of the existence of the death until the 14th, so no toxic effects are meaningful.

Table 3. Acute toxicity test of ethanol extract salam leaf in Wistar white mice

Group	Total	Body weight average Wistar white mice	Symptoms toxic	Death Wistar white mice
Control (1)	5	10	-	0
Group 2	5	6	Date 5, 6 diare	0
Group 3	5	4	Date 3, 4, 5, 6 diare	0
Group 4	5	2,8	Date 3, 4, 5, 6, 7, 8 diare	0
Group 5	5	5,7	Date 3, 4, 6 diare	0
Group 6	5	4,1	Date 3, 4, 5, 8 diare	0
Group 7	5	2,7	Date 3, 4, 5, 6, 7, 8 diare, white urine	0

4. Conclusion

From the screening phytochemical, we found that salma leaves has compound allkaloids and flavonoid. In acute toxicity test, in dosis 1000 mg/kgBw giving of ethanol extract, there was no mortality can be found in 14 days of study, so in conclusions there was no toxicity effect of extract ethanol salma leaves. Beside that, there was no behavioral change of wistar white rat mice.

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Improving Potential Of Sanda Village Towards Kampung Susu Village Through Dairy Goat Business *

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Abstrak. This thematic PPM KKN aims to increase students' empathy towards problems in the community, technical guidance on the cultivation of dairy goats with non-forage feed using complete feed feed (mixture of forage and concentrate) which is already in fast food, feces production is made into organic fertilizer and business management dairy goat farms. The methods applied in this activity include several approaches, namely transfer technology such as the introduction of complete feed manufacturing techniques (mixed forages and concentrates), processing of solid and liquid organic fertilizers from feces and from rine goats. entrepreneurship capacity building through improving management and fostering an entrepreneurial spirit; and participatory rural approach by involving the community starting from planning, implementing and evaluating. Steps taken include: (1) Counseling and coordination of dairy goat groups; (2) technical guidance on complete feed production, technical guidance on the production of organic fertilizer from goat manure, and management of dairy goat farms; (3) Assistance in making feed complients, processing manure into fertilizer, milk processing, and animal husbandry business management; (4) Continuous evaluation of the progress obtained.

Keywords: dairy goat, feed complite, fertilizer processing, management

1. Introduction

Desa Sanda adalah salah satu desa yang terdapat di Kecamatan Pupuan Kabupaten Tabanan. Salah satu potensi unggulan desa ini adalah peternakan kambing perah. Ternak ini memiliki populasi yang cukup banyak yaitu mencapai 254 ekor di desa ini. Di desa ini terdapat 3 kelompok ternak kambing dengan jumlah anggota mencapai 60 orang.

Potensi ternak kambing yang saat ini sedang dikembangkan oleh masyarakat adalah kambing perah yaitu jenis peranakan unggul silang antara kambing gembrong (lokal) dan peranakan Etawa. Susu kambing memiliki keunggulan tersendiri sebab mengandung nilai gizi yang tinggi yaitu protein 3.4 %, lemak 4.1 %, karbohidrat 5.2 %, kalsium 120 mg/100 gram, fosfor 135 mg/100 gram dan berbagai macam vitamin (Thohari.2010). Susu kambing mengandung protein lebih tinggi dibanding susu sapi, merupakan sumber kalsium, fosfor dan vitamin yang sangat diperlukan untuk pertumbuhan untuk usia muda dan mencegah osteoporosis pada manula. Bagi sebagian masyarakat, susu kambing dipercaya dapat meningkatkan vitalitas dan mengobati berbagai macam penyakit karena kandungan gizinya yang lengkap terutama asam amino, vitamin dan mineral. Hasil beberapa kajian pustaka ditemukan bahwa susu kambing dapat menyembuhkan berbagai penyakit diantaranya asma, kolesterol tinggi, asam urat dan osteoporosis serta dapat menggantikan fungsi ASI. Disamping keunggulan di atas, usaha kambing perah sangat cocok sebagai alternatif bagi peternak bermodal kecil dengan harga calon induk sekitar Rp. 3 juta sampai 4 juta/ekor dengan produksi susu per ekor/hari mencapai 1 sampai 2,5 liter. Kelebihan lain ternak kambing perah adalah harga susu kambing minimal mencapai Rp. 15.000.-/liter sedangkan harga susu sapi sebesar Rp. 3.500.-/liter.

Budidaya kambing perah di pedesaan umumnya dan khususnya di Desa Sanda masih konvensional yaitu pakan hanya mengandalkan hijauan. Hal ini dikawatirkan akan merusak kelestarian tanaman dan kesediaannya sangat terbatas pada musim kemarau. Pakan penguat diberikan tanpa mempertimbangkan kebutuhan dan kandungan gizi pakan. Sehingga produksi susu yang dihasilkan tidak maksimal tidak lebih dari 1 liter/ekor/hari,

bau susu yang tidak sedap (prengus) sehingga kurang disukai konsumen. Kotoran kambing yang hanya dibiarkan disekitar kandang dan tidak ditangani/diolah dengan baik menyebabkan pencemaran lingkungan dan dapat mengganggu kesehatan ternak. Sumber pakan kambing berasal dari hasil pemangkasan naungan pohon kopi yang sering jumlahnya berkurang pada musim kemarau. Selain itu, masih minimnya usaha pengolahan susu masih menjadi kendala dalam meningkatkan pendapatan masyarakat dari sektor ini. Alih teknologi dalam produksi pakan komplit dari bahan lokal serta pengolahan susu perah menjadi beraneka produk pangan seperti susu pasteurisasi, susu fermentasi, masker, es cream dan lain-lain akan sangat membantu dalam meningkatkan taraf hidup peternak kambing di daerah ini.

Hasil kajian oleh mahasiswa dan dosen pembimbing lapangan (DPL) KKN LPPM Universitas Udayana (2018) di lokasi kegiatan menunjukkan bahwa kelompok Tani Ternak (KTT) kambing perah di Desa Sanda, Kecamatan Pupuan tersebut akhir-akhir ini menghadapi masalah utama sebagai berikut:

1. Pakan kambing berbasis hijauan ketersediaannya sangat terbatas terutama pada musim kemarau dan kandungan nutrisinya tidak lengkap berdampak terhadap produktivitas ternak (kuantitas dan kualitas susu) menjadi rendah.
2. Kotoran kambing belum diolah sehingga mengotori kandang dan tidak memberi nilai tambah kepada KTT.
3. Produk susu belum ditangani sehingga penghasilannya sangat terbatas.
4. Manajemen dan pembukuan kelompok belum berjalan baik.

Berdasarkan permasalahan yang dihadapi oleh KTT kambing perah di Desa Sanda Kecamatan Pupuan tersebut maka Tim LPPM Universitas Udayana akan menyelenggarakan kegiatan KKN PPM di tempat tersebut dengan melibatkan 1 KTT kambing perah (25 orang petani), 2 dosen pembimbing lapangan, dan 30 mahasiswa yang terdiri dari beberapa disiplin ilmu terkait. Dengan mempertimbangkan permasalahan tersebut di atas akan lebih mudah diatasi jika melibatkan beberapa disiplin ilmu, sehingga semangat pengembangan kambing perah semakin meningkat.

Usulan penyelesaian masalah utama tersebut diatas adalah sebagai berikut:

- 1) Persoalan produktivitas susu kambing yang masih rendah karena ketersediaan hijauan yang sangat terbatas dan kandungan nutrisi rendah disolusikan dengan pembuatan komplit feed yaitu pakan campuran hijauan dan konsentrat yang sudah dalam bentuk siap saji.
- 2) Persoalan kotoran kambing belum diolah sehingga mengotori kandang/lingkungan dan tidak memberi nilai tambah kepada KTT disolusikan dengan bimbingan teknis pengolahan kotoran kambing menjadi pupuk organik padat dan cair dalam skala komersial.
- 3) Persoalan produk susu belum ditangani secara memadai sehingga produksinya belum maksimal
- 4) Persoalan Manajemen dan pembukuan kelompok belum berjalan baik disolusikan dengan : Bimbingan teknis perbaikan manajemen usaha peternakan kambing.

2. Research Method

Dalam pensolusian berbagai persoalan yang dihadapi oleh peternak di Desa Sanda Kecamatan Pupuan Kabupaten Tabanan, maka diambil beberapa pendekatan yaitu:

- (1) Model *Teknologi Transfer (TT)*. Teknologi transfer, yaitu pemberdayaan masyarakat melalui transfer teknologi tepat guna. TTG yang diterapkan diantaranya : (a) teknologi formulasi pakan komplit feed, (b) teknologi fermentasi dalam pengolahan kotoran menjadi pupuk, (c) teknologi pemerahan susu kambing.
- (2) Model *Entrepreneurship Capacity Building (ECB)*. Model ini digunakan untuk meningkatkan kemampuan kewirausahaan peternak kambing perah dan kelompok KUBE pengolahan susu, baik menyangkut manajemen usaha maupun pemasaran

produk.

- (3) Model *participatory rural approach*. Model ini digunakan pada berbagai kegiatan, yaitu dengan melibatkan sebanyak mungkin partisipasi anggota peternak kambing dan KUBE pada setiap kegiatan mulai dari perencanaan, operasional dan evaluasi sehingga kegiatan dapat berjalan dengan efektif sesuai dengan keinginan bersama.

3. Result

3.1. Sosialisasi Program KKN-PPM.

LPPM universitas Udayana melalui koordinator kabupaten (Korkab) melakukan survey ke Sanda kecamatan Pupuan kabupaten Tabanan yang akan menjadi target penerima mahasiswa KKN-PPM pada periode XVII tahun 2018.

3.2. Rekrutmen Peserta KKN.

Rekrutmen peserta kkn dilaksanakan oleh LPPM universitas udayana pada tanggal 2-24 Mei melalui on-line. Selanjutnya dilakukan verifikasi Pendaftaran tanggal 3 – 25 Mei 2018. Setelah ditentukan lokasinya maka ada 30 mahasiswa yang berasal dari berbagai program studi yang memilih lokasi kkn di Desa Sanda.

3.3. Pembekalan KKN

Pembekalan umum dilaksanakan secara bersama di Universitas yang diselenggarakan oleh LPPM unud bertempat di Gedung Widyasaba Universitas Udayana Bukit Jimbaran. Pembekalan ini dilakukan pada tanggal 25 – 26 Juni 2018.

Pembekalan Khusus disesuaikan dengan tema yang akan dikerjakan di Desa Sanda Kecamatan Pupuan Kabupaten Tabanan. Pembekalan khusus dilakukan pada hari jumat tanggal 13 Juli 2018 bertempat di lantai 4 Gedung Agrokomplek Universitas Udayana. Peserta pembekalan ini berjumlah 30 orang khusus mahasiswa KKN-PPM yang memilih lokasi di Desa Sanda Kecamatan Pupuan Kabupaten Tabanan. Materi yang diberikan dalam pembekalan ini disesuaikan dengan program tema yaitu Peningkatan potensi desa sanda sebagai sentra peternakan kambing peranakan etawa. Pembekalan ini dilaksanakan dalam 2 sesi dengan materi sesi 1 tentang pemanfaatan limbah pertanian dalam pembuatan ransum komplit. Materi sesi 2 tentang pembuatan pupuk padat dari kotoran kambing dan pupuk cair dari urin kambing.

3.4. Mobilisasi ke Desa

Observasi ke lapangan sudah dilakukan tanggal 27 Juni 2018, pada saat observasi kita bertemu dengan kepala desa untuk mencari data ketersediaan bahan pakan limbah pertanian yang akan digunakan dalam penyusunan ransum komplit untuk ternak kambing.

Hasil observasi di lapangan ditemukan bahwa desa Sanda merupakan desa sentra penghasil kopi, sehingga ada limbah kulit kopi yang berlimpah yang sementara ini baru digunakan untuk pupuk tanaman. Limbah kopi berupa kulit kopi sangat berpotensi untuk dipakai sebagai bahan pakan dalam penyusunan ransum komplit, karena mengandung nutrisi yang cukup tinggi. Disamping limbah kulit kopi di desa Sanda juga terdapat banyak tanaman pisang. Limbah tanaman pisang berupa pohon atau gedebong yang merupakan tanaman pisang setelah dipanen. Limbah ini sampai saat ini belum dimanfaatkan untuk pakan ternak.

Sosialisasi dan Sinkronisasi program tema dengan program bantu dengan Kepala desa dan kepala lingkungan. Acara ini dilakukan pada hari selasa tanggal 10 Juli 2018 jam 11.00, bertempat di kantor kepala desa Sanda dihadiri oleh unsur pimpinan desa dan semua mahasiswa KKN-PPM 2018. Acara diskusi dipimpin oleh kepala desa dilanjutkan dengan pemaparan program dari Mahasiswa KKN. Mahasiswa berangkat menuju desa Sanda pada hari Jumat tanggal 20 Juli dan sudah menuju posko yang sudah disepakati tempatnya pada saat sosialisasi sebelumnya.

3.5. Pelaksanaan Kegiatan Program KKN-PPM

Kegiatan bimbingan teknis tentang pembuatan pakan komplit berbahan limbah pertanian dilakukan pada hari/tgl: minggu tanggal 28 Juli 2018 jam 16.00 bertempat di kelompok ternak kambing Sanda Sari. Pelatihan dan bimbingan ini diikuti oleh 3

kelompok ternak Kambing yaitu kelompok ternak kambing Sanda Sari, Wana Sari dan Paku Sari.

Kegiatan bimbingan teknis pengolahan kotoran kambing menjadi pupuk padat dan pupuk cair biourine berkualitas . Kegiatan ini dilaksana pada hari minggu tanggal 28 Juli jam 08.00 – 13.00 bertempat di kelompok ternak Sanda Sari Desa Sanda kecamatan Pupuan kabupaten Tabanan. Dihadiri oleh 16 orang peternak dan hadir pula sekretaris desa.

Penyuluhan tentang manajemen kelompok, Kegiatan ini dilaksanakan pada tanggal 11 Agustus 2018 bertempat di kandang kelompok ternak Sanda Sari. Nak dari tiga kelompok ternak kambing yang ada di Desa Sanda.

Pelatihan dan bimbingan teknis Pembukuan Sederhana. Kegiatan ini dilaksanakan pada tanggal 11 Agustus 2018 bersamaan dengan acara penyuluhan tentang manajemen kelompok.

Dari seluruh kegiatan yang dilaksanakan, kegiatan pembuatan pakan komplit mendapat perhatian yang antusias dari masyarakat karena dalam penyuluhan ini dilakukan demonstrasi pembuatan pakan komplit dengan menggunakan bahan limbah kulit biji kopi sebagai bahan penyusun ransum. Kopi termasuk tanaman yang menghasilkan limbah hasil sampingan yang cukup besar dari hasil pengolahan. Limbah sampingan tersebut berupa kulit kopi yang jumlahnya berkisar antara 50 - 60 persen dari hasil panen. Bila hasil panen sebanyak 1000kg kopi segar berkulit, maka yang menjadi biji kopi sekitar 400-500kg dan sisanya adalah hasil sampingan berupa kulit kopi. Limbah kulit kopi belum dimanfaatkan petani secara optimal. Padahal kulit kopi bisa dimanfaatkan sebagai bahan dasar pembuatan pupuk kompos (Puslitkoka, 2005) dan bisa digunakan sebagai pakan karena kulit kopi mempunyai

kecernaan protein sebesar 65% dan 51,4% untuk kulit biji (Azmi dan Gunawan, 2006). Kulit kopi cukup potensial untuk digunakan sebagai bahan pakan ternak ruminansia baik itu ruminansia kecil maupun ruminansia besar. Kandungan nutrisi kulit kopi non fermentasi seperti protein kasar sebesar 8,49%,(Hasil analisa proksimat Balitnak, 2013) relatif sebanding dengan kandungan zat nutrisi rumput.

4. Conclusion

1. Ketiga kelompok ternak kambing di desa Sanda sangat tertarik untuk membuat ransum komplit dengan menggunakan bahan dasar limbah kulit biji kopi.
2. Peternak sangat tertarik dalam mempraktekkan cara pemerah kambing sehingga dapat memperoleh keahlian dalam pemerah susu kambing.

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Characteristics Of Dry Gumitir Flower (Marigold) In Treatment Of Solution

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Abstract. Gumitir flowers (marigold) which are yellow to orange because they contain carotenoid compounds, can be extracted to produce coloring extracts. The dye extract produced from the extraction process is influenced by several factors including the characteristics of dried gumitir flowers. Fresh gumitir flowers need to be soaked in a marinade solution before drying to maintain the content of carotenoid compounds in the material. The purpose of this study was to obtain the best characteristics of gumitir flower to extract the stain. The type of soaking solution used is alkaline solution, acid solution and neutral solution. Fresh gumitir flowers are sorted and then soaked in NaOH solution (pH 8.5), citric acid solution (pH 4.0), and distilled water (pH 7) for 30 minutes, drained and dried in an oven at 50 °C, crushed and sifted with 60 mesh sieve to produce gumitir flower powder, then analyzed. The results showed that the treatment of immersion in alkaline dissolution was the best treatment to produce dried gumitir flowers to extract the dye with the following characteristics: moisture content, carotenoid content, brightness level (L *), redness level (a *), and yellowish level (b *), respectively 10.97%; 15.83%; 44.15; 55.02; and 52.20.

Key words: *natural dyes, gumitir flowers, carotenoids, sodium hydroxide, citric acid*

1. Introduction

The color of food is one of the most important and influential sensory characteristics in food selection. Based on reality, even though nutritional value, taste and aroma, texture are attractive, but if the color of food is not attractive, then the food tends to be less favored. The development of various processed foods now requires the provision of adequate, high-quality and safe coloring materials. The dyes used in food are currently sourced from natural ingredients and from synthetic materials. Increased public awareness of health, has an effect on preferred natural dyes over synthetic dyes. Synthetic dyes when consumed continuously in excessive

amounts will accumulate in the body and potentially cause cancer. Therefore, it is necessary to find alternative sources of safe and stable natural dyes in the processing and storage.

One of the natural ingredients that has the potential as a source of coloring is gumitir, which has not been widely publicized. Gumitir flower is one of the ornamental herbs commonly used as hedgerows and barriers. At present there are two types of gumitir plants known to the public, namely local gumitir (*Cosmos sulphureus*) and marigold gumitir (*Tagetes erecta* L.) (Arini *et al.*, 2015). Tabanan and Badung Regencies are centers of marigold gumitir cultivation in Bali.

The gumitir flower has a yellow to orange color because it contains carotenoid compounds. Analysis of carotenoid content in some gumitir flower cultivars shows that there are seven carotenoids that can be detected, violaxanthin, lutein, zeaxanthin, α -carotene, β -carotene, 9-cis- β carotene, and 13-cis- β -carotene with the highest content

lutein. The content of each type of carotenoid depends on the cultivar (Park et al., 2017). The success of the extraction process is influenced by several things including the condition of raw materials, operational conditions during extraction such as extraction temperatures. Carotenoid compounds have varying levels of polarity, therefore extraction of carotenoid compounds from the material can be carried out with non-polar, polar or a mixture of both. Research results of Aristyanti *et al.* (2017) shows that the best solvent for producing gumitir flower coloring extract is n-hexane solvent. Extraction in the study was carried out at room temperature (between 27-30 °C). The extraction temperature also determines the characteristics of the extract produced, because the temperature affects the process that takes place, generally the higher the temperature to a certain extent the reaction speed will increase. Therefore in this study extraction will be carried out at several extraction temperatures to improve the characteristics of the resulting gumitir extract. The condition of the raw material determines how much the desired compound can be extracted. Preliminary treatment with immersion in a solution of sodium hydroxide and citric acid was able to increase the yield of extraction (Sowbhagya *et al.*, 2013).

Some studies on the extraction of dyes containing carotenoids including those in pandanus showed that to obtain pandan fruit dyes used 60 mesh particle size (Antari *et al.*, 2015), chloroform and acetone solvents (Sari *et al.*, 2015), and extraction temperature 45 °C (Cahayanti *et al.*, 2015). The purpose of this study was to obtain gumitir flowers with the best characteristics to extract the coloring.

2. Research Method

The main material in this study is marigold kenikir flower (*Tagetes erecta* L.) obtained from Belok Sidan Village, Petang District, Badung Regency, Bali Province, with criteria for yellowish orange blooms and 6-8 cm flower diameters. Chemicals consist of materials for the process of soaking gumitir flowers (NaOH and citric acid) and chemicals for analysis that have pa grades (E.Merck), namely petroleum benzene, acetone, Na₂SO₄ anhydrous, and standard β-carotene. The equipment used is equipment for the extraction process namely oven dryer, pumpkin extraction, incubator, stainless steel knife, thermometer, rotary vacuum evaporator, separating funnel, Whatman No. filter paper. 1, and equipment for analysis namely spectrophotometers, analytical scales, color readers.

This study used a Randomized Design Group with a type of marinade treatment consisting of 3 types, namely NaOH solution (pH 8.5), citric acid solution (pH 4.0), and aquades (pH 7.0). Each treatment was carried out 6 times so that there were 18 experimental units.

Gumitir flowers are sorted according to predetermined criteria, namely the color of orange flowers evenly and in full bloom. Gumitir flowers are separated from the stem, then immersed in a solvent according to the treatment for 48 hours at room temperature.

Then drained and dried with an oven at a temperature of 50 ± 5 °C until easily destroyed (water content of about 10%). The dried gumitir flower is then analyzed for water content (Sudarmadji *et al.* (1997), total carotenoid content (Muchtadi, 1989), color visually and color objectively with the L a b system (Weaver (1996).

3.Result

Pretreatment of raw materials of gunitir flowers by immersion using acid solution (pH 4), alkaline (pH 8.5) and aquades (pH 7), produces gunitir flower powder with the following characteristics. The results of diversity analysis showed that the type of marinade treatment had a significant effect on the total carotenoid content of gunitir flower powder, water content, but it had no significant effect on color intensity (L *, a *, and b *). Water content, total carotenoid levels are presented in Table 1, Figure 1 and 2, and the intensity of the color of the dried gunitir flower (brightness / L *, redness / a *, and yellowness / b *) are presented in Table 2, Figure 3, 4, and 5.

Table 1. Water content (%) and total carotenoid levels (%) dried gunitir flowers

Treatment of soaking solution	Moisture content	Total of carotenoids
Acid	10.52 ± 0.76 b	13.23 ± 1.15 b
Base	10.97 ± 0.77 ab	15.62 ± 0.80 a
Neutral	11.68 ± 0.72 a	12.12 ± 1.09 b

Different letters behind the mean values in the same column show very significant differences (P <0.01). Data is an average of 6 groups

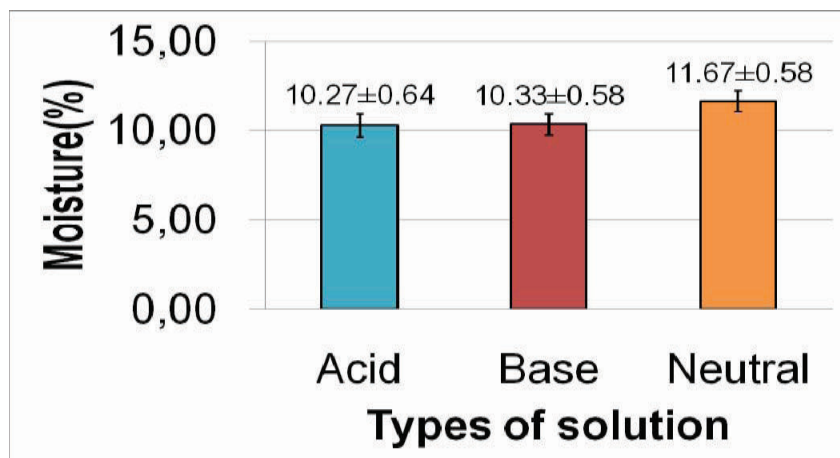


Figure 1. Moisture content of dry gunitir (%)

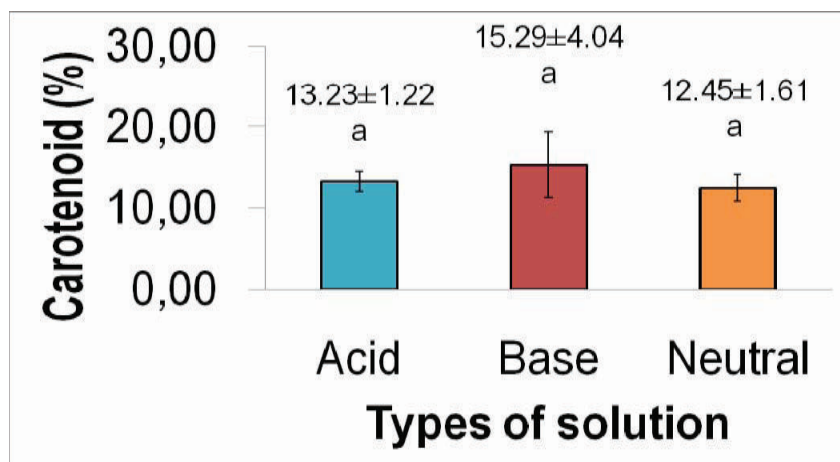


Figure 2. Carotenoid content of dry gumitir (%)

Table 2. The intensity of the color of dried gumitir flowers (L *, a *, b *)

Treatment of soaking solution	L*	a*	b*
Acid	45.34 ± 2.36a	53.24 ± 2.76a	50.94 ± 2.89a
Base	46.66 ± 2.71a	55.08 ± 1.03a	52.20 ± 0.89a
Neutral	44.15 ± 2.31a	52.26 ± 1.69a	50.83 ± 4.74a

Different letters behind the mean values in the same column show very significant differences (P <0.01). Data is an average of 6 groups

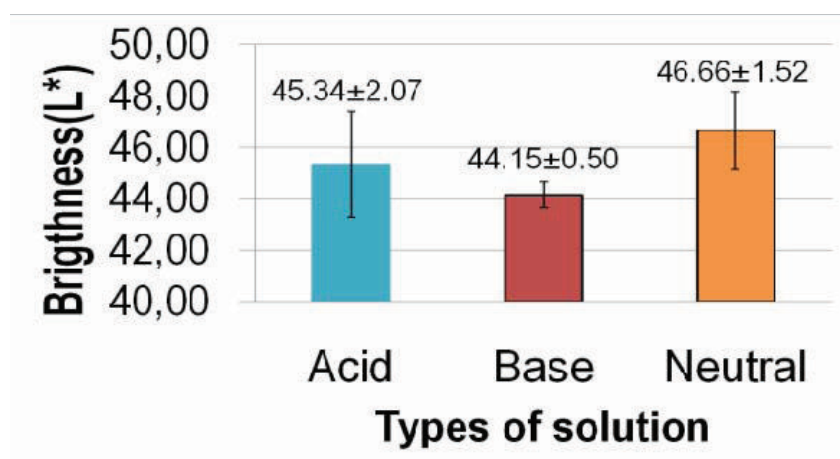


Figure 3. Brightness (L*) of dry gumitir (L*)

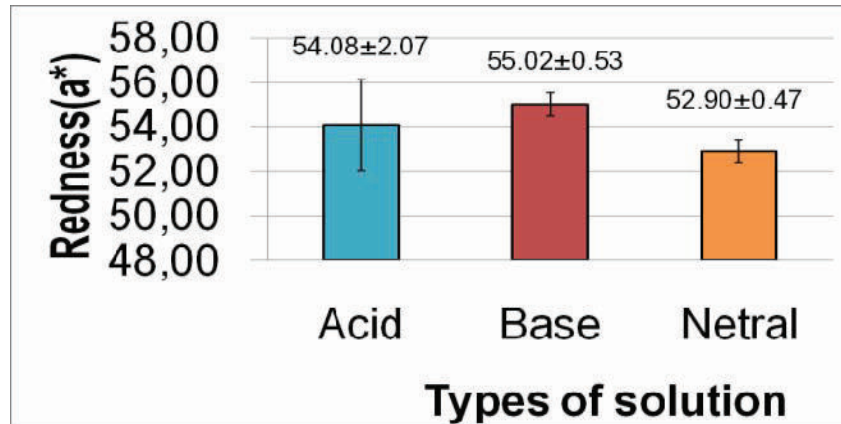


Figure 4. Redness (a*) of dry gumitir

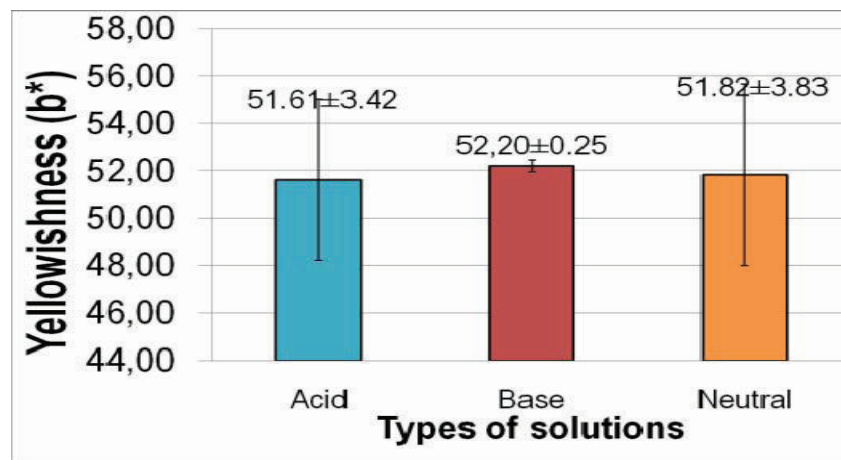


Figure 5. Yellowishness (b*) of dry gumitir

4. Discussion

The water content of dried gumitir produced from the treatment of soaking acid solution is the lowest but not different from the treatment of soaking of alkaline solutions. The highest water content is produced by immersion treatment in aquadest (neutral). The treatment of NaOH, citric acid causes a decrease in water content in materials faster than aquades, because with this treatment, changes in the structure and permeability of cells reduce drying time (Sowbhagya *et al.*, 2013). 10% to facilitate the process of crushing or reducing the size before the extraction process is carried out to get gumitir flower coloring extract.

The most important characteristic of dried gumitir flowers to be processed further into coloring extracts is carotenoid levels because these

compounds contribute yellow to red in the extract. The best characteristics of gumitir flowers are produced from immersion treatments in alkaline solutions. This is related to the nature of carotenoid compounds which are more stable in alkaline conditions than acidic and neutral. The results of this study are in accordance with the results of research by Padmaningrum *et al.* (2009), which shows that the use of alkaline $\text{Ca}(\text{OH})_2$ solutions is best in maintaining carotene levels in soaking before drying.

Table 2 shows that immersion in acidic, basic and neutral solutions did not show differences in the brightness, redness and yellowness of gumitir flower powder, although there was a tendency to immersion in alkaline solutions to have the highest values in all of these variables, followed by the lowest and acid treatment soaking in aquades. High carotenoid levels are related to the intensity of the color of the dry gumitir powder, namely the brightness level (L^*) is low, the redness level (a^*) and the yellowish level (b^*) are high. The best characteristics of gumitir flowers are produced from immersion treatments in alkaline solutions. Therefore, for the manufacture of gumitir flower coloring extracts in the next stage, dried gumitir flowers are used as a result of the treatment.

5. Conclusion

The treatment of immersion in alkaline dissolution was the best treatment to produce dried gumitir flowers to extract the dye with the following characteristics: moisture content, carotenoid content, brightness level (L^*), redness level (a^*), and yellowishness level (b^*), respectively 10.97%; 15.83%; 44.15; 55.02; and 52.20.

Acknowledgement

Thank you to Udayana University, who has funded this research through the Penelitian Unggulan Program Studi with no contract number : DIPA PNBP Universitas Udayana sesuai dengan Surat Perjanjian Kerja Penelitian Nomor : 1786/UN14.2.12.II/PN.01.00.00/2018 tanggal 22 Mei 2018.

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Study On The *Tape* Yeast Addition And Natural Fermentation Time Of Pulp Liquid By-Products To Quality Characteristics And Antioxidant Activity Of Cocoa Vinegar

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Abstract. The pulp liquid as by-product of cocoa beans fermentation is potential to be used as a raw material for making cocoa vinegar, but unfortunately the content of acetic acid is relatively low and there are no studies related to antioxidant activity. The purpose of this study was to: (1) study the effect of addition of tape yeast and natural fermentation time of pulp liquid by-products of cocoa bean fermentation to the quality characteristics and antioxidant activity of cocoa vinegar and (2) determine the addition of tape yeast and natural fermentation time for pulp liquid making cacao vinegar with good quality characteristics and antioxidant activity. Experiments in this study using a factorial RBD two factors, factor I is the addition of tape yeast consisting of 5 levels, namely: without tape yeast (control), the addition of 0.05; 0.10; 0.15; and 0.20% (w/v) and factor II is the natural fermentation time consisting of 6 levels, namely: 5, 10, 15, 20, 25 and 30 days. Characteristics of cacao vinegar observed were as stated in SNI 01-437-1996 and antioxidant activity included total content of polyphenols and antioxidant capacity. The results showed that: (1) the treatment of addition of tape yeast, fermentation time and its interaction significantly affected on the characteristics of cocoa vinegar, namely: acetic acid, TSS, pH, total sugar, and alcohol; and antioxidant activity, namely: total polyphenols and antioxidant capacity, (2) the best treatment for making cocoa vinegar is the addition of 0.10 % tape yeast and 25 days fermentation time with the characteristics, namely : acetic acid content of 4.09±0.01 %, pH of 3.40±0.00, TSS of 5.05±0.07 (°Brix), total sugar content of 0.49±0.02 %, alcohol content of 0.00 %; and the antioxidant activity, namely : total polyphenols content of 78.94±6.54 (mg/100g GAE) and antioxidant capacity of 12.50±0.14 (mg/L GAEAC)

Keywords: *cocoa vinegar*, *'tape' yeast*, *quality characteristics*, *antioxidant activity*

1. Introduction

Pulp liquid is a by-product of fermented cocoa beans. During fermentation of cocoa beans produced 10-15% pulp liquid from the weight of cocoa beans (Ganda-Putra *et al.*, 2008; Ganda-Putra and Wartini, 2014; Ganda-Putra and Wartini, 2016). The potential for pulp liquid is quite large, but so far it has just been thrown away around the processing site. It has a bad impact and pollutes the surrounding environment. Pulp liquid can actually be used to make fermented drinks, such as vinegar (Efendi, 2002), cocoa wine, (Duarte *et al.*, 2010), and new cocoa kefir-based drinks (Puerari *et al.*, 2012). Cocoa vinegar produced from pulp fluid will also contain phenolic bioactive compounds (Da-Silva *et al.*, 2014), so that it can provide functional effects that are positive for health. Acetic acid or vinegar as a fermentation product has many advantages compared to acetic acid synthetic because it contains functional compounds such as acetoin, diacetyl, ethanol, and several kinds of acetate esters (Kunkee and Amerine, 1970).

Vinegar can be made through 2nd stage fermentation, namely anaerobic and aerobic. Anaerobic fermentation produces alcohol as a result of the decomposition of sugar substrate, while aerobic fermentation to convert alcohol to vinegar. Furthermore, vinegar can also be produced through 1 step fermentation with the addition of carbon sources in the form of alcohol.

Tape yeast contains various kinds of microbes including *Candida* sp., *Endomycopsis* sp., *Hansenula* sp., *Amylomyces* sp., *Aspergillus* sp., *Fusarium* sp., *Mucor* sp. and *Rhizopus* sp.

(Steinkraus, 1983), which plays an important role in the fermentation process. Whereas according to Tarigan (1988), tape yeast contains *Saccharomyces cerevisiae*, besides that in tape yeast there are microorganisms that on anaerobic conditions it will produce amylase and amyloglucosidase enzyme, both of which are responsible for breaking down carbohydrates into glucose and maltose. Tape yeast is a mixed population consisting of the genera *Aspergillus*, *Saccharomyces*, *Candida*, *Hansenulla*, and *Acetobacter*. Addition of tape yeast on the fermentation of cocoa beans with a range of 1.0% was tried by Agung *et al.* (1998), which can shorten the fermentation time to 4 days from 6 days in natural fermentation.

So far there have been several studies on the manufacture of fermented vinegar from pulp sources, the byproduct of fermented cocoa beans, but it has not been optimal and there are no studies related to its antioxidant activity. This might be tried to add tape yeast to the making of vinegar from the pulp liquid by-product of fermented cocoa beans. The application of natural fermentation methods in the making of cacao vinegar, apart from the amount of pulp liquid around 10% by weight and also considering the characteristics of pulp liquid which already contains sugar, alcohol, and acetic acid, so the study will be carried out with the addition of tape yeast at around 10% from the treatment of fermented cocoa beans. For this reason, this research was conducted with the aim of: (1) study the effect of addition of tape yeast and natural fermentation time of pulp liquid by-products of cocoa bean fermentation to the quality characteristics and antioxidant activity of cocoa vinegar, and (2) determine the addition of tape yeast and natural fermentation time for pulp liquid in making cacao vinegar with good quality characteristics and antioxidant activity.

2. Research Methods

2.1 Materials and Equipment

The material used is pulp liquid by-products of cocoa bean fermentation for 1-2 days, obtained from farmers in Angkah Village, Selemadeg Barat District, Tabanan Regency. Other ingredients are tape yeast, alcohol, standard of Gallic acid, methanol, Pholin Ciocalteu's, Na₂CO₃, DPPH solution, 1% pp indicator, glucose standard, nelson reagent, HCl, and arsenomolybdat reagent.

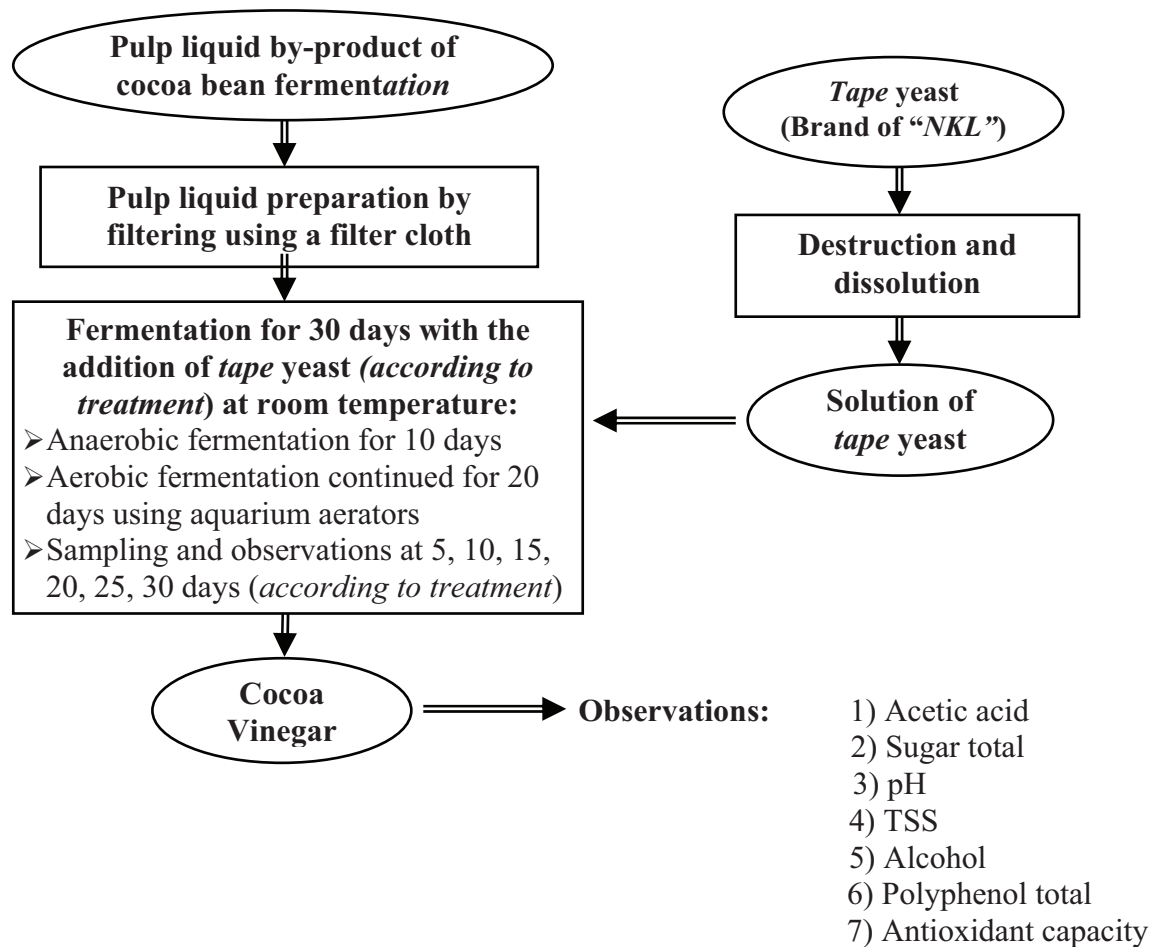
The equipment used includes fermentation containers (gallons and plastic jars), magnetic stirrers, water baths, pH meters, spectrophotometers, hand refractometers, oven incubators, filter paper, and aquarium aerators.

2.2 Experimental Design

The experiment in this study used a Block Randomize Design (BRD) factorial 2 factors. The 1st factor is the addition of tape yeast consisting of 5 levels, namely: without tape yeast (control), the addition of 0.05; 0.10; 0.15 and 0.20% (w/v) and 2nd factor is the natural fermentation time consisting of 6 levels, namely: 5, 10, 15, 20, 25 and 30 days. Each treatment combination (30 combinations) was made in 2 block to obtain 60 experimental units.

2.3 Research Methods

Research methods are described as in the following flow chart:



2.4 Observations

Observation content of acetic acid, sugar total, pH, TSS, and alcohol according to the SNI-01-437-1996 procedure and polyphenol total using spectrophotometric methods (Coseteng and Lee, 1987) and antioxidant capacity with the DPPH method (Kubo *et al.*, 2002).

2.5 Data analysis

The data obtained were analyzed by variance analysis and continued with 5% DMRT if the treatment had a significant effect ($p \leq 0.05$). Other analyzes are based on important characteristics such as SNI 01-4371-1966 and antioxidant activity of cacao vinegar.

3. Results And Discussions

3.1 Cocoa Vinegar Characteristics

1) Acetic acid contents

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the acetic acid content of cocoa vinegar. The average values of acetic acid content of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 1.

Table 1. Content of acetic acid (%) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	1.69±0.03 o*)	2.60±0.02 kl	3.43±0.14 gh	3.55±0.05 ef	3.60±0.02 ef	3.63±0.02 ef
0.05	1.72±0.05 no	2.65±.04 kl	3.38±0.02 hi	3.52±0.01 efg	3.85±0.01 c	3.71±0.11 d
0.10	1.90±0.07 m	2.97±0.02 j	3.72±0.00 d	3.88±0.06 bc	4.09±0.01 a	3.99±0.06 ab
0.15	1.85±0.08 m	2.67±0.07 k	3.37±0.03 hi	3.50±0.01 efg	3.93±0.05 bc	3.69±0.07 de
0.20	1.82±0.07 mn	2.55±0.12 l	3.28±0.01 i	3.52±0.01 efg	3.84±0.03 c	3.58±0.11 ef

*)Note : different letters below the average value ± std. (2 replications) show significant differences in the 5% DMRT

Table 1 shows that the higher percentage of addition of *tape* yeast and the longer the fermentation time causes the acetic acid content to increase, but the addition of *tape* yeast is more than 0.10% and the fermentation time is more than 25 days the acetic acid content tends to decrease. The highest acetic acid content was obtained in the treatment of the addition of *tape* yeast 0.10% and fermentation time of 25 days, which was $4.09 \pm 0.01\%$, higher than the acetic acid content of the sample of cocoa pulp liquid which was $1.16 \pm 0.06\%$. This happens because the addition of *tape* yeast will initially increase the amount of microbes that work to transform the sugar into ethanol, then ethanol will be converted to acetic acid. However, the higher percentage of adding yeast *tape* tends to reduce the levels of acetic acid vinegar. Be expected due to microbial competition on the same substrate so that conditions become less optimal for the process of reforming the substrate. The transform process also requires time so that the longer fermentation time of acetic acid contents are higher until the 25th day, but then tends to decrease because the acetic acid that has been formed is further transformed, as explained by Rahman (1992) that in further fermentation of acetic acid has been formed is transformed into H₂O and CO₂.

Adding 0.10% *tape* yeast with 25 days fermentation time can produce cacao vinegar with 4.09% acetic acid content. These results are higher than the results of the survey by Kozaki *et al.* (1998) in the process of making acetic acid traditionally in Indonesia and the Philippines, which is about 2%. These results also meet the standard acetic acid levels on SNI for fermented vinegar (SNI 01-4371-1996), which is a minimum of 4%.

2) pH

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the pH of cocoa vinegar. The average values of pH of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 2.

Table 2. pH of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	3.70±0.00 cd	3.68±0.04 cd	3.65±0.07 de	3.60±0.00 ef	3.58±0.04 ef	3.48±0.04 gh
0.05	3.73±0.04 c	3.70±0.00 cd	3.70±0.00 cd	3.60±0.00 ef	3.50±0.00 g	3.40±0.00 h
0.10	3.75±0.07 c	3.60±0.00 ef	3.50±0.00 g	3.50±0.00 g	3.40±0.00 h	3.40±0.00 h
0.15	3.85±0.07 b	3.68±0.04 cd	3.60±0.00 ef	3.58±0.04 ef	3.50±0.00 g	3.40±0.00 h
0.20	3.95±0.07 a	3.75±0.07 c	3.60±0.00 ef	3.55±0.00 fg	3.50±0.00 g	3.40 .00 h

*)Note : different letters below the average value ± std. (2 replications) show significant differences in the 5% DMRT

Table 2 shows that the higher the percentage of addition of *tape* yeast and the longer the fermentation time causes the pH of cocoa vinegar is lower, but the addition of *tape* yeast more than 0.10% pH tends to be higher. The lowest pH of cocoa vinegar was obtained in the treatment of adding 0.10% *tape* yeast and fermentation time of 25 days or in all treatments of the addition of *tape* yeast with a time of more than 25 days, which was 3.40 ± 0.00 lower than the pH of the sample of cocoa pulp liquid which was 4.15 ± 0.07 . This condition occurs because of the presence of acetic acid in cacao vinegar which changes in line with changes in pH. The higher the concentration of yeast added, the more microbes, so that the total acid produced increases. The increase in total acid is due to the formation of organic acids as the end result of fermentation in the form of acetic acid and lactic acid. These acids will affect acidity (pH) after fermentation (Ardhana and Fleet, 2003).

However, the pH range of cocoa vinegar produced is not too large, which is between 3.95 - 3.40. This condition is possible because acetic acid is classified as a weak acid with pKa 4.76 (Anon., 2016) so that it does not affect the change in pH value too much.

3) Total soluble solid (TSS)

The results of the variance analysis showed that the treatment of the addition of *tape* yeast and fermentation time had a very significant effect ($P \leq 0.01$), but interaction had a significant effect ($P \leq 0.05$) on the TSS of cocoa vinegar. The average values of TSS of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 3.

Table 3 shows that the higher the percentage of addition of *tape* yeast causes TSS tends to be higher, but the longer the fermentation time causes TSS tends to be lower. The lowest TSS of cacao vinegar was obtained in the treatment without the addition of *tape* yeast and fermentation time of 30 days, which was 4.33 ± 0.04 (°Brix), lower than the TPT of sample of cacao pulp liquid which was 6.70 ± 0.14 (°Brix). Higher TSS in the higher percentage of addition of *tape* yeast due to additional of *tape* yeast dissolved in the cacao vinegar was produced. Furthermore, in acetic acid fermentation, TSS levels in cacao vinegar also decreased, presumably

Table 3. TSS ($^{\circ}$ Brix) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	6.25±0.07 cd	5.63±0.04 gh	5.13±0.04 lmn	4.68±0.04 o	4.43±0.04 p	4.33±0.04 p
0.05	6.40±0.00 bc	5.70±0.00 fg	5.30±0.00 jkl	5.00±0.00 mn	4.68±0.25 o	4.93±0.13 n
0.10	6.58±0.04 b	5.90±0.00 e	5.40±0.00 ijk	5.20±0.00 klm	5.05±0.07 mn	5.00±0.14 mn
0.15	6.78±0.04 a	6.13±0.04 d	5.55±0.00 gh	5.38±0.04 ijk	5.10±0.00 lmn	5.20±0.14 klm
0.20	6.90±0.00 a	6.20±0.00 cd	5.60±0.00 gh	5.50±0.00 ghij	5.30±0.00 jkl	5.45±0.18 hij

*)Note : different letters below the average value \pm std. (2 replications) show significant differences in the 5% DMRT

caused during the fermentation process, sugar which is the dominant soluble solid component in the medium, besides pigments, vitamins and minerals, is utilized by bacteria as a carbon source (Rahman , 1992). In addition, it was stated by Reed and Nagodawithana (1991), that there was a decrease in TSS during the fermentation process by bacteria as well as yeast. This is made clear by the statement of Sartika (2010), a decrease in the TSS during storage because sugar will change to alcohol, aldehyde and amino acids. The remnants of these organic acids, sucrose and lactose which are dissolved will be counted as TSS.

4) Sugar total content

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the sugar total content of cocoa vinegar. The average values of sugar total content of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 4.

Table 4 shows that the higher the percentage of addition of *tape* yeast and the longer the fermentation time causes the total sugar content tends to be lower. The lowest total level of cacao vinegar sugar was obtained in the addition of 0.10% *tape* yeast and 30 days fermentation time, which was $0.34 \pm 0.05\%$, lower than the total

Table 4. Content of sugar total (%) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	1.25±0.07 a	1.09±0.10 bc	0.89±0.08 efg	0.74±0.08 hi	0.51±0.01 j	0.37±0.06 kl
0.05	1.23±0.04 a	1.05±0.10 bcd	0.87±0.08 efg	0.80±0.08 ghi	0.51±0.01 j	0.39±0.06 jkl
0.10	1.16±0.01 ab	1.01±0.10 cde	0.88±0.08 efg	0.78±0.06 ghi	0.49±0.02 jk	0.34±0.05 l
0.15	1.08±0.04 bc	0.97±0.08 cde	0.87±0.06 efg	0.76±0.08 ghi	0.43±0.02 jkl	0.36±0.06 kl
0.20	1.00±0.07	0.94±0.08	0.85±0.08	0.71±0.08	0.42±0.02	0.38±0.05

cde def fgh i jkl jkl

*)Note : different letters below the average value \pm std. (2 replications) show significant differences in the 5% DMRT

sugar content of the sample of cacao pulp liquid which was $1.46 \pm 0.11\%$. This happens as a result of decomposition of sugar during fermentation by microbes contained in *tape* yeast as a carbon source. According to Rahman (1992), in acetic acid fermentation, carbon sources (usually glucose) are oxidized to CO_2 and H_2O .

5) Alcohol content

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the alcohol content of cocoa vinegar. The average values of alcohol content of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 5.

Table 5 shows that the higher percentage of addition of *tape* yeast causes the alcohol content of cocoa vinegar to increase in 5 and 10 days fermentation, but then decreases, even undetectable in observations of the 20th, 25th and 30th days. The highest alcohol content (10 days fermentation) resulting in the addition of 0.10% *tape* yeast treatment compared to the addition of other *tape* yeast treatments. The highest alcohol content of cocoa vinegar was obtained in the treatment of adding 0.10% *tape* yeast and 10 days fermentation time, which was $1.36 \pm 0.01\%$, higher than the alcohol content of the sample of cacao pulp liquid which was $0.55 \pm 0.10\%$. This

Table 5. Alcohol content (%) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	0.96 \pm 0.01 f	1.07 \pm 0.01 e	0.59 \pm 0.02 i	0.00 \pm 0.00 l	00.00 \pm 0.00 l	0.00 \pm 0.00 l
0.05	1.04 \pm 0.01 e	1.24 \pm 0.01 c	0.67 \pm 0.01 g	0.00 \pm 0.00 l	0.00 \pm 0.00 l	0.00 \pm 0.00 l
0.10	1.06 \pm 0.01 e	1.36 \pm 0.01 a	0.52 \pm 0.02 k	0.00 \pm 0.00 l	00.00 \pm 0.00 l	0.00 \pm 0.00 l
0.15	1.10 \pm 0.01 d	1.29 \pm 0.01 b	0.64 \pm 0.02 h	0.00 \pm 0.00 l	0.00 \pm 0.00 l	0.00 \pm 0.00 l
0.20	1.12 \pm 0.01 d	1.27 \pm 0.01 b	0.55 \pm 0.01 j	0.00 \pm 0.00 l	00.00 \pm 0.00 l	0.00 \pm 0.00 l

*)Note : different letters below the average value \pm std. (2 replications) show significant differences in the 5% DMRT

happens because in anaerobic fermentation sugar is broken down by *Saccharomyces cerevisiae*, one of the microbes contained in yeast *tape*, become alcohol and CO_2 . Addition of yeast will increase the amount of microbes that work to break down sugar into alcohol. Furthermore, CO_2 produced in the alcoholic fermentation process can inhibit the activity of *Saccharomyces cerevisiae* itself so that the alcohol content decreases. According to Datar *et al.* (2004), the production of CO_2 during the fermentation process, the growth of *Saccharomyces cerevisiae* will stop even though it is still alive. Decrease in alcohol content also takes place because the alcohol is oxidized by the bacterium *Acetobacter* sp., producing acetic acid and H_2O . Decreasing alcohol content after the 15th day of fermentation for all treatments of adding *tape* yeast can occur because the yeast undergoes a phase of growth retardation due to reduced essential nutrients for the growth of glucose-decomposing

microorganisms. The fermentation process after 10 days produced acetic acid formed from alcohol. In addition, changes in a compound are influenced by time, so that the longer the fermentation time causes the alcohol content of cocoa vinegar is lower, even undetectable from the 20th day. During acetic acid fermentation, alcohol is transformed into acetic acid so that the initial alcohol content is reduced, as stated by Daulay and Rahman (1992), that alcohol is a medium of acetic acid bacteria to live and is converted to acetic acid.

3.2 Antioxidant Activity of Cocoa Vinegar

1) Polyphenol total content

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the polyphenol total content of cocoa vinegar. The average values of polyphenol total content of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 6.

Table 6. Content of polyphenol total (mg/100g GAE) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	37.76±0.95 m	68.05±0.13 hi	74.33±2.52 fg	80.48±1.14 cde	77.78±1.78 ef	70.77±0.03 gh
0.05	43.73±0.88 l	75.39±0.66 efg	80.71±1.58 cde	86.68±4.24 b	79.48±1.46 cde	64.47±1.10 i
0.10	44.60 ±0.60 kl	76.87±0.06 ef	84.83±1.53 bc	92.56±4.11 a	78.94±6.54 def	52.82±3.28 j
0.15	46.94 ±2.05 kl	77.73±0.68 ef	83.00±0.57 bcd	88.20±4.60 ab	77.93±6.51 ef	47.99±2.67 jkl
0.20	48.87±2.57 jkl	77.77±0.63 ef	83.84±2.14 bcd	87.30±4.29 ab	76.02±0.63 ef	49.08±0.13 jk

*)Note : different letters below the average value ± std. (2 replications) show significant differences in the 5% DMRT

Table 6 shows that the higher percentage of addition of *tape* yeast and the longer the fermentation time causes the polyphenol total contents of cocoa vinegar to increase until the fermentation time is 20 days, but then decreases. In the 20th day fermentation, the polyphenol total content tended to be highest in the addition of 0.10% *tape* yeast compared to the addition of other *tape* yeast treatments. The highest polyphenol total content of cacao vinegar was obtained in the treatment of the addition of *tape* yeast 0.10% and fermentation time of 20 days, namely 92.56 ± 4.11 (mg/100g GAE), higher than the total polyphenol content of cocoa pulp liquid samples, namely 31.46 ± 0.11 (mg/100g GAE). This happens because the addition of *tape* yeast will increase the amount of microbes for the formation of polyphenol compounds until the 10th day of fermentation, then the 15th and 20th days show that the addition of 0.10% yeast *tape* provides more optimal conditions than the other addition of *tape* yeast treatments. The decrease in polyphenol total content after 20th day fermentation was thought to be due to further decomposition of the formed polyphenol compounds.

As it is known that the cocoa pulp contains 0.17% polyphenol compounds which are soluble in water and as much as 0.15% alcohol soluble (Anvoh *et al.*, 2009; Dias *et al.*, 2007), so that they will dissolve in the pulp liquid. Polyphenol compounds are allelopathy chemicals which can inhibit plant seed germination (Li *et al.*, 2010; Sing *et al.*, 2001). According to Berri (1985), phenol compounds have an effect on hydrolysis enzymes which play a role in breaking down the substrate into compounds that are ready to be metabolized.

2) Antioxidant capacity

The results of the variance analysis showed that the treatment of the addition of *tape* yeast, fermentation time and interaction had a very significant effect ($P \leq 0.01$) on the antioxidant capacity of cocoa vinegar. The average values of antioxidant capacity of cocoa vinegar which produced from the treatment of addition of *tape* yeast during fermentation is presented in Table 7.

Table 7 shows that the higher the percentage of addition of *tape* yeast causes the antioxidant capacity of cacao vinegar increased until the fermentation time of 20 days and the antioxidant capacity tended to be highest in the addition of 0.10% *tape* yeast compared to the other addition of *tape* yeast treatments. During fermentation, the longer the fermentation time increases the antioxidant capacity until the 20th day, but then at the fermentation time of the 25th and 30th days there is a decrease. The highest antioxidant capacity of cacao vinegar was obtained in the treatment of adding 0.10% *tape* yeast and 20 days fermentation time, which was 13.94 ± 0.43 (mg/l GAEAC), higher than the antioxidant capacity of cocoa pulp liquid samples, which was 3.71 ± 0.24 (mg/l GAEAC). This is possible because the content of polyphenols

Table 7. Antioxidant capacity (mg/L GAEAC) of cocoa vinegar during fermentation in the addition of *tape* yeast treatment

Addition of <i>tape</i> yeast (%, w/v)	Fermentation time (day)					
	5	10	15	20	25	30
0.00	4.32±0.02 l	5.43±0.02 jk	11.02±1.10 cd	12.30±0.02 bc	10.47±0.45 d	4.88±0.45 kl
0.05	4.63±0.06 l	5.71±0.14 ijk	12.62±0.02 bc	13.21±0.76 ab	11.66±0.02 c	6.50±0.01 ghi
0.10	5.71±0.05 ijk	6.00±0.07 hij	12.86±0.05 bc	13.94±0.43 a	12.50±0.14 bc	7.34±0.02 efg
0.15	6.33±0.29 hij	7.02±0.08 fgh	12.96±0.02 abc	13.86±0.15 a	13.28±0.17 a	8.25±0.02 e
0.20	7.53±0.18 efg	7.97±0.22 ef	13.07±0.21 ab	13.89±0.19 a	13.23±0.15 ab	8.33±0.04 e

*)Note : different letters below the average value \pm std. (2 replications) show significant differences in the 5% DMRT

total in cacao vinegar is produced. The higher of polyphenol total contents cause the higher its antioxidant capacity. In line with the results of the research of Suryanto and Momuat (2017), that the highest total polyphenol content showed the strongest antioxidant capacity. This is also shown by Kumalaningsih (2006) that polyphenol compounds are antioxidants that give hydrogen atoms derived from hydroxyl groups so that a stable compound is formed.

4. Conclusion

The treatment of addition of *tape* yeast, fermentation time and its interaction significantly affected on the characteristics of cocoa vinegar, namely: acetic acid, TSS pH, sugar total, and alcohol; and antioxidant activity, namely: polyphenols total and antioxidant capacity.

The best treatment for making cocoa vinegar is the addition of 0.10% *tape* yeast and 25 days fermentation time with the characteristics, namely: acetic acid content of $4.09 \pm 0.01\%$, pH of 3.40 ± 0.00 , TSS of 5.05 ± 0.07 ($^{\circ}$ Brix), sugar total content of $0.49 \pm 0.02\%$, alcohol content of 0.00% ; and the antioxidant activity, namely: polyphenols total content of 78.94 ± 6.54 (mg/100g GAE) and antioxidant capacity of 12.50 ± 0.14 (mg/l GAEAC).

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EMPOWERMENT OF TISTA COMMUNITIES IN THE DEVELOPMENT OF LOCAL CULINERS TO SUPPORT TISTA RURAL TOURISM, TABANAN REGENCY

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Abstract. The purpose of this activity is to increase the participation and active role of the community in the development of local culinary products derived from ingredients from Tista Village, such as: purple cassava, tamarind plants, cem-cem plants, noni plants, catfish, eels, snails, black rice, corn, various fruits for chips which are processed into various kinds of culinary and can last long without using synthetic preservatives and making attractive packaging, so that it can be used as a typical gift of Tista Village in supporting the Rural Tourism of Tista in Tabanan Regency. It can also open up new jobs for the Tista Village community and to increase local income and improve the welfare of the Tista Village community. Thus, agricultural activities carried out by the Tista Village community can be maintained and preserved without the conversion of agricultural land in the Tista Village and growing the local economy.

The approach model includes: (1) Participatory Rural Appraisal (PRA) Model; (2) Entrepreneurship Capacity Building Model (ECB); and (3) Transfer Technology Model (TT). To be able to achieve some of these objectives, several activity plans proposed in the implementation program in Tista Village are as follows: a) Formation of working groups; b) Training in the processing of food ingredients into various types of culinary and training in packaging various local cuisines; c) Activation of the role of the Tista Village Cooperative; d) Establishment of local culinary marketing networks; e) Program for public scrutiny through industrial homes; f) Training on gastronomic knowledge.

Keywords: Local Culinary, Rural Tourism, Community Empowerment, Community Based Tourism

INTRODUCTION

The population of Tista Village mostly embraced Hinduism with a strong rooted tradition of mutual cooperation. The Tista Village community is quite active in social/cultural activities because most people live in an agrarian life, where in the agrarian life there will be intensive social/cultural interactions between people. The vast agricultural lands that are the mainstay of the life of the Tista people are maintained by the Tista Village community. The agricultural system applied by the Tista Village community is the Tumpang Sari System, in which the cropping system is carried out alternately between rice and pulses. This is intended to maintain soil nutrients. With this Intercropping system, various agricultural products can be produced in the Tista Village. In addition, Tista Village has also been proposed as a Tourism Village in Tabanan Regency because it has a very diverse potential that can be used in developing Tista Village as a Tourism Village. One very important component in tourism activities is local souvenirs, where in Tista Village is in accordance with community agrarian activities that can be developed as a local souvenir that can be enjoyed by tourists who come to Tista Village are various types of local culinary with various types of packaging and interesting. To get optimal results, of course, it takes effort and cooperation from all parties, especially the Tista Village community, so that it has a positive impact on the Tista Village community. The management and development of local culinary in the village of Tista still encountered several obstacles/problems, such as: (1) the community did not know and understand the techniques of processing various food ingredients because the community's knowledge was limited to planting

and harvesting; (2) processing after post-harvest, where if the harvest season arrives, the selling price of agricultural crops is low, so post-harvest activities need to be carried out, namely making various kinds of processed products, so that the selling price is higher; (3) the lack of motivation of the Tista Village community to process agricultural products into various types of processed food because traditionally their harvests are sold immediately; and (4) lack of marketing channels or activities to be able to promote and market the production of various types of culinary communities of Tista Village, so that assistance is needed for the community.

RESULTS AND DISCUSSION

1. Local Tista Culinary Recipe Book

The following is the composition of the Tista Local Culinary Recipe Book, namely:

1.1. "BaLeTis" Cuisine Recipe (Lele Tista Meatballs)

Lele has long been cultivated by the Tista Village community. In addition to being consumed directly, people also use it by processing it into consumer goods that are worth selling such as catfish meatballs and catfish nuggets. As the name suggests, the basic ingredients of BaLeTis come from catfish and are mixed with other ingredients such as tapioca flour, garlic, salt, and enough water. Up to now, catfish meatballs are produced for the Tista Village community conducted by mother groups.

1.2. "Abon Lele" Recipe

Other processed catfish products made by the PKK Desa Tista mothers are shredded catfish. Shredded catfish is made from catfish which has been crushed and dried and then packed in a box. Shredded catfish is made to be more durable longer stored. Because shredded catfish is cooked by drying.

1.3. Drink Recipe "Kopi RaDesTa"

RaDesTa Coffee or Kopi Rempah Tista Village is one of the drinks produced by the Tista Village community. This coffee is a healthy drink made from spices including ginger, cloves, cardamom, cinnamon, and lemongrass. This coffee can be consumed by all people, especially people who want to stop smoking because this coffee has a very good content for the body.

1.4. "Ladrang" Cuisine Recipe

Ladrang chips are snacks that are in demand by most people. This chips are made from catfish with a mixture of wheat flour added with some spices and then fried until cooked.

1.5. Cuisine Recipe for "Purple Sweet Potato Apem"

Apem cake is one type of market snack cake which belongs to the traditional Indonesian cake class. This purple tista apem cake has the right sweet taste and is also much loved by all circles. The presence of purple yam mixture in this cake makes it more attractive with an eye-catching hue. This apem cake also does not contain preservatives, because it uses traditional ingredients. This purple apem cake is made from a mixture of rice flour, sticky rice flour, instant yeast, sugar, purple sweet potatoes, and also various other complementary ingredients. This cake is usually made by steaming directly which already contains hot water or boiling water, the process of making this wet cake really takes a long time, because after making the cake mixture is not steamed directly but left until it expands (fermented). After that, the mixture is ready to be steamed.

1.6. "Serapah" Recipe

Serapah is a food from Tista Village that uses pork skin and meat which is chopped as the main ingredient, then cooked with genep spices, added with pork blood which is then cooked to thick.

1.7. "Jukut Kelor" Recipes

Moringa or vegetable kelor is one type of cuisine in Tista Village using Moringa leaves as the main ingredient and cooked with spices and roasted coconut.

1.8. "Sambal Cakcak" Recipes

Sambal cakcak is a sauce made from garlic, lemongrass, and salt that has been mashed. Then mixed with coconut milk. This sauce is called cak-cak because it is made by pounding the ingredients until smooth, the cak-cak sambal is made by the residents of the Banjar Dauh Pangkung Tista Village.

1.9. Recipe for "Starfruit Leaf"

Similar to the lawar in general, the starfruit lawar is also the same as the making and the material is the same as the usual lawar, except that the starfruit lawar is added with starfruit leaves which have been boiled and mixed with other ingredients. Lawar starfruit leaves are made by Banjar Dauh Pangkung Tista Village.

1.10. Cuisine Recipe for "Lawar Pisang Batu"

Another lawar innovation made by Tista Village is stone banana lawar. However, stone bananas that are used should not be too young and too old, the chosen banana bananas should not be bananas whose stones are black because they are too old. This culinary is also made by the Banjar Dauh Pangkung Tista Village.

1.11. Recipe for "Lemongrass"

Passing lemongrass is one of the potential local drinks found in the Tista Village. People use plants that have properties such as lemongrass and ginger to be used as lemongrass drinks for their health. Currently loloh lemongrass has not been produced in large quantities, often only served to entertain guests in the family. Besides being served to guests, this drink is usually consumed at night to warm the body.

1.12. "Kaliadrem" Cuisine Recipes

This traditional snack made from rice flour is indeed good to be used as a friend to drink tea or coffee in the afternoon. The shape can be round like a mini donut or triangular shaped with round holes in the middle which sometimes can be one to three pieces. Its slightly clayey texture tastes sweet in the mouth. Traditional snacks lovers will surely like this one cake.

1.13. Drink Recipe "Surpassing Cemcem"

Loloh Cemcem is one of the famous local culinary in Bali, one of which is in the village of Tista Tabanan. Cemcem itself is one of the leaves that has many useful properties for the body. Usually the cemcem leaf is widely used by refining it to get the green juice of the leaf, after mixing it with young coconut water and the flesh of the leaves and finally with a mixture of other ingredients such as salt, lime and ice. After all the ingredients are mixed, a drink known as loloh cemcem is ready to be enjoyed.

2. Revitalization of the Packaging of Tourism Potentials of the Tista Tourism Village

Revitalization carried out to improve the quality of Tista Tourism Village tourism products are as follows:

2.1. Excellent Tourism Potential Inventory in Tista Tourism Village

Tourism potential is everything that is owned by tourist destinations to attract tourists to visit a tourist destination. Tourism potential according to Sukardi (1998: 67), is everything that is owned by an area for tourist attraction and is useful for developing the tourist destination. Tista Village which is one of the tourist villages in Tabanan Regency which in 2016 has been designated as a tourist village by the government. Tista Tourism Village has several tourism potentials that can attract tourists to come to visit. The tourism potential of Tista Tourism Village is as follows.

a. Natural Potential

Tista Tourism Village has some natural potential that is still very original and has been well maintained and managed by its citizens. As for the natural tourism potential of Tista Tourism Village, such as rice fields and rivers.

b. Spiritual Potential

Bali has a tourist attraction from various aspects, one of which is spiritual which is still very thick and maintained by Balinese people. In the Tista Tourism Village there are spots that have spiritual tourism potential that can be introduced to tourists visiting the Tista Tourism Village and are curious about the spiritual culture of the community, namely: Pura Beji, Batu Gede, and Kahyangan Desa.

c. Cultural Potential

The meaning of cultural tourism potential is all the results of human creation, taste and initiative in the form of customs, crafts, arts, and historical heritage in the form of buildings. As for the cultural potential of the Tista Tourism Village, namely: Legong Andir Tista.

d. Culinary Potential

Culinary tourism potential is a cuisine or culinary that is characteristic of an area and can only be found in the area. Tista village as a tourist village also has some special foods that are only found in this area. As for some food menus that have the potential to be used as local culinary specialties of Tista Tourism Village, namely: Tista Catfish Meatballs, Typical Purple Sweet Potato Tista Village, Catfish Nugget, Shredded Catfish, and Kaliadrem.

e. Artificial Potential

Artificial potential is something that can be packaged by the community as a tourist attraction. The artificial potential in the Tista Tourism Village, namely: fish ponds and gazebo and Tista Festival.

2.2. Development of New Tourist Attractions

To further increase the variation of Tista Tourism Village tourism products, the development of new tourist attractions has a high selling value, which is expected to become a main tourist attraction, namely:

a. Develop Spiritual Tourism (Beji)

Beji Temple is located west of Banjar Carik. The origin of this temple stands because there is a source of water under the temple which is considered a source of life and is considered sacred by the residents of Tista Village. This water source has always been used for religious purposes, such as: Purifying Pretima, Arca, and Ceremony Tools. Also used for bathing, washing and drinking. Things to consider in developing this spiritual tour:

Conditions of Tourist Attractions (Air Pancoran)

The clear and fresh pancoran water is believed by the residents of Tista Village to be beneficial to health because it is rich in mineral content. Around the area of Beji Temple there is

a beautiful stretch of rice fields and is very suitable to be visited in the morning because in the morning it is usual to enjoy the dew and sunrise points. As for what needs to be considered, namely: environmental hygiene in the Beji Temple and Kesucian Pura Beji.

Amenitas

Amenitas are all kinds of facilities needed by tourists while in tourist destinations. Of course these facilities also need to look at and assess the situation and conditions of their own destinations and the needs of tourists. Therefore, in developing a spiritual tourism attraction (melukat), there is a need for facilities that will support these tourism activities. As for some facilities that need to be considered in developing spiritual tourism (melukat) in Beji Temple, namely: parking lots, information service centers, lockers, toilets, and bathing pools.

Accessibility

If an area has tourism potential, then adequate accessibility must be provided so that the area can be visited easily. Access to Beji Temple is very good and organized. Some road instructions must be provided in order to facilitate tourists towards this tourist attraction. From the Tista Village Office to Beji it only takes \pm 10 minutes by foot. Tourists who come to meluk later will cross the track with beautiful rice field views.

b. Develop Fun Rafting Tours

One potential that can be developed in the Tista Village is the river that is located behind the rice field area named Tibulantang. The river is one potential as an attraction that can be developed if managed with neat management and adequate accessibility. The river has a current that is not too heavy but heavy when it is in the rainy season. The Tourism Awareness and Tourism Village Group of Tista has the idea to make the Challenge to be one of the tourist attractions, namely: Fun Rafting. Tibulantang which will be used as Fun Rafting tour is about 150 meters long.

The concept that can be suggested in the development of the Tibulantang Tista Fun Rafting tour is as follows:

- Rainbow Stone is a tourist attraction containing colorful painted stones, arranged along the Yeh Ho River. These colorful stones can be used as contemporary photo spots, which can be enjoyed by all groups, from children, teenagers, and adults.
- Bala-bala boat is a tourist attraction in the form of photo spots by utilizing a boat as a background arranged in such a way that it looks beautiful among the rocks around the Tibulantang River path.

3. Activation of the Tista Tourism Village Website

The Tista Tourism Village website is complete enough to provide information for the community and prospective tourists to find out more about the Tista Tourism Village. It's just that there is some information that still needs to be completed and corrected on the website. Here is a list of deficiencies that must be added and corrected on the website.

- a. The work program still has no information.
- b. Information about the organizational structure is not yet available.
- c. The tour packages on the website are still old tour packages (there is no agreement for a new tour package).
- d. If the admin makes a new post, it's still unknown where the post will appear.

4. Marketing of Local Cuisine in Tista Tourism Village

In this digital era, people are easily attracted to something through images, so the role of photography or videography is very important in introducing a product so that it can attract people to come and try from the products offered. This Tista Tourism Village is located in Kerambitan District, Tabanan Regency. This village is not extensive, but in it there are a variety of tourist attractions that need to be developed, so that it can become an area visited by the general public. In Tista there is a wide trekking path and an attractive river to be used as a photo object and Beji Park which can be enjoyed by the water. Including the culinary potential of Tista Tourism Village which is very diverse, but is still rarely known by the general public, so there needs to be marketing so that it can bring tourists to come to Tista Tourism Village. Media and marketing channels, namely:

a. Video

There are two videos made including videos that introduce tourist attractions and videos that introduce local culinary. This video was made so that it can be disseminated to the general public through social media, so as to be able to introduce tourist attractions in the Tista Tourism Village.

b. Brochure

In marketing a product other than digital, it is also necessary to have the role of print media, one of which is brochure so that the people who come can see what products are in the Tista Tourism Village without having to explain many times to each traveler. In making this brochure, it is necessary to have information on what tourist and culinary places are found in the Tista Tourism Village. In addition, it is necessary to design and draw interesting images, so that tourists who see the brochure are interested in reading. This brochure will be made of two types including tour package brochures and culinary brochures in Tista Tourism Village.

c. PHRI Tabanan

In introducing tourism products, the role of various partners is needed, hence one of the work programs to market the Tista Tourism Village, namely: introducing the Tista Tourism Village to PHRI Tabanan. In a meeting with PHRI Tabanan was immediately received by the Chairman of PHRI Tabanan along with several staff and Mr. Michael Strobel (Germany) as bali.com Founder at PHRI Tabanan Office. In essence the aim of the meeting was to market the Tista Tourism Village to be more effective and be able to bring tourists to visit the Tista Tourism Village. In addition, from PHRI Tabanan partners, namely: bali.com will include content, both in the form of photos, videos, unique descriptions of Tista Tourism Village or other unique tourism products, so that all the potential possessed by Deaa Wisata Tista can be promoted and marketed widely even to penetrate the international market.

d. Collaboration with Supermarkets or Producers

In creating a product, it needs to be marketed so that many people know the product that we create. The product created by the Tista Tourism Village is a product made from processed catfish, but this product has few people who know about it. Therefore, this is part of our work program, namely: marketing the culinary products in the Tista Tourism Village to the minimarkets in the surrounding area of Kerambitan itself, because before introducing this product more widely it needs to be known in advance by the community around the area. Four minimarkets that we offer (UD. Polos, UD. Adi, UD. Bali Bagus, and UD Dwita), they accept to join in selling Tista Culinary products because of the interest from the production of processed catfish.

e. Activation of BUMDes as Souvenir Center

Regulations governing BUMDes, namely: Village Candy Number 4 of 2015 concerning Establishment, Management and Management, and Dissolution of Village Owned Enterprises, which serve as guidelines for regions and villages in the establishment and management of BUMDes. The development of BUMDes is a form of strengthening the village economic institutions and is a means of utilizing the local economy with various types of potential that exist in the village. BUMDes is the backbone of the village government economy to achieve an increase in the welfare of its citizens.

BUMDes Sari Merta itself has sold several products and collaborated with other BUMDes. The original products of Tista Village that we will assist in packaging include Catfish Abon, Tista (Baletis) Catfish Meatballs, Tista Rice, and Tista's typical Kriuk Ladrang. These products are expected to be excellent, making BUMDes Sari Merta a souvenir center for Tista Tourism Village. In addition, our BUMDes kiosk is set up as a booth, with the name "Hanoman" Outlet (Normal Manten Price).

5. Catfish Cultivation in the Tista Village Sewer

Most of the culinary in the Tourism Village, made from catfish, such as catfish meatballs, shredded catfish, catfish nuggets, ladrang catfish, catfish crackers, and others. However, the basic ingredients of the catfish were obtained instead not in Tista Village but outside the village and even outside the sub-district, so that the Tista Tourism Village community still had difficulty in obtaining the raw material for the catfish. With the existence of KKN-PPM activities in Tista Village, the community's constraints related to catfish raw material eventually became an activity program carried out to provide solutions to the problems faced by the community. The program is maintaining or cultivating catfish in the gutters of Tista Village, where this activity was initially considered unsuccessful by the people because the ditches in the Tista Village were very dirty and when the rainy season the sewers would overflow even to the flood. However, with intense discussion and coordination, finally it was decided and tried to cultivate catfish with a cage system. As an initial trial material, cages are made with a width of + 1 meter and a length of + 3 meters and inside are + 100 fish catfish seeds.

After the trial was held it turned out that the results were very encouraging because slowly but surely the Tista villagers began to see and realize the positive meaning of the youth slowly began to support catfish farming activities in the ditch, this was evidenced by the community cooperation to clean the gutters in Tista Village. That is, from the catfish farming program, it can awaken the Tista villagers not to throw trash into the ditch, so that Tista Village which is a tourist village becomes clean and healthy. Furthermore, the Tista villagers will immediately practice the catfish culture spread in the gutters in Tista Village, so that with that spirit is expected to be able to give a positive impact to the entire village in Tista Village and it is also expected that this catfish farming system can produce catfish from Tista Village which is used as a culinary raw material for Tista Village. In addition, this program has also received appreciation from the Tabanan Regency Fisheries Agency, where this was evidenced by the assistance given in the form of catfish seedlings by the Tabanan District Fisheries Service to Tista Village as a follow-up to catfish farming programs in the village ditch.

6. Tourism Village Socialization to Banjar-Banjar and Assessment of Banjar Categories

To further introduce and get closer to the Tista Tourism Village programs and to build community empowerment, the Tourism Village Socialization Program to Banjar-Banjar in Tista

Tourism Village was held. The Banjar-Banjar, namely: Banjar Dangin Pangkung, Banjar Lebah, Banjar Carik, and Banjar Dauh Pangkung. The technicality of the socialization activities to the Banjar Banjar is to visit each village to be given socialization related to the Tista Tourism Village and the Tourism Village Programs to be run. In this activity involved the Village Head and his staff, Bendesa Adat, Kelian Banjar, Pekaseh, and invited the community in each banjar. This activity is very much supported by the Tista villagers because the community as a whole has not yet known for sure and clearly related to their village as a tourist village, so that with the socialization to these villages, people love their village more, care more about the programs held, and more actively participate in the development and progress of the Tista Tourism Village.

In the tourism village socialization activities to the Banjar villages in Tista Village, a Banjar Category Assessment Activity in Tista Village was also inserted. Where the categories assessed include: Clean Banjar Category, Banjar Indah Category, Healthy Banjar Category, and Friendly Banjar Category. So, the technical activity of this assessment is to observe and evaluate the four banjars in Tista Village for 2 weeks by the Jury Team consisting of 3 people, namely: Team from Tabanan Tourism Office, Team from Udayana University, and Student team. In the socialization to the banjars, it was also stated that an assessment would be held for the banjar category, so that the people in each banjar had prepared themselves well to conduct positive activities for their respective banjar. After the assessment has been carried out, the values will be accumulated from the three Assessment Teams then added up and finally obtained the Banjar Category for each banjar. This program is highly appreciated by the Tabanan Regency Tourism Office and adopted for a similar program for all tourism villages in Tabanan Regency.

CONCLUSION

Based on the description, it can be concluded as follows:

1. Tista Tourism Village has a variety of tourism potential that can be presented to tourists / visitors and has uniqueness that is not found in other areas.
2. The active participation of the Tista Village community is very large in supporting the development of the Tista Tourism Village.
3. The Tista Village community began to grow its entrepreneurial spirit by producing various attractive products, such as various culinary products, handicraft products, and others through the growth of home-home industries.
4. As a tourist village, the Tista villagers are very enthusiastic to raise the potential of the village to be used as a tourist attraction in the form of tour packages managed through the Tourism Management and Awareness Group.
5. The marketing carried out by the Tista villagers towards various packaging products / packages that have been produced is done through collaborations with various stakeholders, including determining effective and efficient marketing channels.
6. By managing the tourism potential of Tista Tourism Village, it can provide benefits and benefits directly to the community. This is a positive thing because the community will feel they have and respect the existence of Tista Tourism Village, so that it will be sustainable and its sustainability will be maintained.

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LAU PAHIKUNG : SYMBOLIZATION OF WOMEN'S IDENTITY IN EAST SUMBA

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Abstract. This study aims to reach an understanding of how the Umalulu people in East Sumba interpret the environment symbolized in the traditional fabric they make. The focus of the study covers the functions and meanings of traditional fabrics in the lives of Umalulu women in East Sumba.

The research method used is a qualitative method. Collect data with observation methods, in-depth interviews, and library studies. The analytical method used is ethno- analysis.

The findings reveal that there are several principles that constantly show a structured whole. The first principle is the arrangement of compositions that divide the surface of the woven fabric into three fields, namely one central field and two final fields symmetrically (dyadic-triadic). In *lau* cloth, in general the upper plane and lower plane are different. The middle field is represented by a stitch line meeting two fields. The second principle, the mirror image principle. The third principle is the use of numbers that are most preferred by people in classifying things (2, 4, 8, and 16).

The main purpose of making cloth as a tool to withstand the influence of the surrounding nature. However, there are other functions that are important for the lives of the people of Sumba, namely traditional clothing, familial relations signs, wrapping of corpses and provision of graves, property and status symbols, swaps, gift items, decoration materials and home supplies.

Keywords: *Symbols, female identity, traditional cloth*

Introduction

Women in Sumba Island (East Nusa Tenggara) produce handicrafts in the form of woven fabrics known as "Kain Sumba". The weaving craft is full of beautiful decorative ornaments with various decorative forms that have their own characteristics that create admiration.

For the Sumba people, the fabric they make does not only function as a tool to protect the body from natural influences, but is a cultural object that has "meaning", which expresses certain values. The types of woven fabric they make are *hinggi* (blankets), *lau* (sarong), *tiara* (headbands, scarves), and *tamelingu* (head covering).

There are two kinds of decorative making techniques. In *hinggi* cloth, a decorative technique called "ikat" is used, which is a technique for coloring weaving threads to make certain motifs or drawings by binding them before weaving. While the decoration on the fabric of *lau* is made by the technique of *hikungu* (sungkit, songket) or *pahikungu* (menyongket), but some are embroidered.

Various kinds of decorations made on woven fabrics depend on the skill of the woman who made it. The decorative motifs commonly depicted in *lau* are animal, plant, human and *andungu* (skull tree) motifs. For the upper field *lau* is generally without decorative or just lines. Woven fabrics are named according to the decoration that is the main decoration in the fabric, for example *lau tau* (human cloth), *lau andungu* (skull tree cloth), *lau kurangu* (shrimp cloth), *lau ruha* (deer cloth) and so on.

Umalulu's Overview

Umalulu is a complete area called *Tana Umalulu* (Tanah Umalulu). During the Dutch colonial period, the Land of Umalulu was known as the Tanah Melolo, Landschaap Melolo or the Kingdom of Melolo. Then during the independence period it was called the Melolo Self-Reliance Region, and now the Umalulu region is a sub-district of Umalulu, East Sumba district, East Nusa Tenggara province.

Overall the geographical condition of the Umalulu region consists of hilly and savanna areas (grasslands), with conditions that are infertile for agriculture. One advantage is the existence of the Umalulu river which flows in the area and is always watery even in the dry season. It was around the banks of the river that the residents of Umalulu built their settlements and opened fields.

Most Umalulu residents live from farming in the fields and raising livestock. Agriculture in the form of rainfed rice fields and simple irrigation systems. Another source of income is making woven fabrics that are more famous as "Kain Sumba". In addition there are also manufacturing of handicraft items.

The principle of the descendants of the Umalulu community is based on patrilineal principles (patrilineal descent), namely the hereditary principle which calculates kinship relations through men only. They know four types of kinship groups. The smallest kinship group is the nuclear family, called *biliku*, which consists of a husband and wife with unmarried children. Other kinship groups are households and are called *ukuruma*, which are kinship groups that run the household economy and as a unit that carries out productive efforts. Then there is what is called *uma*, which is a kinship group consisting of one senior nuclear family plus core families from their sons. They live in a big house called *uma* too. Staying in his father's *uma* is something that is in accordance with adat settled after a virilocal marriage. The biggest kinship group is *kabihu* (extended family, clan), which consists of several *uma* who feel themselves to belong to an ancestor and are bound to one another through male lineage.

The life of the rural community in Umalulu is based on a local unity called *paraingu*, which is a large village inhabited by several *kabihu* who gather in it. Every *kabihu* builds their houses in a part of *paraingu* which is called *kuataku*. The meaning of *paraingu* can be equated with the village, while *kuataku* is equated with the village. Tradition that controls the land in a *paraingu* are *kabihu-kabihu* which is recognized as *mangu tanangu* (ruler of the land) in the region, which consists of *kabihu ratu* (priest clan) and *kabihu maramba* (noble clan). The two *kabihu* are unity as holders of power covering all areas of life in society. While *kuataku* is headed by a *mangu kuatakungu* (village ruler, village head). Besides that, in the Umalulu community there was also a known social coating system based on *dedi* (descendants), namely the *ratu* (priest), *maramba* (king, nobleman), *kabihu* (free person) and *ata* (servant).

Every *kabihu* in a *paraingu* has the rights and obligations of each depending on the traditions and history of their ancestors. Although now the Umalulu region is no longer an area that is under a customary government, but if there are things that are related to *adat*, the customary system of government is still ongoing.

Structural Principles in Traditional Woven Fabrics

Traditionally, Sumba woven fabrics are well designed and decorated with decorations arranged in a harmonious composition. Woven fabrics are divided into two *nai* (*lirang*, half cloth) which are individually woven, then put together and sewn to become a cloth. Lines are important elements in the composition of the composition, because they can determine fields and shapes. Harmony is obtained in placing decorative motifs to be depicted, the composition is arranged symmetrically.

When making woven fabric designs there are several principles that constantly show a structured whole. The first principle is the arrangement of compositions that divide the surface of woven fabric into three fields, namely one central field and two final (upper and lower) fields symmetrically (dyadic-triadic). The second principle, the mirror image principle. For formal dress, especially for men, there are two pieces of cloth worn, which are worn horizontally at the waist, and which are worn vertically on the shoulder. Each cloth will have two identical faces, namely on the left and right. Both the top and bottom will form a semicircle or curve in the middle plane, while the design in the final fields will face each other. So the two fabrics, although they are different in their usage, have the same characteristics. That is what is meant by the principle of shadow in a mirror. The third principle, the use of numbers that are most liked by the community in classifying or judging something. The numbers or numbers are 2, 4, 8, and 16 (Soeriadiredja: 1983). Number two has an important meaning in the concept of images in a mirror, number four has an important meaning in regulating social life, number eight is a number that is considered perfect, especially everything related to religious ceremonies, and sixteen numbers indicate things very special.

The numbers contained in woven fabrics are in pairs design, that is, on the two panels which are shadows in the mirror, and at the four angles that form the fields on each piece of fabric. Number eight relates to the lanes and fields of each design. In general, in half the *hinggi* cloth there are four parts (four lanes) decorated with decorations, namely *Talaba dita* (upper part), *padua* (middle part), *talaba wawa* (lower part), and *tau* (body). If it turns out that there are more than four lanes, it is still considered to be four lanes. The remaining lanes are considered to be part of the same or *talaba dita*. The decorative figures depicted in the tau are the main decorative items that determine the name of the cloth.

Functional Aspects in Traditional Woven Fabrics

The main purpose of making cloth, both *hinggi* and *lau*, is to be used by men or women as a tool to withstand the influence of the surrounding nature. However, there are still other functions that are important to the lives of the people of Sumba, namely:

1. Customary clothing

Based on customary provisions, the completeness of men's clothing consists of *tiara* (headband) or also called *kambala*; two *hinggi* strands, a piece wrapped around the waist (*kalambungu*), a strand hung on the shoulder (*paduku*); *ruhu banggi* (belt) which is a rope twist, leather belt or woven fabric; *kabiala* (machete) tucked on the left side of the waist; *kalumbutu* (place of betel nut) which is hung on the right shoulder. As additional equipment, the *ruhu banggi* is also tied to a *tuangalu* (small wooden box) where the jewelry is stored.

The clothes that are commonly worn everyday are *hinggi patinu mbulungu*, *hinggi papabetingu*, or *hinggi kawuru*. While *hinggi kombu* is not used everyday, but if there are important events or ceremonies. Now they prefer factory-made fabrics (*hinggi tiara*), because they are cheaper and easier to obtain in stores.

Clothing worn on important occasions, such as at religious parties or ceremonies, must wear good and clean clothing. The best clothes are *hinggi kawuru* or *hinggi kombu*. In general there is no difference between the clothes worn by nobles in ordinary people's clothes. If there is, it only concerns quality, and fabrics that have certain decorative motifs, such as the motif of the *ruu patola*, which is also called *patola ratu*. Woven fabrics with *patola ratu* motifs can only be worn by nobles.

Women's clothing equipment consists of *lau*. How to wear *lau* by clamping it in the left armpit, hooked on the left shoulder, or folded at the waist. Now besides *lau*, the women wear *kebaya* or other top clothes. In the past, they only wore it bare-chested. The sarong that is used daily is *lau patinu mbulungu* or *lau papabetingu* and *lau tiara*.

If they want to travel or at parties and ceremonies they wear *lau ruukadama*, *lau kawau*, or *lau kombu*. However, because the gloves feel a bit heavy when used, it is preferable for sarongs made from store-bought fabrics. Such a sarong is called *lau tiara hatingu* (satin sarong) or *lau tiara hutaru* (silk sarong). In order to be good, the sarongs were decorated with embroidery from various decorative motifs such as chickens, birds, flowers and so on. This sarong decorated with embroidery is called *lau pabunga* (sarong decorated) or *lau pakambuli* (embroidered sarong).

Noble women adorned their sarongs with silver coins worth two and a half guilders or British gold (pounds), such sarongs were called *lau utu amahu* (gold or silver stitching sarongs). There is also a sarong decorated with beads (*lau utu hada*) and a kind of small clam (*lau wihi kau*). In addition to the sarongs mentioned above, at parties and ceremonies can also be worn by the *pahikungu* or the *lau pahudu*. Other equipment that must be taken is *buala hapa* (betel nut box), head or comb jewelry made and turtle skin (*hai jangga*) on the bun, beaded necklaces and bracelets (*muti ana hida*) and gold earrings.

2. Sign of Family Relationship

In the view of the Sumba community, living in a relationship or *payiara-palayiangu* is a *parengga la handuka* (the fastest goal in trouble), meaning if in distress to relatives, immediately ask for help. Giving something to relatives is not assessed according to the items to be given or to be received. Most of all meet what is needed and there is no bargaining. Goods or animal traffic is always taken into account. A fixed rule, if the direction is to the *yiara* (female family), then in the form of silver and gold, horses and buffaloes. Conversely, if the direction is to the *layia* (male family) in the form of *hinggi* (blanket cloth), *lau* (sarong), *tiara* (headband), *hada* (beads), *nggedingu* (ivory), and *wei* (pig).

In marriage, the *layia* will give dowry in the form of silver-gold and animal goods. In return the *yiara* gave *hinggi* and *lau*, the amount depends on the ability and ability of the family concerned. There are times before the marriage is held, to bind the agreement of the two families, they give each other *kawuku* (proof). From the family side the woman gave *hinggi*, *lau* and *tiara* to the male family, and from the family side the man would give two *mamuli*, two *lulu amahu* and two horses.

At the time of death, if the person dies from the *yiara*, then the *layia* carries silver-gold, a horse or buffalo. If the deceased and the *layia*, *yiara* brings *hinggi* (if the deceased is male) or *lau* (if the woman dies). Likewise in *mandara* (looking for food ingredients). If they want to ask rice or corn to the *yiara*, then bring silver-gold. On the other hand, if the servants bring *hinggi* or *lau*, Thus, not only in matters of marriage or death, the sign of this relationship is also evident in the daily relationship. Both parties always give and receive. If the *layia* need *hinggi* or *lau*, then they can request it from the *yiara*, on the contrary if the *yiara* needs *mamuli* or animals, they can request it from the service. The purpose of the goods and animals is always fixed and cannot be exchanged for direction.

Besides being able to maintain family relations, woven fabrics can also be used to maintain good relations with non-families. For example, in a party or crowd, the host when dividing betel nut or in serving drinking food, guests should pay attention to the position of someone in the community, that must be adjusted to the level and level of age. If there is a mistake, and the person concerned feels insulted or humiliated, then he will sue or leave the party. To remedy this situation, the host must *ndoku* (admit wrong) by giving some cloth to the person concerned and cutting a buffalo or pig. If he does not do that, the relationship will be bad, it can even break up altogether or maybe he will be treated the same way.

3. Body Wrapping and Grave Stocks

According to Kapita (1976), the most important function of cloth is for wrapping the body and stocking the grave. The man's wrapper consists of blankets carried by his relatives, while for women it consists of sarong cloths. The cloths covering the corpse are called *yubuhu*, divided into two parts, namely *yubuhu la tana* (body cloth on the ground) which is buried with the dead, and *yubuhu la kaheli* (corpse in the hall) donated to the dead's family. *Yubuhu* is worn on the corpse during the *Pahadangu* (wake up) ceremony, which is when the corpse is put into the coffin sitting with the knees bent and resting on the chin. At that time all the cloth carried by the relatives of the dead was worn and connected to the body. This is done based on the views of the Sumba people, that life in the afterlife is identical to life in the real world. Therefore, so that the soul of the dead does not live miserably in the afterlife, it is necessary to provide sufficient provisions, among others in the form of *dangangu ihi ngaru*, namely silver-gold and sacrificial animals, and *yubuhu-karandi* consisting of blankets or sarongs and headbands.

Woven fabrics can also be used as a symbol of the presence of a dead person's soul. Bodies that die due to misfortune or accident (*Meti Manjurangu*) may not be brought into the house, and must be buried immediately. The burial is a temporary burial, and the spirit of the dead is still considered to be where the accident occurred. Therefore, before the funeral ceremony is carried out, the *Lua papiti hamangu* ceremony is first held, namely a ceremony to pick up spirits at the scene of the accident with the intention that the dead spirit can gather first with his family and not become curious spirits. The spirit that was picked up was symbolized by a cloth. If the dead person is male, then the cloth used is a blanket cloth, and if the woman is used sarong. After that the excavation is carried out to take the dead body or the dead bone which is then wrapped in the cloth and carried into the house. After *wai maringu* (giver of blessing) cools the corpse or bones with splashes of holy water, then a burial ceremony is carried out as is usually done on ordinary death.

Woven fabrics, especially *hinggi*, can also symbolize people who are still alive. This can be seen at the time of the birth of a child. If there is a mother going to give birth and her husband cannot attend because he is traveling or something else, then the presence of the husband can be represented by a blanket cloth. This is considered very important, because according to their assumption the baby will find it difficult to get out of the mother's womb if not accompanied by her father. With the blanket, the baby is expected to be born safely. This method is called *rambangu hinggi*.

4. Property and Status Symbol

The people of Sumba judge the blankets and sarongs as objects made of gold and silver and livestock, namely as property and status symbols. The more they have it, the more respected in their society. Property in the form of cloth is a woman's wealth and is also a symbol of womanhood. While property in the form of silver gold and livestock is a wealth of men and also as a symbol of manhood. A girl who has a lot of savings in blankets and sarongs will be the dreams of the youth, especially if the fabric of her savings is the result of her own work. Likewise with a wife, she will be the pride of her husband.

5. Exchange rates

There is something that is needed that is not always owned, therefore it must be sought from others. If someone needs a cloth, then he can go to someone who has it in exchange for cattle or silver objects. Conversely, if you need livestock or silver gold, then he can go to people who have it with a cloth exchange. The value of goods exchanged usually depends on the quality of the goods and is based on mutual agreement between people who want to exchange.

6. Gift Items

Giving gifts, both to people who are still relatives and to non-relatives, is something that is usually done by Sumba people. The items presented are generally in the form of blankets or sarongs. There are also times in the form of silver objects or livestock. Woven fabrics are presented not at all times, but if there are important events such as at the birth of a child, marriage, death, or being awarded to people who are considered meritorious and to respected guests. For men a blanket is given, while for women a sarong is given.

7. Decoration Material or Home Supplies.

Traditional Sumba woven cloth as a cultural heritage turns out to have adaptive abilities to deal with change. This is what causes the material culture of the Sumba community to survive and develop. Various production efficiency efforts are carried out to pursue the demands of external market demand. This resulted in a significant change not only in terms of formal aesthetic motif design patterns, but also the technical aspects and functions.

Changes in patterns appear to be reductive measures such as reducing or even eliminating details, enlarging motifs, or stretching the distance between motives. Simplification of motifs and colors and reduction of motive components are increasingly common. This change is substantial, namely overall deviation from the standards of *adati* (traditional). This is related to new functions that are used as room decoration elements (Anas, 2006: 6-9). Changes in functions previously used for sacred spiritual needs, are now also used for secular decorative ornaments based on orders. For example in the use of *habaku* and *patola ratu* motifs. In the past both motives could only be made by *ratu* or *maramba* on certain occasions. Now both motives are by anyone and at any time used without doubt.

The technical changes seen in the use of colors that originally used natural dyes made by themselves, now use store-bought synthetic dyes. Similarly, the use of spun yarn, originally using hand-spun yarn, is now a machine spun thread. Previously only women made woven fabric, now men also participate to increase income.

Conclusion

Traditionally, Sumba woven fabric has a structural principle that includes three aspects, namely the division of two three (dyadic-triadic), mirror images, and the use of favorite numbers in assessing or classifying things (2,4,8, 16). These three principles show the characteristics of cosmological antagonism which coincides with the classification of the cosmos that distinguishes the existence of the upper world, the middle world, and the lower world. The classification system, for the upper world is associated with the sacred environment of men, and for the lower world associated with the environment of profane women. While the middle world is ambivalent.

Classification into two categories such as male and female, sacred and profane, upper world and lower world, gives the understanding that the two categories are interdependent and complement each other. The existence of contradictions in both categories is a necessity to form a totality.

Traditional woven fabric, especially the *lau pahikungu*, is a symbol of women's identity. In addition to these functions, woven fabrics have other important functions in the lives of Sumba people which include religious, social and economic fields, namely as traditional clothing, wrapping of corpses, provision of graves, signs of kinship relations, possessions, swaps, gifts, and decoration materials.

Traditional Sumba woven cloth as a cultural heritage has adaptive abilities to face change. Various production efficiency efforts are carried out in order to pursue the demands of market demand, so that changes in functions that were previously used for sacred spiritual needs are now also used for secular decorative ornaments based on orders.

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KEPATUHAN HUKUM KESATUAN MASYARAKAT HUKUM ADAT KLUNGKUNG TERHADAP PENSERTIFIKATAN HAK KOMUNAL ATAS TANAH

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Abstrak. Hak Komunal sebagaimana diatur dalam Permen Nomor 10 Tahun 2016, belum memberikan jaminan kepastian hukum apabila ditinjau dari Pasal 16 ayat (1) h UUPA, karena Hak Komunal ditetapkan berdasarkan Peraturan Menteri Negara Agraria dan Tata Ruang/Kepala BPN, yang berbeda dengan pegaturan hak atas tanah yang dikenal sebelumnya dalam UUPA/tidak termasuk dari salah satu dasar terbitnya jenis hak-hak atas tanah lain yang dikenal dalam Pasal 16 UUPA.

Hasil Pendaftaran Hak Komunal berupa sertifikat Hak Komunal belum memberikan menjamin kepastian hukum yang sama dengan sertifikat atas jenis hak atas tanah yang diatur dalam Pasal 16 UUPA. Hal ini mengingat persyaratan yang harus dipenuhi untuk dapat ditentukan sebagai subjek Hak Komunal yang diatur dalam Permen Nomor 10 Tahun 2016 masih terdapat ketidaksinkronan dengan peraturan perundangan yang berlaku dalam pendaftaran Hak Komunal yaitu PP Nomor 24 tahun 1997, yang menentukan syarat yang berbeda dengan permen Nomor 10 Tahun 2016 mengenai hal yang sama, sehingga kondisi ini akan berpotensi terjadinya ketidakpastian hukum baik mengenai syarat pemohon dan akan berimbas pula pada ketidakpastian hukum atas sertifikat Hak Komunal dikaitkan dengan sertifikat atas hak atas tanah yang diatur dalam Pasal 16 UUPA.

Dalam penelitian ini dibahas mengenai dua permasalahan yakni bagaimanakah kepastian hukum Hak Komunal ditinjau dari Pasal 16 ayat (1) h. UUPA serta apakah kesatuan masyarakat hukum adat Klungkung memiliki kepatuhan hukum terhadap pensertifikatan Hak Komunal atas tanah. Penelitian ini merupakan penelitian yuridis empiris.

Kata Kunci : Kepatuhan Hukum, Pensertifikatan Tanah Hak Komunal

1. PENDAHULUAN

Pasal 33 ayat (2) Undang-Undang Dasar Negara Republik Indonesia Tahun 1945 (selanjutnya disebut UUD NRI 1945) menyatakan bahwa cabang-cabang produksi yang penting bagi Negara dan yang menguasai hajat hidup orang banyak dikuasai oleh Negara. Pasal ini mengandung tiga makna utama yaitu :

1. Negara menguasai bumi, air dan kekayaan alam yang terkandung di dalamnya.
2. Bumi, air dan kekayaan alam yang terkandung di dalamnya dipergunakan untuk sebesar-besar kemakmuran rakyat.
3. Tanah memiliki arti yang strategis bagi kehidupan bangsa karena tanah merupakan cabang produksi negara yang menguasai hajat hidup orang ramai.

Berdasarkan korelasi tersebut, hak menguasai negara mengandung arti :

1. Mengatur dan menyelenggarakan peruntukan dan penggunaan objek pemilikan.
2. Mengatur dan menyelenggarakan peruntukan, penggunaan, persediaan dan pemeliharaan bumi, air dan ruang angkasa tersebut.

3. Menentukan dan mengatur hubungan-hubungan hukum antara orang-orang dengan bumi, air dan ruang angkasa.

UUPA pada dasarnya merupakan penjabaran dari Pasal 33 ayat (3) UUD NRI 1945 yang mengatur kewenangan negara atas tanah, menyebutkan bahwa sebagai hukum tanah nasional, dalam UUPA dikenal adanya tiga entitas tanah yaitu :

- a. Tanah Negara, hubungan penguasaannya disebut hak menguasai (oleh) Negara, kewenangannya bersifat publik;
- b. Tanah ulayat, hubungan penguasaannya disebut Hak Ulayat, subjeknya Masyarakat hukum adat dan kewenangannya bersifat publik dan keperdataan.
- c. Tanah Hak yang dapat dipunyai oleh orang perorangan atau badan hukum, kewenangannya bersifat keperdataan. Macam-macam hak atas tanah diatur dalam Pasal 16 UUPA.¹

Pada bagian lain dalam penjelasan UUPA menyatakan negara sebagai organisasi kekuasaan seluruh rakyat memang bukan pemilik, melainkan bertindak selaku badan penguasa yang pada tingkatan tertinggi menguasai bumi, air, ruang angkasa dan kekayaan alam yang terkandung di dalamnya. Persoalan sering muncul adalah dengan terjadinya pergeseran penggunaan hak menguasai yang berintikan mengatur dalam kerangka populis menjadi memiliki dalam rangka pragmatisme untuk melaksanakan pembangunan ekonomi dalam situasi sekarang ini. Kondisi ini justru berakibat pada ditidihnya hak atas tanah yang telah dipegang secara fisik oleh Masyarakat hukum adat. Tidak adanya bukti-bukti secara formal tentang tanah Hak Ulayat serta anggota masyarakat secara hukum menjadi cara yang mempermudah pengambilalihan tanah yang sudah secara turun temurun dikelola oleh Masyarakat hukum adat, sehingga rasa keadilan itu dirasakan semakin jauh.

Sedangkan di sisi lain negara secara tegas telah mengakui keberadaan Masyarakat hukum adat sebagaimana diatur dalam Pasal 3 UUPA yang menentukan bahwa :

Dengan mengingat ketentuan-ketentuan dalam pasal 1 dan 2 pelaksanaan Hak Ulayat dan hak-hak yang serupa itu dari masyarakat-Masyarakat hukum adat, sepanjang menurut kenyataannya masih ada, harus sedemikian rupa sehingga sesuai dengan kepentingan nasional dan Negara, yang berdasarkan atas persatuan bangsa serta tidak boleh bertentangan dengan undang-undang dan peraturan-peraturan lain yang lebih tinggi.

Ketentuan pasal 3 di atas tetap harus dimaknai bahwa kepentingan suatu masyarakat hukum adat harus tunduk pada kepentingan nasional dan negara yang lebih luas dan Hak Ulayatnya pun pelaksanaannya harus sesuai dengan kepentingan yang lebih luas.

Salah satu bentuk kebijakan pemerintah dalam bidang agraria bagi masyarakat hukum adat dan masyarakat yang berada dalam Kawasan Tertentu adalah Peraturan Menteri Agraria dan Tata Ruang /Kepala Badan Pertanahan Nasional Nomor 10 th 2016 yang mengatur tentang Tata Cara Penetapan Hak Komunal Atas Tanah Masyarakat hukum adat dan Masyarakat Yang Berada Dalam Kawasan Tertentu (selanjutnya ditulis Permen Nomor 10 Tahun 2016).

Menurut Pasal 1 angka 1 Permen Nomor 10 Tahun 2016 dinyatakan bahwa Hak Komunal atas tanah adalah :

“hak milik bersama atas tanah suatu Masyarakat hukum adat, atau hak milik bersama atas tanah yang diberikan kepada masyarakat yang berada dalam Kawasan Tertentu”.

Dari Permen Nomor 10 Tahun 2016 ini jelas dinyatakan bahwa Hak Komunal dapat diberikan kepada masyarakat hukum adat dan masyarakat yang berada pada Kawasan Tertentu, dengan pengertian kawasan tertentu yang dimaksud di sini adalah daerah perkebunan dan kehutanan. Selanjutnya ditegaskan bahwa yang dimaksud dengan masyarakat hukum adat, dalam Pasal 1 angka 3 adalah

¹Boedi Harsono, 2000, *Hukum Agraria Indonesia, Himpunan Peraturan-peraturan Hukum Tanah*, Djambatan, Jakarta, hal. 5.

sekelompok orang yang terikat oleh tatanan hukum adatnya sebagai warga bersama suatu persekutuan hukum karena kesamaan tempat tinggal ataupun atas dasar keturunan.

Pengertian sebagaimana dinyatakan dalam Pasal 1 angka 3 diatas, bila dikaitkan dengan bentuk dan susunan masyarakat hukum adat, Ter Harr menunjukkan adanya dua faktor yang berpengaruh bagi timbulnya masyarakat hukum adat yaitu faktor territorial dan faktor genealogis², dapat dikatakan bahwa apa yang diatur dalam Pasal 1 angka 3 di atas menentukan terpenuhinya syarat genealogis ataupun territorial.³ Dalam tata hukum Indonesia, keberadaan masyarakat hukum adat telah mendapat tempat tersendiri dalam aturan-aturan hukum yang berlaku di Indonesia, hal ini dapat dilihat dalam beberapa produk hukum di antaranya :

- a. Pasal 18B ayat (2) UUD NRI 1945 yang menyebutkan bahwa Negara mengakui dan menghormati Kesatuan-kesatuan Masyarakat hukum adat beserta hak-hak tradisionalnya sepanjang masih hidup dan sesuai dengan perkembangan masyarakat dan prinsip Negara Kesatuan Republik Indonesia, yang diatur dalam undang-undang. Pasal ini merupakan pengakuan konstitusional atas kesatuan kesatuan Masyarakat hukum adat.
- b. Pasal 32 ayat (1) UUD NRI 1945 : Negara memajukan kebudayaan nasional Indonesia di tengah peradaban dunia dengan menjamin kebebasan masyarakat dalam memelihara dan mengembangkan nilai-nilai budayanya.
- c. Pasal 281 ayat (3) UUD NRI 1945 secara tegas menyatakan bahwa “identitas budaya dan hak masyarakat tradisional dihormati secara selaras dengan perkembangan zaman dan peradaban”. Pasal ini secara eksplisit menunjuk kepada eksistensi masyarakat hukum adat
- d. menjadi objek dan subjek yang harus dilindungi oleh negara. Tanggungjawab negara terutama pemerintah (*eksekutif*) untuk melaksanakan pemajuan, penegakan dan pemenuhan hak asasi manusia, termasuk hak kolektif masyarakat hukum adat ditegaskan pula dalam Pasal 281 ayat (4) UUD Tahun 1945 yang menyatakan : perlindungan, pemajuan, penegakan dan pemenuhan hak asasi manusia adalah tanggung jawab negara terutama pemerintah.
- e. Pasal 51 ayat (1) huruf b Undang-Undang Nomor 24 tahun 2003 tentang Mahkamah Konstitusi, antara lain menyatakan bahwa masyarakat hukum adat sebagai satu kesatuan merupakan salah satu pihak yang dapat menjadi pemohon dalam persidangan Mahkamah Konstitusi.
- f. Secara eksplisit dalam Undang-Undang HAM (Undang-Undang Nomor 39 tahun 1999) pada Pasal 6 disebutkan :⁴
 1. Dalam rangka penegakan hak asasi manusia, perbedaan dan kebutuhan dalam masyarakat hukum adat harus diperhatikan dan dilindungi oleh hukum, masyarakat dan pemerintah.
 2. Identitas masyarakat hukum adat, termasuk hak atas tanah ulayat dilindungi, selaras dengan perkembangan zaman.

Dengan menyimak apa yang diatur dalam Pasal 18B UUD NRI dapat dikemukakan bahwa eksistensi masyarakat hukum adat atau masyarakat tradisional ini diakui dengan tiga syarat yaitu :

1. “Sepanjang Masih ada”

Syarat ini nampak lebih menekankan akan masih hidupnya Masyarakat hukum adat yang bersangkutan, tanpa memberikan perhatian serta menghidupkan kembali masyarakat hukum adat yang pernah ada, sehingga hanya diakui apabila masih ada aktivitas yang disyaratkan dalam masyarakat adatnya. Kondisi ini dapat berakibat semakin berkurangnya komunitas Masyarakat hukum adat yang ada selama ini.

²B. Ter Haar, 2001, *Asas-asas dan Susunan Hukum Adat*, terjemahan : K.Ng Soebakti Poesponoto, Pradnya Paramita, Jakarta, hal.7.

³R. Soepomo, 1977, *Bab-bab tentang Hukum Adat*, Pradnya Paramita, Jakarta, hal. 69.

⁴Hendra Nurtjahjo, 2010, *Legal Standing Kesatuan Masyarakat hukum adat (Dalam Beberapa Perkara di Mahkamah Konstitusi)*, Salemba Humanika, Jakarta, hal. 6.

2. Sesuai dengan perkembangan masyarakat

Penilaian di sini bersifat relatif dan bahkan bisa menjadi bumerang bagi pemerintah sendiri. Jadi bila sistem adat yang berlaku di dalam suatu komunitas adat tersebut ternyata masih dihormati dan diakui oleh segenap komunitas (secara internal) serta tidak bertentangan dengan nilai-nilai yang dianut oleh masyarakat luas, maka komunitas adat tersebut dipandang sesuai dengan perkembangan pada masanya.

3. Sesuai dengan prinsip Negara Kesatuan Republik Indonesia

Sesuai dengan Pasal 37 ayat (5) UUD Tahun 1945 yang dengan tegas menyatakan bahwa khusus mengenai bentuk NKRI tidak dapat dilakukan perubahan. Dalam hal ini pendiri negara sangatlah jelas dan tegas yaitu bahwa Negara Republik Indonesia menghormati kedudukan masyarakat hukum adat sebagai daerah-daerah istimewa dan segala peraturan negara yang mengenai daerah-daerah itu akan mengingat asal usul daerah itu. Dengan kata lain bila sistem nilai adat istiadatnya tidak memecah belah persatuan dan kesatuan nasional, maka sistem nilai adat istiadat tersebut wajib dihormati dan dijaga kelestariannya.

4. Diatur dengan undang-undang (merupakan syarat yang tercantum dalam Pasal 281 UUD NRI 1945).

Masyarakat hukum adat tidak berwenang membentuk undang-undang dan karena posisinya sangat rentan dan berbagai segi juga tidak mempunyai kemampuan untuk mempengaruhi pembentuk undang-undang.

Hak atas tanah dari masyarakat yang berlaku di Indonesia, dalam Pasal 4 ayat (1) UUPA disebutkan bahwa atas dasar hak menguasai dari negara sebagai yang dimaksud dalam Pasal 2 ditentukan adanya macam-macam hak atas permukaan bumi, yang disebut tanah yang dapat diberikan kepada dan dimiliki oleh orang-orang, baik sendiri maupun bersama-sama dengan orang-orang lain serta badan-badan hukum. Macam-macam hak atas tanah sebagaimana disebutkan dalam Pasal 4 ayat (1) UUPA diatas, ketentuan dalam Pasal 16 UUPA mengenal jenis-jenis hak atas tanah antara lain:

- (1) Hak-hak atas tanah sebagai yang dimaksud dalam Pasal 4 ayat (1) ialah:
 - a. hak milik
 - b. hak guna-usaha,
 - c. hak guna-bangunan,
 - d. hak pakai,
 - e. hak sewa,
 - f. hak membuka tanah,
 - g. hak memungut-hasil hutan,
 - h. hak-hak lain yang tidak termasuk dalam hak-hak tersebut diatas yang akan ditetapkan dengan Undang-undang serta hak-hak yang sifatnya sementara sebagai yang disebutkan dalam Pasal 53.
- (2) Hak-hak atas air dan ruang angkasa sebagai yang dimaksud dalam Pasal 4 ayat (3) ialah:
 - a. hak guna air;
 - b. hak pemeliharaan dan penangkapan ikan;
 - c. hak guna ruang angkasa.
- (3) Hak-hak atas tanah yang bersifat sementara, sebagaimana disebutkan dalam Pasal 53 UUPA yaitu :
 - a. Hak Gadai
 - b. Hak Usaha ba sebgi hasil
 - c. Hak Menumpang
 - d. Hak Sewa Tanah Pertanian

Dari pengaturan hak atas tanah dalam Pasal 16 UUPA dan Pasal 53 UUPA, maka dapat dikelompokkan menjadi 3 yaitu :

1. Hak atas tanah yang bersifat tetap yaitu hak-hak atas tanah yang tetap ada dan berlaku selama UUPA berlaku atau belum dicabut dengan undang-undang yang baru. Jenis hak atas tanah yang termasuk dalam pengelompokan ini adalah Hak Milik, HGU, HGB, Hak Pakai, Hak Sewa untuk Bangunan, Hak Membuka Tanah dan Hak Memungut Hasil Hutan.
2. Hak atas tanah yang ditetapkan oleh undang-undang yaitu hak atas tanah yang akan hadir kemudian yang akan ditetapkan oleh undang-undang, di mana jenis hak atas tanah ini belum ada sampai saat ini.
3. Hak atas tanah yang bersifat sementara yaitu hak atas tanah yang sifatnya sementara, dalam waktu yang singkat akan dihapuskan dikarenakan mengandung sifat-sifat pemerasan, mengandung sifat feodal dan bertentangan dengan UUPA. Macam-macam hak atas tanah ini adalah Hak Gadai, Hak Usaha Bagi Hasil, Hak Menumpang dan Hak Sewa Tanah Pertanian.

Berdasarkan pengelompokan diatas dapat dilihat bahwa Hak Komunal tidak termasuk dalam salah satu dari ketiga pengelompokan yang telah disebutkan di atas. Hal ini dikarenakan dasar hukum lahirnya Hak Komunal adalah Peraturan Menteri Agraria/Kepala Tata Ruang dan Kepala BPN. Apabila dikaitkan dengan ketentuan dalam Pasal 16 ayat (1) h UUPA mengenai maksud dari “hak-hak lain yang tidak termasuk dalam hak-hak tersebut di atas yang akan ditetapkan dengan undang-undang serta hak-hak yang sifatnya sementara sebagaimana disebutkan dalam Pasal 53”, menyatakan bentuk lain selain “undang-undang”. Di sini nampak terjadinya insinkronisasi dalam pengaturan mengenai Hak Komunal dan kondisi ini dapat menimbulkan keraguan akan jaminan tercapainya kepastian hukum dari Hak Komunal.

Pasal 2 Tap MPR/IX/2001 berkaitan dengan kepastian hukum, menyebutkan bahwa pembaruan agraria mencakup suatu proses yang berkesinambungan berkenaan dengan penataan kembali penguasaan, pemilikan, penggunaan dan pemanfaatan sumber daya agraria, dilaksanakan dalam rangka tercapainya kepastian dan perlindungan hukum serta keadilan dan kemakmuran bagi seluruh rakyat Indonesia. Dengan demikian terbitnya Permen Nomor 10 Tahun 2016 diharapkan akan dapat memberikan kepastian dan perlindungan hukum bagi masyarakat hukum adat. Dimungkinkannya masyarakat hukum adat memiliki tanah dengan Hak Komunal dengan diterbitkannya Hak Komunal atas permohonan yang telah memenuhi persyaratan, hal ini sejalan dengan tujuan dari pendaftaran tanah yaitu untuk memperoleh kepastian hukum.

Melihat pengaturan Hak Komunal yang didasarkan pada Peraturan Menteri Agraria/Tata Ruang dan Kepala BPN yang berbeda dengan dasar pengaturan hak atas tanah yang disebutkan dalam Pasal 16 ayat (1) h UUPA yang mengenal hak atas tanah yang bersifat tetap, hak atas tanah yang ditetapkan oleh undang-undang, dan hak atas tanah yang bersifat sementara. Menurut peneliti hal ini menunjukkan adanya insinkronisasi pemerintah dalam pengaturan jenis hak atas tanah, apalagi dibarengi pula dengan berlakunya Permen Nomor 9 Tahun 2015 yang mengatur tentang materi yang sama akan tetapi masa berlakunya tidak sampai setahun. Kondisi ini dapat menimbulkan ketidakpastian hukum atas kepemilikan Hak Komunal, baik bagi pemegang Hak Komunal itu sendiri maupun bagi pihak ketiga yang mempunyai keterkaitan dengan pemegang Hak Komunal.

Berdasarkan pada uraian dalam latar belakang di atas, selanjutnya penulis akan mengajukan usulan atau proposal penelitian Hibah Penelitian Unggulan Udayana Batch II Tahun 2018 dengan judul **Kepatuhan Hukum Kesatuan Masyarakat hukum adat Klungkung Terhadap Pensertifikatan Hak Komunal Atas Tanah.**

2. METODE PENELITIAN

Penelitian yang dilakukan sekarang ini adalah penelitian hukum empiris. Dimaksud dengan penelitian empiris ini adalah penelitian yang mengkaji pelaksanaan atau implementasi hukum positif (perundang-undangan) dan kontrak secara faktual pada setiap peristiwa hukum tertentu yang terjadi dalam masyarakat guna mencapai tujuan yang telah ditentukan.⁵ Oleh Soerjono Soekanto, dikatakan bahwa penelitian hukum empiris ini memfokuskan pada 2 (dua) hal, yakni *pertama*, meneliti untuk melakukan identifikasi hukum, dan *kedua* untuk meneliti apakah hukum yang dimaksud itu dapat berlaku efektif. Dalam penelitian ini digunakan 3 pendekatan, yakni: Pendekatan Fakta (*The Fact Approach*) dan Pendekatan Analisis Konsep Hukum (*Analytical and Conceptual Approach*) dan Pendekatan Perbandingan (*Comparative Approach*).⁶ Penelitian yang dilakukan sekarang ini adalah penelitian yang bersifat eksplanatoris diharapkan akan dapat menjelaskan terkait persoalan pada penelitian ini. Oleh karena penelitian yang dilakukan sekarang ini adalah penelitian empiris, data yang diperlukan adalah data primer, yakni data yang diperoleh langsung dari sumber data, jadi bukan hasil olahan orang lain. Sedangkan sebagai pendukung dari data primer ini adalah data skunder yang diperoleh melalui bahan-bahan hukum berupa literatur-literatur yang menyangkut hal yang akan diteliti, dalam hal ini bahan-bahan hukum yang digunakan adalah buku literatur-literatur yang menyangkut hukum adat, khususnya yang berkenaan dengan isu pada penelitian ini.

Teknik pengambilan sampel atas populasi⁷ penelitian yang digunakan dalam penelitian ini adalah dengan teknik *non probability sampling*. Penggunaan teknik *non probability sampling* ini dilakukan oleh karena penelitian yang dilakukan saat sekarang ini tidak digunakan untuk membuat generalisasi tentang populasinya, karena sesuai dengan ciri umum dari *non probability sampling* ini adalah bahwa tidak semua elemen dalam populasi mendapat kesempatan yang sama untuk menjadi sampel, karena pengambilan data dilakukan dengan cara *purposive*.

Sesuai dengan judul penelitian yang diajukan, lokasi penelitian adalah mengambil 1 (satu) kabupaten, yakni di Kabupaten Klungkung. Pada kabupaten yang ditunjuk itu, akan dilakukan pengambilan sampel di 50% (lima puluh persen) kecamatan dan 50% (lima puluh persen) desa Pakraman yang ada di kecamatan tersebut.

Penelitian yang dilakukan sekarang ini adalah penelitian yang bersifat eksploratif. Oleh karenanya, data yang dikumpulkan dalam penelitian ini adalah data naturalistik yang terdiri atas kata-kata (narasi) yang tidak akan diukur dengan angka. Oleh karenanya analisis data dalam penelitian ini dilakukan secara kualitatif untuk selanjutnya dipaparkan dalam suatu diskripsi. Keseluruhan data yang terkumpul baik data primer ataupun data sekunder, akan diolah dan dianalisis dengan cara menyusun data secara sistematis, digolongkan dalam pola dan thema yang diklasifikasikan, dihubungkan antara satu dengan data yang lainnya, dilakukan interpretasi untuk memahami makna data dalam situasi sosial, dan dilakukan penafsiran dari perspektif peneliti setelah memahami keseluruhan kualitas data. Proses analisis tersebut dilakukan secara terus menerus sejak pencarian data lapangan dan berlanjut terus sampai pada tahap analisis. Setelah dilakukan analisis secara kualitatif kemudian data akan disajikan secara deskriptif kualitatif dan sistematis.

⁵Abdulkadir Muhammad, *Hukum Dan Penelitian Hukum*, PT Citra Aditya Bakti, Cetakan ke-1, Bandung, hlm. 53

⁶ Perlu dikemukakan di sini bahwa pendekatan kasus (*case approach*) adalah tidak sama dengan studi kasus (*case study*). Dalam pendekatan kasus, beberapa kasus ditelaah untuk referensi sebagai suatu isu hukum. Sedangkan *study kasus* merupakan suatu *study* terhadap kasus tertentu dari berbagai aspek hukum. Selanjutnya dapat dibaca dalam Peter Machmud Marzuki, 2005, *Penelitian Hukum*, Kencana, Edisi Pertama, Cetakan Ke-1, Jakarta, hlm. 94.

⁷ **Populasi** adalah keseluruhan dari obyek pengamatan dan obyek penelitian, sedangkan **sampel** adalah bagian dari populasi yang akan diteliti yang dianggap mewakili populasinya. Lebih lanjut dapat dilihat pada Pedoman Pendidikan Fakultas Hukum Universitas Udayana, 2013, Denpasar.

3. HASIL DAN PEMBAHASAN

3.1. Hasil

Pasal 1 angka 5 Perda Provinsi Bali Nomor 2 Tahun 2012 tentang Kepariwisata Budaya Bali disebutkan bahwa Desa Pakraman sebagai Desa Dresta adalah kesatuan masyarakat hukum adat di Provinsi Bali yang mempunyai satu kesatuan tradisi dan tata krama pergaulan hidup masyarakat umat Hindu secara turun-temurun dalam ikatan Kahyangan Tiga (Kahyangan Desa) yang mempunyai daerah tertentu dan harta kekayaan sendiri serta berhak mengurus rumah tangganya sendiri. Dari kedua pengaturan mengenai Desa Pakraman dapat dikemukakan unsur-unsur dari desa pakraman adalah :

1. Adanya satu kesatuan tradisi dan tata krama secara turun temurun ;
2. Terikat dalam ikatan Kahyangan Tiga (Kahyangan Desa)
3. Mempunyai wilayah tertentu dan harta kekayaan sendiri;
4. Berhak mengurus rumah tangganya sendiri ;

Penguasaan atas tanah secara yuridis selalu mengandung kewenangan yang diberikan hukum untuk menguasai fisik tanahnya. Penguasaan fisik ini memeberikan alas hak terhadap adanya hubungan hukum mengenai tanah yang bersangkutan. Apabila tanahnya sudah dikuasai secara fisik dan sudah ada alas haknya, maka persoalannya hanya menindaklanjuti alas hak yang melandasi hubungan tersebut mnjadi haka atas tanah yang ditetapkan dan diakui oleh Negara agar hubungan tersebut memeproleh perlindungan hukum, proses mana dilakukan dengan pendaftaran tanah untuk mendapatkan sertifikat hak atas tanahnya. Dasar peguasa atau alas hak untuk tanah menurut UUPA adalah bersifat derivatif, artinya berasal dar ketentuan-ketentuan peraturan perundang-undnagan dan dari hakhak yang ada sebelumnya, seperti Hak-hak Adat atas tanah dan hak –hak yang berasal dari Hak-hak Barat.⁸

Boedi Harsono sebsagaimana dikutip oleh Rosnidar Sembiring merumuskan kriteria tentang keberadaan hak ulayat dengan mengatakan bahwa hak ulayat masyarakat hukum adat dinyatakan masih ada apabila memenuhi 3 (tiga) unsur berikut:

1. Masih adanya suatu kelompok orang sebagai warga suatu persekutuan hukum adat tertentu, yang merupakan suatu masyarakat hukum adat
2. Masih adanya wilayah yang merupakan ulayat masyarakat hukum adat tersebut, yang didasari sebagai tanah kepunyaan bersama para warganya sebagai “*labensraum*”
3. Masih adanya penguasaan adat yang pada kenyataannya dan diakui oleh para warga masyarakat hukum adat yang bersangkutan, melakukan kegiatan sehari-hari sebagai pelaksana ulayat.⁹

Berkaitan dengan pensertifikatan tanah masyarakat hukum adat dengan Hak Hak Komunal saat ini sudah diberikan angin segar oleh pemerintah dengan diterbitkannya Permen Nomor 10 Tahun 2016 serta terakhir khusus untuk Provinsi Bali telah diterbitkan Keputusan Menteri Agraria dan Tata Ruang/Kepala Badan Pertanahan Nasional Nomor 276/KEP-19.2/X/2017 tentang Penunjukan Desa Pakraman Di Provinsi Bali sebagai Subyek Hak Kepemilikan Bersama (Komunal) Atas Tanah, dimana pada bagian Kesatu disebutkan Menunjuk Desa Pakraman di Provinsi Bali sebagai subyek Hak Pemilikan Bersama (Komunal) Atas Tanah dengan syarat :

- a. Ada anggota masyarakatnya yang masih dalam bentuk paguyuban;
- b. Ada kelembagaan dalam perangkat penguasaan adatnya
- c. Ada tanah Hak Pemilikan Bersama (Komunal) dengan batas-batas yang jelas
- d. Ada pranata dan perangkat hukumnya yang masih ditaati.

⁸ AP. Parlindungan I, *Op.cit*, hal. 3.

⁹Rosnidar Sembiring, 2017, *Hukum Pertanahan Adat*, PT. Rajagrafindo Persada, hal. 27.

Hal-hal yang diatur dalam Bagian Kesatu di atas ada 3 hal yang sama dengan yang diatur dalam Permen Nomor 10 Tahun 2016 yaitu :

Pasal 4 ayat (1) Persyaratan Masyarakat hukum adat sebagaimana dimaksud dalam Pasal 2 (1) meliputi:

- a. masyarakat masih dalam bentuk paguyuban;
 - b. ada kelembagaan dalam perangkat penguasa adatnya;
 - c. ada wilayah hukum adat yang jelas; dan ada pranata dan perangkat hukum, yang masih ditaati.
- Sedangkan ketentuan yang tercantum dalam bagian Kesatu huruf c, dapat dilihat dalam Pasal 4 ayat (2) huruf a, meskipun secara kontekstual tidak sama persis yang menyatakan bahwa a. menguasai secara fisik paling kurang 10 (sepuluh) tahun atau lebih secara berturut-turut; b. masih mengadakan pemungutan hasil bumi atau pemanfaatan lahan secara langsung di wilayah tertentu dan sekitarnya untuk pemenuhan kebutuhan hidup sehari-hari; c. menjadi sumber utama kehidupan dan mata pencaharian masyarakat; dan d. terdapat kegiatan sosial dan ekonomi yang terintegrasi dengan kehidupan masyarakat;

Dilihat dari Desa Pakraman yang ada di Bali, keempat syarat di atas dapat dikatakan bahwa Desa Adat yang ada di Bali sudah memenuhi syarat tersebut, dan sebagaimana diketahui walaupun secara administratif tanah masyarakat hukum adat di Bali belum didaftarkan pada Kantor Pertanahan setempat dan belum memiliki sertifikat namun dari anggota masyarakat adatnya patuh dan taat pada aturan-aturan yang ditentukan dalam awig-awig desa, antara lain, bahwa tanahnya tidak dapat diperjualbelikan, tidak dapat dijaminkan, yang mendapatkan hak mengelola atau menempati mempunyai kewajiban untuk menjalankan “ayahan” di desa adat yang bersangkutan dan kalaupun terjadi pelanggaran sanksi yang diatur sudah berjalan.

Adapun tanah-tanah adat atau disebut tanah Ulayat di Bali dapat dibedakan atas atas :¹⁰

1. Tanah Druwe Desa (Tanah Druwe) adalah tanah yang dimiliki atau dikuasai oleh Desa Pakraman, baik yang didapat melalui pembelian maupun usaha-usaha lainnya. Tanah Druwe Desa ini merupakan tanah pertanian (sawah), ladang digarap oleh krama desa dan penggarapannya diatur dengan cara membagi-bagikan secara perorangan maupun secara kelompok kepada warga desa pakraman, kemudian hasilnya diserahkan oleh penggarap kepada desa pakraman. Termasuk tanah druwe desa adalah tanah pasar, tanah lapang, tanah kuburan, tanah bukti (sawah ladang)
2. Tanah Laba Pura merupakan tanah yang semula merupakan milik desa (dikuasai oleh desa adat) yang khusus dipergunakan untuk kepentingan pura. Tanah laba pura mencakup 2 macam :
 - a. Tanah yang khusus dipergunakan untuk membangun pura
 - b. Tanah yang diperuntukkan guna pembiayaan keperluan pura
3. Tanah Pekarangan Desa (PKD) Tanah Pekarangan Desa merupakan tanah yang dikuasai oleh desa yang diberikan kepada krama desa (warga desa) serta dimanfaatkan untuk mendirikan perumahan yang lazimnya dengan luas tertentu, dan hampir sama untuk setiap keluarga. Sedangkan kewajiban yang melekat pada krama desa yang menempati tanah itu adalah beban berupa tenaga atau materi, dikenal dengan ayahan, yang diserahkan kepada desa Pakraman.
4. Tanah Ayahan Desa (AYDS)
Tanah Ayahan Desa merupakan tanah pertanian yang dikuasai oleh desa, sedangkan untuk penggarapannya diserahkan pada masing-masing krama desa, dengan hak untuk menikmati hasilnya dengan kewajiban untuk memberikan ayahan berupa tenaga maupun materi kepada Desa Pakraman.

¹⁰I Waya Arka, 2016, *Desa Adat*, Udayana University Press, Denpasar, h. 88-90

Dari penjelasan mengenai tanah-tanah adat, jelas digambarkan bahwa aturan-aturan adat dari Desa Pakraman ditaati oleh “yang menerima” manfaat dari tanah-tanah adat yang bersangkutan dengan kata lain kearifan lokal yang berlaku di lingkungan masyarakat suatu Desa Pakraman diterima sebagai aturan yang sudah berjalan secara turun temurun.

3.2. Pembahasan

Sehubungan dengan kepatuhan masyarakat hukum adat Desa Adat Klungkung di Semarapura dalam mensertifikatkan hak atas tanah adatnya dengan Hak Komunal, berdasarkan penjelasan dari Ida Bagus Adnyana selaku Bendesa Desa Pakraman Semarapura, Klungkung, bahwa sampai saat ini yaitu setelah Keputusan Menteri Agraria Nomor 276/Kep-19.2/X/2017, tanah-tanah Pura yang ada di lingkungan Desa Pakraman Semarapura sudah seluruhnya disertifikatkan ke Hak Komunal, akan tetapi untuk tanah-tanah milik masyarakat adat selain tanah-tanah Pura, sampai saat ini masih ditunda pengajuannya dengan beberapa pertimbangan dari masyarakat, antara lain :

1. Adanya ketakutan masyarakat akan timbulnya kewajiban baru atas objek yang bersangkutan apabila disertifikatkan; misalnya pembayaran pajak tanah
2. Apabila disertifikatkan akan berakibat bahwa tanah yang bersangkutan dapat dialihkan, sehingga aturan-aturan adat yang telah berjalan selama ini menjadi bergeser.

Sejalan dengan apa yang dikemukakan oleh Ida Bagus Adnyana, Nyoman Mertayasa, yang bertugas pada kantor Pertanahan Kabupaten Klungkung menyampaikan bahwa permohonan pensertifikatan atas “tanah milik” Pura yang berad di Desa Pakraman Klungkung, Semarapura saat ini dalam proses yang bervariasi, ada yang sudah selesai fisik sertifikatnya, dan ada pula yang masih dalam proses untuk pensertifikatan. Penjelasan di atas dikuatkan serta sejalan dengan dengan pendapat Ketua Majelis Desa Pakraman Klungkung yaitu Ketut Rupia Arsana yang berpendapat bahwa :

1. Tanah-tanah desa adat belum semuanya disertifikatkan ada yang sudah selesai proses sertifikatnya, adajuga yang dalam proses dan ada yang memegang belum diajukan
2. Alasan belum diajukannya permohonan Hak Komunal karena masih belum begitu paham apakah nantinya sertifikat yang akan terbit atas nama anggota masyarakat perorangan ataupun atas nama desa adatnya ;
3. Ada ketakutan akan menjadi beban baru yaitu pembayaran pajak, karena selama ini dengan menempati tanah desa adat yang bersangkutan mereka sudah merasa membayar pajak dengan menjalankan ayahan pada kegiatan desa adat yang bersangkutan, sehingga kalau nantinya terbit lagi sertifikat yang diikuti dengan terbitnya kewajiban atas Pajak Bumi dan Bangunan, maka akan menambah beban masyarakat yang sudah cukup berat.
4. Untuk tanah ayahan desa dan tanah pekarangan desa menurutnya lebih baik masih seperti dulu, sehingga rasa kebersamaan antara masyarakat hukum adat lebih dapat dijaga, karena meskipun selama ini tidak bersertifikat akan tetapi secara administrasi desa dan sudah diketahui pula oleh masyarakat desa adat yang bersangkutan bahwa pengelolaan tanah-tanah tertentu berlangsung secara turun temurun.

Pasal 23 ayat (1) Permen Nomor 10 Tahun 2016 menentukan bahwa Hak Komunal masyarakat hukum adat peralihannya berdasarkan ketentuan hukum adat yang berlaku pada masyarakat hukum adat yang bersangkutan. Selanjutnya dalam ayat (2) bahwa Hak Komunal masyarakat yang berada dalam kawasan tertentu tidak dapat dialihkan kepada pihak lain kecuali karena pewarisan. Sehingga dapat dikatakan bahwa apa yang ditakutkan oleh masyarakat sebagaimana hasil wawancara di atas cukup beralasan, karena dalam ketentuan ini diatur mengenai kemungkinan untuk dialihkan.

Berdasarkan uraian dalam pembahasan dapat dikemukakan :

1. Bahwa Hak Komunal atas tanah masih belum menjamin adanya kepastian hukum selain karena : 1. Hak Komunal itu terbitnya didasarkan pada Peraturan Menteri Agraria dan Tata Ruang/ Kepala BPN, tidak didasarkan pada Undang-undang sebagaimana hak atas tanah lainnya, maupun sebagaimana yang diatur dalam Pasal 16 ayat (1) h UUPA, yang menentukan dimungkinkannya adanya hak atas tanah baru di kemudian hari yang ditentukan dengan Undang-undang.

2. Kepatuhan masyarakat hukum adat Desa Pakraman Klungkung atas pensertifikatan tanahnya dengan Hak Komunal belum masih terdapat tiga variasi yaitu
 1. Khusus untuk tanah milik Pura sudah seluruhnya melaukan proses pensertifikatan mekipun belum semuanya sertifikat Hak Kpmunalnya terbit
 2. Untuk tanah-tanah masyarakat hukum adat / Desa Padaraman yang merupakan tanah ayahan desa ataupun tanah pekarangan desa yang dikelola oleh masing-masing anggota masyarakat Desa Pakraman sampai saat ini belum disertifikatkan karena ada keraguan dan merasa kurang myanan serta adanya kekhawatiran akan keamanan tanah yang bersangkutan serta dalam rangka mempertahankan kebersamaan terhadap maysrakaat hukum adat/Desa pakraman yang berdangkutan.

4. KESIMPULAN

Adapun kesimpulan yang didapat dari hasil penelitian yakni sebagai berikut:

Bahwa Hak Komunal atas tanah masih belum menjamin adanya kepastian hukum selain karena : 1. Hak Komunal itu terbitnya didasarkan pada Peraturan Menteri Agraria dan Tata Ruang/ Kepala BPN, tidak didasarkan pada Undang-undang sebagaimana hak ata tanah lainnya, maupun sebagaimana yang diatur dalam Pasal 16 ayat (1) h UUPA, yang menentukan dimungkinkannya adanya hak atas tanah baru di kemudian hari yang dtentukan dengan Undang-undang.

Kepatuhan masyarakat hukum adat Desa Pakraman Klungkung atas pensertifikatan tanahnya dengan Hak Komunal belum masih terdapat tiga variasi yaitu :

- 1) Khusus untuk tanah milik Pura sudah seluruhnya melaukan proses pensertifikatan mekipun belum semuanya sertifikat Hak Komunalnya terbit.
- 2) Untuk tanah-tanah masyarakat hukum adat / Desa Padaraman yang merupakan tanah ayahan desa ataupun tanah pekarangan desa yang dikelola oleh masing-masing anggota masyarakat Desa Pakraman sampai saat ini belum disertifikatkan karena ada keraguan dan merasa kurang myanan serta adanya kekhawatiran akan keamanan tanah yang bersangkutan serta dalam rangka mempertahankan kebersamaan terhadap maysrakaat hukum adat/Desa pakraman yang bersangkutan.

Ucapan Terimakasih

Ucapan terimakasih penulis ucapkan kepada seluruh informan di Kabupaten Klungkung, maupun para peneliti yang telah berjerih lelah dan sepenuhnya mendukung penulisan makalah hingga selesai tepat pada waktunya. Penulis juga tidak lupa mengucapkan terimakasih kepada UNUD atas dana penelitian yang diberikan pada skim Hibah Unggulan Udayana atas penelitian terkait Kepatuhan Hukum Kesatuan Masyarakat Hukum Adat Klungkung Terhadap Pensertifikatan Hak Komunal Atas Tanah ini.

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ETHANOL EXTRACT GREEN MUSTARD (*Brassica rapa L*) REPAIR DAMAGE CELL(8- Hydroxy-2- Dioxiguanosin) IN PANGCREAS HYPERGLYCEMIC WISTAR RATS

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Abstract. Hyperglycemia is a condition in which blood glucose levels exceed the limit. The condition of chronic hyperglycemia results in increased free radical production resulting in oxidative stress. Oxidative stress is one component in the mechanism of damage cell in pancreas hyperglycemia Wistar rat. Oxidative stress can be demonstrated by increasing 8-hydroxy-2-dihydroxiguanosin (8-OHdG) levels. Antioxidant compound active phenol in green mustard. Phenol is a group contained in medical plants can reduce the occurrence of hyperglycemia. This study to determine the effect of giving green mustard ethanol extract (*Brassica rapa L*) in decreasing 8-OHdG levels in hyperglycemic Wistar rats. Wistar rats that have experienced hyperglycemia were divided into 6 groups. P0 (Normal groups), P1 (positive control with given glibenclamide), and P3, P4, P5 (treatment was given orally with green mustard of 10 mg/kg BW; 15 mg/kg BW; 20 mg/kg BW) can decrease 8-OHdG (8-Hydroxy-2-dihydroxiguanosin). The result of treatment ethanol extract green mustard showed P0: 2.040 ng/dL, P1: 7.482 ng/dL; P2: 2.772 ng/dL; P3: 5.158 ng/dL; P4: 4.404 ng/dL and P5: 2.308 ng/dL. The content of phenol groups in capturing and neutralizing the radical scavenging in hyperglycemic Wistar rats. One Way Anova analysis and Post Hoc Study showed that ethanol extract green mustard extract doses 20 mg/kg BW was able to significantly ($P \leq 0,05$) decrease damage cell in hyperglycemic Wistar rats

Keywords : Hyperglycemia, Green Mustard, 8-OHdG (8-Hydroxy-2-dioxiguanosin)

INTRODUCTION

Hyperglycemia is a condition where the glucose levels in the blood plasma exceed its normal limits. A fasting serum glucose level of higher than 110 mg/dL or 2-hour postprandial blood glucose of 140 mg/dL is considered as hyperglycemia. Hyperglycemia when left untreated for years, can cause various complications and death. The state of hyperglycemia is one of the basic diagnoses of diabetes mellitus (DM). Diabetes mellitus is a highly prevalent disease in Indonesia, the latest data in 2015 by the Endocrinology Society stated that the number of diabetic patients in Indonesia had reached 9.1 million people. Until this article was written, Indonesia was the fifth for the highest number of diabetic patients in the world. Since 2000, the number of patients with diabetes mellitus in Indonesia has increased. The World Health Organization (WHO) predicted that by 2030, people with diabetes mellitus would reach 21.3 million people. The latest epidemiology study had put type-2 DM as an epidemic in Indonesia. Nearly 80% of DM is caused by the patient's lifestyle. The lifestyles of the world community, especially in Indonesia, in recent years have shown to be transformed from a traditional and nutritious one to a fast-food lifestyle that is low in nutritional value (junk food).

The impact of these unhealthy lifestyles changes is the emergence of various diseases, one of which is DM, which is a disease characterized by hyperglycemia, that caused by abnormalities in insulin secretion or disorders. This condition can increase the reactive oxygen species (ROS) compounds through enzymatic process namely oxidation and phosphorylation reactions (ox-phos) as well as ADPH-oxidase through a non-enzymatic process by forming glucooxidant and glycation. The state of hyperglycemia and release of excess fatty acids will constitute for triglycerides formation in the liver. The auto-oxidation process in hyperglycemia and glycation results in the release of electrons. This release of electrons triggers the formation of free radicals. Increased production of free radicals produces oxidative stress. Oxidative stress is when the free radicals in the form of reactive molecules are produced through a biochemical reaction of a normal cell that damage the cell and cause various damages to the body. Oxidative stress is one component of the tissue damage mechanism in humans. Oxidative stress can be indicated by the increase in 8-Hydroxy-dioxiguanosin (8-OHdG) serum. (Kubacka, et.al.2009). Increased MDA is a marker of an increase in lipid peroxidation reactions. MDA is formed from lipid peroxidation in cell membranes, namely free radical reaction (hydroxyl radical) with polyunsaturated fatty acids (PUFA). Therefore, hyperglycemia will increase oxidative stress, which will worsen the health of the patients. Therefore, it is of the utmost importance that anti-hyperglycemic medications are properly used to treat this condition.

In its treatment, people use traditional medicines more often. (please specify if the treatment refer specifically for DM or for general diseases) The use of traditional medicine by the community is considered to be 'safer' than using synthetic drugs. Experience also proves that not all synthetic drugs are able to overcome various health problems optimally. One of the medicinal plants that can be used as an antidiabetic drug is mustard green. Mustard green (*Brassica rapa L.*) is a species from the Brassicaceae family which play a major role in vegetable production and consumption throughout the world. Mustard greens have been cultivated for centuries throughout Europe which eventually spread to central and eastern Asia. Plant parts such as roots, leaves, and seeds have been used in traditional medicine, generally for the treatment of several diseases such as diabetes.

Based on Mahmudah's research in 2011, mustard greens contain alkaloids, terpenes, tannins, saponins, and glycosides. Alkaloids have been shown to have the ability to regenerate damaged pancreatic β cells. Terpen serves as an antidiabetic because terpenes are the main component of essential oils while saponin functions to increase glucose homeostasis by increasing insulin sensitivity. Corrugated mustard green leaves contain biologically active compounds such as flavonoids including isorhamnetin, kaempferol and quercetin glycosides, phenylpropanoid derivatives, indole alkaloids, and glucoside sterols. (Srinivan. et.al,2017), Several studies have suggested that polyphenols and flavonoids have beneficial effects, especially in diabetes (Harbone.,JB. et.al.1987) The use of mustard greens as an anti-diabetic drug is still rare. Generally, people use mustard green to make a home-cooked dish.

There has been no scientific study of the effects of mustard greens ethanol extract to decrease blood glucose levels and reduce oxidative stress which is characterized by a decrease in MDA levels. Therefore, this study will examine the effects of mustard greens ethanol extract (*Brassica rapa L.*) on blood sugar and malondialdehyde levels in Wistar Hyperglycemia rats.

MATERIALS AND METHODS

Materials

The materials used were mustard greens (*Brassica rapa L.*) obtained from Sumber Village, Sanankulon District, Blitar Regency. Glibenclamide (BPOM) as the standard anti-diabetes drug, alloxan monohydrate for induction of diabetes in rats, 70% ethanol, FeCl₃, Mg powder, concentrated HCl, 1% HCl, Mayer reagent, anhydrous acetic acid, concentrated sulfuric acid, chloroform, male Wistar rats, standard feed, alloxan, ethylenediaminetetraacetic acid (EDTA) solution, 15% trichloroacetic acid (TCA) solution, 0.37% Thiobarbituric acid (TBA) solution in 0.25N HCl, anesthetic, and distilled water, Kit Damage pancreas cell.

Equipment

The equipment used in this study include: UV-VIS spectrophotometer, Gas chromatography-mass spectrometry (GC-MS), spatula, blender, glass jar, glass tools, funnel, rotary vacuum evaporator, analytical balance, 100 μ L micropipette, water bath, centrifugation tool, test tube (tube centrifugation), syringe, EDTA tube, filter paper, aluminum foil, drop pipette, pricking tool, mouse cage, gloves, and mask.

METHODS

Extraction of Mustard Greens

A total of 1000 g of mustard greens powder (*Brassica rapa L.*) were extracted by maceration using 96% ethanol as solvent until all the powder was immersed in the solvent. Soaking was done for \pm 48 hours repeatedly until a clear filtrate is obtained. The clear filtrate was then run with a thin layer chromatography plate to confirm complete extraction. The ethanol extract was filtered and separated from the solvent using a rotary vacuum evaporator until a thick extract was produced which from now on will be called as ethanol extract of thick mustard green (*Brassica rapa L.*). The thick ethanol extract was fractionated using water, n-hexane, and ethyl acetate. The fractionated products were then evaporated, and dosage form was made for the initial test of the most effective dose to reduce blood glucose levels in hyperglycemic Wistar rats.

Analysis of Ethyl Acetate Fraction of Mustard Green Extract

- Phytochemical screening

Green mustard ethyl acetate fraction added with reagents: Willstatter, FeCl₃, Wagner, diluted HCl, and Liberman-Burchard. (Srinivan,etal,2007) The color changes that occurred were recorded before and after the addition of color reagents.

- GC-MS analysis

The mustard green extract ethyl acetate fraction was identified using the GC-MS tool at the Police Forensic Laboratory of Denpasar, Bali using the appropriate work parameters. The spectrum

obtained was compared with the spectrum in the Wiley (W10N14.L) / NIST (NIST14.L) database at the Police Forensic Laboratory, Denpasar, Bali.

Laboratory-Animals Treatment

After a one-week adaptation process, the samples were grouped. Based on Federer's formula (1977), the rats were randomly assigned into 5 groups consisting of 5 rats each, which will be divided into two control groups and three treatment groups. For the control group, the Wistar rats were not given any treatment; the positive control group diabetic rats were induced by alloxan and given glibenclamide as the standard anti-diabetes drug. For the three treatment groups, diabetes in each of them was induced by alloxan and ethanol extract of mustard green were administered at a dose of 10.0 mg/KgBW for group I, 15.0 mg/KgBW for group II, and 20.0 mg/KgBW for group III.

Before inducing diabetes, all Wistar rats were fasted for 16-18 hours (drinking water was still given sufficiently) and examined for their blood glucose levels using a blood glucose test. After fasting, the O₃, O₅, O₇, and O₉ groups were made into hyperglycemia by administering a single dose of 125 mg/KgBW alloxan. After injection, rats were fed and given fluids as per usual.

Alloxan was given for 3 days. All Wistar rats were examined for their blood glucose levels, if there was an increase in rat blood glucose levels to 125 mg/dL or higher, the mice could be considered to be hyperglycemia and were ready to be tested for 8-OHdG levels and treated with mustard greens extract.

Wistar rats were randomly grouped, the P0 group was only given distilled water as the negative control, and the P1 group was given glibenclamide as a positive control. P2, P3, and P4 group were given mustard green extract with a dose of 10.0 mg/KgBW; 15.0 mg/KgBW; 20.0 mg/KgBW. The extract was given for 30 days. At the end of the phase, blood glucose and 8-OHdG levels were measured.

Analysis of Blood Sugar and 8-OHdG Levels of the Wistar Rats

Measurement of blood glucose levels was obtained from venous blood of mice using the GLUKO method (glucose test device) in mg/dL after the Wistar rats fasted for 10-12 hours units (Srinivasan, 2007) Measurement of 8-OHdG levels of the kit damage method.

Statistical Analysis

The results of the research data were analyzed statistically using ANOVA method with Statistical Product and Services Solution (SPSS) program for Windows software with a 95% confidence interval (CI).

RESULTS AND DISCUSSION

Mustard Green Extraction

The results of the chemical products obtained from the green mustard powder were 8.69%, i.e. from the 1000 gr powder, 86.93 gr of thick ethanol extract were produced. The reaction products were calculated to determine the amount of extract produced by the mustard green powder.

The thick ethanol extract was fractionated using water, n-hexane, and ethyl acetate. The fractionated results were then evaporated and dosage form made to determine the most effective dose to reduce blood glucose levels in hyperglycemic Wistar rats. (already stated in the methods section. Hence, unnecessary. Consider to remove this statement) The results of the preliminary test showed that the ethyl fraction decreased at a higher than other fractions. This was seen from a decrease in blood glucose levels in ethyl acetate, ethanol, and n-hexane fractions of 55 mg/dl, 38 mg/dl, and 26 mg/dl, respectively. From these results, the ethyl acetate fraction was selected for further testing, because the ethyl acetate fraction has the highest potential in reducing blood glucose levels.

Results of Analysis of Mustard Green Ethyl Acetate Fraction

Phytochemical screening performed on ethyl acetate fraction includes alkaloids, flavonoids, terpenoids, steroids, saponins, and phenolics. Phytochemical screening results show that ethyl acetate fraction does not contain steroid compounds, but contains alkaloids, flavonoids, terpenoids, saponins and phenolic compounds (table 1).

Mass spectrometer identification obtained chromatogram with 6 peaks in the fraction. The chromatogram results can be seen in figure 1, and the identification of alleged compounds based on GC-MS spectrometer database can be seen in Table 2.

Blood sugar and 8-OHdG Levels Results

Data on the decrease of blood glucose levels from day 0 to day 14 can be seen in table 3. The results showed that administration of various doses of mustard green ethyl acetate fraction could reduce

blood glucose levels in hyperglycemic Wistar rats. Based on table 3, the higher the dose of the extract, the higher the ability of the extract to lower the blood glucose levels. The 20 mg/KgBW mustard green ethyl acetate fraction has almost the same ability as the glibenclamide (positive control) in reducing blood glucose levels.

Test for normality and homogeneity of glucose levels reduction shows that the data were normally distributed and homogeneous. While the One Way ANOVA test shows statistically significant results. Least significant difference statistical analysis showed that there were significant differences between negative control group on positive control, 10mg/KgBW treatment group, 15 mg/KgBW treatment group, and 20mg/KgBW treatment group, which showed that the treatment with ethyl acetate fraction of mustard green ethanol extract could reduce blood glucose levels in hyperglycemic Wistar rats. Whereas no significant difference between the positive control and treatment dose of 20 mg/KgBW group, which can be interpreted both have a similar effect to decrease blood glucose levels.

The mechanism of action of the mustard green ethyl acetate fraction in reducing blood glucose levels is due to the compounds contained in the extract. Some compounds are potentially active as antihyperglycemic and antioxidants, namely the phenol compounds. Phenol compounds are widely used as antioxidants.¹⁶(Stuckey,1986)Phenol works as an antioxidant which inhibits the formation of free radicals and protects cells from oxidation. Phenol has a cardioprotective effect, which is a very powerful antioxidant. 2-methoxy-4-vinyl phenol, methyl isoeugenol 1 and 3-isopropoxy-5-methyl-phenol compounds are thought to be the active compounds that contribute to antioxidant and antihyperglycemic activity in the mustard green ethyl acetate fraction. According to Ravikumar's research in 2012,¹⁷the 2-Methoxy-4-vinyl phenol compound is a phenolic group that has antioxidant, antimicrobial, and anti-inflammatory activities.

While average blood glucose levels from various doses of mustard green ethyl acetate fraction are presented in Figure 3.

Table 3 Average blood glucose levels

Time (day)	Average blood glucose levels (mg/dL) and standard deviation				
	P ₀	P ₁	P ₂	P ₃	P ₄
0	84.8±2.86	100.2±4.09	85.6±16.77	83.6±7.64	91±9.25
(Pre-test)	94±3.67	209.6±10.9	153.2±12.7	178.4±12.2	211.2±18.9
3		0	9	0	3
7	97.6±3.43	124.6±12.7	122±10.61	132.8±8.23	133.2±17.2
(Post-test)	109.6±24.1	97.8±3.77	103.6±4.56	104.4±10.8	110±11.81
14	5			1	

Description:

P₀: Normal

P₁: Positive control (Glibenclamide)

P₂: 10 mg/KgBW ethyl acetate fraction of mustard green ethanol extract group

P₃: 15 mg/KgBW ethyl acetate fraction of mustard green ethanol extract group

P₄: 20 mg/KgBW ethyl acetate fraction of mustard green ethanol extract group

Least significant difference statistical analysis in Appendix 16 shows that there is a significant difference between negative control on positive control, treatment group dose of 10mg/KgBW, treatment of 15 mg/KgBW, and 20 mg/KgBW which shows that the treatment of ethyl acetate fraction of mustard green extract can reduce MDA levels in hyperglycemia Wistar rats. While the treatment dose of 10 mg/KgBW and the treatment dose of 15 mg/KgBW and positive control of the treatment dose of 15mg/KgBW and 20 mg/KgBW, both have no significant differences and can be interpreted as having the same effect on decreasing 8-OHdG levels.

CONCLUSION

Administration of ethanol extract of mustard green (*Brassica rapa* L.) ethyl acetate fraction at a dose of 20 mg/KgBW can significantly reduce blood sugar levels in hyperglycemic Wistar rats ($p < 0.05$). Administration of ethanol extract of mustard green (*Brassica rapa* L.) ethyl acetate fraction at a dose of 10 mg/KgBW, 15 mg/KgBW, and 20 mg/KgBW can significantly reduce 8-OHdG levels in hyperglycemic Wistar rats ($p < 0.05$). Phenol group compounds contained in the ethyl acetate fraction of mustard greens extract (*Brassica rapa* L.) function as a powerful antioxidant to reduce blood glucose and 8-OHdG levels in hyperglycemic Wistar rats.

RECOMMENDATIONS

Further researches on the isolation and identification of active compounds in green mustard green (*Brassica rapa* L.) ethanol extract which can reduce blood sugar levels in hyperglycemic Wistar rats and acute toxicity test of mustard green ethanol extract are needed. In addition, further research using other anti-inflammatory parameters such as IL-6, TNF- α , is needed.

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DISCLOSURE

The author reports no conflicts of interest in this work.

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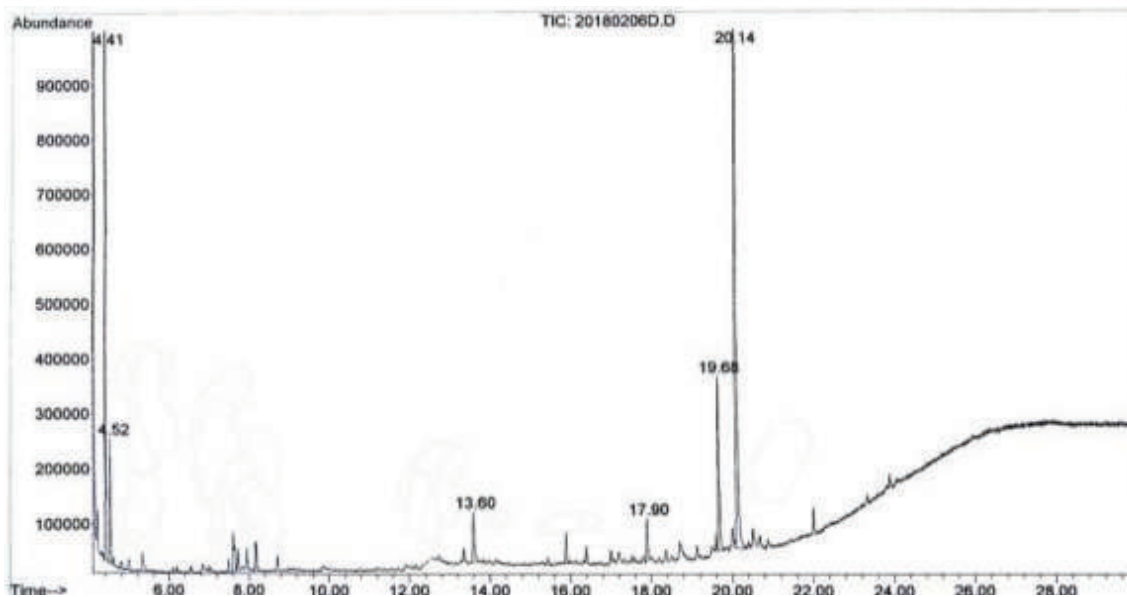
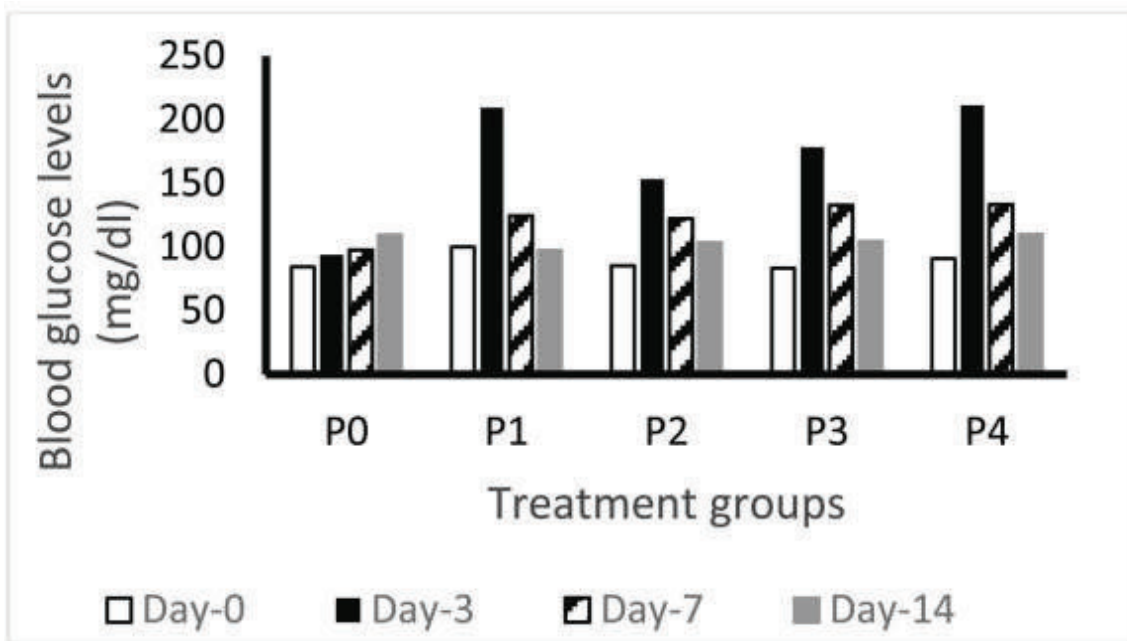
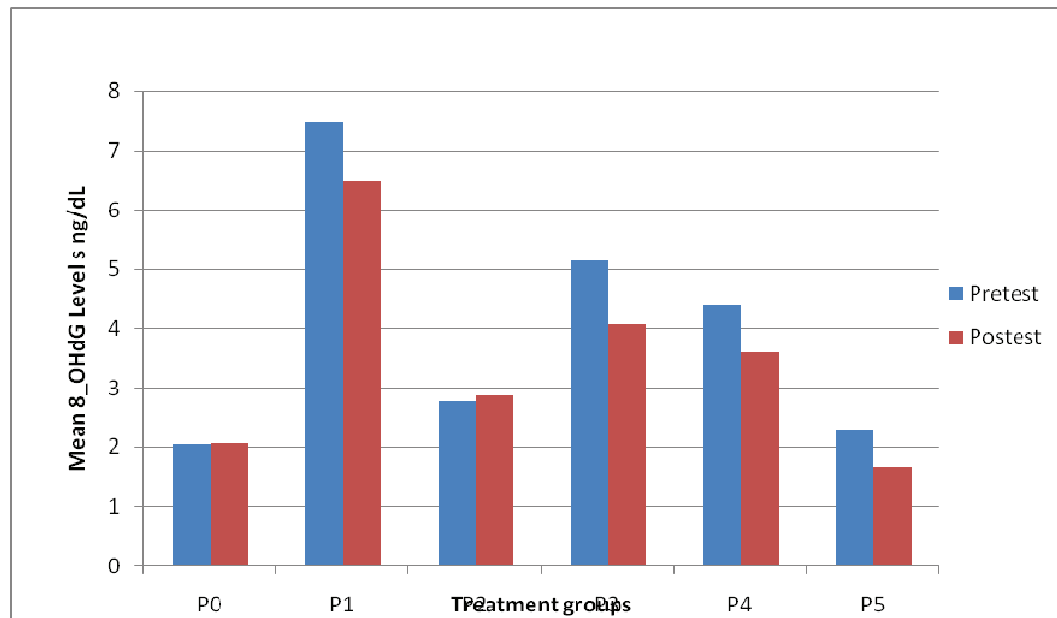


Table 1 Phytochemical screening of Mustard Green Ethyl Acetate Fraction

Tests	Reagents	Outcome
Flavonoid	Willstatter	+
Phenolic	FeCl ₃	+
Alkaloid	Wagner	+
Terpenoid	Lieberman Burchard	+
Steroid	Lieberman Burchard	-
Saponin	Hot aquadest + HCl	+

Notes: (+) detected, (-) not detected



OXIDATIVE STRESS

Oxidative stress may be defined as an imbalance between reactive oxygen species (ROS) and the antioxidant defense system. It is now known that oxidative stress is involved in most of pathological states and diseases. ROS and other oxidants can cause oxidation of lipids, proteins and DNA with following tissue damage. Toxic products of oxidation proceed cytostatic effects causing membrane damage and lead into cell death via apoptosis or necrosis. The redox status of the cell is maintained by antioxidant enzymes such as superoxide dismutase, catalase, glutathione S-transferase and other substances such as glutathione, vitamins E, C and A, which provide to eliminate ROS.

COMPETITIVE STRATEGY ANALYSIS OF SERVICE CROSSING BOAT ON GANGGA EXPRESS IN NUSA PENIDA

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Abstract. The purpose of this study was to determine and analyzes Strategy competing services Ganga Express Boat Crossing in Nusa Penida. The formulation of the problems in this study are 1) Internal factors whether the strengths and weaknesses of Ganges Express in the face of crossing service competition , 2) What external factors become opportunities and threats of Ganges Express in the face of crossing service competition and 3) How alternative the best and suitable competitive strategy for Ganga Express Boat crossing services in the face of tight competition, the method used is to use SWOT analysis.

The results of the study are internal factors that become the strength of the Ganges Express is the company's clear STP, the new Boat Fleet , the mileage is more fast , services that provide convenience to consumers, and private / private companies . While the internal factors that are the weaknesses are: Ticket prices are quite high, lack of promotional activities, competitive position in the market is very high, the number of seats is limited , there are no dock facilities, external factors that become opportunities for Ganges Express are patterns and lifestyles of the community, Technology that continues to grow, good service and satisfying passengers, the number of competitors is still small . While external factors that pose a threat are, the main competitors provide more effective and efficient satisfaction and services , economic conditions, and issues circulating in the community that frequent accidents occur at sea.

The best strategy alternative that can be applied by the company is to increase market share by targeting the merchant market and the community in the lower middle class to use the Gangga Express boat crossing service to cross to Nusa Penida.

Keywords : strengths, weaknesses, opportunities , threats and market bases .

INTRODUCTION

A. Background

The country of Indonesia is an archipelago consisting of 17,504 islands, with a population of \pm 240 million people. System conveyance (transport) will be needed by the people of Indonesia to facilitate the public to move from one area to another.

Transportation especially on the island of Nusa Penida is needed for public transportation facilities and ease people of Bali to Nusa Penida and from Nusa Penida to Bali Island carrying out daily activities this transportation service is very important for the economic development of the people of Nusa Penida. One of the means of transportation that is often used by people in Nusa Penida is the Ganges Express Boat as a crossing tool .

Nusa Penida belongs to the administrative area of Klungkung Regency, Bali Province. This sub-district has an area of about 20,300 hectares consisting of three main islands, namely Nusa Penida, Nusa Lembongan and Nusa Ceningan.

Nusa Penida has three kinds of sea transportation, namely the Nusa Jaya Abadi Passenger Motor (KMP) with the crossing route of Nusa Penida-Padang Bai, Sampan with the same crossing route, Nusa Penida-Kusamba, and Boat with crossing routes from Nusa Penida-Kusamba, as well as from Nusa Penida-Sanur. Sampan (motorized boat) transportation mode with the route Nusa Penida-Kusamba.

A desperate crossing are needed and become an important tool for public transportations Bali and Nusa Penida. So there is often competition between companies with each other . One of the Ganges Express Crossing Services which has long been operating in this area is overshadowed by the number of new players in the same business , including S ekarjaya Boat and Dwi Manunggal Fast Boat.

B. Identification of problems

From the background of the above problems, the problem can be identified temporarily by looking at the weaknesses of the three sea transportation modes.

1. Weakness in "Boat" transportation:
 - a. Ticket prices for one person tend to be more expensive than KPM Nusa Jaya Abadi ticket prices
 - b. Boat during big waves, the boat cannot operate due to its small shape and there are no balancing tools .
2. Weakness in "Sampan" transportation;
 - a. The capacity of the number of seats that is not in accordance with the number of passengers that can be transported so that not all passengers get seats.
 - b. Ticket prices are quite high at Rp. 55,000 for one passenger, and the ticket price for one motorcycle is Rp. 150,000, -
 - c. The number of buoys available is not in accordance with the large number of passengers.
 - d. Cannot operate during large waves .

C. Formulation of the problem

Based on the above conditions, the problems in this study can be formulated as follows:

1. What internal factors are the strengths and weaknesses of Ganges Express in the face of competition for crossing services ?
2. What external factors are opportunities and threats of Ganges Express in the face of competition for crossing services ?
3. How are alternative competing strategies best and suitable for Ganges Express Boat crossing services in the face of intense competition ?

D. Objectives and Uses of Research

Research purposes

The purpose of this study was to find out and analyze Competitive strategy for Ganga Express Boat Crossing services in Nusa Penida .

THEORETICAL FRAMEWORK

A. Literature Review

1. Understanding of Management

Richard L. The list translated by Tita Maria Kanita (2013 : 6) defines management (*management*) is the achievement of organizational goals effectively and efficiently through planning, management, leadership, and control of organizational resources.

2. Understanding Marketing

Marketing according to Kotler and Armstrong (2014: 27) defines is "*marketing as the process by which companies create value for customers and build strong customer relationships in order to capture value from customers in return*". Or it can be defined as marketing as a process by which companies create value for customers and build strong customer relationships to capture the value of customers in return.

3. **Strategy** is the main action pattern chosen to realize the organization's vision through mission (Mulyadi, 2012: 56). Meanwhile, according to Stephanie K. Marrus, as quoted by Sukristono (2015: 78). Strategy " is defined as a process of determining the plans of top leaders who are focused on the company's long-term goals, along with the preparation of a way or effort for how that goal can be achieved.

4. Competitive strategy

According to Porter (2011: I), the competitive strategy is the search for profitable competitive positions in the industry, the fundamental arena in which competition occurs. The aim of a competitive strategy is to establish a favorable position and can be maintained against the forces that determine competition. (Porter, 2011: I).

C. Formulation of Hypotheses

From the formulation of the problem that has been raised, then the answer or provisional estimates for the problem is: "It is believed that the strategy implemented by crossing the Ganga Express Services is not right and is still inferior to its main competitors.

RESEARCH METHODS

A. Method of collecting data

1. Library Studies (*Library Research*)
Literature study is used to collect secondary data from companies, theoretical basis and information related to this research by means of documentation.
2. Field Study (*Field Research*)
In this study the authors collected the necessary data by means of direct observation of the company concerned, through observasi dan interview.

B. Data Analysis Techniques

The data were analyzed and processed by descriptive kua lit Atif. The analysis in this study begins by identifying the environmental factors of Ganges Express, both internal and external environments.

1. Descriptive Analysis

The method used by researchers in this study is descriptive method with a qualitative approach. Research with qualitative methods is a type of research whose findings are not obtained through statistical procedures. Theoretical basis is used as a guide in order to focus study according to helpful fact the field and providing an overview of the background research.

2. SWOT matrix

According to Ranguti in Setiawan (2014), SWOT matrix is a tool used to compile strategic factors of a company. This matrix can be an external opportunity and threat faced by the company, by adjusting the strengths and weaknesses. According to David (2012), the matrix

DISCUSSION AND RESEARCH RESULTS

A. Description of Research Object

A general description of the company

The Gangga Express Boat Company is an individual company with the address Bias Hamlet, Kusamba Village, Dawan District, Klungkung Regency.

It has 4 units of boats including: Ganges Express 2, Ganges Express 3, Ganges Express 4 and Ganges Express 5. Boat material is from good quality BKR, Stainless steel and fiberglass. Boat driving power is an outboard engine of 3 to 5 units, with a power of 250 PK. The capacity of each boat is Gangga Express 2 : 60 people, Gangga Express 3 : 55 people, Gangga Express 4 : 70 people and Gangga Express 5 : 80 people, starting operations on August 1, 2014.

Each boat has a Passenger Ship Safety Certificate from the Transportation Minister, director general of sea transportation, in Padang Bai.

B. Research result

1 Ganga Express Internal Environment Conditions

Internal factors contained in the company were analyzed for the preparation of marketing strategies for ship ticket sales and increasing profits from the Ganges Express . Analysis of the company's internal factors is a stage to find out the strengths and weaknesses in facing competition. In this case there are 3 internal factors, namely STP (Segmentation, *Targeting*, *Positioning*).

2 Conditions of the Gangga Express External Environment

External factors faced by the company were analyzed for the process of developing a marketing strategy for Ganga Express ticket sales .

3. SWOT Matrix Analysis

SWOT matrix analysis produces four types of alternative strategies, namely SO (*Strengths*), WO (*Weaknesses-Opportunities*), ST (*Strenght-Threats*) and WT (*Weaknesses-Threats*).

1) SO Strategy

The SO strategy produced for the *Market Development Strategy* company is:

- a. Increase market share by aiming at the merchant market and the middle to lower level using sea transportation services. This can be done by maintaining and improving the quality of international standard products so that companies can compete in the market.
- b. Increase ticket sales by giving understanding to the community, that traveling with sea transportation services provides a new experience on the road.
- b. Develop an *on-line* ticket program .

This strategy is formulated based on the strengths of Gangga Express including the new Boat Fleet, services that satisfy consumers as well as private companies . ST Strategy

The ST strategy produced in the SWOT analysis is the *Product Development Strategy*, which is creating quality products by innovating the products offered, so as to provide convenience to consumers when traveling. The stages that can be done by the Ganges Express are:

- a. Making innovations in service services held on the trip, making passengers happy while on the road .
- b. Providing better services and satisfying consumers and still maintaining ticket prices to remain affordable to the public .
- c . Adding *online* ticket sales agents

This strategy is formulated based on the strength of the Ganges Express to avoid threats in the company environment .

Threats that are faced and become the basis for strategy formulation are economic conditions, the issue of frequent sea accidents . Based on the results of the formulation of this threat strategy can be minimized by the existence of services that satisfy consumers.

2) **WO strategy**

The WO strategy is a strategy that minimizes internal weaknesses of the company and utilizes opportunities that exist outside the company. In the WO strategy analysis, there is a strategy formulation, namely *Market Penetration Strategy*, where with this strategy conducted intensive and effective promotional activities, and optimizing the distribution channel with the aim of creating *image building* and increasing market share.

This strategy is formulated by minimizing the weaknesses that Gangga Express has and utilizing the opportunities that exist in the corporate environment. These weaknesses are lack of promotional activities and limited number of seats . While the opportunities that can be utilized by the company are good services and satisfying passengers and the number of competitors is still small. namely only Sekarjaya and KMP Nusa Jaya Abadi .

3) **WT Strategy**

WT strategy is a strategy to survive by reducing internal weaknesses and avoid threats.

A. Conclusion

Based on this research, the conclusion to be obtained as follows.

1. Internal factors that become the strength of Gangga Express are clear company STP, new Boat Fleet , faster travel distance , services that provide convenience to consumers, and private / private- owned companies . While the internal factors that are the weaknesses are: Ticket prices are quite high, lack of promotional activities, competitive position in the market is very high, the number of seats is limited , there are no dock facilities .
2. External factors that become opportunities for the Ganges Express are Pola and community lifestyles, technology that continues to grow, good service and satisfying passengers .

Suggestion

The company should conduct intensive promotions with the best services and still complete comfort facilities for consumers and form the Gangga Express brand as the best ferry boat for the Nusa Penida community and guests visiting Nusa Penida.

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IMPLEMENTATION OF SUPPLY CHAIN MANAGEMENT ON MOBILE BASED STORE

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Abstract. SIToleh is an Implementation of Supply Chain Management (SCM) for Mobile- Based Gift Shops. SIToleh as a SCM (Supply Chain Management) application specifically for supplying local products that have large capital. Center for local products that can be used by visiting tourists. SIToleh helps in marketing local products by means of SIToleh. On the other hand SIToleh also helps MSMEs (Micro, Small and Medium Enterprises) engaged in by-sales to find suppliers of various local products at affordable. Home-based industrial products were initially only known to the indigenous people of the region, and with technological innovations these home industry products could be known and sold to tourists through souvenir shops already using the SIToleh application to get these products. This will generate local products that are typical of the region and provide revenue for SIToleh from business to business transactions between gift shops and suppliers of these products. The superiority of the products owned by SIT is to apply SCM that is beneficial for home industries, suppliers and souvenir shops that are difficult to get a variety of products at affordable prices.

Keywords: Supply Chain Management; Home Industry; SiToleh; Local Product

1. BACKGROUND

Based on data from the Ministry of Tourism of the Republic of Indonesia, foreign tourist visits in January to November 2017 are very high, and the above graph does not include visits from domestic tourists. This is of course a great opportunity for the diversity of products in Indonesia, but these products do not yet have a container for marketing. Implementation of Supply Chain Management (SCM) on mobile based

store is an application provider specifically for supplying home-based local products that are difficult to develop by marketing available souvenir shops.



Figure 1. 2017 Tourist Visit to Indonesia

Tourists can buy various kinds of local products in souvenir shops in the area. Local products provided from gift shops certainly come from many suppliers. The application of SCM from this application bridges between suppliers and gift shops which can be called business to business. Based on a survey conducted by the Indonesian Internet Network Providers Association (APJII) throughout 2016 found that 132.7 million Indonesians were connected to the internet. The total population of Indonesia alone is 256.2 million people.

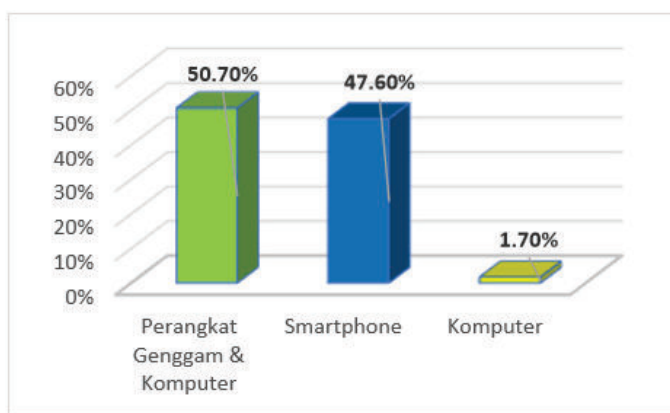


Figure 2. Usage of Smartphone 2016 in Indonesia

Research on the implementation of Supply Chain Management in good mobile applications has been done. Researchers conduct research on things that need to be considered in the application of SCM such as the type of smartphone that is good to use, the area or area that is appropriate for its application, software and drivers needed and so on [1].

The next research explains the importance of conducting market research in implementing a marketing program. The research was conducted to find out potential customers, customer needs, market conditions and so on in order to create a marketplace that is useful for many people [2]. Research on SCM has been conducted to identify 13 critical success factors (CSFs) or critical factors to support the implementation of Supply Chain Management in SMEs and study their impact on Indian SMEs in the context of a growing global market. Based on the results of this study it was observed that the determinants of success (CSFs) had a positive impact on various performance categories such as customer service and satisfaction, innovation and growth, financial performance, and internal business of Indian SMEs [3]. Similar research has also been conducted on the benefits of E-commerce and its impact on global markets and market trends and the development of an Android application integrated with the Prestashop eCommerce Shopping Cart website[4]–[6]

The results to be achieved from the development of this application certainly have many users both from the supplier side and gift shops throughout Indonesia. In addition, it is expected that the result of this research can be recognized by people throughout Indonesia as providers of SCM applications specifically for supplying home-based local products.

2. MATERIALS AND METHODS

This research uses descriptive research method which is one of the most commonly used methods in research that aims to explain an event. This research was conducted in the stages shown in Figure 3 below.

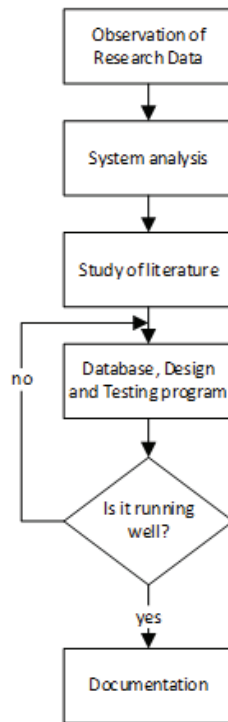


Figure 3 Stage of the Research

2.1 Context Diagram

Figure 4 describes the context of the diagram owned by the Shop Information System By. The context diagram in Figure 3.1 has 3 entities, namely Supplier, Retailer and Admin. Supplier entities can use SiToleh to register accounts, log in to the system, manage data about products sold, view sales reports and edit account info such as email addresses, telephone numbers, and so on. Retailers can use SiToleh to register accounts, log in to the system, view a list of registered suppliers, order products sold by suppliers, view purchase reports, and so on. Admin entities can use SiToleh to see all registered users, see all transactions that occur, approve proof of payment from a transaction, approve users who register as admin, and so on.

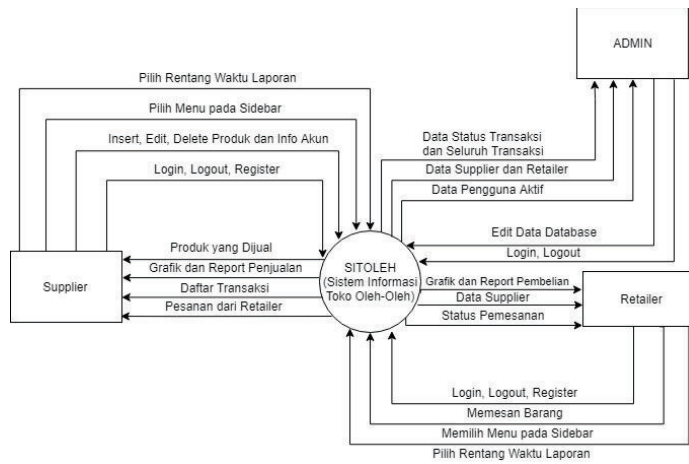


Figure 4 Context Diagram

2.2 Data Flow Diagram (DFD)

Figure 5 describes the DFD Level 0 from the Store Information System By (SiToleh). DFD Level 0 in figure 3.2 has 3 entities and 5 processes. These entities include suppliers, retailers and admin. The process contained in the Level 0 DFD includes the process of register / login, data management, sales, purchases and reports.

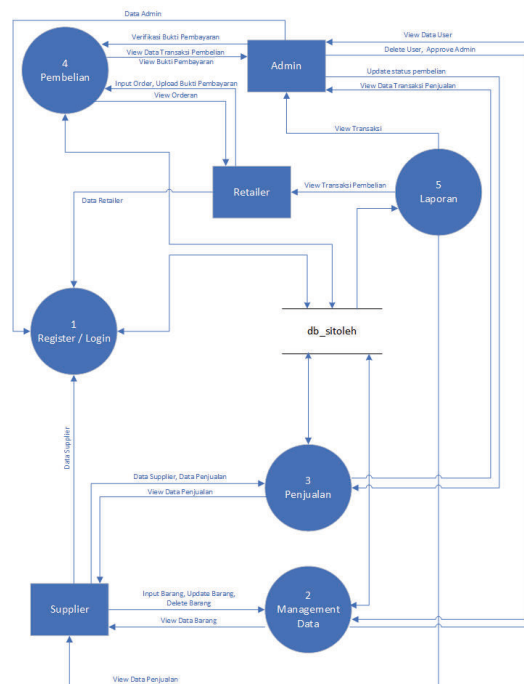


Figure 5 Data Flow Diagram

2.3 Physical Data Model

A physical data model is a model that uses a number of tables to describe data and relationships between these data. The tables contained in the PDM have a number of columns where each column has a name. A complete physical data model will include all database artifacts needed to create relationships between tables or achieve performance targets, such as indexes, constraint definitions, connecting tables, partitioned tables or clusters. The physical data model can usually be used to calculate storage estimates and may include details of specific storage allocations for certain database systems. PDM from the SiToleh system will be explained as follows.

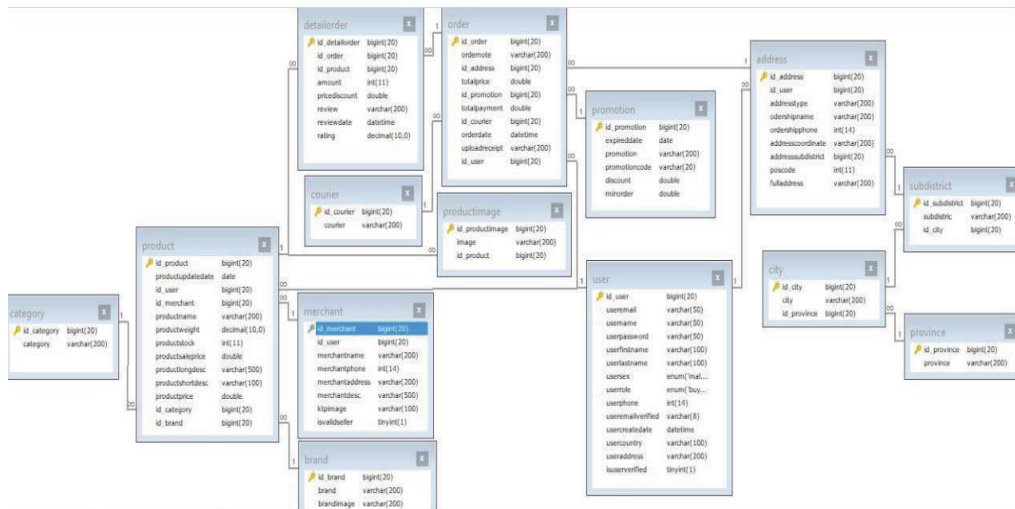


Figure 6. Physical Data Model

3. RESULTS

SiToleh system is designed for use by suppliers, retailers and of course admin. The use of the system carried out by three types of users makes the SiToleh system divided into 3 parts. The sections and explanations about the SiToleh system will be explained as follows.

2.1 Supplier

SiToleh used by Supplier runs on the Android platform. Suppliers can use the SiToleh mobile application to sell their products to SiToleh. The appearance of the SiToleh application will be explained as follows.

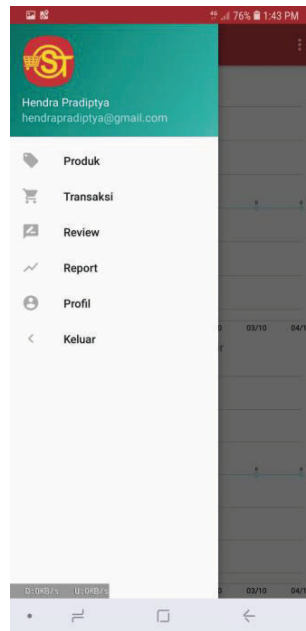


Figure 7. Supplier App Interface

2.2 Retailer

SiToleh used by Retailers runs on the website platform. Retailers can use SiToleh's website to buy products sold by suppliers. A website intended for retailers is currently in the design stage of the mockup. The appearance of the SiToleh website is explained as follows.

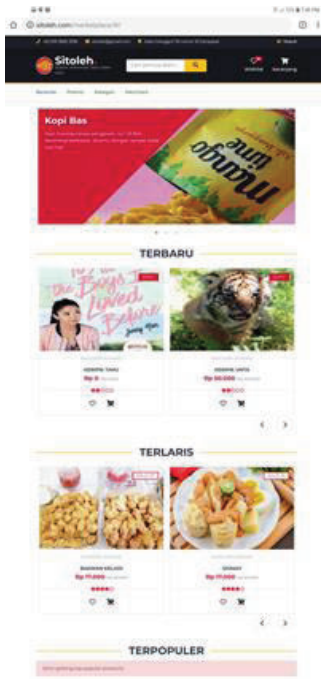


Figure 8. Retailer App Interface

2.3 Admin

SiToleh used by Admin runs on two platforms, namely on mobile and website. Admin can use the website or SiToleh mobile application to manage the data used on SiToleh. The appearance of the website and the mobile application used by the admin is very identical, and of course both are integrated. The appearance of the SiToleh mobile application used by the admin will be explained as follows.



Figure 9. Admin App Interface

2.4 Business Management Mentoring

Mentoring and benchmarking activities were carried out by visiting coffee entrepreneurs in Pujungan village, Pupuan sub-district, Tabanan on 15 August 2018. This activity was conducted to find out how the business process of the coffee company and to collaborate on the use of SiToleh applications.



Figure 10. Mentoring with Coffee Entrepreneurs in Pujungan Village

2.5 Technopreneurship Mentoring

Technopreneurship mentoring activities are carried out by bringing in speakers who have experience in the field of technopreneur. This activity aims to provide an understanding of how to become a technopreneur who runs a technology-based business.



Figure 11. Technopreneurship Mentoring Activities

2.6 Entrepreneurship Exhibition for Udayana University 2018

SiToleh innovation products have participated in the 2018 Udayana University Entrepreneurship Exhibition held on August 18, 2018. In this activity, innovative products that have been developed in this study have been exhibited.



Figure 12. Entrepreneurship Exhibition for Udayana University 2018

2.7 Yogyakarta 2018 Entrepreneurship and Technology Product Exhibition

SiToleh innovation products have participated in the Entrepreneurship and Technology Products Exhibition held on August 29-31 2018 at Yogyakarta State University. This exhibition was held by the Ministry of Research, Technology and Higher Education in a series of activities for the 2018 National Student Scientific Week (PIMNAS). In this activity, innovative products that have been developed in this study have been exhibited.



Figure 13. Entrepreneurship and Technology Products Exhibition at Yogyakarta State University

4. CONCLUSIONS

Based on the results of the activities and outcomes achieved in this study, it can be concluded as follows:

1. The technology innovation product that was developed called the Information System Gift (SiToleh) is an implementation of supply chain management in a sales system that connects resellers and retailers who sell souvenirs for MSME products.
2. Activities that have been carried out for the development of SiToleh applications are business management mentoring and technopreneurship mentoring that aim to provide understanding in entrepreneurship using technology-based innovation products.
3. There are two exhibitions that have been followed, the first is the 2018 Udayana University Entrepreneurship Exhibition held on August 18 2018. The second exhibition is the Entrepreneurship and Technology Products

Exhibition which was held on August 29-31 2018 at Yogyakarta State University. This exhibition was held by the Ministry of Research, Technology and Higher Education in a series of activities for the 2018 National Student Scientific Week (PIMNAS).

5. ACKNOWLEDGEMENT

Thanks to colleagues, students and all those who have supported this research

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“THE INFLUENCE OF PRODUCT DIFFERENTIATION AND E-COMMERCE ON PURCHASE INTENTION (CASE STUDY AT BELLA ITALIA KUTA RESTAURANT)”

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Abstract. Differentiation is differentiator or how to be different from other products or companies. E-commerce is a dynamic asset of technology, applications, and business processes that connect specific companies, consumers, and communities through electronic commerce and trade in goods, services and information electronically. Purchase Intention is a responseffective or process of feeling or liking a product but has not made a decision to buy. Bella Italia Restaurant is a Restaurant that has signature Italian cuisine in Kuta Badung regency, which is currently well known among tourists who come to Bali. The purpose of this study is to know, analyse, and explain the influence, the relationship of Product Differentiation and E-commerce to Purchase Intention at Bella Italia Kuta Restaurant.

This research uses a quantitative approach with descriptive analysis approach. The study was conducted in Badung Kuta area, because there are many Italia Restaurant and Bali tourism centre. Methods of data management using a tool in the form of SPSS with questionnaires distributed to 100 respondents. The data were analysed using Likert scale, validity test, reliability test, multiple linear regression test, classical assumption test, and coefficient of determination.

The results of this study can be explained that; Product Differentiation, E-commerce effect simultaneously to Purchase Intention at Bella Italia Kuta Restaurant with $F_{sig} 0,000 < 0,05$ with F count (46,093) $> F$ table (3.09). In addition, partially between product differentiation to Purchase Intention at Bella Italia Kuta Restaurant equal to $r = 0,635$, and partially between E-commerce to Purchase Intention on Restaurant Bella Italya Kuta equal to $r = 0,652$. This means there is a very strong partial relationship between Product Differentiation and Ecommerce to Purchase Intention at Bella Italya Kuta Restaurant.

Keywords: Product Differentiation, E-commerce and Purchase Intention

Problem Backgrounds

In this era of globalization competition in industries are tightening and fiercer. Beside the expansion of markets to many companies in the world, there is growing competition between several companies. The economic development of Indonesia is marked with high competition in business, of which is culinary business. Currently the development of culinary business is marked with the advent of restaurants, which provide several choice of foods.

Regarding the matter, to dominate the shares of certain market, every company has its own strategy. In this globalization era as this moment is, differentiation and e-commerce is the best way to attract interest of buyers in this modern time.

(Product life cycle). Differentiation is one of three primary tactics to support the strategy, which is utilized to dominate the market shares of certain category. According to Kotler and Armstrong (2014:214), Differentiation is actually differentiating the market to create superior customer value. The Irwin Journal (2013) states that one of the strategic approach to ensure a company's competitive ability and position in the market is to differentiate their products, which

are based on thought, so that a company can still maintain its product position and not declining in product's lifecycle

Tom Peters spread his principle of "Be distinct or extinct" which mean you have to be different in market to survive. However, not all difference make something looks distinct from others. In a study conducted by Ana Kadarningsih (2013), differentiation has a significant positive influence on one's ability to compete. Differentiation strategy is based on service or differentiating oneself to other competitor. Umar Albaar journal (2015) shows that simultaneously, from all the influences of product's differentiation, which consist of quality, price, specialty, style and design, only style that partially influences the consumer' interest

From year to year, internet experiences a growth of two hundred million users from the year of 2015; this is according to State of Connectivity: A report on Global Internet access, which conducted by Facebook, which there are about 3.4 billion of internet users in the world. Looking at the total human population of 7.4 billion concludes that internet is used by almost 50% of earth inhabitant

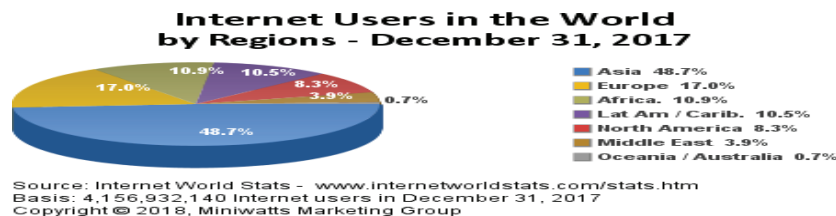


Image 1.1 Percentage of Internet Users in the World

Source: <http://www.internetworldstats.com> (accessed on 31 December 2017).

Image 1.1 shows the percentage of internet users in seven continents of the world in years 2017. From that image we can see that most users come from Asia 48.7% of total, decreasing 0.9% compared to 2016, which is 49.6%. Still, according to Internet World Starts, Asian users currently reaching 2 billion souls with 48.1% of total population of 4 billion souls. It is influenced by the rise of Asia as the primary contributor of Internet Population of the world

Bella Italia Restaurant was established on 12th of March 2015 in jalan Sriwijaya No. 368 Legian Kuta Bali. Founded by Mr. Nicola whom originated from country of Italy. To ensure the survival of the business, the business tried to formulate a strategy. The frequencies of visitors still fluctuated because of the running promotion was still not effective because it was only spread from mouth to mouth and social media, which are Instagram and Facebook. The high level of competition in Badung Regency marked with the growth of restaurant businesses in the regency, which increases from year to year as shown in the following table

Tabel 1.1 the Growth Level of Restaurant Businesses in Badung Regency from Year 2011-2015

Restaurants Facilities	Restaurants (Unit)				
	Restaurants				
	2011	2012	2013	2014	2015
Amount of Restaurant	384	469	567	668	805
Amount of Chairs	32 395	36 607	40 337	50 207	66 575

Source: BPS data of Badung Regency

According to Table 1.1, the number of restaurants and chairs in Badung Regency experiences an increase each year. With the highest level of growth happened in 2015 with 805 restaurants and 66.575 chairs. The cause of the increasing number of restaurants and chairs in Badung Regency is attributed to several factors, which are: (1) Bali is one of the primary tourism destination in Indonesia, particularly south Bali. (2) Every year the numbers of tourist visiting to Bali is increasing

Tabel 1.3 E-Commerce Media in Bella Italya Restaurants

No	E-Commerce Media	Account Id
1	Facebook	Bella Italia Legian
2	Intagram	Bella Italia legian
3	Go-Food	Bella Italia

Source: Bella Italia Restaurant

Based on that matter, the management of Bella Italia Restaurant must know the cause of a lagging sales and visitor. After they find the cause of insignificant increase the Bella Italia Restaurant' management needs a correct strategy so that the needs and wants of the customer can be fulfilled while also opening opportunity to continue to grow in restaurant business competition

In growing number of competitors in restaurant business competition of which provide varieties of food products the Bella Italy must create something different or capable of differentiating their products, either in its service, price or the quality of the food. So product differentiation strategy is very suited for this growing competition in restaurant business in pursuit of costumer interest

The goal of the study are:

1. To know the influence of product differentiation to customer purchase intention on Bella Italia Restaurant in Kuta
2. To know the influence of product differentiation on customer purchase on Bella Italia Restaurant in Kuta

STUDY METHODOLOGY

In the process of composing this study, the data gathering method are following:

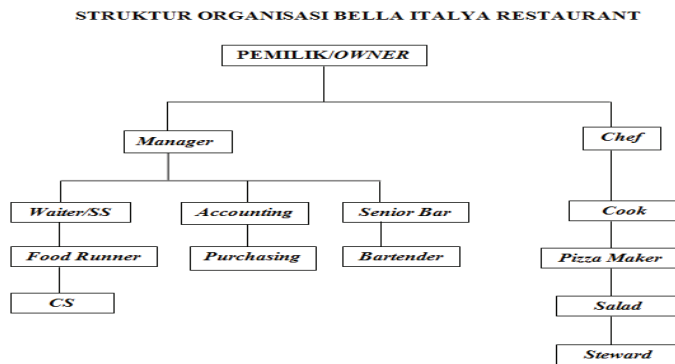
1. Interview, is a data gathering method with question and answer or often called interview which is gathering information by asking directly to the informant
2. Observation is a data gathering technique by doing a direct observation on the study’s object to examine closely the supporting data of the research
3. Literary study is a data gathering method by reading literature related to object and matters of which are studied

The purpose of this study is to test the hypothesis that utilize the relation of cause and effect of several variable which are the cause of Product differentiation influence and E-Commerce Bell Italia Restaurant on its customer’s purchase intention. Is product differentiation and e-commerce influence the purchase intention of Bella Italia’s Customer Questioner, the method of data gathering of information gathering or several source is conducted with several method which are: Questioner, Literary study and Interview. The data analysis technique is Quantitative analysis, Qualitative, Double Linier Regression Analysis, Classical Assumption Test and hypothesis Test

RESULT AND STUDY

Result

Organization structure is a system and relation between every branch and position in an organization or company in running their operation. The following is the Bella Italia Restaurant organization structure in kuta



The respondent characteristic is the visitors of Bella Italya Restaurant, this sample was taken from 100 visitors where the characteristics are categorized by gender, age, profession and citizenship

Karakteristik Responden

No	Variabel	Klasifikasi	Jumlah (orang)	Persentase (%)
1	Jenis Kelamin	Laki – Laki	60	60
		Perempuan	40	40
		Jumlah	100	100
2	Kewarganegaraan	WNA	69	69
		WNI	31	31
		Jumlah	100	100
3	Usia	17-21 Tahun	29	29
		22-26 Tahun	46	46
		27 Tahun keatas	25	25
		Jumlah	100	100
4	Pekerjaan	Pelajar	28	28
		Pegawai Negeri	12	12
		Wiraswasta	45	45
		Pegawai Swasta	15	15
		Jumlah	100	100

Sumber: data diolah pada Tahun 2018

The respondents characteristics can be seen according to categorization of gender, male respondent dominate in this study with 60% percentage, according to citizenship category; foreign citizens dominate this category by 69%. According to age's category, the respondents with age of 22-26 years old dominate the study by 49%. According to profession category, respondent with tourism related career dominate the category by 45%

Study

Correlation coefficient of indicator variable of which the value is tested more than 0.30 ($r > 0.3$). The result shows that the whole indicator on the study is proven valid. Cronbach's Alpha on every instrument is larger than 0.6 (Cronbach's Alpha > 0.6). It shows that every instrument is reliable so it can be used to conduct study. Bella Italia Restaurant offers more variety and complete Italian cuisine so the customer is always eager to buy. The price indicator offered by Bella Italia is more affordable and cheaper than other Italian cuisine restaurant in Kuta region. The service indicator on Bella Italia Restaurant has a modus value of four, which mean the respondents agree

Service and the alertness in attending the customer in Bella Italia, is quicker to make you happy and comfortable. Bella Italia Restaurant Indicator in serving Italian food with spices which give a pleasurable taste, which makes you interested in buying it (X1.4), has a modus value of 4, this means that the respondents agree that Bella Italia Restaurant serves Italian food with spices which give a pleasurable taste which makes you interested in buying it. The food quality indicator (X1.5) has a modus value of 3, this means that respondent is agreeing enough. Bella Italia Restaurant service makes you easy to order the food you wanted indicator (X2.2) has a modus value of 4 this means that respondent agree with the advent of electronic marketing in Bella Italia Restaurant makes it easy to order foods. Bella Italia Indicator has a good electronic advertising (X2.2) has a modus value of 4 this means that respondents agree that Bella Italia Restaurant has good electronic advertising. The use of Go-Jek to order and food delivery in Bella Italia Restaurant is the right choice indicator (X2.3) has a modus value of 4 this means respondents agree that The use of Go-Jek to order and food delivery in Bella Italia Restaurant is the right choice. The payment through electronic payment system in Bella Italia Restaurant is practical and makes it easier to conduct transaction indicator (X2.4) has a modus value of 4 this means that respondents agree that The payment through electronic payment system in Bella Italia Restaurant is practical and makes it easier to conduct transaction indicator

The double linear regression equation is the following $Y = -0,004 + 0,702 X_1 + 0,316 X_2 + e$
The double linear regression equation can be outline as the following:

$X_1 = + 0,702$, Shows that product differentiation has a positive impact on purchase intention in Bella Italia Restaurant Kuta, if the product differentiation increases then the purchase intention will have an increase of 0.702

$X_2 = + 0,316$ E-commerce Shows that E-commerce has a positive influence on purchase intention in Bella Italia Restaurant. If the provided E-commerce improves then the purchase intention will increase by 0.316

The value of R is 0.766 where 0.766 is between the value of 0.60-0.80 which is on a strong level, this mean that between the variable of product differentiation, E-commerce and Purchase Intention in Bella Italia Restaurant have strong correlation according to the analysis result of correlation. The value between product differentiations on purchase intention in Bella Italia

Restaurant Kuta is $r=0.730$ this means there are strong positive relation partially between differentiation and purchase intention in Bella Italia Restaurant Kuta

According to analysis result, correlation value between E-commerce on purchase intention in Bella Italia Restaurant Kuta is $r=0.635$. this means there are strong positive relation partially between E-commerce on purchase intention in Bella Italia Restaurant Kuta. The Kolmogorov-Smirnov value is larger than Kolmogorov-Smirnov table of 0.05 so H_0 , which indicates that data used in this study is distributed normally so it can be concluded that the model fulfilled the assumption of normality. That there is no free variable that has a tolerance value less than 0.10 and there is no free variable has VIF value more than 10. Henceforth the free regression model is free from multicollinearity

According to Anova analysis result, the Fhitung value is $68.769 > F$ value table 3.09 and $F_{sig} 0,000 < 0,0$ therefore H_0 is rejected. This means that Product Differentiation (X_1) and E-commerce (X_2) simultaneously influenced the Purchase Intention (Y) in Bella Italia Restaurant Kuta

According to analysis, data gained the thitung value of $6.559 > t$ table 1.985 and t_{sig} is $0.000 < 0.05$ so H_0 is rejected and H_a is accepted which means that Differentiation Product variable has a significant positive influence on Purchase Intention. Regression Coefficient β_1 (Differentiation Product Variable) is 0.702, shows that the increase of Product Differentiation means the increase of Purchase Intention also in Bella Italia Restaurant Kuta. And according to thitung value $3.557 > t$ table 1.985 and t_{sig} value of $0.001 < 0.05$ thus H_0 is rejected and H_a is accepted which means that E-commerce variable has a significant positive influence on Purchase Intention on Bella Italia Restaurant Kuta. The regression coefficient β_2 (E-commerce variable) is 0.316 shows that the better the E-commerce is, the better the customer purchase intention in Bella Italia Kuta Restaurant

CONCLUSION

Based on the result of the research and study above it can be concluded that

1. Product Differentiation, E-commerce, simultaneously influential on Purchase intention in Bella Italia Restaurant Kuta with the value of $F_{sig} 0.000 < 0.05$ with F value ($68.769 > F$ Table (3.09))
2. Product Differentiation has a significant positive influence on Purchase Intention in Bella Italia Restaurant Kuta, with thitung ($6.559 > t$ table (1.985)) and t value t_{sig} of $0.000 < 0.05$. regression coefficient β_1 (Product Differentiation Variable) is 0.702 shows that the increase of Product Differentiation will also increase Purchase Intention in Bella Italia Restaurant Kuta
3. E-commerce variable has a significant positive influence on Purchase Intention on Bella Italia Restaurant Kuta with value of thitung value $3.557 > t$ table 1.985 and t_{sig} value of $0.001 < 0.05$. The regression coefficient β_2 (E-commerce variable) is 0.316 shows that the better the E-commerce is, the better the customer purchase intention in Bella Italia Kuta Restaurant

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SYMBOLIZATION OF GENDER EQUALITY IN MANGGARAI FLORES TRADITIONAL HOUSE

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Abstract. This study aims to "realize the understanding of cultural diversity based of local wisdom". This goal was achieved through an understanding of how the Manggarai community interpreted gender equality symbolized in traditional house with their local wisdom. Understanding is focused on cultural concepts that underlie the principle of gender equality in the socio-cultural life of the Manggarai community. In addition, how are the roles and functions of women in terms of gender equality symbolized in their traditional house.

The research method used is a qualitative method. Collect data with observation methods, in-depth interviews, and library studies. The analytical method used through ethnographical analysis.

The study produced findings that for the Manggarai people organize space like arranging other fields of life. In socio-cultural life, the role of men is identified with the public sector, which enables them to be more involved in the 'outside' affairs of the house and have a wider reach so that their position is considered higher than women. Whereas women in the domestic sector play a greater role in a 'narrower' scope, especially those related to household economic management and other female duties. Nevertheless, the position of women in society is considered important and decisive. This is symbolized by the existence of a *siri bongkok* (main pole), the beautiful girl. Arranging space for the Manggarai people does not only harmonize with the universe, but at the same time the welfare of their locality can be achieved.

Keywords: Symbols, Gender Equality, Traditional House.

Introduction

As cultured beings, humans give special meaning to their houses. The house is not merely a place of refuge, but can represent the lives of the residents who inhabit it and is closely related to the culture of the community concerned. Houses in this connection give a feeling of security and comfort and allow a person to be a part of a space and interpret his surroundings.

In Indonesia there can be found a variety of traditional house forms that are commonly identified with certain ethnic communities, one of which is a traditional house in Ruteng Pu'u, Manggarai, Flores, East Nusa Tenggara, called *Mbaru Gendang* (Traditional House). For the Manggarai people, a house is not only a place for human living and doing daily work, or a gathering place with only living relatives. However, the house is also a place to carry out various religious ceremonies. In this sense the house is a cultural structure that embodies the cosmic rules that are non-physical in nature, which is the manifestation of an invisible world and at the same time the center of the ceremonial rites in the social life of the community concerned, as stated by Fox (1993: 1-2) that "the house may become a center - a combination of theater and temple - for the performance of

the ceremonies of social life". Once the importance of a house for their lives, the Manggarai people make the house an identity of those they are proud of.

Traditional houses in Manggarai are built with a set of rules, the existence of a life view, values or certain underlying principles and life in culture in the community concerned. This shows that socio-cultural factors are a determining factor for the realization of an architectural building. Thus, the home must be understood in a broader context. As stated by Waterson (1993: 223), "*The house commonly forms a microcosm, its layout and decoration reflecting images of society and cosmos. Attitudes toward houses themselves are an integral part of peoples' world-views and need to be understood in this wider context*". For this reason, an anthropological approach is needed that can help to understand or explain it related to the structure behind the form and spatial layout of traditional houses in Manggarai, and how it relates to gender equality and other socio-cultural phenomena of the community concerned.

Traditional Houses, Gender Equality, and Research Methods

The scope of the discussion presented in this study concerns the limitations of what is referred to as 'traditional house', namely the building of a house whose form, structure, function and method of manufacture are based on the socio-cultural rules that apply in the community concerned, which is inherited from generation to generation from their ancestors (Muanas, 1984: 2).

Gender equality can be interpreted as the realization of everyday guarantees that are characterized by the attitudes of men and women in their relationships with one another, both within the family and within the community, who care, respect, help, support, empower, and give each other the opportunity to grow and develop themselves optimally continuously continuously and responsibly (Permana, 2001: 1).

The purpose of this study is to emphasize aspects of understanding. Therefore, the relevant method for use in this study is a qualitative method. The application of this method will be realized by the stages of data collection using observation, in-depth interviews, and library studies. Then the data from interviews and observations were analyzed continuously throughout the study. Subsequently an interpretation was held.

The research locations were in the villages of Ruteng Pu'u, Golodukal Village, Langke Rembong District, Central Manggarai Regency, Flores, East Nusa Tenggara. The reason for choosing the location is because the region can represent Manggarai culture, and have a house with special traditional characteristics. As a comparison, observations were carried out in the village of Todo.

Environment of the Manggarai People in Ruteng Pu'u Village

Ruteng Pu'u village is one of the *beo* (kampong) in the Golodukal Village, Langke Rembong District, Central Manggarai Regency, Flores, East Nusa Tenggara. The geographical of the Golodukal area is a hilly area with fertile soil for agriculture or plantations. The fertile lowlands are located around the valleys which flow through the river. The area itself is dominated by relatively steep land. As a result of these conditions it is a critical area that is prone to landslide hazards.

The origins of the Manggarai people in particular, who are now inhabiting the Manggarai area, cannot yet be ascertained. But according to Coolhaas, a researcher

who is very interrelated about Manggarai, especially from a historical point of view, and also by Verheijen (1991: 23, 71), it was draw that the Manggarai people were descendants of people from Boneng Kabo (Minangkabau), Goa, Bugis, Makassar, Bima, Serang (West Sumbawa), Sumba, and Sabu. In the new area, the group of migrants is still carrying out their lives as in their ancestral lands. They established their villages in the interior far from the coast.

The main livelihood in the village of Ruteng Pu'u, as well as other residents in the Golodukal Village, is to cultivate in fields known as *lingko* (ulayat round garden), and *uma tingkul* (a garden produced by private cultivation). In general, the fields of the population are not so far from villages and rivers. Besides farming in the fields, livestock is an important livelihood for the people of Golodukal Village. Farming is not only done to increase the income of a household, but also to help with agriculture with manure.

To fill their free time, the people of Ruteng Pu'u Village do handicrafts, for example making woven mats from pandanus. Besides being used for personal use, these crafts are also for sale. In the trade sector, they trade the results of their fields, livestock or handicrafts. Other types of livelihood as laborers or employees in government and private offices.

Mbaru Gendang's House

The concept of a house as a social unit cannot be separated from a society house is a very important element for supporting the formation of the Manggarai culture. Houses in the Manggarai language are called "*mbaru*", this word is close to the words "*mbau*" (shelter) and "*ru*" (own). There are three types of houses for the Manggarai people. First, *mbaru gendang* (drum house), also called *mbaru tembong* or *mbaru niang*. This type of house is a traditional house of the Manggarai people. The second is *mbaru tambor* (tambur house), which is a house used to store musical instruments such as gongs and drums. The third is a residence, called *mbaru sondong*. *Mbaru sondong* in ancient times was also called *munya lapu*. *Mbaru lapu* is generally inhabited by many families. Because the development of the period, *Mbaru lapu* was later dismantled and then houses were built that were smaller in size and occupied by a family.

One of the living policies of the Manggarai people is to see the house as a starting point for doing everything where he lives (*mbaru bate kaeng*). In the Manggarai culture, *mbaru* (house) has a very broad scope. *Mbaru* (house) and *beo* (kampung) have a very close relationship and are able to represent the views and appreciation of the Manggarai people for the universe. *Mbaru* is inhabited by a family that has one family bond (one clan). The family bond is drawn based on the patrilineal line. That means women as wives live following their husbands. *Mbaru* is divided into several *kilos* (family room). *Kilo* has two meanings. The first meaning is *kilo* means room in a house. Whereas in a broader sense the *kilo* means a household consisting of a husband, wife and children. Husbands become leaders in a *kilo*. In this *kilo* a family carries out its obligations to grow and develop (*beka agu buar*). From birth to death, someone is always in a "*kilo*" scope.

Settlement Pattern

In the past, the ancestors of the Manggarai people built houses (kampongs) in the hills or mountains, so that the village in the Manggarai language was called *golo lonto*. *Golo* literally means hills, mountains. The choice of the region because of the hill they considered to provide security, far from being disturbed by wild animals, and also a fortress in the past when there were still wars between tribes or villages. In addition, it also relates to the belief that the higher the place of residence, the closer it is to their ancestors.

Settlements in Ruteng Pu'u are built around a compound (a sacred area in the middle of the village). The location of the house is adjusted to face in a direction. They did this because in the view of the Ruteng Pu'u compang people it was the center of life and was considered good. The orientation of the location and direction of the house results in the position of houses in a circular shaped village with a center as a center located in the middle of the village. In that area there are dolmen. The house which is considered to be the main house is located east of *Compang*, which consists of two main houses namely *Mbaru Gendang* and *Mbaru Tambor*. In the middle of the page there are also *haju langke* (dadap trees) which are sacred by the community.

Ruteng Pu'u village has two traditional houses (*Mbaru Niang*). There is something called *Mbaru Tambor* for *pele sale*, and there is *Mbaru Gendang* for *pele awo*. In tracing in every Manggarai village, only the Ruteng Pu'u village had a dualistic structure in the village with two traditional houses. Around the yard there are likes, arrangement of rocks arranged in a pedestrian place.

House's Shape

The traditional house in Ruteng Pu'u village is an eight (octagonal) stilt house. The shape of the stilt house has rounded cone roofs (such as a half-open umbrella) and is a central house or main house of a family that is wide and sacred, because in this house at all times all the residents meet and perform various religious ceremonies, and hence the house is referred to as *mbaru niang* (large house, traditional house). *Mbaru Niang* consists of three parts. The first part is *ngaung* (downstairs), which is a part of the house that is used to store firewood, agricultural equipment, and also as a chicken coop or other pets, sometimes used to weave or do other women's work. The second part is *waselele*, *tenda*, *lutur* (middle floor, halls) are the central part of the house as human habitation. It is in this second part that the

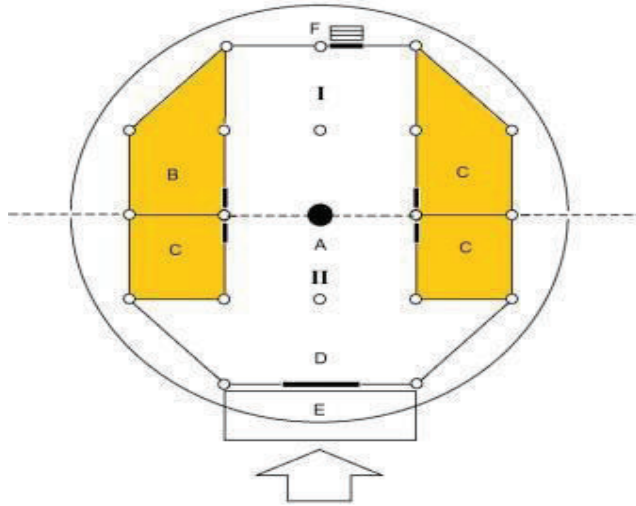
residents just carry out their daily activities, gather, discuss and conduct various religious ceremonies. The third part is the *ruang koe* (top floor, tower) is the upper part of the house that is used to store or put special objects (war equipment) and sacred objects as a special room for ancestral offerings, therefore specifically this space referred to as *sehang kode*.

According to the Manggarai people, the three parts of the house are symbols of three levels of nature, namely *tanang wa* (lower world) as a place to live various kinds of spirits, *mbaru bate ka'eng*, *tana lino* (residential house, earth, middle world) as a place living only humans and other living things, and *awang eta* (upper world) as the abode of the Gods and ancestors. The traditional house is roofed with palm trees (*wehang*) and is set as high as - / + 1.50 - 2 meters above the ground on wooden poles. Poles are made of logs which are formed in a round length of 20-30 cm in diameter, but there are also square blocks with a width of 30 cm, while the size of the length is adjusted to the needs. The wood that is considered good for house poles and other uses is timber (*haju*) from Lumu, Worok, Kenti, Mpui, Nte'er trees. Wood which is often used for poles and boards because the quality of the wood is considered very good is Lumu and Worok wood. The wooden poles on the new pole in Ruteng Pu'u village numbered 21 poles, while the most important pillars were nine poles. The core of a traditional house is a furnace or kitchen (*sapo*), which is a rectangular fireplace located near the back of the main pole (*siri bongkok*) in the middle of the house. The main pillar (*siri bongkok*) is a symbol of the role and function of humans, especially women, in society, namely as an upholding of ancestors, parents (mothers), wives, farmers, ranchers, and craftsmen (the backbone of the family economy). Whereas wood for other uses such as roof ring forming rings are Kenti, Mpui and Nte'er wood. Bamboo materials such as bamboo *betong* (betung) and *pering* (pering apus) are also used, among others, for battens, slices for arranging reeds, and also for roofing.

The house spaces are partitioned by walls which are made of wood boards, for example. As for the floor or halls made of wooden blades or boards. In the past the house was traditionally windowless and had two main doors. One door on the face and one on the back. Now, especially in Ruteng Pu'u, the house has windows and planks. To enter the house through a wooden staircase in the form of a line of wooden blocks that cross the front and back of the house. The roof material for traditional houses is *wunut* (ijuk), and for ordinary houses using *ri'i* (alang-alang). Now many ordinary houses use zinc roofs.

Spatial

The rooms in the traditional house building in Ruteng Pu'u village can be seen in the following plan.



Floor Plan 1: *Mbaru Gendang*, Ruteng Pu'u

Information :

A: The main mast (*Siri Bongkok*), here also functions as the traditional chairman's sitting room.

B: The main bedroom

C: Bedroom

D: Main entrance

E: Home

F: Back door

I: *Nolang*, private area

II: *Lutur*, public area

In principle, the division of space in the Manggarai traditional house can be divided into two based on its function, namely *Nolang* (I) as the private space of the occupants of the house, and the *Lutur* (II) room, in this room the host receives and entertains guests who come to visit. The front of the house that functions as a veranda. The middle part of the house is an inside that only new residents and people who are still relatives can only enter. In this room there is a sleeping room, and a space to store the gongs that are sounded when a religious ceremony is held.

In honor of the guests, the host invited them to sit in the *Lutur* section, while the host himself sat in the *Nolang* section. Especially for customary leaders a special place is provided in front of the main pole (A). If there are guests who intend to stay overnight, they are also provided with a special room that is part of the *Lutur*. For female guests, they are accepted and entertained by hosts at the back of the house and used as a place for women to do their daily work.

Space that is considered a neutral room is a room around the kitchen (*sapo*), because in this room all residents of the house (male, female, old, young) can gather together and be used together, for example cooking, preparing food, eating, chat and relax. Therefore, for Manggarai people the kitchen (which is located adjacent to the main pole) is the core or center of a house. It is around the kitchen that life begins, runs, and ends.

For the Manggarai people, establishing a house is to realize a life. Therefore, everything related to the construction of houses, they are planned in advance. Before a house is built, a consultation is held (*kumpul weki*). This meeting was conducted between one family and another family in a broad family with the intention that the plan to build the house could be carried out smoothly. As discussed in the deliberations are matters that include land that will be used as a place to build a house, building materials needed, the size of the house to be built, labor, implementation costs, and when the house will be built. All of these activities begin with the *Wejang Manuk* ceremony in the forest, namely the ceremony to prepare and collect the necessary building materials.

After the building material has been collected, it is then taken or transported to the village which was previously preceded by the *Roko Molas Poco* ceremony, the ceremony of taking the main pole (*siri bongkok*) of traditional houses. Arriving in the village, the *Wedi Ruha* (step on egg) ceremony was held as a symbol that the official *siri bongkok* wood was received as a villager, then another *Hambor Haju* (reconciling wood) ceremony was carried out so that all materials obtained from different places could "make peace" with harmoniously.

In Ruteng Pu'u village, the land that will be used as a place to build a house is traditionally obtained and can only be used by the residents of the clan concerned. The land in Ruteng Pu'u Village is communal land. Every plot of land is clear who has the right to use it and it is determined by custom.

Analysis of Manggarai Traditional Houses

Anthropological analysis of traditional Manggarai houses in Ruteng Pu'u village is applied to the 'shape' and 'layout' of the house. Maybe the 'shape' and 'layout' of a house is not the smallest unit, but in line with the opinion of Ahimsa- Putra (1999: 68) that analyzing the smallest unit is not the only way that can be taken. The main thing is that the unit must be a relation, because structural analysis focuses on relations.

Because it is also structural analysis can be applied to the existing relationship system in a larger unit by comparing it with other relations systems, so that certain patterns are repeated over and over in the same combinations of making the house in a particular society . Can be said to be related to the context or relation to the socio-cultural reality of the community concerned.

Relation to the Views of the Universe and Religion

According to Verheijen (1991, see also Jeraman, 2005: 91-92), the Manggarai people have the view that the universe consists of three main parts, namely *tanan wa* (lower world), *tana ine mese* (middle world, large motherland), and *awang eta* (upper world). The upper world is considered to be the residence of Mori Keraeng or Mori agu Ngaran (the Most Great), the Gods, fine spirits such as *darat*, *naga* and *teno*. The middle world is called *tana ine mese* or *mbaru bate ka'eng*, *tana lino* (house of residence), which is earth where humans and other living things live. In this case the earth is imagined as a mother (*ine*) who always cares for and protects her children. Whereas the lower world is called *tanan wa* (lower world) as a place to live various kinds of evil spirits such as *poti* and *jing*, besides that it is also used as a place for pets. The upper world is sacred, the lower world is not pure or not pure yet, while the middle world is a combination between the two. These three worlds are different, but have a close relationship with each other. The symbolization by the Manggarai people is expressed in their architecture by dividing it into three parts as well, namely the *ruang koe* (upper floor), *tenda* (middle floor), and *ngaung* (lower floor, under). Specifically, from the middle to the upper floors are divided into five parts, namely *tenda* (where humans move), *lobo mese* (food storage room), *lempa rae* (garden seed storage room), *ruang koe* (a place to store war equipment or heirlooms), and *se kang kode* (a place to store sacred objects). Overall, the Manggarai traditional house in addition to human habitation and activities in it, but can be said as a place of worship, as a meeting place between humans and the gods, ancestors, and the creator (*Mori Agu Ngaran Ata Jari Agu Dedek*).

Ruteng Pu'u Village people think that humans as inhabitants of the middle world who live in the real world, it is not easy to make contact with the inhabitants of the upper world and the lower world which are the occult world. According to the beliefs of the Manggarai people only certain humans from certain groups can relate to the inhabitants of the two supernatural worlds, and must be in a certain place. Humans or individuals who can relate to the inhabitants of the unseen nature are the traditional elders, namely *tua golo*, *tua teno*, *tua panga*, *tua kilo*. It is they who are considered to have knowledge of *adat* and lead the ceremony and say prayers (*torok*).

Through traditional elders who act as intermediaries, everything related to the occult is done. For this purpose the traditional elders lead various religious ceremonies carried out. They also determine when a ceremony can be done, because there are certain times that are considered good and there are times that are considered not good. In Manggarai on Thursday it was believed to be a good day to carry out a ceremony.

Now the religion adopted by most of the people of Ruteng Pu'u Village is Catholic. But in the past the belief system adopted was based on the worship of ancestors worship. Even so it does not at all cause a denial of the existence of the Creator. The main purpose of the worship ceremony is not solely to the spirits of the ancestors, but to *Mori Keraeng*. The belief in *Mori Keraeng* is a form of Manggarai people's trust in the highest form. According to Verheijen (1991: 224) *Mori Keraeng* is the origin of everything, protector and protector of humans, the center of the entire universe and the end point of human life, which creates everything that is on earth, and maintains what already exists. *Mori keraeng* is believed to be the creator, maintainer, owner of everything.

The community of Ruteng Pu'u Village also has the belief that every wood in the forest has its own guardian spirit. Therefore, in the process of taking wood to build a traditional house, it must go through a ceremony to ask permission from the "wood guard" by carrying out the *roko molas poco* ceremony. *Roko Molas Poco* is the ceremony of carrying out the main pillar (*sirih bongkok*) which is described as a beautiful girl (*molas*) who comes from the mountain (*poco*), then is picked up at the village gate (*pa'ang*) to be subsequently paraded into the construction site of the *rumah adat* (*gendang*). Before being paraded to the village, there was also a ceremony for *racang cola* to ask for blessing to the *Gas Tanah* in the forest where the wood used as *Siri Bongkok* grew. This ceremony aims to request the blessing of *Gas Tanah* by providing offerings in the form of betel (*cepa*) and pig. Pigs used are male pigs. After that all the villagers were mobilized into the forest to pick up the hunchback series. At the time of picking up *siri bongkok* in the forest, the *manuk teta weja* ceremony is held, with the aim of asking for prayer (*tesu*) to appreciate the land *ata riang agu lami tara mangan todo haju* (which preserves and gives life to trees). After that the wood was carried together to the village. One interesting thing is how the Manggarai community described the main pillar as a beautiful girl who came from the mountain. Mountain is always associated with coolness, beauty, harmony and cooperation. In this case wood gets preferential treatment. Without timber, traditional houses will not stand firm. For Manggarai people the house is not only a place to live, but also as a symbol of world order and social order. Home arrangement is also not only determined by the consideration of its functions, but also by the meaning contained in it.

Relation to Local Living Unity and Customary Government

Traditional customary government in Manggarai initially grew and developed from the tribal government (*wa'u*) led by the tribal chief (*tua golo*). The emergence of settled life in a settlement called *beo* has encouraged all *beos* to create rules and regulations to ensure security both inside and outside, especially in the face of attacks that disrupt village security. The tribal government was a genealogical government and was formed by *wa'u* (*klen*) forming a *beo*. The customary government still exists in the lives of the people of Ruteng Pu'u Village and this can be seen in the prevailing customary organizational structure.

Women in the organizational structure or customary government can be said to have almost no rights or obligations. However, in a customary consultation if there is an agreement or disagreement between the parties who are deliberating, then it is the voices of the women who can disperse the dispute or ease the atmosphere to be harmonious again.

Relation to the Kinship System

Every family in a class has never stood alone, and always has relationships with other families. Such relationships are made possible by the existence of kinship relationships due to marriage. Every family knows which family to take women in, and which family to give women. the female giver's family is considered to have a higher position and is called *anak rona*, while the female recipient's family is deemed to have a lower position and is called *anak wina*.

Marriage between young people in Manggarai can occur between couples of the same descent (one *wa, u*). Besides that it can also be of different breeds. Marriage in the line of one's own relatives is called *tungku* and marriage of *cako*. *Tungku* marriage occurs between a male child and a daughter from a mother's brother (*anak de amang*). *Tungku* marriage is a marriage that is considered legitimate by the Manggarai people. This is done so that family ties remain intact.

The pattern of settling after marriage in the descent (*wa'u*) system of the Manggarai people is patrilinear, which is calculated according to the male relative's relationship. Therefore, every individual in the community is included in his father's kinship. Whereas the mother's family is not included in the circle of kinship. The relationship between the family of the father and mother was woven through the *woe nelu* (kinship relationship built by marriage).

Adat way of stays after marriage are patrilocal. Married families live in men's homes. This is also very closely related to the phrase *ata peang* for Manggarai women. After marriage a woman will leave her father and mother and settle or become part of the husband's family. Status *ata peang* after marriage raises new rights and obligations for women. There are two daughters' rights as the host, namely: *Widang* and *Wida*. The court is a gift from parents or relatives who have a family in the form of items that can be used, such as clothing, jewelry etc. Whereas *Wida* is a gift from the parents or relatives who have family (*anak rona*) to *ata peang* side (*anak wina*). While the obligation is *hena le bantang* and *cau sida*. *Cau sida* is a mandatory contribution from *ata peang* in matters of death, marriage, and other customary affairs. *Hena le bantang* may be said to be an informal obligation.

Linkages to Settlement and Agricultural Land Patterns

As is known that the life of the Manggarai people in general, in the village of Ruteng Pu'u in particular, is based on the local unity of life called *beo*, which is a village inhabited by several families who gather in it. Each clan or family builds their houses in a part of the village by surrounding or orienting to a *compang* which functions important for religious ceremonies that are sacred.

In Manggarai, agricultural land (rice fields, gardens) is always centered towards the center, forming like a spider web. The division of agricultural land (*lingko*) which resembles a spider web is called *moso*, while at its center is called *lodok* so that such land or rice fields are called *lodok* fields. According to Sumardi (2016: 46) the center of

traditional houses, namely the main pole (*siri bongkok*) and agricultural land such as *Lodok* rice fields are places to connect with the unseen world called *ema eta agu ende wa* (father of heaven above and mother earth below). This supernatural existence is represented by the main pillar in the form of a phallus and a circle like the female genitals, a symbol of the unity of male and female concepts, *lingga* and *yoni*. Replication of fertility symbols, such as the main pillar (*siri bongkok*) which is described as a beautiful protective woman and a circular cone roof.

Relation to House Shape

As stated earlier, that the Manggarai people classify the form of their house into three parts, namely the upper part (A), middle (B) and bottom (C), which are imaginatively if we connect one another between the three points it will form a triangle. The floor under the stage (the part under the house) is the lower floor called *ngaung*. Then there is the middle floor where people are active, and at the top of the place where food is stored as well as a place for storing things that are considered valuable and sacred. The house is protected by an *ijuk* (*wunut*) roof with a circular cone shape. This house with a conical roof upwards is interpreted as a form of respect for the Almighty God. While the main pole (*siri bongkok*) and the circular roof like a spider web are symbols of fertility and protection.

Relation to Spatial Planning

Based on the *Mbaru Gendang* plan, it can be seen that in compiling the traditional house rooms, they divide it into three parts. There are rooms that are classified as opposite fields, namely fields A and C, and some are classified as middle-field, namely field B. There is a private space, public space, a special room for the establishment of the main pole in the middle. This classification system apparently relates to the views of the Manggarai people about the universe and their way of life.

The principle of division is essentially pointing to something that is contradictory, but which fills one another as one entity. The unit is connected by the existence of a *siri bongkok* (main pole, central part of the house) which acts and functions as an intermediate field. Likewise, a house, like a piece of wood, has a part of the skin, there is a piece of wood, and a middle part of wood. For Manggarai people, home is a place where life begins and also ends and is the center of the universe. Organizing a home is harmonizing life with nature.

The top-down opposition is a paired opposition related to the view of the universe divided into three parts. The male-female opposition is an opposition relating to the differentiation of the role of an individual inside and outside the home based on their sex. The role of men is identified with the public sector, which allows them to be more involved in the 'outside' affairs of the house and have a wider range. Therefore, all matters relating to the 'outside world' are done by men. As for all matters relating to adat and religion, it is the duty of men as well so that their position is considered higher than that of women. Whereas women in the domestic sector play a greater role in a 'narrower' scope, especially those related to household economic management and other female duties. Nevertheless, the position of women in society is considered important and decisive, because they are the ones who care for and educate the children, they are also the backbone of the family economy, and in their religious fields also provide all the ingredients for the ancestors.

Conclusion

For Manggarai people, home is a place where life begins and also ends and is the center of the universe. Organizing a home is harmonizing life with nature. This reveals the existence of a "center-network" pattern that always appears in the socio-cultural reality of the Manggarai people. The main element, in this case *siri bongkok*, the beautiful girl, as the main pillar that is supported and united thanks to the presence of other elements that become reinforcing elements. This union will create an harmony and continuity in the lives of the Manggarai people. In addition, the spirit of togetherness that assesses the public interest is higher than the personal interest reflected in the figure of the *gendang onen lingkon pe'ang* (drum house in *ulayat* land). The basic principle which is the embodiment of the Manggarai people's view of life in adapting to their environment. Arranging space for the Manggarai people does not only harmonize with the universe, but at the same time the welfare of their locality can be achieved.

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CRUISE SHIP INDUSTRY IN INTERNATIONAL RELATIONS STUDIES

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Abstract. This article aims at exploring the cruise ship industry from the perspective of International Relations. There are several reasons why this topic is interesting to discuss; first, the development International Relations post Cold War was no longer dominated by the issues of war and peace. Globalization with its complex dimensions is one of the contemporary issues in international relations. The dimension of globalization including environment, economic development, human resources, culture, democracy, and so on is a discourse that is not less interesting in the field of global politics. Second, the emergence of various non state actors such as international organization, nongovernmental organizations, transnational corporation, and even individuals has shifted the role of state as the only significant actor in the world stage. Cruise ship industry has several aspects which can be studied from the perspective of International Relations. This research is a descriptive qualitative research using literature study and in depth – interview method. Informants in this study were determined through purposive technique and snowball sampling. This research was mainly conducted in Denpasar, Tabanan, and Gianyar. This study found that cruise ship industry described the power relations between developed and developing countries. The results of this study are expected to provide a source of enrichment materials for the course of globalization and the introduction to tourism in global politics in the course of international relations, Faculty of Social and Political Sciences, Udayana University.

Keywords: cruise ship industry, power relations, international relations

BACKGROUND

The aim of this article is to analyze the cruise ship industry from International Relations perspective. The rapid development of this industry since 1990s has attracted the interest of young people particularly from developing countries to seek job opportunities in this industry. There are various reasons that become the motivation of the young people to work in cruise ship such as: looking for a more challenging work experiences, earning a high income in a short time, getting the opportunity to travel to many countries, and so on. In fact, the high income and material progress achieved by the cruise ship workers have cause many families, particularly in Bali, forced their family members to work in the industry (Resen and Pradipta, 2017). For the people from developed countries, cruise ship tourism offers wide range options of entertainment package while enjoying the journey over the ocean (Klein, 2002:2). There are several reasons why this study is interesting. First of all, the development of International Relations study has brought about many contemporary issues such as global environmental issues, global poverty, global diseases, gender, or human rights issues. It has expanded and enriched the discipline which traditionally covered the issues of war and peace. These global problems can no longer rely solely on the action of a state as a unitary actor. Cooperation among states must be established to find the solutions of these global issues. Secondly, one of the most crucial issues in the contemporary International Relations is globalization which covers many dimensions including environment, economic development, social, political, and cultural

aspects, democracy and many more. Those dimensions of globalization have also appeared to be discourses that is not less interesting. Thirdly, the expansion of issues in International Relations puts new actors, other than state to play significant role in the stage of world politics. These actors includes international organization, transnational corporations, and even individuals. All actors in International Relations interact one with another based on the power relations that they possess in political stage. Based on those reasons, the author is interested to discuss more in depth about the cruise ship industry which seems to begin experiencing the rapid development in the era of globalization. Wood (2006) mentions that a cruise ship is an icon of globalization. Two specific aims to be explored in this article are first, to analyze the development of cruise ship industry and second to explore the various issues in cruise ship industry from International Relations perspective.

METHODS

The data used in this study was predicated on library research and in depth interviews with key informant i.e. cruise ship workers. The subjects of the study were determined by purposive sampling and snowball techniques in order to obtain a complete and in-depth information about experiences during work on a cruise ship. Data analysis in this study began with the reduction of the data, the presentation of data, and the withdrawal of the conclusion. Data reduction is done to conduct the selection of relevant data in order to be able to achieve the purpose of the study. The presentation of the data is done in a descriptive qualitative for describing the data as a whole. Finally, inductive conclusion is done through finding the relationships between data that has been collected (Yusuf, 2014:400).

A. CONTEMPORARY INTERNATIONAL RELATIONS

The first definition of this study is elaborated from the name of this academic discipline : Inter-National-Relations which refer to the study of interactions of nation – states (Elias and Sutch, 2007: 1). Based on this definition, international relations merely described as the relationship between countries, in which state is the principal actor in the international political stage. Karen Mingst (2003) Karen Mingst defining international relations in a perspective no longer centred on the state. Mingst defines International Relations as the study of the interactions among the various actors that participate in international politics, including states, international organizations, non-governmental organizations, subnational entities like bureaucracies and local governments, and individuals. It is the study of the behaviors of these actors as they participate individually and together in international political processes (Mingst, 2003 ; 2). Currently, the definition of international relations presented by Karen Mingst (Mingst 2003; Hadiwinata, 2017) would certainly be the most appropriate definition in the context of international politics marked by the emergence of an era which is referred to as globalization.

In addition to the emergence of a diverse range of actors that participate in global politics, the scope of the issue of international relations also increasingly widespread. International Relations still discusses issues of war and peace, but other issues also have a significant portion of the discussion such as poverty, hunger, and global disease. International Relations also deals with natural disasters, refugee issues, human rights issues, women's issues, development issues and many other. A variety of these issues become the focus of this academic discipline post Cold war era in which the world is marked by the phenomenon of

globalization which has some characteristics such as deterritorialization which indicates that all forms of social activity is getting less restricted by the boundaries of geography and national borders (Baylis and Smith, 2000:25). Research on the cruise ship industry in International Relations studies focuses on actors such as transnational corporations (transnational corporations) as well as individuals in this case cruise ship workers. Transnational corporations operates like a double edged sword in the interaction between developed and developing countries. As Mingst (2003) mentioned at one hand transnational corporations are regarded as the agents of development, while on the other hand, transnational corporations are regarded as an instrument of exploitation especially in the host countries where they operates. became a discourse which is pretty interesting because on one hand, the transnational corporations be regarded as agents of development, especially in developing countries. While the other hand, transnational corporations were regarded as an instrument of exploitation against countries – developing countries. The contemporary issues in relation to cruise ship industry and International Relations are the politics of transnational corporations, environmental issues, and gender.

B. THE ISSUES

1. The Politics of Trans National Corporation

Transnational corporations is one of the manifestations of globalization in economic aspect. In fact, economic globalization which has started since the time of imperialism interconnect international trade, transnational production, global labour division, as well as global financial system (Heywood,2011:97). The relations between cruise ship industry and the politics of transnational corporations can be viewed from the system of flags of convenience (FOC) under which many cruise ship companies operating. The cruise ship industry allow a cruise ship to operate under the flag of another country, which is not the flag of the country of origin of the company. Thus flags of convenience is a connecting bridge between the countries "owner of the cruise ship" with the countries that offer the "flag" of his country. Major cruise ship companies comes from developed countries such as the United States, Germany, United Kingdom, Japan, and Italy. When they operated, they can use the flag of other countries that have registered themselves as the state flags of convenience. Countries listed as FOC countries are usually the developing countries have been built, such as the Bahamas, and Sri Lanka. The cheap registration fee , low taxes, cheap labor, as well as other regulatory causes cruise owners to register their ships under the flags of other countries. By using a system of FOC, then the cruise ship operation and subject to state rules based on FOC.

2. Environmental Issue

According to Jackson and Sorensen (2013), environmental issues enter into the discussion of International Relations with the consideration that the environment can also be a source of conflict, whether the domestic conflict and conflicts between countries (Jackson and Sorensen, 2013:508). The notion which strongly support the idea that environmental degradation threat is not just an issue for one particular state but a global issue can become a driving force for countries to conduct cooperation and establish environmental regime. In other words, the concern on environment is a global issue that should be the responsibility of the whole globe to overcome. The same argument expressed by Jaoyce Kauffman in Bakri (2017) by using an analogy of common good to refer the global environment.

From the perspective of International Relations, it is interesting to analyze the environmental regime of marine environment safety due to ship called the International Convention for the Prevention of Pollution from Ships abbreviated as MARPOL. In Klein (2002) it is stated that parts IV and V of MARPOL are specifically intended for regulation of cruise ships. Part IV regulates the regulation of pollution prevention (sewage / sewage) into the sea, while section V, which has been in force since 1989, regulates garbage from ships. Even though there have been international rules or regulations regarding the disposal of waste into the ocean, the implementation is still difficult to implement. Damage to the marine environment due to pollution from the cruise ship industry is huge. Some environmental organizations gave reports that the pollution caused by the waste of a cruise ship is indeed great. Some organizations voiced this issue, for example U. S. Environmental Protection Agency (EPA) States: "each passenger generates 100 gallons of wastewater per day, including 10 gallons of sewage. A mega ship with 5000 passengers and crew produces almost 500,000 gallons of wastewater and 50,000 gallons of sewage every single day of the year" (Klein, 2002). Based on the fact that there many cruise companies violate the regulation stated in MARPOL raises a question on the effectiveness of international regime to control the states, whether international regime has power over transnational corporations or it support the idea that transnational corporations have bigger power than state itself.

3. Gender

Gender issues in International Relations focus on the argument that women play many roles in international relations, both in war and peace, both in economy and development. However crucial the role played by women, women are still seen as having an inferior position in all aspects. This ultimately puts the women in disadvantaged position such as acts of discrimination, harassment both physically and mentally, sexist, and many other (Resen and Pradipta, 2017).

Klein (2002) stated that around 100,000 people worked on cruise ships in 2001, and 120,000 more workers would be needed in 2007. This number will continue to increase along with the development of the cruise ship industry. In the 1960s and 1970s, many cruise ships were from European countries. The company will be proud if it employs staff from Western countries. Along with the development of this industry and the development of globalization, most workers come from non-industrial countries such as from Asian countries, Latin America and the Caribbean. Workers from non-industrial countries dominate service (service) positions and find it difficult to develop their careers because managerial positions or other high positions have been held by workers from developed countries.

The number of jobs offered by the cruise industry, especially for workers from non-industrial countries, causes "working on a cruise ship" to be a dream. Apart from prestige, working on a cruise ship is considered a shortcut to collecting money quickly compared to working in the area of origin (Resen and Pradipta, 2017). Not only for male workers but also for women workers from developing countries.

In cruise ships, as in many other fields of work, female workers often get sexual harassment and sexual exploitation (Klein, 2002; Brida and Zapata, 2002, Resen and Pradipta, 2017). In 1999, sexual harassment cases surfaced on the Carnival Cruise Line, which admitted that there had been approximately 108 reports of sexual violence including 22 rape cases, 16 of which occurred between crew members. Similar violations were also recognized by the Royal Caribbean company which stated that 58 reports of sexual violence against women had been reported in the same year. Most of these cases of violence were not followed up further because

most victims did not dare to speak out due to the vulnerability of their position.

In many cases, women are helpless when fellow workers, whether from the same region or other countries, ask them to "date" and have intimate relations. (Interview on 17 June 2018). In some cases, female workers did not have the power to refuse because to avoid other problems that might arise because they still had to be aboard the ship for the next several months. The consequences they face such as physical violence, harassment, and anxiety because no one can help or higher authorities can eliminate the acts of violence directed at them (Interview June 20, 2018). Women in this case feel that their physical weakness and the absence of a place to save themselves when they feel threatened makes them finally join the "system" that occurs on the ship. One informant said that there were frequent physical harassment of women in various forms ranging from palpation, forced relations, to rape. In most cases, this only becomes a story that must be forgotten. Relationships with guests can also be a separate security threat for female cruise ship workers. The issue of sexual violence against women is not only experienced by cruise ship workers, but also experienced by female passengers. This shows that in general women have a fairly weak position in their relations with men. These cases related to gender issues show that in society, women are still seen as inferior beings compared to men. So that women are still vulnerable to various threats and pressures caused by gender differences. Therefore, studies on women are still very much needed to increase gender awareness and gender relations in many aspects of life.

CONCLUSIONS

The cruise industry is an icon of globalization as well as a symbol of power relations between developed and developing countries. This is the basis of why the cruise ship industry can be studied from the point of view of the study of International Relations. The development of the massive cruise ship industry since the 1970s has a close connection with global political issues including transnational corporate politics, global environmental issues, and gender in international relations.

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BIOMATERIAL DEVELOPMENT FROM INDONESIAN INDIGENOUS SILK WORM COCOON

(*PENGEMBANGAN BIOMATERIAL DARI KEPOMPONG ULAT SUTRA ASLI INDONESIA*)

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Abstract. Objectives: Silk is biocompatible as biomaterial and has been used commercially as sutures. More interesting properties of the silk is that the mechanical properties exceed all natural polymer and synthetic materials. In this research a type of silk suture is being developed from species of *Attacus atlas* to obtain better biocompatible sutures. *Attacus atlas* is a species of silkworm that consume not only single type of leaves so that yield variety type of cocoon fiber that can be arranged for the purpose of better biocompatibility comparing commercial silk suture. Silk suture that already established in the market is a base product of *Bombyx mori* species of silk which is only consume one type of leaf (mulberry leaves).

Methods: In this research, the *Attacus atlas* cocoon was produce by feeding with herb *Erythrina variegata*. The microstructure was observed , element composition as well as biocompatibles properties was investigated.

Results: A high composition of kalium (K) as well as chloride (Cl) are identified in the fiber. The released fiber from cocoon also indicates high biocompatibility that is promising as biocompatible suture.

Conclusion: The biocompatible fiber for future application as sutures is possible to be prepared by feeding the wild silkworm of *Atacus atlas* with leaf of *Erythrina variegata*. The fiber is found rich with kalium (K) as well as chloride (Cl) with irregular shape of crystal at the surface of the fiber.

Key words: Silk, herb, *Erythrina variegata*, sutures, biocompatibility

INTRODUCTION

Recently silk have been developed as engineering fiber to make artificial composite for biomaterial in medical application. Silks that is obtained from the cocoon are become long-standing interest by the scientist. The cocoon biophysics structure should be understood to make it constructive and effective. The scientist recently put attention on appearance and behavior of cocoon produced by different type of silkworm [1].

Silks are protein that are spun into fibers by larvae of Lepidoptera such of silkworms, mites , scorpions, flies , and spiders. Silk are produced through biosynthesis process in epithelial cells. The proteins are stored into the lumen of these gland prior spinning into fibers. Each exhibits mechanical properties to their specific functions and has a different composition of amino [2].

The silkworm *Attacus atlas* (Fig.1) is an insect species that can produce silk. Not like domesticated mulberry silkworm of *Bombyx mori* that eat only one type of plant (mulberry plant) or *monophagous*, the larvae or *Attacus atlas* feed variety of plants (*oli-gophagus*). They often move from one plant to another in their development. The maximum wing span of this moth reach 300 mm. This is the largest wing of all moths. This species is found in Southeast Asia in tropical rainforest habitats at altitudes around 1500 m [3].

Tissues such as ligament, tendons, bone, are incapable of self-repair because of the diseased or damaged. It is required a substitute biomaterial to aid the healing process. Silk is slow degradability and biocompatible with impressive mechanical properties that render silk as a biomaterial for further exploration. Silk fibroin protein is mechanically robust and biocompatible so it can be designed to desired specifications [4].

The larvae of silkmoth spin the silk threads to form a cocoons. The function of the cocoon is to enwrap for metamorphosis. The variations in climate and diet, resulted diversity in the properties and types of the cocoons and fibers produced by silk within the samespecies. The cocoon are composed of two proteins namely, fibroin and sericin. The function of these protein structures includes protection from predators, pathogens, parasitoids, and assisting to complete metamorphosis by moisture and thermal. The larvae of *Attacus atlas* produce cuticular wax from abdominal tubercles. This wax forms a dense, white, powder coating over dorsal and lateral surfaces of the larva. The function of waxes is for conservation of the water, anti parasitoid, and anti predator [5].

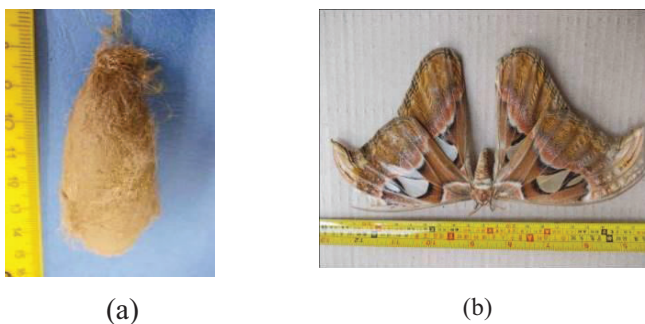


Fig 1.: Indonesia origin of cocoon(a) and Silkmoth of wild *Attacus atlas* (b)

Medicinal plants provide molecules that lead to the discovery of new drugs. Plants derived biologically active compounds have become important source of drug Because of the increasing recognition of herbal medicine as an alternative of health care. *Erythrina variegata* plants contain phytopharmaceuticals, which have very important applications in the fields of medicine for the prevention of diseases. Plant metabolites that are phenolic exhibit antiallergenic, antimicrobial, antiatherogenic, antithrombotic, antiinflammatory, cardioprotective and vasodilatory effects [6].

Erythrina variegata has been used in folk medicine for treatment of a antihelminthic and narcotic, venereal disease, tooth-ache, asthma, insomnia and malarial fever. Alkaloids from *Erythrina variegata* were investigated for their anti-cancer activity, a muscle relaxant as well as Haemoerythrina [7].

The bark of *Erythrina variegata* traditionally is used to treat stomachache and swellings. Its leaves are occasionally used to treat wind-damp obstruction syndrome in rheumatic joint pain and spasm of the limbs or lower back and knee pain, to stimulate lactation and menstruation for women and eye ailments. Isoflavones are compounds in plant foods, structurally similar to the mammalian estrogens recently received attention for use in the prevention of postmenopausal bone loss. Data from animal experiments provided evidence that isoflavones can attenuate

menopausal bone loss, and it was suggested that isoflavones is responsible for protective effects on bone. Phytochemical studies on *Erythrina variegata* plant have led to the isolation of many isoflavones [8].

Phytochemical investigation of the non-alkaloidal secondary metabolites in *Erythrina variegata* revealed the presence of several isoflavonoids and one cinnamylphenol and which exhibit activities of antibacterial and anti-inflammatory. *Erythrina variegata* is used medicinally as an antibacterial, antipyretic, anti-inflammatory, antiseptic agent and as a collyrium. *Erythrina variegata* is found in many tropical and subtropical regions [9].

Erythrina variegata having positive result as antifungal against *Aspergillus fumigatus*, *Rhizoctonia solani*, *Pythium ultimum*, but negative for *Phytophthora parasitica*. It is also found that *Erythrina variegata* having negative result as antibacterial for *Staphylococcus aureus* and *Escherichia coli* [10].

In this research, the leaves from *Erythrina variegata* is managed to become a food for *Attacus atlas* larvae. The cocoon obtained will be observed and the element contained in it will be identified as well as its biocompatibility to mammalian cells for future application as sutures.

EXPERIMENTAL

The egg of *Attacus atlas* were collected from their original location in Indonesia. The leaf of *Erythrina variegata* (Fig. 2) were prepared from the source in Indonesia. Figure 3 is the appearance of caterpillars of *Attacus atlas* during consume leaf of *Erythrina variegata*



Fig. 2: Indonesian source leaf of *Erythrina variegata*



Fig. 3: Caterpillar of *Attacus atlas* consuming leaf of *Erythrina variegata*

The special cage with the tree of *Erythrina variegata* that was grow inside the cage was prepared. The caterpillars of *Attacus atlas* were let to consume the leaves *Erythrina variegata* until reach their final stage inside the cage. At final stage the silkworm provide themselves a cocoon for final step of metamorphose.

The silkmoth of *Attacus atlas* was let free exit from the cocoon for the next breeding. The cocoons left by the silkmoth were dried. The microstructure of the cocoon were investigated and recorded under scanning electron microscope (SEM). The Energy Dispersive X-ray spectroscopy method was introduced to reveal elements compositions in the cocoon. The result was presented in table and graphic.

For biocompatibility test, the cocoon of *Attacus atlas* were boiled in 0.1 M NaOH for about 1 hour. Released fibers obtained were washed by hot water. Released fibrous tufts were sterilized with ethanol for 1 day at room temperature. Samples were washed by PBS. Fibrous tuft was soaked with suspension of U2OS cells in DMEM cultivation medium supplemented with 10 % FBS (105 cells per ml) for 2 h in the atmosphere of 5 % CO₂. The humidity was 95 % and temperature at 37°C. The cell suspension was gently aspirated and the fibers were immersed in the cultivation medium and the cells were cultivated for two days. The fibers were transferred to PBS and gently washed with PBS. Cells attached to the fibers were fixed with formaldehyde in PBS and washed. Nuclei were stained by using DAPI Sigma-Aldrich, (USA) and actin microfilaments by phalloidin covalently conjugated with TRITC (Sigma-Aldrich,USA) in PBS. Fluorescence microcopy was carried by microscope IX-71 (Olympus, Japan).

RESULT AND DISCUSSION

Figure 4. is the appearance of the cocoon that is obtained by feeding with leaf *Erythrina variegata*.



Fig 4: Cocoon of *Attacus atlas* yield from feeding with *Erythrina variegata*

Result on observation by using SEM with low Magnification (100x) can be seen at Fig. 5. Irregular crystals were found on the surface of the cocoon that was feeding with *Erythrina variegata* at very high magnification (10000x) as can be seen in Fig. 6.

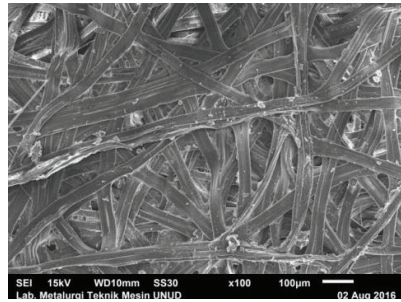


Fig. 5: Cocoon of *Attacus atlas* yield from feeding with *Erythrina variegata* (100x)

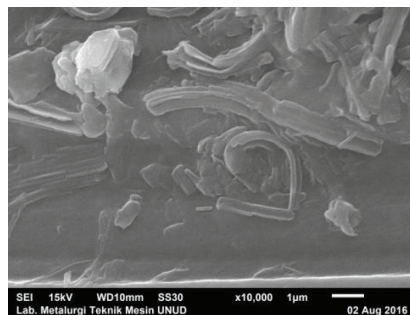


Fig. 6: Irregular crystal shape were found on the surface of the cocoon feeding with *Erythrina variegata* (10000x)

Elements analysis with energy dispersive X-ray spectroscopy (EDS) on the surface of the cocoon reveal that by feeding the larvae of *Attacus atlas* with *Erythrina variegata* resulting the cocoon contain Chlorine (Cl) around 2.96 mass% (Fig. 7). The other elements were found are Carbon (C), Oxigent (O), and Kalium (K) as can be seen at Table 1. Other species of wild silk cocoon usually having cubic crystal on the surface such as *Antheraea pernyi*, *Hyalophora gloveri*, and *Bunaea aleinoc* [1].

Finally, we analyzed biocompatibility of the fibers obtained by degumming of *Attacus atlas* by using 0.1 M NaOH. The fibers were sterilized by ethanol and a suspension of human osteosarcoma cell line (U2OS) was applied. The cells were able to attach and grow during following two days, indicating their excellent biocompatibility. The cells were attached and grew well on the fiber surface.

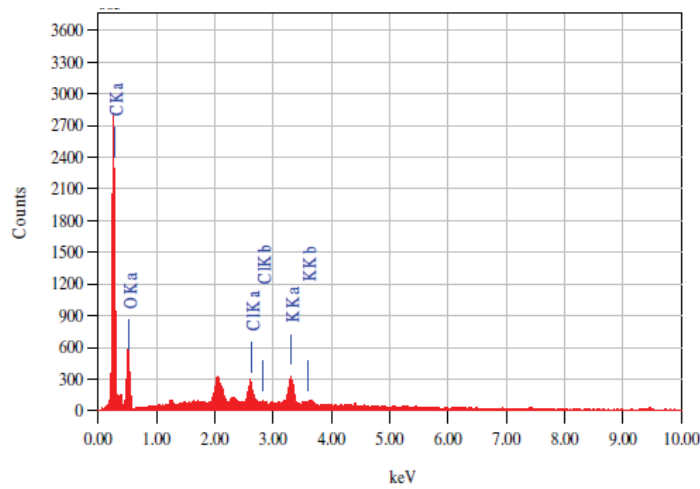


Fig. 7: Energy dispersive X-ray spectroscopy result on the cocoon feeding with *Erythrina variegata*

Table 1: Elements composition in the cocoon feeding with *Erythrina*

2	O	26.27
3	Cl	2.96
4	K	5.92

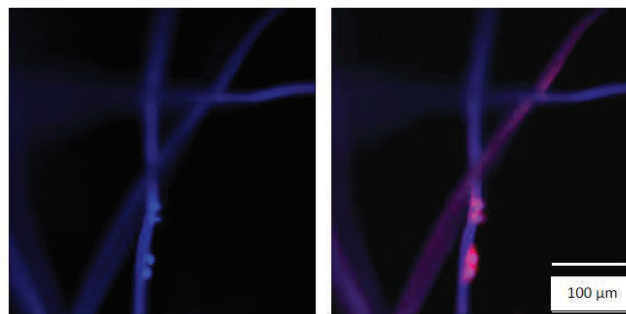


Fig. 8: Cell growth on *Attacus atlas* fibers. U2OS cells were allowed to attach to the fibers and cultivated for two days. Nuclei were stained (using DAPI) and was analyzed by fluorescence and light microscopy.

CONCLUSION

The biocompatible fiber for future application as sutures is possible to be prepared by feeding the wild silkworm of *Attacus atlas* with leaf of *Erythrina variegata*. The fiber is found rich with Potassium (K) as well as chloride (Cl) with irregular shape of crystal at the surface of the fiber.

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TYOLOGY OF AREAS AND POTENTIALS LEADING COMMODITIES OF THE AGRICULTURE SECTOR FOOD PLANTS IN KARANGASEM DISTRICT

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Abstract. Karangasem Regency is one of the regencies in Bali Province which has potential in the agricultural sector, in addition to Tabanan Regency. Until now the agricultural sector is still the main sector supporting the economy. The magnitude of the role of the agricultural sector in Karangasem Regency is inseparable from the efforts of Karangasem Regency to maintain land use, especially in agricultural businesses. In November 2017 there was an eruption of Mount Agung in Karangasem Regency. Based on these conditions, it is very interesting to study further about regional typologies, identify potential leading commodities in the agricultural sector (the food crops sub-sector) and the competitiveness of food crops sub-sector commodities so that later regional development strategies can be directed to the Karangasem Regency. This research uses Klassen typology analysis, location quotient (LQ), and shift share analysis (SSA). Klassen typology states that Karangasem District includes quadrant IV (relatively underdeveloped area). Potential of superior commodities such as wet rice are found in all sub-districts except Kubu and Abang. Corn is found in Karangasem, Manggis, Kubu, Abang Districts. Potential of sweet potatoes is found in the Districts of Rendang, Bebandem, Selat, and Abang. Potential of cassava is found in Kubu Subdistrict. Potential peanuts are found in Rendang, Karangasem, Bebandem, Selat, and Sidemen Subdistricts. Soybean potential is found in Sidemen and Manggis Districts. While green beans have the potential to be planted in Kubu District. Among the eight sub-districts, Rendang and Karangasem sub-districts that have the highest competitiveness for rice, corn and cassava commodities.

Keywords: Klassen typology, LQ, SSA

BACKGROUND

The process of economic development does not occur by itself, but requires a variety of consistent efforts from various parties that aim to provide maximum prosperity for humanity. Economic growth and its sustainable processes are the impacts of economic growth in addition to increasing income and ultimately will affect regional revenues. Increasingly able to explore the existing regional economic potential, the greater the Gross Regional Domestic Product (GRDP) and Regional Original Income (PAD), so as to be able to improve regional finances in financing sustainable development processes. One sector that often gets considerable attention from the government is the agricultural sector. The agricultural sector is the base sector in rural economic activities. If this base sector can sustain the lives of people in an area, the sustainability of the agricultural sector will still be realized. Bali Province is one of the provinces in Indonesia that uses rural areas as a gateway to the agricultural sector that supports the tourism sector.

The contribution of the agricultural sector in 2016 amounted to 14.74 percent of the GRDP of Bali Province, number two of eleven sectors (the sector of providing accommodation and eating drinking occupied the first position, amounting to 22.82 percent). The food crop subsector contributes 2.15 percent to the agricultural sector in Bali Province (BPS Bali

Province, 2017). Karangasem Regency is one of the regencies in Bali Province which has potential in the agricultural sector, in addition to Tabanan Regency. The contribution of the agricultural sector amounted to 26.21 percent of the GRDP of Karangasem Regency and 12.35 percent of the GRDP of the Province of Bali. Until now the agricultural sector is still the main sector supporting the economy. The potential of the agricultural sector which is quite large can also be seen from the livelihoods of the people in Karangasem Regency who mostly work as farmers, which is 50.61% (BPS Bali Province, 2017). The magnitude of the role of the agricultural sector in Karangasem Regency is inseparable from efforts Karangasem Regency to maintain land use especially in agricultural businesses.

In November 2017 there was an eruption of Mount Agung in Karangasem Regency. Mount Agung eruption has had an impact on the development of sectors in Karangasem Regency, including the agricultural sector. This condition will certainly influence the contribution of the agricultural sector to the district GRDP. Based on these conditions, it is very interesting to investigate further about the changes in sectoral contributions that occur and the identification of potential leading commodities in the agricultural sector (especially the food crops sub-sector) so that later regional development strategies can be directed to the Karangasem regency. Based on the background of the above problems, the purpose of this research is to find out: 1. Typology of Karangasem Regency; 2. Potential superior commodities of food crops sub-sector; and 3. Competitiveness of each region (sub-district) related to leading commodities of the food crop sub-sector.

MATERIALS AND METHODS

Research location This research will be conducted in Karangasem Regency, Bali Province. Site selection is done purposively with the consideration that this district has the second lowest economic growth rate after Jembrana Regency and has experienced Mount Agung eruption in 2017. This condition will affect the sector's contribution to GRDP so that identification of regional typologies and determination of leading sectors is needed, so that the potential for each sub-district in Karangasem Regency can be known.

The data used in this study is primary data and secondary data. Data analysis methods used to answer research objectives are:

1. To analyze the regional typology in Karangasem Regency, the Klassen Typology analysis is used (Hoover and Giarratani, 1985).

Kuadran I (Developed sector) $si > s$ dan $ski > sk$	Kuadran II (Stagnan sector) $si < s$ dan $sk > ski$
Kuadran III (Developing sector) $si > s$ dan $ski < sk$	Kuadran IV (Underdeveloped sector) $si < s$ dan $ski < sk$

Figure 1. Typology Klassen

Note:

s: GRDP growth rate in the study area

si: GRDP growth rate in the reference area

sk: GRDP per capita in the study area

ski: per capita GRDP in the reference area

2. To analyze the potential of superior commodities in the food crops sub-sector, use Location Quotient (LQ) analysis. LQ analysis is used to find out base and non-base commodities in an area. The calculation results will show that a commodity is classified as a base or not in each sub-district, which is indicated by the LQ value. The LQ model has the following formula (Hoover and Giarratani, 1985):

$$LQ = \frac{V_{ik} / V_k}{V_{ip} / V_p}$$

Note:

V_{ik} = Value of commodity production in the study area (sub-district)

V_k = Total production value of all commodities in the sub-district

V_{ip} = Value of commodity production in the reference area (district)

V_p = Total production value in Karangasem Regency

3. To analyze the competitiveness of each region (sub-district) related to the leading commodities of the food crops sub-sector, the Shift Share (SSA) analysis is used. The SSA model has the following formula (Hoover and Giarratani, 1985):

$$PPW = r_i (r_i' / r_i - n_t' / n_t)$$

$$PP = r_i (n_t' / n_t - N_t' / N_t)$$

Note:

r_i = commodity production i early year district

r_i' = commodity production i final year district

n_t = commodity production in the district in the early years

n_t' = commodity production in the final year regency

N_t = total district production in the first year

N_t' = total district production in the final year

$PP > 0$ = commodity i in region j rapid growth

$PP < 0$ = commodity i in region j slow growth

$PPW > 0$ = j region has good competitiveness in commodities i compared to other regions or region j has comparative advantage for commodities i compared to other regions

$PPW < 0$ = commodity i in region j cannot compete well when compared to other regions

PB = net shift = $PP + PPW$

$PB \geq 0$ = growth of commodity i in region j including progressive group (forward)

$PB < 0$ = growth of commodity i in region j including sluggish

RESULTS AND DISCUSSIONS

Typology of the Region of Karangasem Regency

Karangasem Regency occupies quadrant IV (2012-2016). Quadrant IV is a regional typology that is relatively left behind. The position of Karangasem Regency was followed by Bangli, Klungkung, and Jembrana Regencies. This indicates that these districts are relatively underdeveloped regions, both in terms of the level of development and the pace of growth compared to other districts in the Province of Bali. Karangasem Regency requires special attention from the government in overcoming the economic problems faced. Karangasem Regency is ranked lowest in terms of economic growth rate.

Kuadran I (Developed sector) Badung, Denpasar	Kuadran II (Stagnan sector) -
Kuadran III (Developing sector) Gianyar, Tabanan, Buleleng	Kuadran IV (Underdeveloped sector) Bangli, Klungkung, Karangasem

Figure 2. Typologi Klassen of Bali Province

According to the Bali Provincial BPS (2017), the average economic growth rate of Karangasem Regency over the past five years was 5.09. The average GRDP per capita of Karangasem Regency for 5 years (2012-2016) was Rp. 17,744,861.28, the second lowest after Bangli Regency. This condition is influenced by one of them by the number of poor people in Karangasem Regency. Karangasem Regency has a high figure for the percentage of poor people in Bali Province. The percentage of poor people in this district is 6.61 percent. Besides that, the monthly per capita expenditure in Karangasem Regency is also very low. The average per capita expenditure of Karangasem Regency by type of expenditure in regencies / cities in Bali Province in 2015-2016 was Rp. 677,704.

Table 1. Average GRDP Per Kapita of Karangasem Regency (from 2012 to 2016)

No	Kabupaten	PDRB Per Kapita (Rp)
1	Buleleng	27.297.681,45
2	Jembrana	26.395.091,04
3	Karangasem	17.744.861,28
4	Klungkung	19.599.587,15
5	Bangli	15.804.991,28
6	Gianyar	29.410.602,78
7	Tabanan	27.366.305,27
8	Badung	48.104.858,62
9	Denpasar	30.999.009,26
	Bali	29.714.521,87

Source: Data is processed from BPS, Bali Province (2017)

Potential of Commodities for Food Crop Subsectors

LQ (Location Quotient) analysis is an analysis technique that is used to determine the concentration of an activity in an area within a wider aggregate area coverage. This LQ analysis is one of the techniques developed to carry out basic economic analysis, not only limited to economic discussion but also used to determine the distribution of commodities or identify areas based on their potential. Based on an understanding of basic economic theory, relevant LQ techniques are used as a method of determining superior commodities, especially from the supply side (production or population). According to Rustiadi, et al. (2015), several assumptions used in this analysis are: (1) the condition of the area is relatively uniform, (2) the activity pattern is uniform, and (3) each activity produces the same product quality. The condition of the area is relatively uniform, meaning the conditions outside the analyzed variables are assumed to be the same, for example the quality of the land is the same, the quality of human resources is the same, the capacity of the infrastructure is the same. A uniform pattern of activity means that the mastery of technology is relatively the same. The average production of lowland rice in Karangasem Regency during the last 5 years (2012-2016) was 71,841.11 tons (BPS Karangasem Regency, 2017).

Based on the LQ analysis, the commodities of lowland rice with $LQ > 1$ were Rendang, Sidemen, Manggis, Karangasem, Bebandem and Selat Subdistricts. This condition illustrates that these sub-districts still have the potential to be planted with paddy fields, except Abang and Kubu Districts. Abang Subdistrict in 2015 experienced a decrease in rice production due to crab pest attacks, while Kubu District was one of the sub-districts in Karangasem Regency which did not have the potential of paddy fields. Kubu District is in the northern part of the island of Bali and is in direct contact with the Bali Sea and is at the foot of Mount Agung. This sub-district is one of the areas that became the lava flow route when Mount Agung erupted in 1963. That is also why, at present, Kubu District is a sand mining area and is the main supplier to meet the needs of sand and stone material for the Western part of Bali. Buleleng Regency and Negara Regency. The type of rice planted is superior rice and rice. Superior rice includes: IR 64, Cihorang, Fatmawati, Sinta Nur, while the local rice species grown in these sub-districts are Rojolele.

Based on the potential of corn commodities, districts that have $LQ > 1$ are Manggis, Karangasem, Abang and Kubu Districts. The average maize production in Karangasem Regency for 5 years (2012-2016) was 13,448,062 tons. Abang District has the biggest potential compared to other districts. The types of corn grown in these sub-districts are local corn (frog corn, kretek corn, yellow manado corn, metro corn). In Karangasem Subdistrict, especially in East Seraya Village, corn is planted as corn which is used as popcorn. This type of corn is *Zea Mays Saccharata*. The type is almost the same as other corn, but the size of the corn grain is relatively smaller with hard skin, but the inside of the corn seed contains flour.

Cassava is also a potential in Karangasem Regency. Only Kubu District has an LQ value > 1 . This cassava plant is very potential to be developed in the district, considering the geographic conditions in this sub-district are not possible for rice cultivation. The average production of cassava for 5 years (2012-2018) is 81,007.97 tons. The people in this sub-district plant cassava for sale as a substitute for rice. The types of cassava grown in this area are hui jendral, boled, hui prancis, ketela pohung, cassava, yam.

Sweet potato plants also have the potential to be developed in Karangasem Regency. Potential of sweet potatoes is found in Rendang, Abang, Bebandem, and Selat Districts (LQ value > 1). Average sweet potato production in Karangasem Regency for 5 years (2012-2018) is

17,108.33 tons. The types of sweet potatoes grown are hui boled, pendem cassava, and Javanese cassava.

The potential of peanut in Karangasem Regency is found in Rendang, Sidemen, Karangasem, and Bebandem Districts ($LQ > 1$). The average peanut production in Karangasem Regency for 5 years (2012-2016) was 136.01 tons. Peanut production is not as much as other food crop production. The peanut producing districts have the moisture needed for the growth of peanuts. The average humidity in the area is 65-75%, which is one of the good growth conditions for peanuts.

The average soybean production in Karangasem Regency is 103.31 tons for 5 years (2012-2018). The potential of soybeans is in Sidemen and Manggis Districts ($LQ > 1$), considering the area's height is < 500 asl, which is one of the requirements for soybean growth). Soybeans do not demand specific soil structures as a growing requirement. Even under conditions of less fertile and somewhat acidic soils, soybeans can grow well, not flooded with water which will cause root rot.

Other potentials found in Karangasem Regency are green beans. Only Kubu District has the potential of green beans ($LQ > 1$). This plant has a high content of vegetable protein and contains lots of vitamins, minerals and omega 3 so it is not surprising that this plant is widely consumed and cultivated by Indonesian farmers. The average green bean production in Kubu District for 5 years (2012-2018) is 2,008.57 tons. Kubu Subdistrict is the only sub-district in Karangasem Regency that grows green beans because the geographical conditions are very supportive. Green bean plants grow well in lowland areas, an altitude of not more than 700 asl, and have an average rainfall of 50-200 mm / month.

Competitiveness of Each District (Sub-District) Regarding Leading Commodities for Food Crop Subsectors

Karangasem Regency has the potential in developing food crops sub-sectors, especially those related to foodstuffs, such as rice, corn, sweet potatoes, cassava, peanuts, soybeans, and green beans. Nearly eight sub-districts in Karangasem Regency have this potential. All sub-districts in this district (Rendang Subdistrict, Sidemen Subdistrict, Manggis District, Karangasem District, Abang Subdistrict, Bebandem District, Selat Subdistrict, and Kubu District) have the potential for rapid growth of wetland commodities ($PP > 0$). However, only three sub-districts have good competitiveness, namely Rendang District, Karangasem District, and Selat District ($PPW > 0$) compared to other districts in the district.

When viewed from the corn commodity, only Karangasem District has better competitiveness compared to other sub-districts in Karangasem Regency ($PPW > 0$). The two corn-producing villages are Seraya Barat Village and East Seraya Village which are located in the hills of Gunung Agung area. This type of maize is a type of brondong corn (*zea mays saccharata*) which is used in making popcorn.

Tubers such as cassava, all sub-districts in Karangasem Regency have rapid growth ($PP > 0$). Among these sub-districts, there are only three sub-districts that have good competitiveness, namely Rendang Subdistrict, Karangasem District, and Selat District ($PPW > 0$). As for the sweet potato commodity, only Rendang and Selat sub-districts have good competitiveness ($PPW > 0$).

Although the cassava commodity in this district is quite high, but the processing into value-added commodities has not been found in this district. This commodity is consumed more as a primary product. The direction of the development of cassava commodities is emphasized

more on improving the quality of cassava stripping facilities, procurement of washing facilities and cassava storage warehouses

Other commodities that are potentially also in this district are nuts (peanuts, soybeans, and green beans). Manggis and Karangasem Subdistricts have good competitiveness for peanut commodities ($PPW > 0$) even though the growth is slow ($PP < 0$).

Soybean commodities that have good competitiveness ($PPW > 0$) are found in the Manggis District. The average soybean production in the Manggis District every year (2012-2016) is 71.04 tons. Soybeans in this sub-district have been processed into value-added products, such as tofu and tempeh which are traditionally processed. The direction of developing secondary activities for soybean commodity is to develop the tofu, tempe, milk and cake processing industries.

Green bean commodities are only produced in Kubu Subdistrict. These green beans have fast growth ($PP > 0$). The average green bean production for five years (2012-2016) in Kubu District is 2,000.58 tons. Green bean commodities are mostly consumed as primary products.

CONCLUSIONS

Karangasem Regency is one of the regencies in the Province of Bali which has a very high IKG which occupies a quadrant IV typology (the area is relatively underdeveloped). Karangasem Regency has potential in the agricultural sector. The base of the food crops sub-sector in this district is paddy rice, corn, sweet potato and peanuts. Almost all sub-districts have the potential, except for commodities of cassava and soybeans. Based on SSA analysis, only three sub-districts have good competitiveness for lowland rice, namely Rendang District, Karangasem District, and Selat District ($PPW > 0$) compared to other districts in the district.

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OPTIMIZATION OF PLACEMENT AND SIZE OF DISTRIBUTION GENERATORS USING QUANTUM GENETIC ALGORITHMS TO IMPROVE POWER QUALITY IN BALI DISTRIBUTION NETWORKS

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Abstract-- World energy requirement increased significantly, the main energy source from an oil is very limited. This problem drive an enhancement develop which support small scale generator to be connected near distributed network or near load center. Distributed Generator (DG) is a power plant which have a little capacity range between 15 kW to 10 MW. Basically, DG instalation is one way to fix a voltage profile where an installed DG would inject voltage to a transmission system or electric power distribution.

Bali is a tourism area which it's electric power source got a supply from Java and some large scale plant which use fuel of oil and gas, which until now still needed more of electric energy. An addition small scale generator for Bali is very helpful where economic profit is distribution cost and transmission cost's reduction, electric cost and saving fuel energy. Technically a distributor of DG must be done correctly and optimal from it's size or location so that give a maximum result from economic side, minimalizing electricity loss and increase voltage profile which result an electric power quality is improved. For that, in this research will use heuristic optimation with use Quantum Genetic Alghorithm method to placing distributed generator to Bali Electricity Network. To counting electicity loss and voltage profile, a method which used to solve it is Newton Raphson method.

The result of this research, DG is installed to feeder which plaed in Abang Sub-District, Karangasem District where Abang Feeder had a total 43a bus which is a part from Bali Distribution System. With using QGA, DG is installed to bus 1, 5, 7, and 302 with each DG capacity is 0,374 MW, 1,894 MW, 1,988 MW and 0,500 MW, after installment of DG, voltage profile can be fixed. Voltage profile for some bus to Abang Feeder could be fixed from 0,83 pu to 0,98 pu. Electricity loss from 1,105 MW become 0,234 MW.

Keywords : Optimation, Distributed Generator (DG), Quantum Genetic Alghorithm, Voltage Profile, Electricity Loss.

I. INTRODUCTION

Electricity requirements in Bali that are increasing every year must be balanced with an increase of electricity supply. Concerns about economic problems and environmental pollution encourage to increasing in development that supports small-scale generators to be connected close to distribution networks or near load centers. To meet this urgent requirements, the distribution of small-scale generators from renewable energy such as Micro Hydro Power Plants, etc. which are connected to the PLN electricity network is due to the decreasing voltage in several loads which increases power losses. PLN standardizes the normal voltage from 0.9 pu to 1.05 pu (SPLN 72: 1987) where in some of the load stress is brought in 0.9 pu and this matter needs to be stabilized.

Installation of Distribution Generator (DG) has several advantages in economic, environmental and technical terms. Benefits from economic is reduce transmission distribution and costs, electricity prices and fuel economy. Planning an electrical system with DG Presence requires the definition of several factors, such as: the number and capacity of the unit, the best

location, the best technology to be used, the network connection method. For large networks, software is needed to calculate it.

This research proposed to use Quantum Genetic Algorithm (QGA) combined with Newton Raphson power flow to optimize the placement and size of Distributed Generators (DG) in the Bali distribution system to improve the quality of electric power.

II. LITERATUR REVIEW

A. Power System Distribution Network.

Electric power centers are generally located far from the center of the load. Electrical energy produced by the generation center is channeled through the transmission network. Generator of generator voltage is relatively low (6 kV - 24 kV) where this voltage is raised with a power transformer to a higher voltage of 150 kV - 500 kV. The purpose of increasing this voltage, in addition to enlarging the conductivity of the channel (directly proportional to the square of the voltage), is also to minimize power losses and voltage losses in the transmission line. The reduction in voltage from high extra high voltage networks before to consumers is done twice. The first is done at the substation (GI), reducing the voltage from 500 kV to 150 kV or from 150 kV to 70 kV. The second is done at a distribution substation from 150 kV to 20 kV or from 70 kV to 20 kV. The power line from the source of the power plant to the last transformer, often referred to as the transmission line, while from the last transformer, until the last consumer is called the distribution channel or primary channel. The distribution system voltage can be grouped into 2 major parts, namely:

1. Primary Distribution (20kV)

The 20kV distribution network is often called the Medium Voltage Distribution System. Networks In the medium voltage distribution system (Primary 20kV) can be grouped into five models, namely the Radial Network, The Connecting Network (Tie Line), Circle Network (Loop), Spindle Network and Cluster Systems.

2. Secondary Distribution (380/220V).

The 380 / 220V distribution network is often called a secondary distribution network or called the 380 / 220V Low Voltage Network.

B. Newton Raphson Method

Newton Raphson (N_R) is a method that is often used in power flow analysis to calculate system losses and stresses on each system bus. In the use of several things known as:

Power Injection

Power on Bus i :

$$S_i^* = V_i^* \sum_{k=1}^n Y_{ik} V_k \dots\dots\dots 1)$$

Updated variables after k iterations :

$$\Delta\delta_i^{(k+1)} = \Delta\delta_i^{(k)} + \Delta\delta_i \dots\dots\dots 2)$$

$$|V_i|^{(k+1)} = |V_i|^{(k)} = \Delta|V_i| \dots\dots\dots 3)$$

Power flow from bus i ke bus j :

$$S_{ij} = V_i I_{ij}^* = V_i \left(\frac{V_i - V_j}{z_{ij}} + V_i Y_{ij0} \right) \dots 4)$$

Power flow from bus j ke bus i :

$$S_{ji} = V_j I_{ji}^* = V_j \left(\frac{V_j - V_i}{z_{ji}} + V_j Y_{ji0} \right) \dots 5)$$

Channel losses :

$$P_i = \sum_{i=1}^{bus\ no} \sum_{j=1}^{bus\ no} (S_{ij} + S_{ji})$$

$$= \sum_{i=1}^{bus\ no} \sum_{j=1}^{bus\ no} \{ (P_{ij} + Q_{ij}) + (P_{ji} + Q_{ji}) \} \dots \dots \dots 6)$$

C. *Quantum Genetic Algorithm (QGA)*

Quantum Genetic Method Algorithm is based on the concepts of quantum bits (cubite) and superpositions of quantum mechanical forms. The smallest information is stored in two forms of quantum numbers called quantum bits or cubits. Kubit may be in the '1' or '0' state / status, or the superposition of both. The status of the cubite can be shown as the following equation:

$$|\psi\rangle = |\alpha|^2 + |\beta|^2 \dots \dots \dots 7)$$

Where α and β is a complex number that corresponds to the probability of the amplitude of the state. Normalization from the states is:

$$|\alpha|^2 + |\beta|^2 = 1 \dots \dots \dots 8)$$

QGA is based on the concept of cubite. One cubit is defined to consist of a number pair (α, β) as follows :

$$\begin{bmatrix} \alpha \\ \beta \end{bmatrix} \dots \dots \dots (9)$$

Which is the equation of the equation (8) dan (.9).

For m cubits represented as the following matrix below :

$$\begin{bmatrix} \alpha_1 & \alpha_2 & \dots & \alpha_m \\ \beta_1 & \beta_2 & \dots & \beta_m \end{bmatrix} \dots \dots \dots (10)$$

Where,

$$|\alpha_i|^2 + |\beta_i|^2 = 1, i = 1, 2, 3 \dots m$$

This representation has the advantage of being able to represent several superpositions of circumstances. For an easier understanding, here the following example: three cubits with three pairs of numbers as follows:

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{\sqrt{3}}{2} & 1.0 \\ \frac{1}{\sqrt{2}} & \frac{1}{2} & 0 \end{bmatrix} \dots \dots \dots 11)$$

The three pairs of numbers above can be represented as follows:

$$\frac{\sqrt{3}}{2\sqrt{2}}|000\rangle + 0|001\rangle + \frac{1}{2\sqrt{2}}|010\rangle + 0|001\rangle +$$

$$\frac{\sqrt{3}}{2\sqrt{2}}|100\rangle + 0|101\rangle + \frac{1}{2\sqrt{2}}|110\rangle + 0|111\rangle$$

This result shows that the probability of state $|000\rangle, |010\rangle, |100\rangle$ and $|110\rangle$ is $\frac{3}{8}, \frac{1}{8}, \frac{3}{8}$ dan $\frac{1}{8}$.

Three cubite systems from equation (11) have four types of information at the same time. Evolutionary calculations by representing cubits that have diverse characteristics, are better than the classical approach because they can represent every situation. One cubit string like equation (11) can represent four states (status). Convergence can also be obtained by qubit representation. As $|\alpha|^2$ or $|\beta|^2$ the approach to 1 or 0, converges the qubit string to a single state and the property of diversity disappears gradually. That means, qubit representations can have two characteristics of exploration and exploitation simultaneously.

Rotation Gate /Q-gate

Gate Rotation (Quantum-gate) is defined as the operator of the QGA variation, where the updated qubit operation must meet the normalization conditions, $|\alpha'|^2 + |\beta'|^2 = 1$, where α' and β' are updated qubit values.

Rotation Gate Equation as follows:

$$\begin{bmatrix} \alpha_j(t+1) \\ \beta_j(t+1) \end{bmatrix} = \mathbf{R}_i(\mathbf{t}) \times \begin{bmatrix} \alpha_j(t) \\ \beta_j(t) \end{bmatrix} \quad (j = 1, 2, \dots) \dots\dots(12)$$

$$\mathbf{R}_i(\mathbf{t}) = \begin{bmatrix} \cos \Delta\theta_i & -\sin \Delta\theta_i \\ \sin \Delta\theta_i & \cos \Delta\theta_i \end{bmatrix} \quad (i = 1, 2, \dots, n) \dots\dots(13)$$

$\Delta\theta_i$ is the angle of rotation (figure 1) of each member of the population. Rotation angle $\Delta\theta_i$ is related to differences in normalization Δf_i between the achievements of each member of the population and the best optimal global.

Equation for $\Delta\theta_i$:

$$\Delta\theta_i = \Delta f_i \times \text{sign}(\alpha_b - \alpha_j) \times \text{sign}[\beta_j \times \sin \Delta f_i - \alpha_j \times (1 - \cos \Delta f_i)] \dots\dots\dots 14)$$

where :

$$\Delta f_i = \pi \times \left(1 - \frac{f(b)}{f(p_i(t))}\right) \quad (i = 1, 2, \dots, n) \dots\dots 15)$$

$$\text{sign}(\alpha_b - \alpha_j) = \begin{cases} +1 & \text{if } \alpha_b \geq \alpha_j \\ -1 & \text{if } \alpha_b < \alpha_j \end{cases} \dots\dots\dots 16)$$

$$\begin{aligned} & \text{sign}[\beta_j \times \sin \Delta f_i - \alpha_j \times (1 - \cos \Delta f_i)] \\ = & \begin{cases} +1 & \text{if } \beta_j \times \sin \Delta f_i \geq \alpha_j \times (1 - \cos \Delta f_i) \\ -1 & \text{if } \beta_j \times \sin \Delta f_i < \alpha_j \times (1 - \cos \Delta f_i) \end{cases} \dots\dots\dots 17) \end{aligned}$$

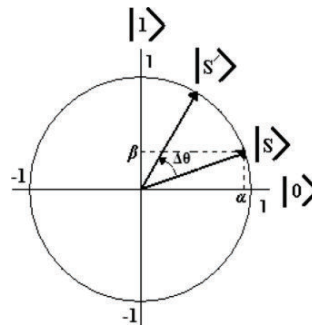


Figure 1. Basic of quantum bits (qubit)

D. Problems in formulation :

Objective Function

$$\min \{P_i = \sum_{i=1}^{bus\ no} \sum_{j=1}^{bus\ no} (S_{ij} + S_{ji})\} \dots \dots \dots 18)$$

Voltage Limitation

$$|V_{i\ min}| \leq |V_i| \leq |V_{i\ max}| \dots \dots \dots (19)$$

DG Capacity Limitation

$$P_{DG\ min} \leq P_{DG} \leq P_{DG\ max} \dots \dots \dots (20)$$

E. QGA implementation for optimization of location and size of DG.

1. $t = 0$
2. Initialize a population from n population (qubit string)

$$Q(0) = \{q_1(0), q_2(0), \dots, q_n(0)\}$$

Every qubit string representing :

$$q_1(0) = \left[\begin{array}{c|c|c} |\alpha_1(0)| & |\alpha_2(0)| & \dots & |\alpha_m(0)| \\ \hline |\beta_1(0)| & |\beta_2(0)| & \dots & |\beta_m(0)| \end{array} \right]$$

3. For all qubit strings initialize amplitude amplification at:

$$q_1(0) = \left[\begin{array}{c|c|c} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \dots \\ \hline \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \dots \end{array} \right]$$

4. Create randomly binary solutions with observing state $Q(0)$:

$$P(0) = \{p_1(0), p_2(0), \dots, p_n(0)\}$$

In this study, each DG is representative of an 8-bit binary number. MSB signifies where the DG is located. If the bit is 1, DG will appear on the bus and DG output will be determined from the remaining 7 bits and also based on Pmin and Pmax from the input parameter matrix. If MSB = 0, the DG will not appear on the bus but as a load bus. Assess each $p_1(0)$ ($i = 1, 2, \dots, n$) and prepare the data bus matrix.

5. Using the data bus, run the load flow and get the loss. Hitung fungsi objektif dan menyimpan nilai fitnessnya.
6. Perform steps 5-7 for each member of the population.
7. Find members of the population that have the highest objective function and are stored in the winner's place (iteration).
8. Next Iteration ($t=t+1$)
9. Generate the next population from the existing population with the rotation of each existing member so that the new generation gets closer to the winner, see figure 1. Rotation is solved by the rotation of the matrix which has been calculated through equations 12) -17)
10. Perform steps 4, 5, dan 6 as much as needed.

- 11. The most optimum solution is the last iteration.
- 12.

III. RESULT AND DISCUSSION

A. Measurement and Location Data

This study uses measurement data and secondary data on feeder Abang located in the eastern part of Bali province precisely in Karangasem Regency. Feeders who are in the area of PT. PLN (Persero) This East Bali Area has a total channel length of 207,946 Km. The total number of buses found in Penyulang Abang is 431 with the system working on a 20 kV system with an electrical power supply from the GI Amlapura of 150 kV then connected to the GI transformer to be reduced to 20 kV.

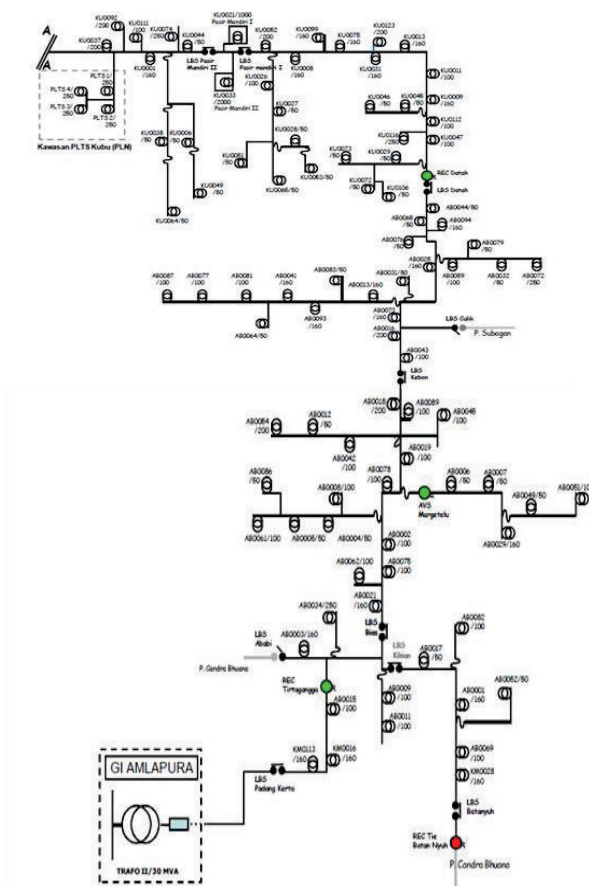


Figure 1. Single Line Diagram of Abang Feeder
(Source : PT PLN (persero) East Bali Area)

Abang feeder is a feeder that uses a radial configuration type where between the point of the power source and the load point is in a straight line. The point of the electricity source and the end point in the feeder has a distance of 207.946 Km, because the distance decreases the voltage profile. Based on the simulation using the lowest voltage ETAP profile on feeder brother is equal to 0.83 p.u or 16.6 kV found on buses 401, 403, 421, 426 and 431 with a total power loss of 1,105 MW. The allowable stress profile is between 0.9 - 1.05 or 18 kV - 21 kV (SPLN 72: 1987). Because of these problems, the stress profile must be improved by installing several

DGs on several buses with certain capacities so that a bad voltage profile can achieve the allowable voltage profile value.

Table 1. Load Data With Voltage below 0.9 pu

BUS	BUS INPUT	MAG	ANG	LOAD		GENERATOR	
				MW	Mvar	MW	Mvar
319	401	0,83	-5,9	0,024	0,015	0	0
249	402	0,86	-4,9	0	0	0	0
250	403	0,83	-6,1	0,026	0,016	0	0
251	404	0,86	-4,9	0	0	0	0
252	405	0,85	-5,4	0,011	0,007	0	0
256	406	0,86	-4,9	0	0	0	0
255	407	0,84	-5,9	0,02	0,013	0	0
259	408	0,86	-4,9	0	0	0	0
257	409	0,86	-4,9	0	0	0	0
258	410	0,85	-5,4	0,01	0,006	0	0
323	411	0,86	-4,9	0	0	0	0
324	412	0,85	-5,3	0,009	0,006	0	0
260	413	0,86	-4,9	0	0	0	0
262	414	0,86	-4,9	0	0	0	0
336	415	0,85	-5	0,003	0,002	0	0
326	416	0,86	-4,9	0	0	0	0
261	417	0,85	-5,1	0,004	0,003	0	0
330	418	0,86	-4,9	0	0	0	0
328	419	0,85	-5,2	0,007	0,004	0	0
333	420	0,86	-4,9	0	0	0	0
334	421	0,83	-6	0,024	0,015	0	0
343	422	0,86	-4,9	0	0	0	0
341	423	0,86	-4,9	0	0	0	0
340	424	0,85	-5,1	0,006	0,003	0	0
347	425	0,86	-4,9	0	0	0	0
346	426	0,83	-6	0,024	0,015	0	0
350	427	0,86	-4,9	0	0	0	0
348	428	0,86	-4,9	0	0	0	0
263	429	0,85	-5,1	0,004	0,003	0	0
353	430	0,86	-4,9	0	0	0	0
352	431	0,83	-6	0,024	0,015	0	0

B. Field data testing

Measurement data and secondary data on Abang feeder located in the eastern part of Bali province precisely in Karangasem Regency. Feeders who are in the area of PT. PLN (Persero) East Bali Area has a total channel length of 207,946 Km. The total number of buses found in Abang feeder is 431. Abang feeder are feeders who use radial configuration types where between the point of the power source and the load point are in a straight line. Based on the simulation using the lowest voltage ETAP profile on feeder brother is 0.83 p.u or 16.6 kV found on buses 401, 403, 421, 426 and 431. (SPLN 72: 1987). By using the QGA program the results obtained are as follows:

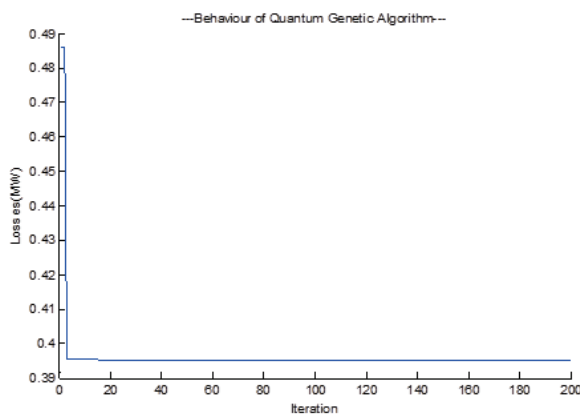


Figure 2. Graphics of Abang Feeder simulation results with QGA

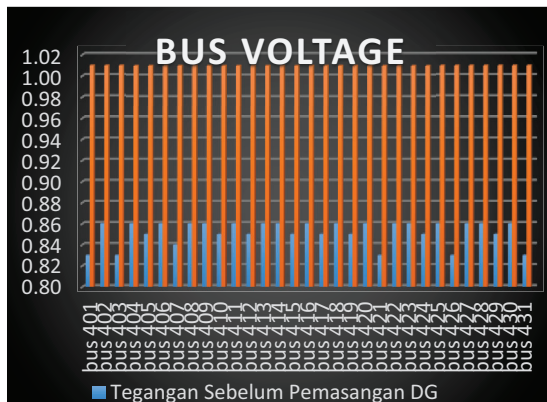


Figure 3. Voltage Repair with QGA

From the results of running the program of Distribution Generator (DG) is installed on buses 1,5,7 and 302 with a sequence of capacities of 0,374 MW, 1,894 MW, 1,988 MW and 0,500 MW where the total installation is 4,756 MW. Likewise, the channel power loss from the previous power loss is 1.105 MW reduced to 0.234 MW.

IV. CONCLUSION

Of the total number of buses in Penyulang Abang there are 431 Distribution Generators (DG) placed on several buses to improve the overall voltage profile. From the results of running the program (Running) on Abang feeder, the Distribution Generator (DG) is installed on buses 1,5,7 and 302 with a sequence of capacities of 0,374 MW, 1,894 MW, 1,988 MW and 0,500 MW where the total installation is 4,756 MW. Voltage profiles can also be improved as shown in Figure 3. The previous power loss was 1.105 MW, reduced to 0.234 MW

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AUTHENTICITY LEVEL OF TEMPLES RENOVATION IN BALI

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Abstract. The purpose of this article is to measure the authenticity of temples in Bali that have undergone a renovation process. This research is motivated by the news in the mass media over the destruction of the temple which has a historical site due to the impact of a large fund disbursement from both the provincial/district government and CSR to renovate or rehabilitate the temple. The community and funders basically depart from the same intention of improving better worship facilities. Only a way to implement the intention that is not appropriate and the lack of information on public knowledge about the conservation of sites of historical value. From the initial survey through secondary data shows that since the launch of this policy, approximately 18 temples in Bali, which have been categorized as being preserved, have been renovated by demolishing old buildings and making them new (Bali Pos, September 6, 2017). From an aesthetic point of view alone, this new temple is certainly more magnificent, but from the point of view of the value of the physical cultural heritage and the meaning behind it is a great loss. The building of physical cultural remains is a priceless chain of history, the loss of one of these historical links is the same as breaking the storyline of a civilization.

Thirteen (13) temple samples in all regencies / cities in Bali were used as study objects. Identification of the level of change is observed based on 3 aspects: Architecture, territory and humans (Song, 2016). While the level of change will be seen from the level of conservation intervention (preservation, restoration, renovation, adaptation and demolition).

The results showed that the level of temple authenticity in Bali could be categorized into three groups: (1) two temples (Padang Luwih Temple, Badung and Rambut Siwi temple, Jembarana) included in the category of major changes (alert level); (2) eight temples fall into the category of moderate change; and (3) two temples included in the category of minor changes (normal). The model of temple conservation in Bali is determined by three important factors, namely: (1) Availability of funds; (2) Temple hierarchy; and (3) Level of Knowledge. To conserve the temple is done with a win-win solution between the temple manager and the community of cultural observers, academics and non-governmental organizations. Awareness is needed through training. The need for role models who understand well about conservation. Other research needs to be conducted in relation to the temple conservation model, to determine the dominant factors that most influence the form of conservation interventions.

Keywords: Authenticity, renovation of temples, conservation, cultural heritage, architecture

I. INTRODUCTION

Development does not always connote to create or create new ones. Development also means maintaining and safeguarding what already exists. It is often heard that the Indonesian people have the ability to create something new, but at the same time this nation is not equipped with the ability to maintain what has been built. A number of buildings and facilities that are financed with large funds, then we see and read in the mass media, suffered major damage due to maintenance that was not carried out. Maintaining and conserving what is already there is still seconded, this might be a feature of developing countries. This indication can be seen in the Regional Development Budget Plan, where the allocation of maintenance funds is very small. Without neglecting the scale of development priorities in terms of limited funding, it should be, building a new one and conserving have rational portion.

Maintaining and conserving buildings (fabric) that are old and historic value certainly requires more funds than maintaining modern buildings. There needed special skills and expertise, special materials, special equipment and special technology. This level of difficulty is increasing and complicated if what is to be treated is an old and historic worship building. The problem will be more complex, because in addition to the historical value that must be preserved on the one hand, this house of worship is active (living monument), which contains the meaning must follow the demands of the times, both capacity and quality of space on the other side.

In Bali, the maintenance of old and historic categories of worship facilities, especially temples, does not really meet the difficulties compared to other regions in Indonesia, for example in terms of funding. The mutual cooperation value of *Pakraman* (Custom Village) to collect independent funds is able to finance its maintenance. Another, from the funding source of the Provincial Government of Bali in the form of Social Assistance that prepares the allocation of a number of budgets for renovation of the temple. This is related to the policies of the local government of Bali which makes culture an icon of development. As a world tourism destination, Bali utilizes the richness and uniqueness of culture based on Hinduism as one of its attractions. *Pura* (temple) is one of the Hindu Religion assets that need to be preserved. In addition to its historical value, it is also at the same time as a tourist attraction to visit it. Not only looking at the physical environment but at the same time enjoying all the activities of the community in it. Other funding sources are from CSR in Bali. In short, the problem of funds for the maintenance of places of worship that are of historical value (in this case the renovation of the temple) in Bali can be said to be almost more resolved than other regions in Indonesia.

The adequacy of funds allocated for renovation of this temple received a fairly good response from the people of Bali. Dozens of temples in Bali have been successfully renovated. The impact is, the availability of funds is quite a lot, encouraging people to intervene in forms of development that are somewhat excessive. The original target was only renovation, developing into replacement, additions, and demolition, and then it was built new, as had happened in Jatiluwih Tabanan, Padang Luwih Dalung Badung, Sumerta and Kesiman Denpasar. This method of building makes the cultural observers, NGOs and academics concerned (Radar Bali date ...). They assume that temple managers do not understand that the site has historical value about past civilizations that must be preserved so that they cannot be modified. The temple manager can circumvent and argue that the temple is not a museum, it is a living monument, which is still actively used, the demands of space need to accommodate the needs of the community must be fulfilled.

Government efforts to overcome differences of opinion in the community have been carried out with the issuance of Law No.11 of 2010 concerning cultural heritage. Through BPCB Bali (Center for Preservation of Heritage) has provided advocacy assistance and technical assistance to renovate several temples in Bali (Prabawa, 2018). However, some temples that are categorized as cultural heritage, are reluctant to consult with the BPCB for various reasons, or negotiations not to fully follow BPCB's advice.

Moreover, pretending that does not rely on funds entirely from the government, the control is very difficult. On the other hand, observers of conservation of cultural heritage who tend to be conservative and idealistic, have received information about conservation according to western thought which tends to be tangible (physical) conservation thinking (Alho, s.a.; Poloz, 2015) whereas in conservation treasures in Asian countries in general there are intangible (non-physical) factors that are practiced from generation to generation (Zhu, 2012; Kwanda, 2015).

Raisons for and against of the practice of temple conservation in Bali, if not handled seriously will bring harm to both parties. Pretending to be conserved without control will bring to the loss of the historical chain of a people 's civilization. Historical values cannot be substituted for anything. On the other hand, these cultural heritage temples, as well as living monuments that are still actively used, if in their use they cannot meet the demands of their users' needs and requirements, it will have a bad effect.

Based on the description above, it feels the need for a solution that benefits all parties. Of course it must be done in a comprehensive and gradual manner. As a basic first step is the need to identify the level of authenticity of the temple which has been renovated to date. From this identification can be obtained a description of the gradation of the development of authenticity and the comparison between temples and other temples. So that future solutions may not be treated uniformly, but vary depending on the level of authenticity in each temple.

Based on the explanation of the research problem which has been described previously, the research question (research question) submitted is as follows.

How much authenticity is the temple in Bali that has undergone a renovation process?

2. LITERATURE REVIEW

Research on the conservation of historical buildings has been carried out, both international and local researchers, namely Aygen (2013), who has conducted a lot of research in several Middle Eastern countries (Egypt, Turkey, Bahrain, Iraq and Israel); Ashurts and Dimes (2006) in several cities in Europe (Cambridge, Oxford, Sicily, Paris and Rome), especially in many historical buildings using decorative and stone ornaments; Some studies have architectural domains and are technical in nature conservation, like those carried out by Jokilehto (2002).

Research on the conservation of cultural heritage in Indonesia has been done quite a lot as done by Wirastari (2012) who conducted research in the Bubutan Surabaya cultural heritage; Gampong Pande Cultural Heritage Kutaraja District, Banda Aceh by Wibowo (2012). Whereas cultural heritage in the form of places of worship, there have also been many such as Pekanbaru's old mosque by Rahman (2017); Kuncen mosque, Madiun (Triatmoko, 2012); For temple buildings, as was done by Wartha (2016) who examined several temples in Bali such as: Penataran sasih Temple, Pusering Jagat Temple, Gunung Kawi Temple, Tirta Empu Temple, Goa Gajah Pura Bukit Tulisan Temple, Kebo Edan Temple; pura Beji in Sangsit Village, Sawan, Buleleng (Adi Prawira, s.a).

2.1. Basic Principles of Conservation

2.1.1. Tangible Conservation (Western View)

Scientific conservation approaches were born in Europe (West) which then spread to various parts of the world (Zhu, 2012; Kuwanda, 2015). This approach relies on tangible approaches. This is indicated by the birth of various guidelines, rules and or charter of conservation agreements initiated by Western countries such as The Athens Charter (1931), the Venice Charter (1964), recommendations on the protection and role of Historical Areas by UNESCO (1976) , Operational Guidelines on UNESCO World Heritage (2005), The ICOMOS Charter for the Conservation of Historic Towns and Urban Areas (1987) and the Burra Charter 1988,

1999 and 2013. Most products of agreements, guidelines and rules contain physical approaches to conservation. The principle of authenticity and true nature is emphasized in this approach. The principle of the basic conservation principle (Main Conservation Principles) are: Retention or restoration of historical meaning (Retention or restoration of historical significance), the conservation process based on research (Conservation process based on research) or minimum physical intervention (minimum physical intervention) and maintenance of visual arrangements (Maintenance of visual settings). Where the core of this tangible approach is: Research becomes a priority before going down the field (Research prior to planning work), minimum intervention - fixing rather than changing (Minimum intervention - repair rather than replace) and paying attention to the background (Respect the setting).

2.1.2. Intangible Conservation (Eastern View)

Conservation models that exist in the West there are not fully accepted and applied in Asian (Eastern) countries. In Japan and China, for example, removing and replacing wooden building materials is periodic. Even the Great Ise Temple in Japan must be replaced every 20 years based on the Shinto belief that death and renewal must be carried out for the survival of life itself. Likewise, in India, the Jeernodharanam tradition or regeneration is also carried out from generation to generation, including regeneration in buildings. Thus the process of restoration , reconstruction, new building and replacing it with new materials is common in Asian countries in general (Kwanda, 2015).

For Asian and Eastern countries generally spiritual and symbolic sustainability is more important than physical. The spiritual message behind the form of architectural material is more focused than the material itself. Thus the conservation model is more emphasized on non - physical (intangible) problems. Later, at a meeting of world conservation experts in Nara, Japan (1994), which was then continued at a meeting in San Antonio (1996) and Burra Charter (1999) and the World Heritage Operational Guideline in Bonn (2015) it was agreed that tangible and intangible issues serve as a basis for consideration in the conservation process of cultural heritage.

2.2. Site Authenticity Criteria

The authenticity of a site can be seen from various aspects and benchmarks. This article the authenticity of the site will be seen with the Criteria:

1. Form and Design

Is a combination of elements that create the shape, plan, space, structure and style of a site. This is the result of decisions made during the original conception and site planning (or significant changes) and applies to activities as diverse as community planning, engineering, architecture, and landscape architecture. Design includes elements such as space arrangement, proportion, scale, technology, ornament and material.

2. Building Materials and Substances

physical elements that are combined or stored for a certain period of time and in certain patterns or configurations to form the historical value of a site. The choice and combination of materials used can reveal the preferences that make the site and indicate the availability of certain types of materials and technologies used. Local building materials often become the focus of building traditionally in an area and thus help define the sense of time and place when the site was built.

3. Workmanship

Physical evidence of certain cultural products or people as long as there is a period given in history or prehistory. This is evidence of labor and the skills of craftsmen to build or change buildings, structures, objects, or sites. Work can apply to the site as a whole or to its components. Can be expressed in vernacular construction techniques that are finalized plainly or very sophisticated in configuration and ornament details. This can be based on the similarity of tradition or innovative period techniques.

4. Settings

In connection with information and data regarding the space, time and atmosphere of the site when it was built and the current condition. Location of space refers to a particular place where the site is located or activities occur; sometimes management refers to the character of the place where the site plays its historical role. Understanding this location and setting also includes how the site relates to reciprocal environmental features.

5. Functions and Uses

the level of original sustainability of significant use in a site. The historic and surrounding areas form a coherent unity including its inhabitants related to activities and construction; continued use as well as compatible or initial functions by minimizing negative impacts on authenticity of use.

6. Spirit and Attachment

Information about intangible factors behind the physical site. How do people interpret it in the form of behavior and real action? Included in this aspect are community motivation, level of participation and sense of attachment (place attachment).

The six aspects above will be used as an assessment attribute in the analysis stage. Each temple will be observed from these six aspects.

When observed in the six aspects above, can be grouped into three levels of observation, namely: Level of architecture (attributes 1 to 4); Regional level (attribute 5); and human level (attribute 6). Furthermore, this attribute is derived into more operational aspects to facilitate data collection in the field. More detail about this can be seen in Table 1.

Table 1
Authenticity Conditions: Level, Attribute and Qualities

LEVEL	ATTRIBUTE	QUALITY	
Architecture	1. Form and Design	Combination of design elements creates the form, size	Such as organization of space, proportion, scale, technology, Ornamentation, materials.
	2. Materials and Substance	Physical elements Key exterior materials	Recreation and Reconstruction are not acceptable. Retaining existing fabrics does not always achieve authenticity.
	3. Use and Function	Historic use. Building's program Structural system.	Relocation may lead to new value in a new location.
	4. Tradition & Techniques	Physical evidence of craft, labor and skills.	Expression in such as vernacular methods of construction and configuration.
Urban	5. Location & Setting	Place & surroundings Location is complimented by its setting.	Present urban role in urban fabric. Relationship to the adjacent landscape.
Human	6. Spirit & Feeling	Experience of historic character of place Symbolic value.	Aesthetic and historic sense of a particular of period of time.

Sumber: Song, 2016

2.3. Type of Conservation and Level of Change

In the practice, conservation of cultural heritage buildings, the level of intervention that can be carried out has different levels, including:

1. **Preservation** is maintaining the material and place under existing conditions and slowing weathering.

2. **Restoration / Rehabilitation** is an effort to restore the physical condition of the building as before by removing additional elements and replacing the original elements that have been lost without adding new parts. In other words, Restoration is returning the building to its appearance when it was built. Another understanding of Restoration, Ministry of Finance version: repairing buildings that have been partially damaged with the intention of using certain functions that can remain or change while maintaining the architecture of the building while the structure and utility of the building can change. While the Burra Charter version (1999) is returning parts or components from a site based on consideration of accuracy of historical values. Makes it really fit and exactly the same as the original state.

3. **Reconstruction** is to return a place to its original state as it is known by using old materials and new materials and distinguished from restoration

4. **Renovation** is the repair of a damaged place or replacing a good one with the intention of improving quality or capacity. In other words, giving a part of a site in the form of a new or updated display. Ministry of Finance version: repairing buildings that have been partially damaged with the intention of using appropriate functions that can remain or change, both architecture, structure and utility of the building. Whereas the Burra Charter version (1999) is changing or upgrading the display towards a more modern one,

5. **Rehabilitation** is the repair of a partially damaged place without improving quality and or capacity with the intention of being used in accordance with the original conditions. Ministry of Finance version: repairing buildings that have been partially damaged with the intention of using in accordance with certain fixed functions, both the architecture and the structure of the building are retained as before, while utilities can change.

6. **Adaptation / Revitalization** is any effort to change the place so that it can be used for the appropriate function

7. **Demolition** is the destruction or renovation of a building that is damaged or dangerous.

The term above does not seem to be agreed unanimously, their use depends on the context, purpose and agency of the maker. Sometimes it seems that this term is very similar to one another or the meaning is the same as a different term. What is important in the context of this study is that this term has a level of change or intervention which can be seen in Table 2.

Table 2
Type of Conservation and Level of Change

No.	Activities	Level of Change			
		never	Few	More	Total
1	Preservation	v	–	–	–
2	Restoration	–	v	v	–
3	Reconstruction	–	–	v	v
4	Adaptation/Revitalization	–	v	–	–
5	Demolition	–	–	–	v

This level of change or intervention will be used as the main part in analyzing the determination of the authenticity level in this article.

3. RESEARCH METHODS

The approach used in the research is qualitative. Based on the approach, a fake case study in Bali is used by conducting field verification which is descriptive and explorative.

The location of the study was conducted in several locations in all regencies / cities in Bali. Based on data / information from BPCB (Center for Preservation of Heritage), obtained a list of temple temples in Bali which are classified as cultural heritage (more than 50 years) and have undergone a renovation process. From the list, each regency / city is chosen again to be represented in the study.

Informants will be chosen intentionally (purposive sampling) for people who are considered to know the most about temples that are used as objects of research. The number of temple sampling was initially 16 samples, but after the data was collected not all of them met the requirements, including insufficient information obtained. So that there are 12 temples that can be verified.

Images data will be analyzed by super impose techniques (analysis of overlapping plans, maps) in the form of images before and after renovation. From this analysis will be obtained an illustration of where the lost and new temples are. There will also be a form of building quality development, as well as the quantity of development.

The level of authenticity will be calculated through the weighting system. Based on the types of conservation that have been described in Chapter 2, weighting the level of change from small changes to big changes. Not all lists are taken, with consideration: 1). simplification of the number of terms for the same purpose; 2) To obtain contrasting weight values. So from 7 types of conservation, 5 types were chosen to be used in the next analysis. Preservation is given a weight of 0, because it is assumed that the change does not exist, on the contrary Demolition is given the highest weight (4), the assumption is that conservation of this method is through total demolition and then rebuilt.

Table 3
Weighting of Conservation Types, from Small Changes to Large Changes

No	Conservation Types	Weight
1	Preservation	0
2	Restoration	1
3	Renovation	2
4	Adaptation	3
5	Demolition	4

4. DISCUSSION

4.1. Description of Research Object

This study was originally planned to take a sample of 16 (sixteen) temples in regencies / cities in Bali based on the criteria of the age of the temple > 50 years and had undergone a renovation process. But after the data is obtained, three (3) temples are eliminated because the data is invalid. The three temples are: Pura Sakenan (Denpasar), pura Abiansemal (Badung) and Pura Mihi (Bangli) with the details listed in Table 4.

Tabel 4
Location of Temple Samples in Regencies / Cities in Bali

No	TEMPLE	Regencies / Cities
1	Pura Maospahit	Denpasar
2	Pura Desa Puseh, Desa Adat Padang Luwih	Badung
3	Pura Mengening	Gianyar
4	Pura Yeh Gangga	Tabanan
5	Pura Dasar Bhuana, Gelgel	Klungkung
6	Pura Agung Kentel Gumi	
7	Pura Kayu Sakti	Karangasem
8	Pura Penataran Yeh Santhi dan Pura Batan Cagi	
9	Pura Kehen	Bangli
10	Pura Gede Jembrana	Jembrana
11	Pura Rambut Siwi	
12	Pura Dalem Segara Madhu	Buleleng

Source: Observation, 2018

Based on the age of 12 the temple studied was very varied, from the youngest 100 years to the oldest more than 1000 years. Three of them did not obtain building age data, namely Kayu Sakti Temple (Karangasem); Penataran Yeh Santhi Temple (Karangasem), and Rambut Siwi Temple (Jembrana). The detail age of the temples can be seen in Table 5.

Table 5
Pengelompokan Pura Berdasarkan Usianya

AGE (YEAR)	TEMPLE	REGENCIES/CITIES
100 - 350	Pura Desa Puseh, Desa Adat Padang Luwih	Badung
	Pura Gede Jembrana	Jembrana
	Pura Dalem Segara Madhu	Buleleng
500 - 650	Pura Bukit Sari Kaba-Kaba	Tabanan
	Pura Agung Kentel Gumi	Klungkung
	Pura Yeh Gangga	Tabanan
700 - 850	Pura Maospahit	Denpasar
	Pura Dasar Bhuana, Gelgel	Klungkung
900 - 1200	Pura Kehen	Bangli

Source: Analysis

4.2. Motives and Reasons for Renovating Temple

The renovation of the temple was motivated by a variety of motives and objectives, but keep in mind that all temple buildings that are the research samples are still actively used as a living monument, not a dead monument. Thus, aside from the age of the temple which is quite old, it is also still functional to this day, thus requiring improvements / facilitation (facilities, elements, quantity and quality of space) to accommodate the demands of activities and needs of the community in line with the times. In detail the reasons and motives of each temple that is the research sample are explained as follows.

1. Temple of Puseh Village, Padang Luwih Traditional Village, Badung Regency

- The road surface is higher than the temple which causes rainwater from the entrance to the temple area.
- Problems with inadequate capacity
- Some buildings are prone to collapse.

2. Pura Maospahit, Denpasar

- Is a routine activity every year to perform temple maintenance including restoration / repair activities.
- Is an old temple that must be preserved in Bali

3. Temple in Gianyar

Pura Mengening in Tampaksiring

- As a historical legacy, which needs to be treated and preserved.
- Some hard elements and temple support facilities need to be added to meet the needs of *pemedek* (visitors) such as stairs, information center buildings, *pecalang* (Traditional police) postal buildings, gazebos, toilets and bathrooms.

4. Pura Gede Jembrana

- Is one of the ancient relics
- There is overall damage to the structure and architecture, starting from the legs, body and roof. The forms of damage include: darting, sliding, breaking and worn (peeling).

5. Rambut Siwi Temple, Jembrana

- Some *pelinggih pura* (small shrine) are considered too small and not proportional, so they need to be modified.
- The condition of *pelinggih - pelinggih* in the innards of temple has begun to be fragile and the pillar (*saka*) has begun to decay.
- At the time of *piodalan* (ritual), the *pemedek* (coreligionists) who are going to pray are sure to overflow and to anticipate this, *pelinggih - pelinggih* are made outside the area of the temple's innards.
- In addition to the comfort factor, renovation of the landslide dumping is eroded by sea water.

6. Kayu Sakti Temple, Karangasem

- The condition has been damaged, some *pelinggih* are collapsed and destroyed.
- Megalithic heritage in the form of an altar from a pile of stones that began to scatter.

7. Penataran Yeh Santhi Temple and Batan Cagi Temple
 - Some *pelinggih* which are damaged due to age and due to the widening of the temple area.
 - Megalithic
8. Pura Dasar Bhuana Gelgel, Klungkung
 - The addition of a building with a new function
 - Renewal of materials due to age, for example some buildings are replaced with palm trees.
 - Two (2) architectural elements are material cultural heritage that needs to be preserved, namely Bentar and Kori Agung Temples (Prabawa, 2018).
9. Pura Agung Kentel Gumi
 - The physical structure of the temple that needs to be rehabilitated is due to a very old age factor and also supporting elements that have begun to be fragile and can endanger the user. .
 - Expansion in the parking area is carried out to accommodate the number of public vehicles arriving and also the renewal of the parking element.
10. Pura Dalem Segara Madhu, Buleleng
 - Some buildings have been prone to collapse and the wood in the sakanya has been rotten
 - Parts of the temple were badly damaged as a result of the Jagaraga war and pretended to be used as a fortress, after being bombed, parts of the temple were destroyed, especially the chori The front is used as a hiding fortress against the Dutch. The Kori Agung and Candi Bentar sections on the temple are prostituted into smaller parts.
 - There is no place for my mother to take shelter while leading a prayer
11. Temple Yeh Gangga, Tabanan
 - Efforts to restore the damaged physical condition of the Cultural Heritage Building in accordance with the authenticity of the material, shape, layout, and / or workmanship techniques to extend their age.
12. Luhur Pucak Bukit Sari Temple, Kaba kaba
 - Restoration of the physical condition of a damaged Cultural Heritage Building in accordance with the authenticity of the material, shape, layout, and / or workmanship techniques to extend the age.

4.3. DISCUSSION

The discussion will focus on answering research questions: (1) Level of Authenticity (Authenticity) of Temples in Bali, and (2) Model of Temple Conservation in Bali. To answer these problems, the steps taken are as follows: based on conservation criteria developed by

Alho (2015) and Song (2016) an assessment of twelve (12) temples in Bali was conducted; So that the level of authenticity (authenticity) of the temples in Bali is obtained (Output 1). From the output 1, several handling solutions were made in the form of temple conservation models in Bali, schematically can be seen in Figure 1

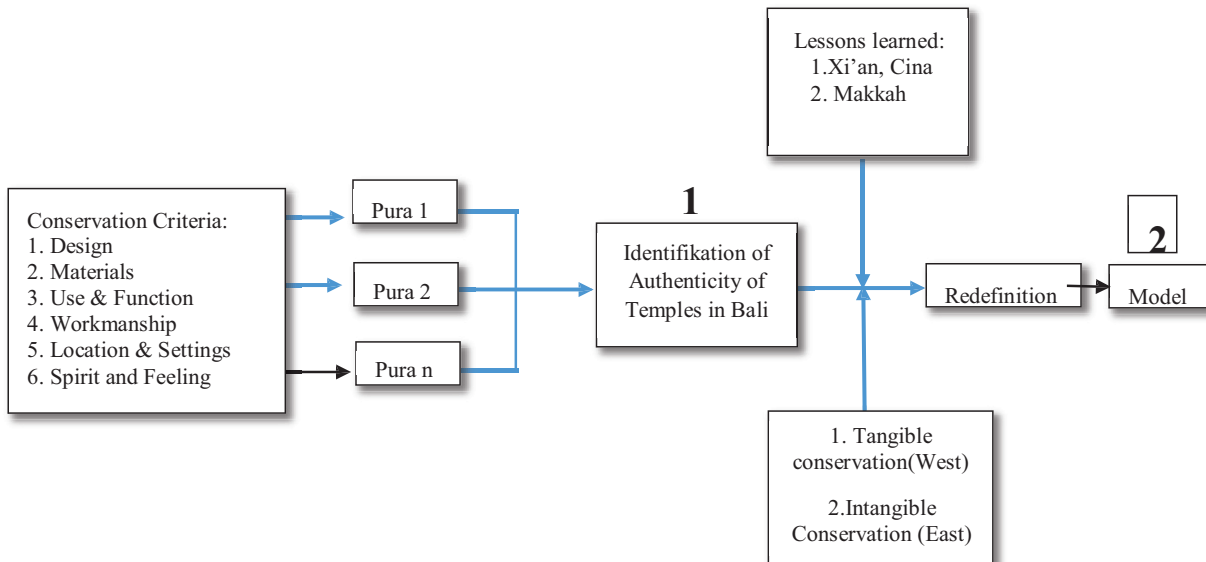


Illustration 1
Schematic Approach

4.2.1. Identify the level of authenticity of temples in Bali

This discussion is an evaluation of the level of authenticity that has been carried out on 12 sham samples in Bali. While the components of temples that are maintained, modified and added can be seen in Table 6. To evaluate these, six attributes have been described in Chapter 2 of the previous Literature Review, namely: (1). Design: (2) building materials, (3) techniques and ways of building; (4) setting ; (5) Function and use and 6) Spirit and attachment to place (Alho, 2015; Song, 2016). These six attributes are assessed for their level of authenticity through weighting as explained in the Chapter of Research Methods. In full, the results of the analysis can be seen in Table 7.

Table 6

Components of the Temple that are Conserved, Added, Modified and Renovated

NO	TEMPLE	Conserved	Added	Modified	Renovated
1	Pura Maospahit	Candi kusuma		Piasan ngerurah and ratu pengalasan, change form with the addition of a roof	Candi rengat Candi rebah Perepan Bale gede
2	Pura Desa Puseh, Desa Adat Padang Luwih	Nothing is conserved Only old sculptures are painted in colorful colors	The use of black andesite material replaces the brick Extended of pura Padmasana Ratu gede Jelawung Rambut sedana Gedong simpen Bale Paselang Kori Pengapit Ruang parkir	Move stakes Pelinggih Hyang Soka Pelinggih Ratu Hyang Gumi from east to north.	
3	Pura Mengening		Fence wall Patung pandita Patung dewi Gangga Kamar ganti		
4	Pura Yeh Gangga	Meru tumpang 7 renovasi sesuai aslinya			
5	Pura Dasar Bhuana, Gelgel		Penambahan massa bangunan Fungsi baru (toilet...) Pembaruan material		
6	Pura Agung Kentel Gumi		Perluasan parkir		Fisik bangunan yang sudah tua
7	Pura Kayu Sakti		Fence wall Candi bentar Pelinggih in front of candi bentar prayer place		
8	Pura Penataran Yeh Santhi dan Pura Batan Cagi		Fence wall		Menyusun ulang pelinggih yang berbentuk batauan yang berserakan Direkat dengan semen
9	Pura Kehen	Pelinggih Bale Panjang, sesuai aslinya	Pelinggih batara sakti perampean Pelinggih genah tirta		
10	Pura Gede Jembrana	Kori Agung Fence wall Area jeroan, Replace damaged material (eg bricks are still used instead)			
11	Pura Rambut Siwi		Bale gong 2 pelinggih and 1 bale piyasan in exterior	Change the pelinggih dimension to be bigger	Pelinggih penyanggan Dalem Ped Penyawangan Melanting Penyawangan gading Wani
12	Pura Dalem Segara Madhu	Kori depan/candi bentar	Room for mangku		

Source: Analysis

a. Form and Design

In general, from the aspect of form and renovation design, the temple is still trying to refer to the initial design with various variations. From Table 7, Puseh Adat Padang Luwih Village, Badung, has changed completely, both from the shape and extent of the site that has expanded, as well as from the elements of the building elements in it. In terms of extent, the temple experienced development from the initial floor plan. The addition of field / parking space is the main addition to the expansion of the temple. Where the temple previously did not have the facility.

The most significant changes occur in shifting space zoning. The parking space zones that existed previously were the main mandala zones of the temple. While the main *mandala* zone is shifted backward (see Figure 2).

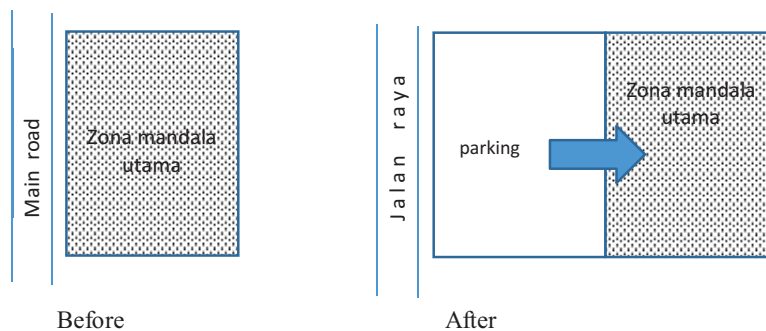


Illustration 2
Schematic Plan of Pura Puseh desa Adat Padang Luwih

In addition, about 90% of the 13 samples temporarily added new spaces and functions that did not exist before, such as: guard posts, toilets and bathrooms, gazebos and information rooms. Other utilities added are electric lighting, both lighting and aesthetic functions (spotlights). Based on the forms and designs that are all in demolish then rebuilt, get the weight of rating 4 (major changes or interventions).

While other temples are dominated by forms and designs that are adaptation, restoration and renovation.

b. Building Material

All temples that are sampled use two main materials, namely stone and wood (saka), all of which are local building materials that are still easily available. Wood materials are very susceptible to damage for a certain period of time. So this material is most often replaced. The forms of damage include: darting, sliding, breaking and worn (peeling). When used for structures and constructions, the pillars and roofs are very vulnerable and endanger safety.

The current trend of renovating the temple is to replace the total building material that was originally brick or paras into black andesite stone, for example the abiansema temple and the Puseh temple of Padang Luwih traditional village.

c. Techniques and workmanship

Technological progress is very helpful in the conservation efforts undertaken. For example the use of reinforced concrete is widely used for the construction of Candi Bentar, Bale Kul Kul.

Especially in Bali skilled power for traditional buildings is still very easy to obtain, including carving and sculptor. So it makes it easy to replicate the original details of an element of a temple building, including its ornaments.

d. Location and setting

most temples have not changed, except the Puseh Village Temple, Padang Luwih Traditional Village, which has experienced a footprint. So for this category most are preservative.

Based on Table 7 above, the level of authenticity of the temple in Bali can be sorted from the category of major changes to small changes whose details can be seen in Table 8

Table 8
Order Level of Authenticity of Temple in Bali, from
Large to Small Changes

No.	Temples	Weight
1	Pura Desa Puseh, Desa Adat Padang Luwih	14
2	Pura Rambut Siwi	10
3	Pura Maospahit	9
4	a. Pura Kehen b. Pura Dalem Segara Madhu	8
5	Pura Mengening	7
6	a. Pura Dasar Bhuana, Gelgel b. Pura Agung Kentel Gumi c. Pura Kayu Sakti d. Pura Penataran Yeh Santhi dan Pura Batan Cagi	6
7	Pura Yeh Gangga	3
8	Pura Gede Jembrana	2

Source: analysis result; Note: the greater the weight the greater the change, the smaller the authenticity

From Table 8 it can be seen that the temple that experienced a major change was Puseh Village Temple, Padang Luwih Traditional Village, while the one who experienced a minor change was Pura Gede Jembrana. From the same table, there is also a grouping rate of change. The group weighing 8 consists of two temples, namely: Kehen Temple and Pura Dalem Segara Madhu; the second group (weight 6) consists of four (4) temples, namely: Dasar Bhuana Temple, Gelgel; Pura Agung Kentel Gumi; Kayu Sakti Temple and Penataran Yeh Santhi Temple and Batan Cagi Temple.

The level of authenticity of the temple can be made into three categories: small, medium and large which can be seen in Table 9.

Table 9

NO	TEMPLES	WEIGHT	CATEGORIE
1	Pura Desa Puseh, Desa Adat Padang Luwih	≥10	Large
	Pura Rambut Siwi		
2	Pura Maospahit	6 - 9	Medium
	a. Pura Kehen		
	b. Pura Dalem Segara Madhu		
	Pura Mengening		
	a. Pura Dasar Bhuana, Gelgel b. Pura Agung Kentel Gumi c. Pura Kayu Sakti d. Pura Penataran Yeh Santhi dan Pura Batan Cagi		
3	Pura Yeh Gangga	2 - 5	Small
	Pura Gede Jembrana		

Categorie of Change of Temple in Bali

5. CONCLUSIONS AND SUGGESTIONS

5.1. CONCLUSION

Based on the Problem Questions at the beginning of this article, the conclusion as the answer is as follows:

1. Authenticity level of temple in Bali are: two temples (Puseh Temple Padang Luwih Badung and Pura Rambut Siwi, Jembarana) included in the category of major changes (alert level); eight temples fall into the category of moderate change; and two temples belong to the category of small changes (normal).
2. Model of temples conservation in Bali, determined by three important factors, namely: (1) Availability of funds; (2) Temple hierarchy; and (3) Level of Knowledge.

5.2. Suggestion

1. In the future, temple conservation by win-win solution is done between the temple manager and the cultural observer community, academics. Awareness is needed through training. The need for role models who understand well about conservation.
2. Other research needs to be conducted in relation to the temple conservation model, to determine the dominant factors that most influence the form of conservation intervention.

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Table 7
Analysis of Authenticity in Bali

NO	TEMPLE	ASPECT	LEVEL OF CHANGE						Total
			SMALL PRESERVATION (Weight 0)	RESTORATION (Weight 1)	RENOVATION (Weight 2)	ADAPTATION (Weight 3)	LARGE DEMOLISH (Weight 4)		
1	Pura Maospahit	1Form & design 2materials 3use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1	2 2	3		9	
2	Pura Desa Puseh, Desa Adat Padang Luwih	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0		2		4 4 4	14	
3	Pura Mengening	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1		3 3		7	
4	Pura Yeh Gangga	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1 1				3	
5	Pura Dasar Bhuana, Gelgel	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0			3 3		6	
6	Pura Agung Kentel Gumi	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1 1		3		6	

7	Pura Kayu Sakti	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0				3 3		6
8	Pura Penataran Yeh Santhi dan Pura Batan Cagi	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0				3 3		6
9	Pura Kehen	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1			3 3		8
10	Pura Gede Jembrana	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1					2
11	Pura Rambut Siwi	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0		2 2		3 3		10
12	Pura Dalem Segara Madhu	1Form & design 2Materials 3Use & Function 4Workmanship 5 Location & setting 6 Spirit and Feeling	0 0 0 0	1 1			3 3		8

ANALISIS KOMPARATIF PENDAPATAN PETANI POLA ROTASI TANAMAN DI KECAMATAN SUKAMAJU KABUPATEN LUWU UTARA

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Abstract. This research was conducted in Sukamaju Sub-district of North Luwu Regency, in June-August 2017, aimed to find out the comparison of revenues of crop rotation of paddy-paddy, paddy-sweet corn and sweet corn-sweet corn. The selection of villages as representative of the crop rotation pattern was chosen deliberately based on the number of farmers most cultivating the rotation pattern of the crop. Respondents were randomly selected for 10% of each rotation pattern. The data in this study consists of primary data that is data obtained from the respondents through interviews with the help of questionnaires and observations of the object under study while secondary data obtained from the agencies associated with this research. This study used cost and income analysis methods for each plant species cultivated in each crop rotation pattern with the formula $Pi = TRi - TCi$, followed by comparative analysis to find out the rotation patterns of plants provide maximum revenue and R/C analysis to determine business feasibility. The results showed that the highest income was obtained from the rotation pattern of sweet corn- sweet corn is Rp. 26,642,188, - per ha per year or 34.26% higher than the paddy-sweet corn of Rp. 17,515,259, - per ha per year and 17.47% higher than paddy-paddy rotation pattern is Rp. 21,986,416, - per ha per year. The result of R/C analysis of paddy-paddy rotation pattern showed the highest R/C value of 2.55, followed by paddy-sweet corn 2.02 and sweet corn-sweet corn 1.56. however, it is not advisable for farmers to plant with a sweet corn-sweet corn rotation pattern continuously because it makes the environment unhealthy.

Keywords : komparative analysis, rice, corn, cropping pattern, farming

Penelitian dilaksanakan di Kecamatan Sukamaju Kabupaten Luwu Utara, pada bulan Juni-Agustus 2017, bertujuan untuk mengetahui perbandingan pendapatan usahatani pola rotasi tanaman padi-padi, padi-jagung manis dan jagung manis-jagung manis. Pemilihan desa sebagai perwakilan pola rotasi tanaman dipilih dengan sengaja dengan pertimbangan jumlah petani yang paling banyak mengusahakan pola rotasi tanaman tersebut. Responden dipilih secara acak sebesar 10% dari setiap pola rotasi. Data dalam penelitian ini terdiri dari data primer yaitu data yang diperoleh dari responden melalui wawancara dengan bantuan kuisioner dan observasi terhadap obyek yang diteliti, sedangkan data sekunder diperoleh dari Instansi yang terkait dengan penelitian ini. Penelitian ini menggunakan metode analisa biaya dan pendapatan pada setiap jenis tanaman yang diusahakan pada setiap pola rotasi tanaman dengan rumus $Pi = TRi - TCi$, kemudian dilanjutkan dengan analisis komperatif untuk mengetahui pola rotasi tanaman yang memberikan pendapatan maksimum serta analisis R/C untuk mengetahui kelayakan usaha. Hasil penelitian menunjukkan pendapatan tertinggi diperoleh dari usahatani pola rotasi tanaman jagung manis-jagung manis yaitu sebesar Rp. 26.642.188,- per ha per tahun atau 34,26 % lebih tinggi dari usahatani padi-jagung manis yaitu sebesar Rp. 17.515.259,- per ha per tahun; dan 17,47 % lebih tinggi dari usahatani pola rotasi padi-padi yaitu sebesar Rp. 21.986.416,- per ha per tahun. Hasil analisis R/C pola rotasi tanaman padi-padi menunjukkan nilai R/C tertinggi yaitu sebesar 2,56 diikuti padi-jagung masis sebesar 2,02 kemudian jagung manis-jagung manis sebesar 1,56, namun demikian tidak disarankan petani untuk menanam dengan pola rotasi jagung manis-jagung manis secara terus menerus karena membuat lingkungan menjadi tidak sehat.

Kata kunci : analisis komperatif, padi, jagung, pola rotasi tanaman, usahatani

1. PENDAHULUAN

Usaha peningkatan produktivitas padi, palawija, sayuran dan tanaman pangan lainnya terus dilakukan untuk memenuhi kebutuhan penduduk, sehingga lahan pertanian yang ada dapat diusahakan secara lebih intensif. Upaya menjaga keseimbangan antara pertumbuhan penduduk dan pengadaan berbagai macam bahan pangan yang dibutuhkan maka untuk meningkatkan produktivitas tanaman pangan ada berbagai macam metode yang dapat digunakan antara lain pengaturan pola tanam (*cropping pattern*).

Pola tanam (*cropping pattern*) adalah cara bertani yang melibatkan seluruh jenis tanaman yang bermanfaat bagi kehidupan manusia, beserta segala teknik bercocok tanam dan pengolahan hasil yang dipadukan secara serasi sehingga dapat meningkatkan produktivitas sumberdaya alam (lahan, iklim, tanaman) dan sumberdaya manusia (waktu, modal, teknologi dan manajemen) yang dimiliki keluarga petani per satuan luas lahan dan persatuan waktu, yang ditujukan kepada usaha untuk meningkatkan kesejahteraan petani beserta keluarga (khususnya) dan masyarakat luar (umumnya) (Handoyo, 2009).

Pengembangan pola usahatani perlu dilakukan secara rasional dan dinamis dengan mempertimbangkan perubahan faktor lingkungan dan permintaan pasar, agar memberikan manfaat maksimal dalam peningkatan produksi dan pendapatan petani.

Karama *et al* dalam Rusastra (2004) mengatakan bahwa ada beberapa faktor yang perlu dipertimbangkan dalam penyusunan pola tanam adalah sebagai berikut: (a) Ketersediaan air yang mencakup waktu dan lamanya ketersediaan yang tergantung pada kinerja air irigasi serta pola distribusi, dan jumlah hujan; (b) Keadaan tanah yang meliputi sifat fisik, kimia, dan bentuk permukaan tanah; (c) Tinggi tempat dari permukaan laut, terutama sehubungan dengan suhu udara, tanah, dan air pengairan; (d) Eksistensi hama dan penyakit tanaman yang bersifat kronis dan potensial; (e) Ketersediaan dan aksesibilitas bahan tanaman yang meliputi jenis dan varietas menurut kesesuaian agroekosistem dan toleransi terhadap jasad pengganggu; (f) Aksesibilitas dan kelancaran pemasaran hasil produksi dengan dukungan infrastruktur (fisik dan kelembagaan) dan potensi pasar yang memadai; (g) Kemampuan permodalan, ketersediaan kredit, dan kelayakan serta kemampuan petani menggunakan kredit; dan (h) Karakteristik sosial budaya masyarakat setempat yang terkait dengan adopsi teknologi dan pengembangannya dalam perbaikan taraf hidup mereka.

Rotasi tanaman merupakan bagian dari pola tanam adalah sistem budidaya tanaman dengan cara menggilir atau menanam lebih dari satu jenis tanaman yang berbeda dalam waktu yang tidak bersamaan. Rotasi tanam tersebut sudah lama dikenal di dunia pertanian, bahkan hingga sekarang pun sering dijadikan rekomendasi untuk beberapa jenis budidaya tanaman.

Rotasi tanaman memiliki banyak keunggulan. Pada beberapa sistem budidaya tanaman organik, rotasi tanaman sangat direkomendasikan. Beberapa keunggulan rotasi tanaman adalah mampu mengurangi intensitas serangan hama atau penyakit, meningkatkan kesuburan tanah, serta mampu membentuk ekosistem mikro yang stabil. Selain itu, di dalam dunia agribisnis pada beberapa jenis komoditas terutama jenis sayuran mampu memenuhi permintaan pasar yang diinginkan. (anonymous, 2015)

Tersedianya lahan sawah seluas 6.941ha (Anonymous, 2016) di Kecamatan Sukamaju Kabupaten Luwu Utara mendukung diusahakannya berbagai macam usahatani untuk meningkatkan berbagai kebutuhan bahan pangan dan juga tentunya dapat berdampak pada pendapatan petani, tanpa harus mengabaikan keberlanjutan lingkungan (menjaga kelestarian sumberdaya). Usahatani yang diusahakan diantaranya adalah usahatani pola rotasi padi-padi, padi-jagung manis, dan jagung manis-jagung manis. Usahatani tersebut merupakan sistem budidaya tanaman dan termasuk tipe pergiliran tanaman (*crop rotation*).

Hasil penelitian Amelia (2009) yang berjudul "*Perbedaan Pendapatan Petani dengan Pola Tanam Kedelai-Kedelai-Padi dengan Pola Tanam Jagung-Jagung-Padi di Kabupaten Asahan*" menunjukkan Pendapatan dari pola tanam jagung-jagung-padi lebih menguntungkan dari pola tanam kedelai-kedelai-padi. Hasil penelitian Dharmaningtyas(2011) menyimpulkan bahwa rata-rata pendapatan yang diperoleh usahatani pola rotasi jagung-padi-kacang tanah adalah Rp. 4.642.039,66/Ha/Th lebih rendah dari pendapatan usahatani pola rotasi padi-padi-padi yaitu Rp.5.443.298,69/Ha/Th.

Berdasarkan latar belakang tersebut diatas, maka masalah dalam penelitian ini adalah pola rotasi tanaman mana yang menghasilkan pendapatan maksimum serta berapa besar perbandingan pendapatan usahatani pola rotasi tanaman padi-padi, padi-jagung manis dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu Utara.

Tujuan penelitian adalah untuk mengetahui pola rotasi tanaman yang menghasilkan pendapatan maksimum serta perbandingan pendapatan usahatani pola rotasi padi-padi, padi-jagung manis dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu Utara.

Hasil Penelitian diharapkan bermanfaat sebagai bahan masukan bagi petani dalam mengembangkan usahatannya dan bahan masukan pemerintah dalam membuat kebijakan pengembangan usahatani di Kecamatan Sukamaju dan Kabupaten Luwu Utara pada umumnya

2. METODE PENELITIAN

2.1. Waktu dan Tempat Penelitian

Penelitian ini dilaksanakan pada Bulan Juni sampai dengan Agustus 2017 di Kecamatan Sukamaju Kabupaten Luwu Utara. Pemilihan lokasi berdasarkan pertimbangan bahwa di daerah ini lahan sawah terluas dan masyarakatnya mengusahakan usahatani pola rotasi padi-padi, padi-jagung manis, dan jagung manis-jagung manis.

2.2. Populasi dan Sampel

Populasi dalam penelitian ini adalah desa terpilih yang kelompok tani/petani yang paling banyak melakukan pola rotasi tanaman padi-padi, padi-jagung manis, dan jagung manis-jagung manis pada lahan sawah beririgasi teknis yang ada di Kecamatan Sukamaju Kabupaten Luwu Utara.

Berdasarkan survey awal dan data dari BPP sukamaju, desa terpilih untuk usahatani pola rotasi padi-padi adalah Desa Tulung Indah dengan jumlah petani sebanyak 453 orang. Desa terpilih untuk usahatani pola rotasi padi-jagung manis adalah Desa Mulyasari dengan

jumlah petani sebanyak 58 petani sedangkan untuk usahatani pola rotasi jagung manis-jagung manis adalah Desa Tulung sari dengan jumlah petani sebanyak 204 petani. Dari masing-masing desa terpilih diambil sampel secara random sebesar minimal 10 % (Gay dan Diehl, 1992), sehingga jumlah sampel untuk usahatani pola rotasi padi-padi sebesar 45 petani, pola rotasi padi-jagung manis sebesar 20 petani dan usahatani pola rotasi jagung manis-jagung manis sebesar 20 petani.

2.3 Metode Pengambilan Data

data yang diambil dalam penelitian ini terdiri dari data primer data sekunder. Data primer adalah data yang di peroleh secara langsung dari responden melalui observasi dan wawancara dengan berpedoman pada daftar pertanyaan (kuesioner) antara lain menyangkut identitas petani dan keterangan usahatani yang telah dilakukan petani selama ini. Data Sekunder adalah data yang di peroleh dari literatur, instansi terkait dan laporan atau hasil-hasil penelitian dari berbagai pihak yang berkaitan dengan penelitian ini.

2.4 Analisis Data

Untuk mengetahui pendapatan usahatani pola rotasi tanaman padi-padi, padi-jagung manis, dan jagung manis-jagung manis, maka digunakan analisis pendapatan sebagai berikut:

$$P_i = TR_i - TC_i$$

$$TR_i = Y_i \times H_i$$

Keterangan :

- P_i : pendapatan usahatani(i) (Rp).
 TR_i (*Total Revenue*) : penerimaan usahatani(i) (Rp).
 TC_i (*Total Cost*) : total biaya yang dikeluarkan dalam usahatani (i) (Rp)
 Y_i : produksi usahatani (i) (kg)
 H_i : Harga satuan produksi (i) (Rp)
i : jenis tanan yang dianalisis (padi-padi, padi-jagung dan jagung manis-jagung manis)

Dari hasil analisis pendapatan dilanjutkan dengan analisis komperatif yaitu membandingkan pendapatan yang dihasilkan usahatani pola rotasi tanaman padi-padi, padi-jagung manis dan jagung manis-jagung manis dan analisi R/C rasio untuk mengetahui kelayakan usahatani (Suratiyah, 2015)

3. HASIL DAN PEMBAHASAN

3.1 HASIL

3.1.1 Usahatani Pola Rotasi Tanaman

Usaha tani pola rotasi padi-padi dilaksanakan sebanyak 2 kali dalam setahun secara bergiliran terdiri dari padi musim tanam I (MT I) sekitar bulan Januari/Februai sampai dengan April/Mei dan terdapat bera selama lebih kurang dua bulan sebelum masuk musin tamam II (MT II) yaitu Juli/Agustus sampai dengan Oktober/November. pada musim tanam II (MT II) yang ditanam tetap tanaman padi.



Gambar 1. Pola rotasi tanaman padi-padi

Usaha tani pola rotasi padi-jagung manis adalah budidaya tanaman yang dilakukan secara bergiliran terdiri dari padi musim tanam I (MT I), dan jagung manis pada musim tanam II (MT II). Pola rotasi padi-jagung manis juga dilaksanakan 2 kali setahun, sama halnya dengan pola rotasi padi-padi yang membedakan pada musim tanam II petani menanam jagung manis. Pada pola rotasi padi-jagung manis terdapat juga masa bera yaitu tanah dibiarkan istirahat selama lebih kurang dua bulan sebelum ditanami jagung manis.



Gambar 2 Polarotasi tanaman padi-jagung manis

Usahatani pola rotasi jagung manis-jagung manis dilakukan sebanyak 4 kali dalam setahun. secara bergiliran terdiri dari jagung manis musim tanam I (MT I), jagung manis musim tanam II (MT II), jagung manis musim tanam III (MT III), dan jagung manis musim tanam IV (MT IV) pada lahan yang sama. Pada pola rotasi ini tidak ada masa bera. Begitu selesai panen jagung manis langsung dilakukan penanam kembali.



Gambar 3. Pola rotasi tanaman jagung manis-jagung manis

3.1.2 Biaya Usahatani

Biaya adalah semua pengeluaran yang digunakan dalam berusahatani pola rotasi padi-padi, padi-jagung manis dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu Utara dimana biaya pengeluaran terdiri dari biaya tetap dan biaya variabel.

Biaya tetap adalah biaya yang sifatnya tidak mempengaruhi besarnya produksi, seperti pajak, penyusutan alat dan bangunan. Biaya variabel adalah pengeluaran yang digunakan untuk produksi tertentu dan jumlahnya berubah sebanding dengan besarnya produksi seperti biaya penggunaan bibit, penggunaan pupuk, penggunaan obat-obatan, dan biaya tenaga kerja dan lain-lain. Sedangkan biaya total adalah biaya tetap di tambah biaya variabel

Untuk lebih jelasnya biaya tetap, biaya variabel dan biaya total pada usahatani pola rotasi tanaman padi-padi, padi-jagung manis dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu dapat dilihat pada tabel berikut ini

Tabel 1. Biaya tetap, biaya variabel dan biaya total usahatani pola rotasi tanaman padi-padi, padi- jagung manis dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu Utara.

Uraian	Total Biaya Usahatani Pola Rotasi					
	PADI-PADI		PADI-JAGUNG MANIS		JAGUNG MANIS-JAGUNG MANIS	
	Rata2 Responden	Konversi	Rata2 Responden	Konversi	Rata2 Responden	Konversi
	0,70 ha	1 ha	0,58 ha	1 ha	0,29 ha	1 ha
Biaya tetap	187,670	269,126	123,704	212,185	127,799	446,458
Biaya Variabel	9,699,813	13,909,866	9,902,900	16,986,106	13,496,875	47,150,655
Total Biaya	9,887,483	14,178,991	10,026,604	17,198,291	13,624,674	47,597,113

Sumber : Data primer setelah diolah

Tabel diatas menunjukkan total biaya tetap terbesar adalah biaya tetap yang dikeluarkan oleh usahatani pola rotasi jagung manis-jagung manis yaitu sebesar Rp. 47.597.113 per ha per tahun dan yang terendah adalah total biaya usahatani pola rotasi padi-padi yaitu Rp. 14.178.991 per ha pertahun.

3.1.3 Pendapatan

Pendapatan bersih atau keuntungan usahatani merupakan selisih antara penerimaan dengan total biaya yang digunakan dalam usahatani. Penerimaan diperoleh dari hasil kali antara jumlah produksi dengan harga produksi sebelum dikurangi dengan total biaya yang digunakan.

Adapun pendapatan bersih atau keuntungan rata-rata per hektar ketiga usahatani pola rotasi dapat dilihat pada tabel tabel 2

Tabel 2. Pendapatan usahatani pola rotasi tanaman padi-padi, padi jagung dan jagung manis-jagung manis di Kecamatan Sukamaju Kabupaten Luwu Utara.

Uraian	Pendapatan Usahatani Pola Rotasi					
	PADI-PADI		PADI-JAGUNG MANIS		JAGUNG MANIS-JAGUNG MANIS	
	Rata2 Responden	Konversi	Rata2 Responden	Konversi	Rata2 Responden	Konversi
	0,70 ha	1 ha	0,58 ha	1 ha	0,29 ha	1 ha
Penerimaan	25,219,344	36,165,408	20,248,000	34,730,703	21,251,000	74,239,301
Biaya tetap	187,670	269,126	123,704	212,185	127,799	446,458
Biaya Variabel	9,699,813	13,909,866	9,902,900	16,986,106	13,496,875	47,150,655
Total Biaya	9,887,483	14,178,991	10,026,604	17,198,291	13,624,674	47,597,113
Pendapatan (Keuntungan)	15,331,861	21,986,416	10,221,396	17,532,412	7,626,326	26,642,188
Komparatif		17.48		34.26		100.00
R/C	2.55	2.55	2.02	2.02	1.56	1.56

Sumber : Data primer setelah diolah.

Dari tabel 2 tersebut diatas menunjukkan pendapatan atau keuntungan tertinggi diperoleh dari usahatani pola rotasi tanaman jagung manis-jagung manis yaitu sebesar Rp. 26.642.188,- per ha per tahun atau 34,26 % lebih tinggi dari usahatani padi-jagung manis yaitu sebesar Rp. 17.515.259,- per ha per tahun; dan 17,47 % lebih tinggi dari usahatani pola rotasi padi-padi yaitu sebesar Rp. 21.986.416,- per ha per tahun. Hasil analisis R/C pola rotasi tanaman padi-padi menunjukkan nilai R/C tertinggi yaitu sebesar 2,55 diikuti padi-jagung manis sebesar 2,02 kemudian jagung manis-jagung manis sebesar 1,56, hal ini menunjukkan usahatani pola rotasi tanaman padi-padi lebih layak diusahakan dari usahatani pola rotasi tanaman jagung manis-jagung manis meskipun usahatani pola rotasi tanaman jagung manis-jagung manis memberi keuntungan yang paling tinggi namun nilai R/C yang paling rendah artinya pengeluaran usahatani pola rotasi tanaman padi-padi sebesar Rp.100 akan menghasilkan Rp. 255 sedangkan usahatani pola rotasi tanaman jagung manis-jagung manis dengan pengeluaran yang sama sebesar Rp.100 hanya menghasilkan Rp. 156.

3.2 Pembahasan

Meskipun usahatani pola rotasi jagung manis-jagung manis menghasilkan keuntungan yang lebih tinggi dari pada usahatani pola rotasi tanaman padi-padi dan padi-jagung manis, tidak disarankan petani untuk menanam usahatani pola rotasi jagung manis-jagung manis secara terus menerus, karena pola rotasi tanam yang sejenis dapat menimbulkan ledakan hama penyakit. Dengan menanam tanaman berbeda jenis akan memutus siklus hama penyakit.

Rotasi tanam menjadi salah satu tindakan yang sangat dianjurkan dalam konsep pengendalian terpadu. Rotasi tanaman yang berasal dari famili yang berbeda, misalnya tanaman padi – tanaman jagung manis dapat membantu dalam proses penekanan atau pengendalian hama dan penyakit tanaman. Keunggulan rotasi tanaman adalah mampu mengurangi intensitas serangan hama atau penyakit, meningkatkan kesuburan tanah, serta mampu membentuk ekosistem mikro yang stabil. Selain itu, di dalam dunia agribisnis pada beberapa jenis komoditas terutama jenis sayuran mampu memenuhi permintaan pasar yang diinginkan.

Meskipun pola rotasi tanaman padi-padi merupakan pola rotasi tanaman sejenis namun dapat direkomendasikan untuk tetap dilaksanakan karena disamping menghasilkan nilai R/C tertinggi, pola rotasi padi-padi memiliki masa bera lebih kurang dua bulan sebelum masuk musim tanam ke dua. Masa bera tersebut diharapkan dapat menekan hama penyakit tanaman. Namun demikian perlu adanya penelitian lebih lanjut untuk membuktikan pengaruh rotasi tanaman terhadap pola perkembangan dan penyebaran hama dan penyakit dengan pola tanam padi-padi, padi-jagung manis dan jagung manis-jagung manis.

4. KESIMPULAN

Pendapatan usahatani pola rotasi tanaman padi-padi adalah sebesar Rp. 21.986.416,- per ha per tahun dengan R/C sebesar 2,55, padi-jagung manis adalah sebesar Rp. 17.515.259,- per ha per tahun dengan R/C sebesar 2.02 dan jagung manis-jagung manis adalah sebesar Rp. 26.642.188,- per ha per tahun dengan R/C 1,56. Jika dibandingkan dari ketiga usahatani pola rotasi tanaman tersebut diatas maka usahatani yang paling tinggi menghasilkan pendapatan adalah usahatani pola rotasi tanaman jagung manis-jagung manis namun ditinjau dari analisis R/C adalah usahatani dengan pola rotasi tanaman padi-padi yang lebih layak dilaksanakan.

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NGUSABA DANGSIL:**THE LOCAL WISDOM OF KARANGASEM BALINESE AGA
IN MAINTAINING SOCIAL ORDERS****GPB Suka arjawa***(Prodi Sosiologi, Fisip Universitas Udayana)*

Abstrak. Tulisan ini menggali makna simbolis penghormatan kepada pemimpin yang ada pada upacara *Ngusaba Dangsil* yang diselenggarakan oleh masyarakat Bali Aga di Desa Bongaya, Kecamatan Bebandem, Karangasem. Di tengah pemberlakuan sistem demokrasi Indonesia sekarang, ada kecenderungan banyak posisi pimpinan yang tidak mendapat penghormatan oleh masyarakat layaknya sebagai seorang pemimpin. Ini terlihat tidak saja pada berbagai kritik yang bermunculan melalui media, tetapi juga upaya rekayasa untuk menggusur pemimpin yang ada melalui berbagai cara, baik halus maupun kasar. *Ngusaba Dangsil* yang diselenggarakan oleh masyarakat Bali Aga di Desa Bongaya mampu memberikan pesan penting kepada masyarakat tentang bagaimana cara menghormati pimpinan tersebut. Penelitian ini dilakukan di Desa Bongaya, Kecamatan Bebandem, Kabupaten Karangasem dengan jenis kualitatif. Disamping melakukan terjun langsung ke lapangan melihat dan mewawancarai warga setempat, digunakan juga data-data sekunder yang termuat di buku dan media massa untuk melengkapi penelitian. Teori yang dipergunakan adalah interaksionisme simbolis yang dipadukan dengan metode teoritik *verstehen* untuk menafsirkan makna dibalik peristiwa yang terjadi, serta menggunakan pendekatan *hermeneutik* untuk menafsirkan kata dan kalimat yang diungkap oleh warga. Temuan yang didapatkan adalah bahwa upacara *Ngusaba Dangsil* tersebut ternyata merupakan ungkapan terima kasih masyarakat kepada seluruh pimpinan yang dipandang melindungi mereka sebagai umat manusia. Pimpinan yang dimaksud adalah pimpinan Bali, pimpinan wilayah Karangasem sebagai wilayah kerajaan mereka di masa lalu serta pimpinan setempat dimana masyarakat ini hidup dan berkembang.

Kata Kunci; *Ngusaba Dangsil*, Kepemimpinan, Simbol, Tradisional

Introduction

Social order is a condition in which people are able to carry out life well without having to be disturbed by conflicts and tensions that occur. This condition can be achieved if all the social components run in an orderly manner where the norms, values and customs are adhered to. Traditional communities in Bali, have enough instruments and messages of wisdom that can be used to create order. Balinese people have normative rules called *awig-awig*. *Awig-awig* contains rules concerning social life that must be followed by the community in *pekraman* (customary) village environment (Windya, Sudantra, 2016: 21). Besides that, conceptually there is a social message *Tat Twan Asi* which means "I am you." The meaning of this message is the alignment of human relations.

Whereas in the context of social action, Balinese people have wisdom called *ngayah* and *metulungan*. *Ngayah* is a joint social action without taking into account any rewards or economic benefits. This action is carried out in relation to the joint place of worship. Whereas in the context of human relationship and inter-group, the collective action without taking into account any economic return is called *metulungan*. The construction of houses, rice planting or ritual ceremonies in the family, will be easier to hold if carried out with this action. In Indonesian context, it is called mutual cooperation.

At the level of the ritual, which is annually held, Balinese community also has a quite big number of rituals held every year. The money giving ritual, *mesuryak* held in Bongan Village, Tabanan Regency, for example having the meaning of togetherness through sharing the fortune among the people for the grace of God Almighty.

Either the concept of *Tat TwanAsi*, *ngayah* or *metulungan* ritual as well as *mesuryak* provides significant contributions to the creation of harmoniously social relationship in the community. Organizationally, Balinese people have a traditional organization called *pakraman village* which regulates the management of traditional community sustainability, especially in relation to *Khayangan Tiga* temple.

However, Balinese people, especially the people of *Bali Aga*, still have other rituals that are actually able to provide a multifunctional message to the community if extracted from the hidden meanings in it, namely *Ngusaba Dangsil*. The *Bali Aga* Community, is a label for people who had been occupying the island of Bali before the arrival of Majapahit Kingdom's influence in Bali in the 14th century. Majapahit, along with its chief commander of Gajah Mada,

conquered the kingdom of Bali. This *Bali Aga* community inhabited the mountainous areas in the middle of the island of Bali and spread in three regencies, namely Karangasem, Bangli and Singaraja.

Compared to other rituals in Bali, this *Ngusaba Dangsil* ritual provides a more complex message to the community and the younger generation who were born later. Message of respecting the leaders, honouring the ancestors and origins, unity among communities and other groups is able to build social movements in simplicity.

Ngusaba Dangsil is a traditional ritual that has been held for generations by Balinese Aga people in Karangasem regency. This ritual is religiously and socially held in Bungaya Village, held within every 10 to 14 years. Although this ritual is held in Bungaya Village, all *Bali Aga* people in Karangasem district will come to the peak of the celebration. This *Ngusaba Dangsil* ritual is able to present at least twenty thousand people at the peak of the celebration.

The meaning of this ritual is not too much understood because the meanings contained in it have never been fully explored. Besides, there has never been any study of hidden meanings, the ritual is also not publicly well known in Bali. The articles on the meaning of rituals in Bali only concern *Galungan*, *Nyepi*, *Ngusaba Nini*, or *Memungkah* festivals, which are mostly held in the southern part of Bali. The writing about *Ngusaba Dangsil* is only in the form of news, both in print and electronic media as well as in social media (internet). In fact, this ritual can take up to one month and present approximately 20,000 people. If the meaning is explored more deeply, this ritual has a message that is very useful for the community, especially in terms of respecting and rewarding leaders, respect and appreciation for their ancestors and origins, maintaining unity among groups and showing respect for the younger generation. On the other hand, *Ngusaba Dangsil* ritual is one of the socializations of the values of respect, unity and simplicity given to young people before entering adulthood. The ritual can also be seen as an effort to mature the new generation of those values for *Bali Aga* people in Karangasem Regency

The article below describes the meanings found in *Ngusaba* ritual, using the method of social interpretation and symbolic *interactionism* theory (Ritzer, Goodman, 2007:289). The hope is that the various meanings contained in *Ngusaba*, not only can be understood more deeply by Balinese Aga community in Karangasem or Balinese community, but also understood by public as a whole.

General Overview of *NgusabaDangsil*

Ngusaba Dangsil is a religious-cultural ritual held by Bali Aga community in Karangasem Regency, located in Bungaya Village. This ritual is held every 10 to 14 years. The last time it was held on Monday, Agustus 29, 2016 (Fajar Bali, 30 Agustus 2016). *Ngusaba* has a meaning of *ruwatan* ceremony – a ceremony of freeing people from bad luck that will befall - organized by all villages in Bali (Darna, 2016).. Nearly all Hindu communities in Bali hold this *ruwatan* ritual in a different form. In general the aim is to ask for safety and social balance. While *Dangsil* is a symbolic tool that is used to realize people's gratitude for success, especially agriculture, which is dedicated to God, Ida Sang HyangWidhi (Darna 2016). In this *Dangsil*, all natural yields or offerings are placed, or attached as a symbol of the success of agricultural yields and prosperity. *Dangsil* has a form like a mountain, called *gunungan or meru*, which is decorated with all the results of human cultivation. The size can be small which can be carried by someone, but the larger ones must be carried by some people or thousands of them. The *Dangsil* used in Bungaya Village is a large *Dangsil* that must be carried by thousands of people.

Bungaya village, where *Ngusaba Dangsil* is usually held in, is one of *Bali Aga* villages in Karangasem regency. From its location, this village is located in the middle of Karangasemregency. Seen from the spread of *Bali Aga* villages in Karangasem regency, Bungaya village is relatively more reachable than the other existing *Bali Aga* villages. The distance from the regency capital is approximately 10 kilometers. As a whole, there are ten villages of Bali Aga in Karangasem Regency. They are *Bungaya, Kastala, TengananDauhTukad, Tenganan, Timbrah, Bebandem, Macang, KayuPutih, Tihingan, andBugbug*. When *Ngusaba Dangsil* ritual is held, all people from those villages come to Bungaya Village. That is why on the day of the ritual, approximately 20,000 people attend the ceremony.

These Balinese Aga villages are villages located in mountainous areas. Their inhabitants are considered as native Balinese. In this sense, they had inhabited the island of Bali before the arrival of Majapahit influence in the 14th century. However, it is also stated that the Balinese Aga came from Java in the 8th century, which was brought by *Rsi Markandeya* when clearing the forest to build Besakih Temple. They came from the foot of Mount Rauung in East Java (Stuart Fox, 2010:306). These are the people who are called Aga people. Besides occupying the area of Karangasem regency, people of Bali Aga also occupy the central mountains of Bali in

Bangli and Buleleng Regencies. However, the most widely distributed population is in the area of Karangasem Regency.

In general, they have a livelihood as farmers, especially cultivating their own fields in their own areas. However, with the current social developments in Bali, many have worked as employees, both public and private, as well as being professionals. The roads that connect the villages of *Bali Aga* to the regency capital or Bali province capital, make it possible for residents to get out of the villages to work in the city. Conversely, with that good infrastructure, it enables city traders to enter the villages to market goods. With the entry of electricity to the remote villages, it is also possible for the community to build and make *insutri* in the villages. However, when *Ngusaba Dangsil* ritual is held, Bali Aga community of Karangasem regency who spread in some towns in Bali, return home and then gather in Bungaya village to get involved in the ritual.

For *Balinese Aga* people of Karangasem, attending this ritual has its own social meaning. The main factor that makes outsiders come during the ceremony is because the ritual has a close connection with religion. The variously held rituals, take place at the location of the temples that is *PuraDesa* and *Pura Penataran*. As a religious community, they have a moral obligation to come to the village following the ritual, praying along with the *ngusaba* ceremony. Besides that, as people of Bali Aga, they have one philosophy and *awig-awig* (*customary rule*) to celebrate this ritual together. *Ngusaba Dangsil* is a traditional ritual that always takes place in every 10 to 14 years. This is what makes them obliged to come to the village.

This ritual has an important meaning in social life that can be a positive message for future generations to maintain social order, unity and recognition of leaders. In the midst of social changes that are now faced by society, not many understand the symbolic meaning that exists in that *Ngusaba Dangsil* ritual. The search in the field shows that no community members know and understand the deep meaning of the ceremony. They mentioned that this ceremony was for the sake of the harmony of Bali.



Dangsil yang diarak ini adalah yang menyimbolkan penghormatan kepada Pemimpin Bali di masa lalu. Ini merupakan Dangsil yang paling besar.

(Sumber: Fajar Bali, 2/9/2016)

The Procedures of UsabaDangsil Ritual

This ritual begins with the purification of *Ida Bhatara* to *Bugbug Beach*, 12 days before the peak feast day. In the 2016 ritual, the cleansing ceremony was held on August 17, 2016, followed by thousands of residents with traditional attire in accordance with local traditional customs. This ceremony is also called *Melasti*. In its implementation, carried out by parading *Jempana*, namely *pelelingih Ida Bhatara*, where the front one is *Ida Bhatara Bagus Selonding*, followed by *Ida Bhatara Lingsir* (Latri, Jungutan, 2016).

After carrying out the *Melasti* ceremony, on the day, a *pewintenan* ceremony was held for the young girls and boys or called *daha* and *teruna*. The number of *daha* and *teruna* reached 600 people from the villages of Bali Aga in Karangasem Regency (Fajar Bali, 18 Agustus 2016). Next was the highlight of the event, namely *Usaba Dangsil*, on August 29, 2016. At the time the ritual was held, there were seven *Dangsil*s paraded, starting from the *Desa Temple* to the

Penataran Temple. This ceremony began with a *mesayaan-sayaan* ceremony between the young girls and boys of the villages involved in the ceremony. Next, Ida Bhatara Kabeh did cleansing to *Penataran Temple* and then returned to Pura Bale Agung. After Bhatara Kabeh had returned to Pura Bale Agung, then Ida Bhatara Bagus Selonding headed for *Penataran Temple*. After Ida Bhatara Bagus Selonding had been in *Penataran Temple*, then those *Dangsils* were paraded, right after being given a signal by Pan Kober Lanang Wadon.

At *usaba Dangsil* ceremony which was held on August 29, 2016 in Bungaya village, Karangasem there were seven *dangsils* paraded, each of them was the overlapping *Dangsil Nungnungan* which was paraded by Kastala Village people, the overlapping *Dangsil Desa* paraded by people of Tenganan Dauh Tukad village, *Dangsil Dalem*, the highest and had 11 overlaps, paraded by people of Timbrah village. The overlapping *Dangsil Sana Kauh* and *Dangsil Puseh*, paraded by the villagers of Bebandem, Macang, Kayu Putih, and Tihingan. The overlapping *Dangsil Penghulung* and *Susuhunanan* paraded by villagers of Adat Bugbug (Bagiarta, Balipost Magazine, No.153, 19-25 September 2016, p. 49). Among the seven paraded, the highest one was *Dangsil Dalem*, with 11 levels and carrying the descendants of Kelungkung King. Then, the next one was, the 9-level - *Dangsil Village* which carried the descendants of Karangasem King.

The culmination of *Usaba Dangsil* ceremony was the parade of *Dangsil* from the Village Temple to *Penataran Temple*. Seven *Dangsils* were paraded and accompanied by tens of thousands of people wearing simple clothes. The eleven-level - *Dangsil* was climbed by descendants of Ida Dalem Semarapura, the nine-story-*Dangsil* ridden by descendants of Karangasem King, and the seven-story- *Dangsil*, climbed by Puri Descendants of Bungaya. The five-story *Dangsil* was climbed. This was what was then paraded to *Penataran Temple* from *Desa Temple* or *Bale Agung Temple*. People who did not participate in lifting *Dangsil* up would have to join in walking together from *Desa Temple* to *Penataran Temple*. All members of the community wore simple clothes, namely *gringsing fabric* made in the village of Tenganan Pegringsingan. Both male and female members of the community joined *Dangsil's* journey from the *Desa Temple* to *Penataran Temple*. The distance between the two temples was around 300 meters. Since there were too many people taking part in parading and accompanying *Dangsil's* journey, the time spent on 300-meter - journey, would take about an hour.

Various Symbolic Meanings

There are three symbolic messages seen in *Ngusaba Dangsil* ritual series, namely a symbolic message which shows that Bali Aga villagers in Karangasem are religious people. Second is the message addressed to the general public about the attitude of Karangasem Bali Aga people, both to the leader and to themselves, and third is a symbolic message that means socialization to the new generation .

The Balinese Aga community, like other Balinese people, is a very religious community. *Ida Bhatara* is a representation of God for the Balinese Aga in Karangasem and other Balinese Hindu people. Therefore, in this *Ngusaba Dangsil* ceremony the relationship between God and the people looks very close. Here, God is considered as the One who gives protection and blessings to the rituals. The respect for God is shown by the community in the first/earliest ceremony, which is *Melasti* ceremony that is conducted at Segara Kidul (Bugbug Beach). *Melasti* pictured which the ceremonial where mass people gathering to the beach. The purpose of this ceremony is to clean the Lord's throne and *Ida Bhatara* is present at Penataran Temple before the ceremony is held. In the ritual the people carry *Ida Bhatara* with this throne to the *Penataran* Temple. This means that ceremony is blessed the way is opened by God so that the ceremony can be held as expected. Thus, this ceremony shows the religiosity attitude of the Balinese Aga community in Karangasem Regency and also gives confidence to the community that the ceremony will take place without any problems.

The parade of *dangsil* from PuraDesa to PuraPenataran and the person/entity who sits on the *dangsil* show us that this ceremony is a symbol of community's submission to their leaders – a Balinese leader in the past, *Ida Dalem Semarapura*, the leader of Karangasem, and the leader in their neighbourhood. This is a social recognition of the power that is possessed by these leaders. Various Balinese Aga communities in Karangsem who carry out the ceremony and do the parade are affirmation and recognition of the power of the Balinese Aga people towards/toward the kingdom in Bali.

In *Ngusaba Dangsil* ceremony which took place on 29 August 2016, the *Dangsil* that was used to carry *Dalem Semarapura*, had a clear difference with other *Dangsil*s. It had 11 (eleven) levels, the tallest compared to the others. The *Dangsil* that was used to carry the descendant of the King of Puri Karangasem had 9 (nine) levels while the *Dangsil* that was used to carry the

descendant of the King of Bungaya had only 7 (seven) levels. This showed that PuriKlungkung had gained recognition as the highest authority. In the *Dangsil* parade that started at Pura Bale Agung and ended at *Pura Penataran*, the first *Dangsil* that was used to carry the descendant of the King of Karangasem was taken first and then the people took the *Dangsil* that was boarded by DalemSemarapura, who was the descendant of the King of Klungkung. This indicated that the people of Bali Aga and the King of Karangasem recognize the rule of the King of Klungkung.

The *Dangsil* of Puri Karangasem that was in the front opened the way and guarded the King of Klungkung. It is written in history that PuriKarangasem was a subordinate of PuriKlungkung. *Dalem Baturenggong*, one of mahapatih of King of Klungkung, was given the authority to rule Karangasem by the King whose kingdom used to be the center of power/kekuasaan in Bali. The level of the Kingdom of Karangasem is the same as that of Kingdom of Gianyar, Tabanan, Denpasar and the others. In other words, the front position of the *Dangsil* on which the descendant of the King of Karangasem sit, had the meaning that the descendant was guarding and protecting the King of Klungkung.

This loyalty was shown by all of the people and religion was not an obstacle. In the *Usaba Dangsil* held on August 29, 2016, a moslem from Moslem kampong of Belalungan in Bungaya Village participated as the controller of towing rope of the *Dangsil* (Murdiana, 2016). The participation of a Moslem signified a high respect from the people to the King, that he must be honoured and must not be disgraced by the people.

Of the seven *Dangsil*s that were paraded, only one *Dangsil* was decorated with some restraining ropes. It was the *Dangsil* which was used to parade *Ida dalem Semarapura*. These ropes were tied to the levels that resemble the shape of *meru*. These ropes were held by some men to control the *Dangsil* and they were directed by a Moslem from *Selam Belalungan*. The ropes did not function to pull *Dangsil*, which weighed up to six tons, but they were used to but control the peak of *Dangsil* so that it would not collapse. The use of these ropes were a symbol of the role of the people in keeping the King of Bali from falling, he must remain on the right track when running the government. It was the people who helped maintain the king's integrity and honor so that he remained authoritative and did not lose respect. The peak of the *Dangsil* symbolizes the authority of the King.

The Same Identity

Overall, *Ngusaba Dangsil* ritual is a shared identity of the people of Balinese Aga people in Karangasem Regency. This is the only ritual that is done by all Balinese Aga people in the regency. One day before this ceremony is done, a particular dance is performed to tell and remind them of their their origin. The dance is also to honour Rsi Markandeya for successfully founded the Pura Besakih (Besakih Temple) in the 8th century AD (Stuart Fox, 2010:306). It was the Balinese Aga people who accompanied and helped Rsi Markandeya from Mount Raung, East Java clear the forest to build this Temple. The cloth *gringsing*, which was made by the Balinese Aga people, was worn by young women and men who did not wear slippers during the ritual. This is to remind them of their own product and of the past daily life of the Balinese Aga people who did not wear any footwear. *Gambelan Selonding* is also their shared identity. They came from *Gunung Rawung* in East Java to Bali with this gambelan, which is the oldest gambelan in Bali and only found in the villages of Balinese Aga in Karangasem, Bangli and Singaraja. During the *Usaba Dangsil* ritual, the position of Selonding got a special locus, it was the first music instrument that was brought inside *Penataran Temple* where the seven *Dangsils* would reside. This traditional music instrument was also called *Ida Bhatara Bagus Selonding*, which was a reflection of high respect and recognition of this music instrument. Thus, *NgusabaDangsil* with all its equipment is a shared identity of the Balinese Aga people in Karangasem.

Socialization to Teenagers

The recognition of the king's rule and the efforts to achieve social stability must be passed down to the next generation in order to maintain this valuable local wisdom. In the Middle Age there were no modern instruments that could be used to spread this wisdom through literacy because books and stationery did not exist. Moreover, the Balinese Age people in Karangasem Regency were spread far enough away from each other. To solve these challenges, two ways of socialization were used, gathering the teenagers and young adults and making them actively involved in the rituals that are related to religion and culture. The involvement the teenagers in this socialization played an important role because adolescence is a period of absorption of knowledge.

The gathering of the Balinese Aga people allowed their identities to be recognized by all of them and created a sense of brotherhood and unity. It also allowed interaction between individuals and between groups that could result in a form of a shared identity as the people of Balinese Aga. This sense of togetherness evoked solidarity, feeling of awe, and stronger unity. Although they are separated in different villages, their Bali Aga identity is still apparent for example by *pagringsingan* clothe that is still worn by these people. This is what makes them feel very close to each other and this unity is also shown by the dance which is about the arrival of Rsi Markandeya. This dance is, surely, another unity identity of the Balinese Aga people. In this unity they are deeply involved in symbolic activities when they parade their lords, the King of Klungkung and the King of Karangasem. This togetherness is a form of unity and friendship. Dance together is an affirmation that they have the same community roots, and with them they all recognize the rule of the King of Klungkung and respect the government and other leaders. Social stability can be, then, achieved through these similar identities. These symbolic messages are hopefully understood and maintained by the teenagers involved in this ritual so as to create a social stability in various places where Balinese Aga people live.

Conclusions

The *NgusabaDangsil* that was organized by the Balinese Aga people in Karangasem Regency is a local wisdom that has positive messages for the present and future generations. The rituals show how a group of people maintains social order in a balanced manner through the recognition of the power of the government in the past and the recognition of their origin. With this recognition of the power, they receive political protection and recognition of their origins, and will be able to foster their shared identities. It is this shared identity that creates strong unity among the people of the Balinese Aga, and it leads to social stability. This local wisdom is then directly socialized to the younger generation, who are the main actors in this ritual. Through various prohibitions on the use of luxury things, the Balinese Aga people want to maintain their simple and modest life as their ancestors had when they cleared the forest in the 8th century. With this local wisdom they give lessons to the new generation, so that they can survive today's social life.

The understanding of the symbolic meaning of the *Ngusaba Dangsil* ritual has great benefits both for the people of Bali and people of the world. In Bali demonstrations and protests against the local government and Indonesian leaders in Jakarta are very rare compared to those

against the government in Jakarta. The demonstrations that criticized the Governor of Bali for failing to solve Benoa Bay reclamation controversy made the Balinese people seem to be divided into two, the people who agree and disagree. This could cause a crisis at the social level, which could lead to a conflict. At the state level, protests to President Jokowi, who seemed to be slow to respond to public disagreement, often occurred. One example was a demonstration on November 4th, 2016 that gathered hundreds of thousands of people in Jakarta. It was about the alleged blasphemy by the Non-Active DKI Governor, BasukiTjahayaPurnama. The protest was also directed at the government because it was considered slow in handling this case. The social consequences of this demonstration were many people could not go to work, there were traffic jams and many shops were closed earlier.

By understanding and socializing the symbolic meaning such as respect for the leaders and feeling of having a shared identity as a Balinese or an Indonesian to the young generation, these protests can be minimized so as to create a social stability for all. In this maintained social stability, maximum work will be achieved for the sake of the welfare of the people.

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DEVELOPMENT STRATEGIC OF KIDUNG AS RELIGIOUS SONG IN DENPASAR

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Abstract. Kidung as an integral part of the Hindu religious ritual in Bali is extremely important where no ceremony can be completed without its present. In performance religious practice, kidung is mostly dominated by those who are elderly; increasingly shunned by the younger generation. As an offering on Hindu religious ceremonies, the most problems of kidung are land on facet of its dissemination, regeneration, especially to the young generation is need to have an attention. Learning methods are more likely to be taught individually, emphasizing more on imitation learning systems. This method makes the kidung singers not understand enough in terms of their musicality and poetic literary content. This phenomenon has an impact on the level of maximization of religious ceremonies being held.

Striving for strategic coaching become urgent to be improved. It is realized that this is a joint task of various components, i.e. singers, the coaches, government and others institutions or organizations related to this matter. Some methodologies can be applied with the emergence of the technology of utilizing learning media can be optimized. Observation, discography, competition and social engineering can be done as a reliable strategy tool. Analysis and methodological based learning systems will be able to accelerate the regeneration process of children's activities both in increasing their quantity, quality and stability as yoga offerings.

Keywords: *kidung, aesthetic, regeneration, methodology, sekaa santi*

BACKGROUND

The Hindu religious song, *Kidung*, is a form that is included in the ceremony as an offering known as Dharma Gita, which role is very dominant in the implementation of Hindu religious ceremonies in Bali. It has become a tradition that Kidung singers in a ceremony are performed by several singers who group themselves and are assigned informally to sing the type of Kidung accordingly, related to a ceremony being held. This sometimes has an impact on the reluctance of young children or other kidung singers to join, because they feel they are not included in their group. On the other hand, to preserve kidung, the role of future generations who are the younger Hindu's generation is very important. Because in preserving the heritage of the cultural arts of the ancestors in the form of such rich and diverse *kidung yadnya* songs, it is necessary to be saved (Suarti Laksmi, 2007: 4). The next reality concerns the understanding of the kidung interpreter who is still minimal towards the appreciation of literature which affects the appreciation of the melody of the songs which is actually very important to be known by the singers.

Coaching in kidung refers to a positive activity and is a process of improvement in order to produce something better. Strategies coupled with the right and creative methods in coaching will be able to achieve maximum results according to the desired target. With the synchronization between good communication, effective media and material that is interesting

especially with the ability to deliver an interesting one is the main key that must be done in developing of the *Kidung*. The results of interviews with a number of experts and coaches of *Kidung* in Denpasar said that; it was very difficult to determine the right strategy and could be accepted by all the community of lovers and actors especially for beginners. All efforts have been implemented so that eventually found a strategy that is quite effective. The next learning process begins by inviting participants to randomly sing *kidung* songs including melodic learning and the literature in the stage of imitation. The next process, forming, is done by the vocal formation of the singer, among others, the formation of vowels by singing a few examples of songs. Imitation process, copycatting of each syllable to every row of song's stanza with the correct vocal technique in accordance with the coach's will be part discussed in this study.

MATERIALS AND METHODS

Chanters: Understanding *Kidung* and Its Song's Text

Through its chanting texts which are sung poetically in singing *kidung* can be likened to have a dialogue to the Supreme Creator. *Kidung*'s literary work is so beautiful with the contents of deep meaning arranged in such a way as to the literary flow desired by the author. Song is a writing in the form of poetry and with this can be considered as a work of literature (Sukatno, 2013: 5). As a beautiful literary work, the *kidung* literature also has deep meaning. The series of words strung in *kidung* literature are adapted to their usefulness. A hope that is our joint responsibility that how the lyrics of the song can be understood by the singers who sing it. In understanding *kidung*'s literature to achieve this level of understanding, it is very important for each singer to understand the meaning of each of the song's lyrics. The first thing is done by understanding the meaning of the language of the lyrics contained in the text. In literature the lyrics are very clearly revealed that the literary sequence in a song contains meaning that requires understanding from the reader. Language style in the form of *kidung* is different from the style of language in the form of *kakawin*. In idiomatic way a *kidung* is more similar to *macapat*, a poetical literary form in the New Javanese language, although it is still different (2013: 6). Every series of words in his literary work is very clear so that the singer of *kidung* can easily adjust to what interests the song should be sung in accordance with its interests. As an example, below two hymns are usually presented in an opening (*pamahbah*) in the *Dewa Yadnya* ceremony along with its meaning:

1). *Kidung* Bremara Ngisep Sari (long form):

<i>Mogi tan kecakra bawa,</i>	Hopefully free from obstruction,
<i>Tityang I katunan sami,</i>	We are lacking of all,
<i>Nista kaya wak lan manah,</i>	Very poor of deeds, words and thoughts,
<i>Langgeng ngulami Hyang Widhi,</i>	Endlessly worshipping the God,

<i>Sang suksma maha Acinthy,</i>	The Supreme Almighty God,
<i>Nirbana Çiwa kasengguh,</i>	Heavenly holy named Shiwa,
<i>Singidan ring tampak aksi,</i>	Which is not visible by naked eye.

2). Kawitan Wargasari:

<i>Purwakaning,</i>	As an opening.
<i>Angripta running wana ukir</i>	Creating the beauty of mountain forest,
<i>Kahadang labuh,</i>	At the beginning of the rainy season
<i>Kartika pandenging sari,</i>	Month when the flowers blossom,
<i>Angayon tanguli ketur,</i>	Beautiful yellow tree of <i>Tanguli</i> ,
<i>Angringring jangga mure,</i>	The beauty of the blooming <i>Gadung</i> flower

With the sincerity of the soul, all kidung literature with its easy to understand free translation, leads us to a desired level of understanding. *Mogi tan kecakrabawa*; provide an understanding of societal ethics that contains hope that the community is shunned from disasters that can happen to them at any time. This is a characteristic of Balinese society which is inherited by ancestors for generations. In everyday life each performs a certain activity such as stepping in front of other people who are sitting, taking the upper part of the body's organs, or giving something to others, especially to people with higher caste, or older age, and some other actions. It has become the custom of the Balinese to call the word *tabek* or *sugra*, to be polite and full of respect, which aims to get forgiveness so that what it does, does not have a negative impact on their lives now and in their future lives. *Tityang I katunan sami*; containing an awareness of imperfection manifested as a human being with all its limitations. This imperfection is expressed sincerely which implicitly contains an understanding to get forgiveness from the Creator. *Nista kaya wak manah*; contains an understanding related to the teachings of religion "trikaya parisuda", about conducting good deeds, words and thoughts of our daily behavior. In this case the author declares himself that his actions, words and thoughts are far from good or perfect. *Langgeng ngulami Hyang Widhi*; incessantly praying by calling and worshipping the Supreme Almighty God. Behind this sentence is a very deep understanding of surrender and respectfulness to His will. *Sang Suksma Maha Acinthy*; The worshiped form of God is *Sang Hyang Suksma* who is often also called *Maha Acinthy*, as well as other titles such as *Sang Hyang Tunggal*, *Hyang Kawi*, *Hyang Brahman* and other God names. *Nirbana Çiwa kasengguh*; about heaven or nirvana where Sang Hyang Widhi resides, which is also called Sang Hyang Çiwa. The name Çiwa here is to name other names from God Almighty and not a designation for his manifestation as Lord Çiwa as a destroyer. Single and the ring looks action; contains an understanding of God's omnipotence that cannot be seen with the naked eye. Only saints and those who have a high spiritual level can see Him.

Kidung Kawitan Wargasari as a continuation of *kidung Bremara Ngisepsari* has a slightly different understanding but both are usually sung together in the opening of a ceremony. In *Bremara Ngisep Sari* generally contains an apology while the *Kawitan Wargasari* literature contains the beauty of the universe in a particular season that coincides with the flower season. *Purwakaning angripta running wana ukir*; means as an opening, the beginning of the creation of the universe that needs to be understood that the omnipotence of God in creating the beauty of the universe, the world with all its contents (*sarwa prani*). The opening song (*pamahbah*) is sung in every ceremony, as a continuation is sung by the songs which are related to the ceremony. In the Dewa Yadnya ceremony, the opening song was continued by singing some *Kidung Wargasari (pangawak)*.

Singer's Understanding Kidung and its Melody

Melody is a beautiful of tones arrangement which is a vital part of singing in *kidung* as a benchmark of the beauty of musical offerings to the almighty God. *Kidung's* melody tightly interwoven with literary *kidung* lyrics and one influence each other. Singing *kidung* is more beautiful when sung with beautiful melodies that are reflected in beautiful ornamentation. Sharing musical aesthetic in both *sekar alit* and *sekar madya* categories apply the system of singing in using technique of *paca-periring* and *wilet* style.

There are several things that must be understood to be a professional song's composer. The most urgent thing should be acknowledged before singing the melody of the *kidung* that the chanters are required to know and understand the scales. The hymn they sing accumulated from melodic array structure in sequences from tones arrangement based on to certain scales (*patet*). In Balinese traditional musical sounds (*karawitan*) discourse there are two tunings system apply namely *pelog* barrel and *slendro* barrel. Song tuning / *gending* with these two tunings requires a recording mark that in Balinese music uses Balinese script writing which is identified with the sequence of tones in the diatonic scale such as: 1 2 3 4 5 6 7 (do, re, mi, fa, so, la, si). The sequence of tones in question such as the *pelog* barrel seven tones (*sapta nada*): $\sim \circ \circ \circ \circ \circ \circ \sim$ (*dang, daing, ding, dong, dēng, deung, dung, dang*). Out from this scale immerge *pelog* five tones (*panca nada*): $\sim \circ \circ \circ \circ \sim$ (*dang, ding, dong, deng, dung*) and *laras slendro*: $\circ \circ \circ \circ \sim / \sim \circ \circ \circ \circ$ (*nding, ndong, ndeng, ndung, ndang / ndeng, ndung, ndang, nding, ndong*). In the *kidung* melody is often found a barrel that is not in accordance with the sequence of tones in the *pelog* and *slendro* tunings, because the tune is slightly tilted which is often referred to as *slanted pelog barrel* or *slendro slant*. Both of these tunings are the *pelog barrel* and the *slendro barrel* used in *karawitan* art, both applied in vocal music and instrumental music. The following chart can be seen the sequence of tones in the *pelog* and *slendro* tunings and their correlation with diatonic scales:

Diatonic Musical Scale	1	2	3	4	5	6	7
Pelog Scale Seven Tones	∧	∩	○	∩	∩	∩	∩
Pelog Scale Five Tones	∧	-	○	∩	∩	-	∩
Slendro Scale 1	○	∩	∩	-	∩	∧	-
Slendro Scale 2	∩	∩	∧	-	○	∩	-

The *pelog sapta nada* barrel consists of a row of seven tones with five main notes *dang*, *ding*, *dong*, *dēng*, *dung* and two notes which are *daing* located between the *dang* and *ding* tones and *deung* lies between *deng* and *dung* tones. Whereas in the barrel of slendro there are two ways of denoting it in accordance with the habits of singers and *pangrawit*. Some are more accustomed to using tonics *ding* = 1 and some people are more accustomed to tonics *deng* = 1. This is not a big problem as long as theoretically it can be understood by everyone so that it does not invite confusion both in the process of writing and in the process of reading the song melody including types other songs. In the development of increasingly sophisticated technology today it is time and become the duty of a songwriter to increase his insight by learning and understanding in theory the singing of melody sung so that quality will affect the singing kidung performance. On the other hand, the insights and abilities of the chancellor grew so that they became more confident.

RESULTS AND DISCUSSIONS

Development Strategy from Mapping Results

From the results of the kidung mapping that was studied and sung in *pesantian* groups that were widely distributed in Denpasar there were similarities in the learning process. In the training process that is carried out routinely the coaches can decide the right and attractive strategies to achieve adequate results and produce reliable singing by singers. The results of interviews with trainers and coaches of the song that to achieve the desired goals there are several obstacles faced. The constraints that plague include the imbalance between literary understanding and the melody of the song learned. Anom Ranuara, a practitioner of kidung and *pesantian* coach in the East District of Denpasar, explained how to do it in order to facilitate the development of kidung in his area. The singers are taught to understand and memorize the melody before the lyrics of the kidung, and then combined into a unity between melodic understanding and lyrics. This method is said to be very effective and this method is also followed by the singers in *pesantian* in the Dentim area, (interview 29 July 2018). Ida Bagus Nyoman Dharma explained different things about the strategy applied to *pesantian* in the Sanur village area. The hymn is invited to sing the song hymns repeatedly so that in the end “Santi

Sapa” can interpret and understand the songs both musical and literary. This was confirmed by I Made Langgeng Buana, a *pesantian* coach in the South District of Denpasar, including Sesetan and surrounding areas (interview on 29 July 2018). A slightly different information was put forward by several chieftains in the West District of Denpasar region such as I Made Kembar, I Made Gde Ariawa, I Made Murda and I Wayan Sukayasa said: that many of the *sekaa santi* in the region did not understand the song they sang. This concerns melody and kidung literature which come into contact with a musical value and literary value that can build the religious value of each presentation of the song. Before learning the whole song, *sekaa santi* was given an understanding of the meaning and meaning of kidung literature to be studied. The expectations of the coaches so that *Sekaa Santi* understands at least the kidung literature he sang. (interview on July 29, 2018). I Made Gina and I Gusti Agung Ketut Sugiada are two of the few *pesantian* coaches in the North District of Denpasar who have difficulty implementing the song learning system in their area. It cannot be denied that the songs that have been sung many times have not yet understood the meaning of the song. It is very difficult for them to determine the right strategy and can bring the chant to directed direction. The strategy applied is step by step. While carrying out the obligation to paddle in various places little by little the meaning of the song was discussed little by little so that the interpreter unconsciously understood the meaning of the texts of the song he was singing (Interview on 29 July 2018).

Appropriate and Attractive Coaching Strategies

To achieve the maximum results of the kidung coaching, an appropriate and interesting method is needed so that the planned target can be realized. As with other types of learning methods, how to learn kidung requires warm communication between coaches and singers who are fostered, media and meaningful messages. As said by an expert that one of the tactics, plans and means needed in each use of the strategy is "communication" to produce the interaction between the user of the strategy and the object to be targeted which is then called the "Communication Strategy". From the perspective of strategic management science is connected with several related parties such as sponsors, media, audiences, and products. In an effort to create persuasive communication, the sponsor must first establish the purpose of the communication followed by choosing the audience to be targeted, choosing the right media to target them and then designing the message in a way that is appropriate for the media and for the audience. In developing this communication strategy, the sponsor must establish the main communication goals and the objectives that generally want to be achieved include the establishment of awareness of a product (Sri Suprapti: 2010: 235).

"Communication Strategy" is very helpful to make an approach to carrying out a noble mission in terms of conducting kidung material coaching which Sri Suprapti called a product. "Media Strategy" is useful to facilitate and facilitate communication with the community, in this case the right media is concerned so that effective coaching can be realized. "Message

Strategy" in relation to this research is related to material that can attract the public to learn Song. Likewise, the opinions of other experts who provide a clear picture of the learning strategy, provide a broader insight in realizing a creative method to achieve a coaching result to be achieved.

Coaching refers to a positive activity and is a process of improvement and improvement in order to produce something better. The strategy coupled with the right and creative methods in a coaching will be able to achieve maximum results according to the desired target. Prof. Suarka (interview, July 24, 2018) said that singing kidung is easier than singing *pupuh macapat* or kakawin. Therefore, it is necessary to do an introduction that sets the mindset that kidung is an interesting type of song. This method will lead to a love that evokes the need to learn song. With the synchronization between good communication, effective media and material that is interesting especially with the ability in the delivery of interesting is the main key that must be done in conducting guidance Song.

Strategies for Overcoming Coaching Problems

In every kidung coaching there are several obstacles that often interfere with coaching activities resulting in results from coaching that is not optimal. In this case there are several strategies that can be done to get effective and effective coaching results including: Entering songs in the basic and secondary education curricula, both in the curricular and extra-curricular; Stimulates the growth of groups, *sekaa*, *pesantian* which are the basis of shared learning in various Gita Santi from *sekar ageng*, *sekar madia*, *sekar alit* even in *sekar rare*; Increase the number of doing kidung in performance of devotion (*ngayah makidung*) events that can stimulate as an encouragement, thus increasing the desire to learn the song.

Creating more competitions with all the awards that can be achieved for those who excel, both institutionally and structurally and sustainably at local, regional and national competitions. Inviting chanters to perform spiritual journey *matirta yatra*, dharma yatra opens up opportunities to add a place to perform *ngayah makidung* as part of *bhakti karma sandhyasin*. Providing references on kidung both in written texts and in the form of discographic documentation.

CONCLUSIONS

The strategy in learning Kidung is necessary to improve the wishes of the singer in singing the Hindu religious songs with more adequate quality. The strategy is also expected to stimulate the interest of the younger generation to learn Hindu religious songs to achieve effective and effective chanting. The coaching strategy involves literary understanding and melodic understanding which is a unity in creating ceremonial service.

Although this study is focused in Denpasar area, since Denpasar is a place as urban area, this discourse could be applying as reflection to a boarder picture of development strategic of kidung in Bali at large. The ability of practitioners by doing the kidung in highest

aesthetic singing level; understanding texts in its context; the effort of regeneration of kidung to the young practitioner; and immerse of the awareness that kidung as a media offering in religious practices; and open widely the opportunity in various even; the problems in strategic development of kidung could be solved. The strategy is also expected mainly to stimulate the interest of the younger generation to learn Hindu religious songs to achieve quality and quantity of chanters effectively as part of religious practices.

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PHYTOCHEMICAL TEST OF ANTICANCER ISOLATES OF XESTOSPONGIA TESTUDINARIA SPONGE

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Abstract. Cancer is a disease caused by abnormal cell growth in body tissues. Until this time cancer is still a feared disease because it is the second cause of death after heart disease. The requirement for new anticancer medicines is increasingly urgent, because anticancer medicines are expensive as well as low selectivity. The study to discover new sources of anticancer compounds has been carried out, particularly from marine organisms. Sponge is a very prospective source of bioactive compounds from the sea. *Xestospongia testudinaria* sponge extract has activity as anticancer against HeLa cells. The purpose of this study was to determine the class of compounds from anticancer isolates derived from methanol extract from *X. testudinaria*. Extraction of metabolites was conducted by maceration method with methanol at room temperature followed by fractionation into n-hexane, chloroform and n-butanol respectively. Separation and purification of metabolites was carried out by column chromatography. Toxicity assay was done by Brine Shrimp Lethality Test (BSLT) method. The most toxic isolates were tested for anticancer against HeLa cells. Anticancer isolates were tested phytochemically to determine the class of compounds. Partition of the methanol extract produced n-hexane, chloroform, and n-butanol extract. The chloroform extract was most toxic with LC₅₀ value of 39.81 ppm. The separation of the chloroform extract by column chromatography produced four fractions (A, B, C, and D). Anticancer assay of the fractions resulted that the fraction B was the most toxic LC₅₀ value of 44.67 ppm. The isolate inhibited the growth of HeLa cells with an IC₅₀ value of 2,273 ppm. The isolates contained alkaloids, steroid,s and polyphenols.

Keywords: Phytochemicals; anticancer; Xestospongia testudinaria

BACKGROUND

Marine organisms are a source of natural materials that are very rich in unique biological activities. Secondary metabolites are produced by organisms to response their environment. For survival and facing various challenges, marine organisms must compete to get growth space, light, and food (Murniasih, 2005). Marine invertebrates which have a more limited physical movement structure compared to marine vertebrates, are able to develop their self-defense systems by producing bioactive compounds. One type of marine invertebrate is a sponge. Sponge is one of the coral reef ecosystems in the sea that is very potential as a source of bioactive materials. Murniasih (2005) reported that sponges were the biggest source of bioactive compounds compared to other invertebrates. According to Harper *et al.* (2001), fifty percent of the bioactive compounds were found in marine invertebrates originated from the phylum of the sponge in the last decade

Sponge research that has been published was dominated by the discovery of compounds that have high biological activities such as antimicrobial, antifungal, antiviral, and anticancer (Trianto *et al.*, 2004), antiviral (Munro *et al.*, 1989), anti-HIV, anti-inflammatory, antifungal, antileukimia (Soediro, 1999), inhibitors of enzyme activity (Soest and Braekman,

1999), antimalarials (Ibrahim, 2005), antioxidants (Hanani *et al.*, 2005) as well as cytotoxic and antitumor (Kobayashi and Rachmaniar, 1999). Research about the potential of secondary metabolites in sponges from waters in Indonesia has begun four decades ago, when Corley (1988) isolated laulimalides and isolaulimalides from the sponge *Hyatella* sp. which has cytotoxic properties. Antioxidant compounds were identified from sponge *Callyspongia* sp. origin of the Thousand Islands (Hanani *et al.*, 2005). Setyowati *et al.* (2007) reported the sponge *Kaliapsis* sp. from Menjangan Island, West Bali was cytotoxic toward myeloma tumor cells. Rasyid's research (2009) mentioned that *Cryptotethia crypta* has potential as an anticancer drug. *Haliclona* sp. sponge extract possessed anticancer activity with LC₅₀ of 8.16 µg/mL, while that of *Agelasna kamurai* extract was 4.50 µg/mL (Trianto, 2005). Based on the various studies above, several types of sponges have toxic properties and anticancer agents.

Cancer was reported as the second cause of death in the world after heart disease. In 2008, around 7.6 million people died or 13% of the deaths were caused by cancer (Tarman *et al.*, 2012). According to cancer experts, cervical cancer was one of the most easily preventable and curable types of cancer (Riono, 1999).

Various compounds have been developed against cancer including alkylating compounds, antimetabolites, radiomimetic drugs, hormones and antagonist compounds (Cram *et al.*, 1992; Calabresi and Chabner, 1991; Lorgan *et al.*, 1996). However, none of these compounds produced satisfying effects without adverse side effects (Green *et al.*, 1982; Herzig *et al.*, 1987; Astuti *et al.*, 2005). Therefore, research on anticancer drugs without or minimum side effects is very important and urgent. Active compounds from natural ingredients are a priority in the discovery of new medicines to overcome cancer treatment problems. Natural ingredients that are used properly will produce high treatment effectiveness and low side effects because medicines from natural ingredients are natural so that they can be metabolized by the body. Anticancer agents from natural ingredients are able to treat the source of the disease by repairing damaged cells, tissues, and organs and enhancing the immune system (Kamuhabwa *et al.*, 2000). Methanol extract of *Xestospongiates tudinaria* sponge has anticancer activity against HeLa cells with IC₅₀ value of 1,327 ppm. (Swantara *et al.*, 2018).

Publications on anticancer activity of *X. testudinaria* sponge have not been discovered. The anticancer activity of *X. tetudinaria* sponge is only published by El-Gamal *et al.* (2016) and Swantara *et al.* (2018). According to El-Gamal *et al.* (2016) the extracts of alcohol and n-hexane of *X. testudinaria* from Saudi Red Sea showed strong cytotoxic activity against human cervical cancer (HeLa), human hepatocellular carcinoma (HepG-2), and human medulloblastoma (Daoy) cancer cell line. Swantara *et al.* (2018) reported that *X. testudinaria* methanol extract from Sanur, Bali, Indonesia had activity as anticancer against HeLa cells with IC₅₀ values of 1,327 ppm. While other activities besides anticancer *X. testudinaria* has been widely reported, including antibacterial activity (Cita *et al.*, 2017); antifouling activity (Nguyen *et al.*, 2013); antimicrobial activity (Bourquet-Kondracki *et al.*, 1992); toxicity (Swantara and Rita, 2018); antifungal activity (Ayyadet *et al.*, 2011); toxicity and anti-acetylcholinesterase activity (Zhou *et al.*, 2011). Preliminary test of an anticancer activity was

carried out by toxicity test using the Brine Shrimp Lethality Test (BSLT) method (Meyer, 1982). If a material has LC_{50} value of less than 1000 ppm, the material has the potential to be anticancer and can be continued with anticancer assay. *X. testudinaria* methanol extract from Sanur Bali beach has activity as anticancer with the IC_{50} value of 1,327 ppm (Swantara *et al.* 2018). In this study, the active compounds from *X. testudinaria* methanol extract collected from Sanur, Bali, Indonesia will be isolated. The most toxic isolates were tested for anticancer activity against HeLa cells and tested for phytochemicals to determine the class of the active compounds.

MATERIALS AND METHODS

Materials

The *X. testudinaria* sponge was collected from the coastal waters of Sanur, Bali. Methanol, n-hexane, chloroform, n-butanol was purchased from E. Merck, Germany. *Artemia salina* Brine shrimp egg was purchased from American Technology. Cell HeLa was obtained from the Center for Study of Primates, Bogor Agricultural University.

Sample Preparation and Extraction

Fresh sponge was washed thoroughly, then cut into small pieces, and dried without direct sunlight for 7 days. Then, the sponge is grinded to a level of 100 mesh fineness. The powder was extracted by maceration using methanol. Every 24 hours the extract was filtered and the pulp was extracted again using new methanol. This extraction process was carried out three times. The methanol extract was evaporated until a crude extract was obtained.

Partitions

This crude extract was dissolved in a methanol-water mixture (3:7) until the extract dissolves, then it was evaporated until the methanol was exhausted. Then, the water extract was partitioned into n-hexane (3x100 mL), chloroform (3 x 100 mL), and n-butanol (3 x 100 mL) respectively. The extracts were evaporated to obtain n-hexane (EH), chloroform (EC) and n-butanol extract (EH, EC, and EB). The extracts (EH, EC, and EB) were tested for their toxicity.

Separation and Purification

The most toxic extract were then separated by column chromatography with stationary phase of silica gel and suitable mobile phase to obtain several fractions. All these fractions were tested for their toxicity. The most toxic fraction was carried out purity test by thin layer chromatography (TLC) using several eluent systems. If the isolate provides a single stain on the TLC plate with various eluent systems, it indicates that the isolate is pure according to TLC, then the isolate was assayed its anticancer activity against HeLa cells.

Toxicity Test

The media for hatching larvae was made by filtering sea water. The Seawater was placed into aquarium which was divided into two parts, dark and bright part. As much as 50 mg of *A. salina* eggs are placed or immersed in the dark and leave for 48 hours until the hatch becomes mature larvae and ready to be used for the bio indicator test. Twenty milligrams of each sample were dissolved with 2 mL of solvent. This solution was taken as much as 500 μ L,

50 μL and 5 μL , then each was put into a test tube and the solvent was evaporated. Fifty μL of dimethyl sulphoxide, 1 mL of sea water, and 10 larvae were put into a test tube which contained a sample, then added sea water to 5 mL volume, to obtain samples with concentrations of 1000, 100 and 10 ppm. 0 ppm concentration was prepared as a control without the addition of extract. After 24 hours, the death of *A. salina* larvae was observed. The standard for assessing larval mortality is when the larvae do not show movement for a few seconds of observation (Carballo *et al.*, 2002). The number of live and dead larvae was recorded, then the data was analyzed to calculate the death concentration (LC_{50}).

Anticancer Test

HeLa cells were used for anticancer assay. Cervical cancer cells (HeLa) were cultured on RPMI 1640 media, counted the initial number of cells under a microscope. Then the cell was harvested by adding trypsin. The cell was centrifuged, the supernatant was removed and the precipitate is formed into a pellet and 1 mL complete media was added, then the cell count was calculated using a hemocytometer. After sufficient cells, cells were planted in the 96 microwell plate. Each well contained 2×10^4 cells in 100 μL solution. Cell was incubated for 1-2 hours so that the cell attached. After that, 100 μL extracts were added with various concentrations (1000; 500; 250; 125; 62.5; 31.25; 15.62; 7.81; 3.91; 1.95; 0.97; 0.48; 0.24; 0.12 and 0.06 $\mu\text{g}/\text{mL}$) into each well. So the total of each well contains 200 μL . The cells were incubated in an incubator for 24 hours at 37 °C. After 24 hours it was observed under a microscope, added MTT (3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyltetrazolium bromide) (5 $\mu\text{g}/\text{mL}$) to each well, then incubated for 4 hours. The SDS stop solution (sodium dodecyl sulfate) 10% in HCl 0.01 N was added to each well and incubated again one night. The absorbance was analyzed using an ELISA reader at a wavelength of 550 nm.

Phytochemical Test

Anticancer active isolates were tested for their chemical compounds including: tests of alkaloids; flavonoids, triterpenoids / steroids; polyphenols, and saponins.

RESULTS AND DISCUSSION

Extraction

Fresh samples of 5 kg were washed, cut, and dried for 7 days that produced 476 grams of dried samples. The dry samples were refined to produce 390 grams of dry sample powder. 250 grams of dried sample powder were extracted using methanol to produce 36 grams of methanol extract. According to Sadek (2002) methanol with a polarity index of 5.2 and having 100% solubility in water will dissolve polar compounds.

Partitions

Methanol extract of 25 grams were partitioned in succession with n-hexane, chloroform, n-butanol. The extracts were evaporated to produce n-hexane, chloroform and n-butanol extract (EH, EC, EB) and tested for their toxicity. The results of evaporation and toxicity tests of the extracts are shown in Table 1.

Table 1. The weight of concentrated extracts from partitions and their toxicity results

Samples	Weight (gram)	Concentration (ppm)	The number of death larvae			% Mortality	LC ₅₀ (ppm)
			I	II	III		
EH	2.6	0	0	0	0	0	70.79
		10	1	1	2	7	
		100	5	6	6	58	
		1000	10	9	9	94	
EC	1.9	0	0	0	0	0	39.81
		10	2	1	1	8	
		100	7	8	8	75	
		1000	10	9	10	95	
EB	4.6	0	0	0	0	0	63.09
		10	2	2	1	13	
		100	5	6	7	58	
		1000	10	9	10	100	

Separation and Purification

Chloroform extract which was the most toxic extract was separated by column chromatography with a stationary phase of silica gel (70-230 mesh ASTM) and a mobile phase of n-hexane-chloroform mixture (1.5: 8.5). Eluat was collected every 5 mL. In this process 158 bottles of eluat were produced. The stain patterns of 158 of the eluat were observed using thin layer chromatography. Eluat with the same pattern were combined, and it obtained 4 fractions (F_A, F_B, F_C, and F_D). The fractions were tested for their toxicity, the toxicity results were shown in Table 2.

Table 2. The results of toxicity test of F_A, F_B, F_C, and F_D

Samples	Bottle to-	Concentration (ppm)	The number of dead larvae			% Mortality	Nilai LC ₅₀ (ppm)
			I	II	III		
F _A	1-38	0	0	0	0	0	50.12
		10	2	1	1	7	
		100	7	7	6	67	
		1000	10	9	9	94	
F _B	39-93	0	0	0	0	0	44.67
		10	2	1	1	8	
		100	7	7	6	73	
		1000	10	10	9	100	
F _C	94-129	0	0	0	0	0	56.23
		10	2	2	1	13	
		100	7	6	6	62	
		1000	10	9	9	94	
F _D	130-158	0	0	0	0	0	79.43
		10	2	2	1	13	
		100	5	5	6	54	
		1000	10	9	9	94	

Based on Table 2, it can be seen that fraction B was the most toxic with an LC₅₀ value of 44.67 ppm. If we compared to the toxicity of chloroform extract before isolation, the F_B toxicity was lower. This indicates that the compounds which are toxic in the chloroform extract are synergistic (the purer ones were the less toxic). Furthermore, this F_B was tested for anticancer and phytochemicals.

Anticancer Tests

Anticancer activity against HeLa cells was determined by the MTT method. The principle of the MTT test is the occurrence of a mechanism of yellow coloration of tetrazolium salt (3-(4,5-dimethylthiazole-2-yl)-2,5-diphenyltetrazoliumbromide) which is reduced to purple formazan crystals in the living cell mitochondria. MTT is absorbed into living cells and is broken down by the reduction reaction by the reductase enzyme in the mitochondrial respiration chain to formazan which is dissolved in purple SDS 10% (Doyle and Griffiths, 2000).

Absorption value of formazan formed was measured by microplate reader at a wavelength of 595 nm with triplo treatment. The stronger the intensity of the purple color formed, the higher of the absorbance, this indicates that more MTT was absorbed into living cells and was broken down through the reduction reaction by the reductase enzyme in the mitochondrial respiration chain, so that the formazan formed was also increasing. Data

obtained from cytotoxicity testing with MTT was absorbance value or optical density (OD), then the average value of OD was converted into % inhibition. Observations of absorbance and calculation of % inhibition of HeLa cells after being given toxic isolates (FB) of *X. testudinaria* extract are presented in Table 3.

Table 3 Absorbance of toxic isolates (FB)

Sample concentration (ppm)	Absorbance/Optical density			Average	% Inhibition
	1	2	3		
100	0.046	0.045	0.25	0.038	80.8 ^a
50	0.052	0.046	0.032	0.043	78.28 ^b
25	0.062	0.056	0.03	0.049	75.25 ^c
12.5	0.071	0.056	0.04	0.056	71.71 ^d
6.25	0.075	0.063	0.07	0.069	65.15 ^e
3.125	0.098	0.083	0.09	0.090	54.54 ^f
1.56	0.102	0.1	0.1	0.100	49.49 ^g
0.78	0.125	0.115	0.117	0.119	39.89 ^h
0.39	0.139	0.140	0.150	0.143	27.77 ⁱ
0.195	0.145	0.155	0.160	0.153	22.72 ^j
Cell control	0.195	0.197	0.202	0.198	0.00 ^k

The values followed by the same letter in the same column show no significant differences based on Duncan's Multiple Range Test at P <5%.

Based on the data above, we can graph the relationship between concentration and inhibition with the equation of the regression line model: $y = a + b (\ln x)$, so that the equation of the regression line is obtained: $y = 41.8842 + 9.8803 \ln (x)$ ($R^2 = 0.9637$). The graph of the relationship between sample concentration and % inhibition for determining IC₅₀ values is shown in Figure 1.

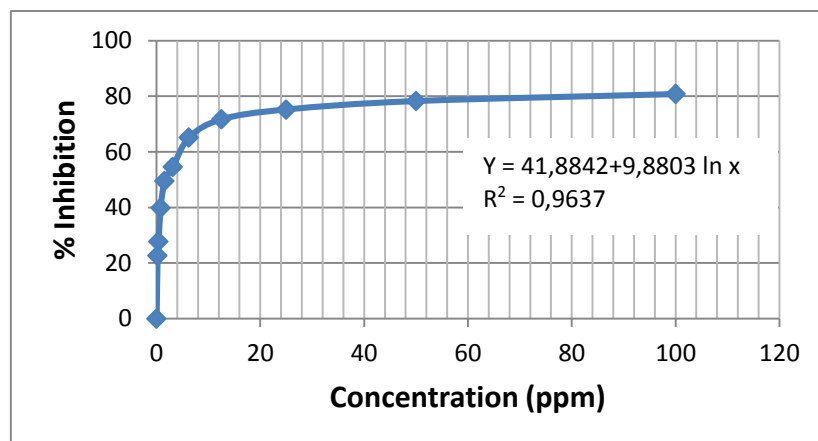


Figure 1 Graph of the relationship between concentration and % inhibition

Calculating the IC_{50} of the sample above can go through the regression equation, namely:

$$y = a + b (\ln x). 50 = 41,8842 + 9,8803 \ln x. \ln x = (50 - 41.8842) / 9.8803 = 0.821412.$$

So $x = 2,273$. Anticancer activities of 2,273 ppm are categorized into very strong activities. (Chao, *et al.* 1998).

Phytochemical Test

The above anticancer active isolates (FB) were tested for the class of compounds they contained. Phytochemical test results can be seen in Table 4.

Table 4 Phytochemical test results of anticancer active isolates

Test	Reactor	Discoloration	Conclution
Alkaloids	Dragendrof Mayer Wagner	Red sediment White sidement Brown sidement	Positive Alkaloids
Flavonoids	Na OH 10% Test Wilstatter Test Bate-Smith dan Metacalf	Never changecolour Never changecolour Never changecolour	Negative flavonoids
Triterpenoids/ Steroids	Lieberman-Burchard H ₂ SO ₄ 10%	Green colour Green colour	Positive Steroids
Polyphenol	FeCl ₃ 10%	Black colour	Positive Polifeno l
Saponin	Foam/Froth Test +HCl 2%	No foam	Negative Saponi n

CONCLUSION

Based on the results of the above research, it can be concluded that the anticancer isolates derived from *Xestospongia tstudinaria* methanol extract positively contain alkaloids, steroids and polyphenols.

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