Mapping Commodities Production Level of Vegetables and Fruits in Kolaka District

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Abstract

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Farming development in the agricultural sector in Kolaka District has challenges in markets, supply, and production. This study aimed to analyze seasonal cropland phenomena' scaling and distribution principles, focusing on vegetable and fruit crops. This type of research is descriptive and quantitative. The research location is in Kolaka District, Southeast Sulawesi Province, Indonesia. The data collection technique used data from Kolaka District in Figures 2020 and the Kolaka Regional Medium-Term Development document. The data analysis technique uses a scaling method presented in the form of an interval table. Then the data is viewed from the point of view of the principle of economic geography distribution. The results of this study, firstly, the potential harvest area spread in each sub-district is chili with 158 hectares, then long beans, spinach, and kale. Second, seasonal fruit and vegetable production distribution in each sub-district is 2,048 quintals of chili, followed by eggplant, kale, long beans, and spinach. Meanwhile, data on scaling in harvested areas is very lacking, production potential is very less, and production levels are less. The recommendations for the potential development location of fruit and vegetable agriculture is Iwoimendaa Sub-district.

INTRODUCTION

One of the goals of development in Indonesia is for the welfare of the people with its various programs in terms of human resources and the use of natural resources. Among others, the government has put efforts to improve the welfare of its people through the agricultural sector. Agriculture focuses on the biological resource activity carried out by humans to produce food, industrial raw materials, or energy sources, as well as to manage their environment, the livelihood concentrates on the agriculture process like the process of making palm sugar and producing rice (Hilman and Sunaedi, 2018; Mor et al., 2015).

The agricultural sector is the main sector of the Indonesian economy. Almost all sectors in Indonesia cannot be separated from the agricultural sector (Zulkifli 2017). Development in the economic field is a very important and fundamental problem, because economic development is expected to be able to overcome poverty, and unemployment and improve people's welfare, and also affected in human development index (Elistia and Syahzuni, 2018; Marlina et al., 2021). While the goal of National development is to create a just and prosperous society that is materially and spiritually evenly distributed based on the implementation of both Pancasila and the 1945 Constitution (Nursalam et al. 2019).

A measure of the existence of economic development is the occurrence of economic growth. Economic growth is a real picture of the policy changes implemented, especially in the economic field carried out by each Region. Regional development as part of National development is directed at developing their respective regions and harmonizing growth rates between regions. Regional development can be done through harmonious and integrated development between economic sectors (Azila and Abdullah, 2014).

Indonesia's natural potential makes Indonesia a fertile country with a variety of flora and fauna that can grow and develop. As an agricultural country, most of Indonesia's population uses the agricultural sector as a source of livelihood. Therefore, there is a need for National development that is based on agricultural development (Chaturvedi et al. 2015). The agricultural sector is the main economic sector and the largest employment provider in Indonesia (Rika, Susilo, and Nurjani 2016).

Development planned change process and is a series of continuous, sustainable, and gradual activities towards a better direction. The existing development process must be adapted to the potential of each Region. Agricultural development is an integral part of National development because the vision and mission of agricultural development are formulated in the framework and refer to the vision and mission of National development (Chaturvedi et al., 2015; Foster and Holleman, 2014). The practicalities of agricultural

development or development activities affect the human economy, livelihood, and disaster management (Hadmoko et al. 2017; Woodhouse et al. 2015).

The development of the horticultural crop sub-sector is an integral and inseparable part of agricultural development to realize the national development program. Horticultural is one of the major agricultural sectors (Yeboah et al. 2014). Local government must develop public finance such as public facilities and all land use like woodland, grassland, and farmland (Arts et al. 2018; Li et al. 2016).

Horticultural farming, especially fruits in Indonesia, has so far only been seen as a side business that is planted in the yard with a narrow area and the application of cultivation techniques and post-harvest handling is still simple. Market demand for fruit from both local and export markets requires a certain quality, uniform size, and continuous supply of fruit. To develop fruits in Indonesia and to increase competitiveness in both the local and export markets, the government is managed agricultural development in the horticulture sector. Green marketing and green technology are the way to increase cropland results that process in the natural way (Basu 2017; Mor et al. 2015).

From the point of distribution view, the agricultural sector is one of the croplands that portion in every region. Kolaka District planned the development area function with local government policy about regional plan that conducted in 2016. The cropland in seasonal agriculture relates to the human economy are vegetables and fruits. The regional planning portion the region as a potential function like forest, settlement, and farming area (Imanda, 2013; Sejati and Saputra, 2021).

The seasonal cropland focus on vegetables and fruits in Kolaka District can be viewed by the distribution principle of economic geography. The distribution then knew the vegetables and fruits phenomena that spread out in every sub-district in Kolaka. The distribution principle of geography in natural resources conservation from identified and inventoried in the small areas like sub-district (Widiyati 2012). Distribution geography is one of the geography analysis skills that are important to master by a geographer (Ikhsan et al. 2018).

The research by Abadi et al. (2019) focus on the commodity that describes the harvest area, temperature, rainfall, and soil type. Research Zulfikar, Barus, and Sutandi (2013) mapping the farming area according to Law number 41 of 2009 on the Protection of Sustainable Food Agricultural Land. The research Widiyati (2012) applies all principles of geography to describe the natural resources phenomena in the West Bogor. This research neither describes the commodity nor maps the agricultural sector like previous research, but focuses on the relating the distribution principle of geography in the agricultural sector, focusing on the fruits and vegetables. The research is not wide-scale like the Widiyati (2012) but focuses on the one sector of cropland and one principle of geography.

The research novelty in this paper is combine the method in the agricultural and economic geography to describe the vegetable and fruit crops. The previous research partially in the scaling or mapping, and or distributing of crops. The first research objective to analyze the mapping commodities production level of vegetables and fruits

in Kolaka District. The second research objective to analyze the distribution principle in the phenomena of vegetables and fruits in Kolaka District.

RESEARCH METHODS

The type in this research is descriptive with a quantitative approach. This research produces analytical information in the form of data from the observed variables. Descriptive research processed the accumulation of data in a descriptive way, there is no need to look for hypotheses, make relationships, and forecasts even though the research aims to find these things contained in descriptive methods (Sejati, Hasan, et al. 2020; Sejati, Hasan, and Hidayati 2019). The quantitative approach was chosen because the data presented were in the form of numbers which were then analyzed by scaling and rescaling techniques.

The research location in the Kolaka District, Southeast Sulawesi, Indonesia. The reason for choosing the research location is the challenge in market, supply, and production of vegetable and fruit in Kolaka must be researched for determine the hoticultural potential development. Population in this research is vegetables and fruits crops in 12 Sub-District in Kolaka District. The research sample is total sample or all population as a sample.

The research data by looking at the available data on the area of horticultural commodity land through a comparison of the horticultural harvested area with the total harvested area (hectare), horticultural crop productivity through the comparison of horticultural crop production with the harvested area of horticultural crops (quintal). The data collection method are observation and documentation. The documentation data from Kolaka District in Figures 2020 and the Kolaka Regional Medium-Term Development document.

The data analysis technique of the first objective using scaling method is presented in the form of interval tables. Scaling and Rescaling. The formula (1) is the scaling formula to obtain the interval measurement scale.

$$\text{Scaling Formula} \quad = \frac{N - N\,min}{N\,max - N\,min} \quad X\,k \quad\quad (1)$$

Information

N	= Value of searched area (District)
N min	= Lowest score overall (District)
N max	= Highest score overall (District)
K	= Constant (number 100 as coefficient)

Then the value of scaling classified in the table 1 below.

Table 1. Potential Horticulture Commodity Classification

Nu.	Value of Scaling	Criteria	Classification
1.	81 – 100	Very good	I
2.	61 - 80	Good	II
3.	41 - 60	Enough	III
4.	21 - 40	Not enough	IV
5.	0 - 20	Very less	V

Rescaling is the sums of scaling data to know the district or sub-district that must be develop in the horticulture commodity. According to (Faturahman 2017) rescaling indicate that the priority area that potential to develop in the beginning that big influence in the surrounding areas.

The data analysis technique of the second objective using distribution principle of economic geography. The distribution principle in the economic geography is the economic phenomena like vegetables and fruit that spread out in the various area. The distribution principle to know how the economic growth in the areas, indicate from pattern in every small sub-area. The vegetables and fruits data that spread out in every district, identified, inventoryzed, and sorted from highest to lowest. According to (Widiyati 2012) distribution principle analyzed in form of identification dan inventory phenomena in every area from small sub–area. The distribution data can be shown in form of tables, maps, and graphic (Sejati, Karim, and Tanjung 2020).

RESULT AND DISCUSSION

Mapping Commodities Production Level of Vegetables and Fruits

A potential agricultural harvest area is a supporting capacity for economic growth and economic improvement of farmers. The harvest area of vegetables and fruit crops in Kolaka District, the data from 2017 to 2019 is listed in Table 2. Based on this data, there are fluctuations in the decrease and increase in harvested area. The lowest decrease in the harvested area occurred in 2018 of 1 hectare in Chayote and Watermelon fruit plants. The extreme rainfall happened in 2018 with many flood cases, which caused the vegetable and fruit to decrease in productivity. The findings Abadi et al. (2019), the suitability of commodities depends on conditions of temperature, rainfall, and soil type. The decrease of harvest area in this research caused by flood disaster, different from research Hidayati and Kurniawati (2013) tat crop failure caused by volcanic eruption.

The highest increase occurred in 2017 of 360 hectares of Cucumber plants. The Cucumber is easy to cultivation. The demand of Cucumber in the 2017 is high. The research Sallam et al. (2021) state that the Cucumber is widely cultivated vegetable, mostly under the greenhouse environment. The research Kusumiyati et al. (2022) the flower ratio balance affected in decrease of Cucumber harvested if the number of male flower lower than female flower.

Table 2. Data on Harvested Areas of Seasonal Vegetables and Fruits 2017-2019

Vegetables and Fruits	Harvested Area (hectare)			Amount (hectare)
	2017	2018	2019	
Spring onion	46	2	82	130
Spinach	96	6	79	181
Big Chili	38	6	59	103
Cayenne pepper	148	6	99	253
Long bean	114	11	109	234
Kale	9	6	97	112
Cucumber	360	2	55	417
Chayote	11	1	12	24
Petsai	52	6	69	127
Watermelon	43	1	38	82
Eggplant	50	10	90	150
Tomato	50	2	60	112
Total	1017	59	849	1925

Source: (BPS 2020)

Agricultural resources are a sector that can support the development and economic growth of the community. Identification results Information on agricultural resource data for the horticulture crop sub-sector, in detail per sub-district in Kolaka District year 2019 (BPS 2020) is contained in Table 3.

The results of the harvested area in vegetables and fruits were analyzed by the sub-district. Findings showed a total harvested area that can be developed on a sub-sector of vegetables and fruit amounted to 715 hectares. This area is very supportive of efforts to increase community economic growth, taking into account market demand, and types of vegetable and fruit crops to be cultivated. Each region has the potential for agricultural resources to be developed (Hidayati et al. 2019).

The development of agricultural crop was analyzed by highest and lowest of harvested area. The lowest harvested area is in the Toari sub-district of 8 hectares, while the highest harvested area is in the Kolaka District of 138 hectares. The development of regions depend on the approach. Central place approach develop the highest potential area for affect the lowest potential area (Adiyanto and Supriatna 2018; Bergs 2021; Suryana 2018).

Table 3. Data on Harvested Areas of Seasonal Vegetables and Fruits to each District

Sub-district	Harvested Area by District (hectares)											
	Spring-onion	Spi-nach	Chilli	Po-tato	Long-beans	Kale	Cucu-mber	Cha-yote	Petsai/Mustard	Water-melon	Egg-plant	To-mato
Watubangga	7	4	17	-	11	4	4	-	3	6	6	6
Tanggetada	1	7	15	-	7	7	4	4	6	5	5	6
Toari	1	1	1	-	1	1	-	-	2	-	-	1
Poligona	5	4	4	-	3	4	2	-	2	1	1	3
Pomalaa	-	5	15	-	10	7	6	-	-	-	-	6
Wundulako	7	9	23	-	8	11	10	6	3	-	-	8
Baula	-	16	4	-	9	10	4	-	16	-	-	2
Kolaka	30	12	46	-	21	11	4	1	18	7	7	11
Latambaga	11	4	3	-	5	4	1	1	3	-	-	3
Wolo	-	3	3	-	7	7	1	-	-	19	-	2
Samaturu	20	8	19	-	15	24	17	-	10	-	19	-
Iwoimendaa	-	6	8	-	12	7	2	-	6	-	-	12
Kolaka-District	82	79	158	-	109	97	55	12	69	38	38	60

Source: (BPS 2020)

The percentage of potential scaling analysis in Kolaka District is 18.50%, based on the classification of potential harvested area for horticultural commodities including level V with very less criteria. This shows that in Kolaka District in determining policies related to horticulture crops on the types of vegetables and fruits. It is very minimal as an indicator of carrying capacity in increasing community economic growth.

The results Faturahman (2017) state that determining policies must be following potential data that can be developed. Then that research findings showed in the medium-term development plan set up programs to improve food security but the program is still in general, not specifically mentioned plants and the areas to be developed to improve food security in the region. The Faturahman (2017) scaling in the Pacitan District, East Java and specific found that sweet potato is the plant must be develop.

Production development data crops sub-sector horticulture in the Kolaka District in years 2017-2019 shown in the Table 4. The commodity crop horticulture in this research is calculated including vegetables and seasonal fruits cultivated by farmers. There are 12 types of horticulture commodities. Commodities that include vegetables, namely: green onions, spinach, large chilies, cayenne pepper, long bean, kale. Commodities that included in seasonal fruits, namely cucumber, chayote, Chinese cabbage, watermelon, eggplant, and tomato. Indentification of commodities is the early process in the mapping potency in area. The research Fauziah, Virgantari, and Setyaningsih (2017) identify the the kind animal food is one of the scaling process in mapping animal food security in Indonesia.

The development efforts carried out in the research area are intended to increase the level of community welfare, reduce unemployment, alleviate poverty, and tax revenue, increase regional output and create job opportunities. This effort is one of the economic growth indicators. The low rate of economic growth will make these efforts difficult to achieve. Agricultural sector is one of livelihood can influence the economic growth (Kurnianto et al. 2018)

The ability of each region to achieve its economic performance is highly dependent on the available resources condition (Elistia and Syahzuni 2018). Determining policies in the context of developing agricultural resources for horticultural crop, including seasonal vegetables and fruits, can see the level of production in each sub-district.

Table 4. Production Data of Vegetables and Fruits by Type of Crop Year 2017-2019

Vegetable Plant	Production of Seasonal (quintal)			Amount (quintal)
	2017	2018	2019	
Spring onion	313	49	339	701
Spinach	1.336	122	1.276	2.734
Big Chili	489	132	810	1.431
Cayenne pepper	1.964	106	1.238	3.308
Long bean	1.304	160	1.609	3.073
Kale	2.303	180	1.774	4.257
Cucumber	537	67	1.099	1.703
Chayote	99	32	71	202
Petsai	1.679	100	1.249	3.028

Watermelon	517	3	1.434	1.954
Eggplant	787	113	1.686	2.586
Tomato	792	33	798	1.623
Total	3.534	1.097	2.018	26.600

Source: (BPS 2020)

Identification results Information of the horticulture crop sub-sector production data, in detail to each sub-district in Kolaka District in 2019 is contained in Table 5.

Table 5. Production Data of Vegetables and Fruits by District in 2019

Sub district	Spring onionn	Spinach	Chilli	Potato	Long beans	Kale	Cucumber	Chayote	Petsai	Watermelon	Eggplant	Tomato	Amount (quintal)
Watubangga	28	21	159	-	68	20	32	-	12	128	139	6	613
Tanggetada	3	17	187	-	57	18	43	42	14	36	103	6	526
Toari	3	11	2	-	9	8	-	-	4	-	6	1	44
Poligona	19	8	32	-	12	14	5	-	8	6	25	3	132
Pomalaa	-	20	164	-	72	39	52	-	-	-	87	6	440
Wundulako	22	22	53	-	33	30	37	17	9	-	22	8	253
Bahula	-	905	60	-	206	745	153	-	692	-	29	2	2.792
Kolaka	91	52	386	-	110	58	37	79	35	66	95	11	1.020
Latambaga	39	10	29	-	16	16	11	5	6	-	40	3	175
Wolo	134	25	99	-	88	513	507	-	219	1.198	298	2	3.083
Samaturu	-	12	15	-	28	23	5	-	-	-	28	-	111
Iwoimendaa	-	173	862	-	910	290	217	-	250	-	814	12	3.528
Total	339	1.276	2.048	-	1.609	1.774	1.099	71	1.249	1.434	1.688	60	12.647

Source: (BPS 2020)

The results of the analysis of vegetable and fruit crop production data for the 2019 period by sub-district. The findings show that the total production in the sub-sector of vegetables and fruits in 12 sub-districts in the Kolaka District is 12.647 quintals. Areas that have high production levels are very supportive of efforts to increase community economic growth like in the Countries in Latin America (Parraguez-Vergara et al. 2018). Each region has the potential to develop plant kind that have production capabilities, supported by regional, soil, and climatic conditions like the annual and seasonal areas that analysing by that factor in Konawe Selatan District (Sejati and Saputra 2021).

The data contained in Table 5 shows the level of production in each sub-district. The lowest production of seasonal vegetables and fruits is in the Toari District area of 44 quintals. This matter showed that the area of the Toari sub-district does not have the potential for the development of vegetable and fruit season. Meanwhile, those with the highest production are in the Iwoimendaa sub-district of 3.528 quintals. This shows that the District Iwoimendaa area is an area for the development of commodity types strategic crops of vegetables and fruits a season. This finding is one of the indicators in determining the development of these commodities and the government can consider it as a reference for future planning strategies and policies. According to Li et al. (2016) future, sustainable management in managing and protecting cultivated land is crucial.

The percentage of potential scaling analysis in Kolaka District based on 2019 data in the classification of production levels on seasonal vegetable and fruit crop commodities consists of 12 types of plants in each sub-district. The results of the

analysis show that each crop harvested area with a level of production can show the classification results of each sub-district. The total harvested area in Kolaka District in 2019 was 849 hectares, while the total production was 12.647 quintals. The production level scaling value of 27.64 in Kolaka District is classified as IV with fewer criteria. The results show that Kolaka District is an area that has less for the development of seasonal vegetables and fruits. Kolaka District is hilly topography, while in research by Suwarno et al (2016) terracing on the slope is effective for seasonal plantation as a terracing farming system. The hilly topography in Kolaka District suitable to develop as a forest area and or annual production farming like oil palms, cocoas, and cloves (Kasmiati et al. 2020).

The harvest area experienced the highest increase in long bean vegetable crops at 109 hectares, the increase occurred as a result of high market demand. The data for the highest harvested area until 2019 was on Cucumber fruit plants of 417 hectares. Ramli et al. (2019) stated that, in Pinrang District if an area has competitiveness, it wastes the area as a commodity for developing paddy, maize, peanuts, soya beans, green beans, coconut, coffee, and cocoa.

The potential area for harvesting vegetables and fruit is one of the resources, which can be one the supporters of the development strategy to grow the community's economy. Formula superior agricultural commodities development strategy stated research Abadi et al. (2019) there is four (4) formulation of the strategy: a strategy to increase production results; downstream industry development strategy based on leading agricultural commodities; a strategy to increase business financing capacity; and strategy to increase the market availability of downstream industrial products.

The second side is production. It is the result of plant cultivation efforts. The amount of production is based on the harvested area of each plant. Seasonal types of vegetable and fruit plants can produce and have properties and characteristics. In certain climatic conditions, it can grow, as well as pests and diseases that can affect production yields (Damhuri, Sejati, and Hidayati 2018). Production data for each type of seasonal vegetable and fruit crop are listed in Table 3 for 2017-2019. Data information shon that each type of vegetable and fruit crop has decreased and increased in production each year. Total production decreased in 2018, namely watermelon fruit plants by 3.00 quintals and in 2019 there was an increase of 1.434.00 quintals

The results of the analysis of vegetable and fruit crop production data for the period 2017-2019 according to the type of plant. The findings show that the total production in the vegetable and fruit sub-sector is 26.600 quintals. This production is very supportive of efforts to increase community economic growth, taking into account market demand, and the types of vegetable and fruit crops to be developed. Demand in vegetable or fruit affect the supply efforts, it is normal in the economic system (Mor et al. 2015).

Each type of plant can produce, supported by regional, soil, and climatic conditions that have the potential to be developed. The data contained in Table 4 occur fluctuations in the level of production. The lowest production of vegetables and fruit for the chayote type is 202 quintals, this indicates that the chayote type commodity does

not have market potential, so farmers do not expand the crop. While which has a total production of the highest on the type of plant kale for 4257 quintals, the right shows the kale plant is a plant that is in demand by the public. Local demand is important point to develop the kind of vegetable or fruit in Northern Ontario (Finnis 2021).

A commodity is designated as a base or non-basic commodity and the government adopts it by making efforts to develop or increase the production of the commodity by adopting technology, expanding land for planting, and other things that can increase production. Next, there will be a change from non-basic to basic or even vice versa. Changes in the determination of commodities are caused, among other things, by decreasing natural resource reserves, critical land conditions, and other factors. Meanwhile, Faturahman (2017) shows that the Regional Medium Term Development Plan regulates programs to improve food security, but the program is still general, not specifically mentioning plants and areas that will be developed to improve food security in Pacitan District.

The agricultural development policy strategy of the horticultural crop sub-sector in Kolaka District can help in economic growth. The results of the classification analysis show that the category is lacking, so efforts to increase economic growth require design and development strategies that can be implemented. The results of Faturahman (2017) research found that program selection was carried out by selecting programs, and priorities to support regional development according to the chosen strategy. The selection of regional development programs in the context of increasing food security is still limited to general programs and sub-districts specifically that must be developed in programs to maintain food security according to regional potential. Kolaka District is an area that mostly has mining potential, which causes soil conditions to greatly affect harvested area and production. Research results by Mora et al. (2020) found that preventing the conversion of agricultural land is expected to achieve food security and livelihood support in a sustainable community largely dependent agriculture sector.

Distribution Principle of Vegetables and Fruits Crops

The data harvested area identified that the type of vegetables and fruits that spread out in every sub-district are chili, long beans, kale, and spinach. Then the data inventory that just 4 of 12 types of vegetables and fruits spread out in every sub-district in Kolaka District. Then the highest distribution agriculture phenomena are chili, then long bean, kale, and spinach that spread out in every sub-district in Kolaka District. This mean, that type of agricultural seasonal plan is suitable for the physical and economy of Kolaka District. According to Farizki & Anurogo (2017) distribution of geography, phenomena can be seen from various sides, like the settlement quality phenomena seen from settlement density, building layout, driveway width, driveway condition, residential location, and protective trees.

The production data identified that the type of vegetables and fruits produced in every sub-district are chili, kale, eggplant, long bean, and spinach. Then the data inventory that just 5 from 12 types of vegetables and fruits are produced in every sub-district in Kolaka District. Then the highest distribution agriculture phenomena are

chili, then kale, eggplant, long bean, and spinach produce in every sub-district in Kolaka District. The harvested area is in line with production in the type of chili, kale, long bean, and spinach. Then the eggplant does not need a large area for high production. It produced many in the small areas. According to Kusmana & Hikmat (2015) the distribution of flora and fauna in Indonesia is seen from the type and sum of them in every area. According to Widiyati (2012) the distribution principle of geography focus on the phenomena that spread out in every little area in the region like sub-district, then the phenomena that did not spread out in every little area are the exception and studied in another principle.

CONCLUSION

The chili, long bean, spinach, and kale harvest area are in line with production. While the eggplant produced high, without wide area. The scaling data in the harvest area is very less, production potency is very less, and production level is less. The rescaling about the production level of seasonal vegetables and fruit crops in Kolaka District that can be developed is kale. The potential development for seasonal vegetables and fruit crops is in the Iwoimendaa sub-district. The highest potential of harvest area that distribution in every sub-district is chili, then long bean, spinach, and kale. The production distribution for seasonal vegetables and fruit crops in every sub-district is chili, then eggplant, kale, long beans, and spinach.

RECOMMENDATION

The paper limitation is focus in scaling, rescaling, and combining with the distribution principle of crops land phenomena. The research focus in the documentation data. The recommendation for further research to combining scaling, rescaling, with the inferential statistic that focus in the interview data.

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