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Human Resource Management in Greenhouse Hydroponic Businesses

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Abstract

Malang Raya is one of the vegetable-producing areas in East Java leading to many latest innovations related to vegetable cultivation, such as the hydroponic greenhouse system. This study aims to determine human resource management in hydroponic greenhouse farming in the Malang Raya area through business characteristics, work types, company organizational structure, human resource management functions, payroll and bonuses, and labor allocation. This research used qualitative research methods that were processed by data reduction using Excel with data collected from 15 managers and actors of hydroponic greenhouse farms located in the Malang Raya area. Meanwhile, the data processing method was descriptive quantitative and descriptive qualitative analysis. The results of this study showed that most hydroponic farmers in the Malang Raya area use the NFT system with 2 different greenhouse models, namely open greenhouses and closed greenhouses. Most of them have a workforce of less than 5 people who work mostly 4 hours per day. The division system of labor is based on individual expertise with the dominance of technological development to maintain work effectiveness. The recommendation is to develop human resource management through a planned division of labor to improve the quality of workers and agricultural income.

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INTRODUCTION

Modern agriculture is often referred to as specialized agriculture, which reflects the development of a farm to a more advanced level. In modern agriculture, the main focus is on obtaining the most optimal results from the available resources and optimizing the commercial benefits of the agricultural activity. Two specific features of modern agriculture are commerciality and the utilization of increasingly sophisticated technology. This modern farming system is known to be efficient in generating abundant production. Modernization in the agricultural sector, in addition to positive impacts, has also resulted in significant changes, including in economic, social, cultural, and ecological aspects (Hunowu et al., 2021). With this statement, it can be concluded that modern agriculture is a system in the field of agricultural specialization that reflects agriculture towards a more advanced level.

Hydroponic systems have gained popularity worldwide and are increasingly being used for various purposes in different geographical regions (Lee & Lee, 2015). Hydroponic systems require many factors to be implemented (Amaluddin et al., 2023). Hydroponic agriculture requires special attention to water and sunlight factors. Son (2020) suggested that for stable plant production, disinfection systems using filters, heat, ozone, and ultraviolet radiation are needed in hydroponic systems. A supporting statement was also made by Despommier (2009) that the hydroponic greenhouse of modern agriculture is efficient agriculture and can be commercialized. The main advantage of hydroponic greenhouse cultivation is the efficient use of natural light, for light plays an important role in plant development.

Besides the importance of the system, many factors of the hydroponic system tend to evolve and change over the years. According to Savira & Prihtanti (2019), hydroponic vegetables are one type of horticultural commodity that is increasingly popular and growing rapidly in the agricultural sector today. The primary superiority of hydroponic crops is their extremely fresh quality as well as their cleanliness which is higher than that of conventional vegetables. This is due to the fact that hydroponic plants grow without contact with soil, use sterile growing media, and have a relatively low risk of disease and pest attacks. According to Martin & Molin (2019), hydroponic farming produces green vegetable products that perfectly meet supermarket standards. In addition, Ahmed (2021) said the stigma that occurs in society makes organic hydroponic fresh products valued and gains a good reputation in improving human health and environmental issues because farmers are looking for sustainable cultivation systems as hydroponic systems.

The growing number of entrepreneurs interested in starting a hydroponic greenhouse farm must also be supported by human resource management in running a farm. According to (Muharram, 2021) in the context of vegetable farming, it is necessary to strengthen the personal capacity of farmers so that they can be successful in running the farm. This involves the ability of farmers to recognize potential and take advantage of existing opportunities so that farming is carried out

in accordance with predetermined goals and steps to facilitate its realization. According to Redu (2023), to develop a marketing system for organic agricultural products, emphasis should be placed on organic certification, which can improve product quality and quantity.

Based on the view of (Dessler, 2015), human resource management refers to the process of acquiring, training, assessing, and compensating employees. In addition, these management duties also include health and safety maintenance, labor relations management, and aspects related to the principle of fairness. According to the same research conducted by (Noe, 2010), it is explained that human resource management is basically linked to rules or policies as well as systems that have a direct impact on the behavior, attitude patterns, and performance of workers. Consequently, human resource management is closely associated with its various functions. Aspects of human resource management involve workforce resource planning, recruitment or selection processes, coaching and development of human resource potential, compensation management, welfare efforts as well as security in the work environment, industrial relations governance, and exploration of knowledge in the field of human resources.

The novelty of this research is presented through the data and the way the hydroponic greenhouse business actors in the Malang Raya area carry out human resource management to manage their agricultural business. This research is expected to be a reference in seeing the development of the human resource management sector that develops in hydroponic greenhouse farming in the Malang Raya area as one of vegetable producing centers in East Java Province. The objectives of this study are: 1) To know the characteristics of hydroponic greenhouse farming in the Malang Raya Area. 2) To know how to manage human resources in hydroponic greenhouse farming in the Malang Raya Area. 3) To know the allocation of labor on hydroponic greenhouse farming in the Malang Raya area.

RESEARCH METHODS

This research has been conducted in the Malang Raya Area, which is located in East Java Province. The Malang Raya Area includes Malang Regency, Malang City and Batu City. The selection of the research location was made carefully based on consideration of the topography of the area, which is dominated by mountains and hills that provide a cool climate. These natural factors also influence the dominance of the community's profession in Malang Regency, especially in the agriculture sector. Viewed from the data available at the Food Crops, Horticulture, and Plantation Office (DTPHP) of Malang Regency, it is known that the total area of agricultural land ranges up to 30 to 40 percent of the entire area in Malang Regency, which is approximately 2,997.05 km^2. Therefore, the selection of this location is very suitable for in-depth observations in the field of agriculture.

Malang Raya is the center of horticulture in East Java, famous for its variety of methods. Not only traditional methods but also abundant agricultural innovations such as Greenhouse Hydroponics. Moreover, the Food Crops, Horticulture, and Plantation Office (DTPHP) of Malang Regency encourages urban and land-limited farmers to adopt hydroponic systems.

The research implementation time began in May 2023 to September 2023. This research timeline consists of preparing a research proposal, searching and

collecting research data, processing data to presenting research results in the form of a journal.

The population is hydroponic greenhouse farmers in the Malang Raya area with the criteria that the farms have been running for at least 6 months. Determination of the number of samples using accidental technique. Meanwhile, the sample determination used a non-probability sampling technique with a purposive sampling method.

From the survey conducted, 15 respondents were found to be greenhouse farming actors in the Malang Raya Area. The details are 5 respondents from Malang City, 5 respondents from Batu City, and 5 respondents from Malang Regency.

Data collection methods in this study were through surveys and interviews. The survey was conducted in the form of observation and documentation of farm characteristics and human resource management. Meanwhile, the interview method is carried out by asking questions in a questionnaire that aims to obtain data and information uniformity from greenhouse hydroponic farming actors.

The analysis method used in this research based on objective 1, objective 2, and objective 3 uses a qualitative descriptive analysis method. Qualitative descriptive analysis according to (Rahmania & Kriswibowo, 2022) is a method that describes a situation or condition of the subject/object in research, be it a person, institution, society, and so on, which in this case is carried out in the form of written words or oral expressions and can also be a pattern of behavior of a person that can be observed directly at a time with the aim of obtaining facts from the informant.

Based on this understanding, the data that has been collected is then processed using a qualitative descriptive analysis approach with data tabulation which aims to discover finding points and group similar and different findings. Next, the summarized data will be presented in tables and descriptions according to the result variables found. According to (Yuliani, 2018), the concept of qualitative descriptive analysis refers to a research method that adopts a simple qualitative approach with an inductive approach. This inductive approach refers to qualitative descriptive research steps that begin with an explanation of a particular process or event. Furthermore, from the process or event, we can conclude general findings that become the final conclusion.

RESULT AND DISCUSSION

Characteristics of Greenhouse Hydroponic Farming in Malang Raya Area

In this study, the characteristics of hydroponic greenhouse farming in the Malang Raya area were reviewed with 7 indicators: Type of Farming, Years of Farming, Source of Capital, Greenhouse Model, Installation Model, Monthly Turnover and Products. The results of the research on business characteristics are described in Table 1 as follows.

Table 1. Characteristics of Greenhouse Hydroponic Farming in the Malang Raya Area

Category	Dimensions	Number of Respondents.(15)	Percentage
Type of Farm	Collective Farming	**9**	60 %
	Individual Farming	**4**	26.66%

	Cooperative Farming	**1**	6.66%
	Limited Liability Company	**1**	6.66%
Length of business	<1 year	**4**	26.66%
	1 – 10 years	**9**	60 %
	10 – 20 years	**1**	6.66%
	> 20 years	**1**	6.66%
Capital Source	Personal Capital	**9**	60%
	Pooled Capital	**3**	20%
	Bank Loan/Aid Capital	**2**	13.33%
	Investor	**1**	6.66%
Greenhouse Model	Open Greenhouse	**6**	40 %
	Closed Greenhouse	**9**	60 %
Installation Model	Floating Raft	**2**	13.33%
	Drip Irrigation	**1**	6.66%
	NFT	**8**	52.33%
	DFT	**3**	20%
	Mixed	**1**	6.66%
Monthly Turnover	1 million - 5 million	**7**	46.66%
	5 million - 10 million	**6**	40%
	10 million - 15 million	**0**	
	> 15 million	**2**	6.66%
Products	Monoculture	**3**	20%
	Polyculture	**12**	80%

Source: Primary Data Processed, 2023

Based on the research results described in Table 1, the types of farms that developed in this area include; collective farms, individual farms, cooperative farms, and limited liability partnerships. These types are based on the capital, business strategy, and background of each farm owner. This is in line with the statement made by Eliyatiningsih (2023) who said that policies and identification of priority strategies can be applied by farmers in developing their farms. The same thing was also described by Pivoto (2019) who said technology adoption and education will affect the economic characteristics applied to a business. Therefore, it can be concluded by the opinion of Liu (2018) that the individual characteristics of farmers including age, experience, education, and environmental culture affect awareness, and interest decisions in determining the scale of business.

Meanwhile, the main source of capital for the hydroponic greenhouse farms developed in this area is dominated by combined capital. The combined capital here is mostly coming from a combination of personal funds and bank loans. This is in line with the statement of Stasa dan Machek (2022) who said that farmers use business, personal, and community networks as a source of cultural and economic capital. Furthermore, a reinforcing statement from Bonini dan Capizzi (2019) also

said that the company's initial funds came from large financial institutions that are traditionally interested in investing in late-stage and mature companies.

Table 1 also shows that most of the hydroponic greenhouse farming income is still below IDR 5 million. This is due to the fact that most respondents have a small land area and business scale. This is in accordance with the statement from Cooper dan Nguyen (2020) who said that if the characteristics of the company that affect corporate tax planning and business turnover are below 5 million rupiah, then the business scale is still small.

Another finding from Table 1 is that most of the hydroponic greenhouse farmers in the Malang Raya area developed the NFT hydroponic installation model. According to some respondents, the reason for choosing the NFT installation model was because the majority of them cultivate lettuce vegetables. This is in line with research from Frasetya (2021) where his research shows that the NFT hydroponic system for lettuce plants is 6%-10% more efficient than the floating raft system and the DFT system in increasing yields. Other advantages of NFT are also stated by Velazquez Gonzalez (2022) who said NFT systems require smaller amounts of nutrient solution than floating root systems. Excess solution returns to the storage tank by gravity and the flow of nutrient solution can be continuous or periodic.

Human Resource Management in Greenhouse Hydroponic Farming

The research results of the application of human resource management in hydroponic greenhouse farming in the Malang Raya area are reviewed with 4 indicators including planning, organizing, directing, and supervising. After that, it is presented with a table containing a summary of the application of human resource management in each indicator. The results of the application of human resource management in hydroponic greenhouse farming are presented in Table 2 below.

Table 2. Application of Human Resource Management in Greenhouse Hydroponic Farming

No	Type of Management	Activities
1.	Planning	Recruitment factors, worker recruitment systems, and labor organization. The factor of recruiting workers is mostly based on the need for labor on the farm, which is dominated by family members or friends of the farm owner. The worker recruitment system is mostly taken directly from relatives or close friends of the farmer. Only a few have actually opened job vacancies for people outside the farmers' community. Therefore, the labor positioning on farms is mostly based on workers' Personality and Performance.

2.	Organizing	Business organization in hydroponic farming in the Malang Raya area tends to be poorly implemented, as evidenced by 73% of respondents not having an organizational chart. Most positions or tasks are set directly by the farm owner without a written organizational chart. However, in larger-scale farms, there is a fairly clear organization chart. Therefore, most of the positions that emerged in hydroponic farms without organizational charts were Farm Owners and Workers. On the other hand, those with organizational charts tend to be more complex with manager and division head positions.
3.	Briefing	This includes routine assignments, explanation of SOPs, and coaching. This is mainly caused by the lack of organization, resulting in the need for more intensive supervision, and only labourless farms that do not implement briefings. Briefings are usually morning briefings or weekly meetings that discuss work plans and coaching, as well as explaining SOPs to new employees or about new innovations in hydroponic installations if any.
4.	Monitoring	Monitoring includes worker assessment, installation monitoring, schedule monitoring, and team monitoring. From the data collected, 60% of them conducted worker assessments, which were assessed on personality and task completion. Installation monitoring is mostly carried out directly by the farm owner. The form of monitoring here is monitoring the acidity (pH) of water, nutrition, electricity, and component installations. Monitoring activity is carried out in the morning but some is accomplished in the afternoon.

Source: Primary Data Processed, 2023

Based on the findings described in Table 2, there are many opinions and ways each farmer manages their farming sites. This is in line with the statement of Boon (2019) who said, that the same human resource system is measured in very different ways without any clarity, but the measures still capture the same lack of clarity in the measurement of human resource management. In addition to this, the importance of implementing management on a farm cannot be ruled out. According to Alreahi (2023), the application of human resource management has proven its efficiency in many industries. The same opinion was also expressed by (Risa, 2018) who said that the cultivation business requires a complete and precise management system in all activities or processes carried out to ensure that all the main objectives of the cultivation business can be achieved.

Based on the summary of planning points in Table 2, most of the factors for recruiting workers are based on the labor needs of the farms they run. Additionally, the origin of workers used is mostly family members or close relatives, based on the owner's motivation to prosper their family and relatives. This is in accordance with the statement from Silva (2023) who said that family farming emerged as an alternative to monoculture and plantations to strengthen themselves from social impacts.

Meanwhile, based on the summary of organizing points in Table 2, it was also found that many of the business actors have not implemented a clear organizational

system in their companies. This is because most of them feel that developing an organizational system for family-run farming is not necessary. As said by Silva Taveira (2019) family farms have close community relationships that make the selection of work techniques and decisions based on family decisions.

Based on the summary of briefing points, the types of briefing that are often used include routine assignments. However, only a small number of them implement work SOPs and some of them also provide training to their workers. This is in accordance with the statement of Ong (2021) who said that small-scale farms have problems communicating with each other and usually lack Standard Operating Procedures (SOPs) compared to industrial farms.

Meanwhile, in terms of monitoring, most of the hydroponic greenhouse farming actors in the Malang Raya area assess workers from their personality and task completion. This is in accordance with the statement of Voegtlin and Greenwood (2016) that human resource management plays an important role in how a business strategy is understood, developed, and implemented. The same applies to the company's understanding of social responsibility and workers' behavior.

Labor Allocation in Greenhouse Hydroponic Farming in Malang Raya Area

The results of the research on labor allocation in hydroponic greenhouse farming in the Malang Raya Area are reviewed from 3 indicators, which are the number of workers, working hours and positions, and the work effectiveness management. Those points will then be presented through tables on each indicator. More complete results will be presented in Table 3.

Table 3. Number of workers in Greenhouse Hydroponic Farming in Malang Raya Area

No	Category	Respondents
1	0	4
2	< 5	10
3	5 – 10	1
4	>15	0
	Total	**15**

Source: Primary Data Processed, 2023

Based on the findings in Table 3, it is known that out of the 15 hydroponic greenhouse farmer respondents, most of them have less than 5 employees. Although they have a relatively small number of employees, the number of workers and workload are found to be optimal. This is in line with the statement from Smith (2015) that most organic farming systems are more energy efficient than conventional systems, although there are some exceptions. The same idea was stated by Kumar (2021) who said hydroponics costs money, reduces dependence on human labor, and lowers overall start-up costs to increase the commercialization of hydroponic farming.

Table 4. Working Hours of Workers and Owners of Greenhouse Hydroponic Farming in the Malang Raya Area

No	Working Hours	Respondents
1	< 4 hours	4
2	4	6
3	5	1
4	6	-
5	7	-
6	8	4
	Total	**15**

Source: Primary Data Processed, 2023

Based on Table 4, it is found that the working hours of workers and hydroponic farming owners are mostly below 6 working hours. This is in line with the statement of (Cournut et al., 2018) that workers organize farming workload by considering their own preferences about work (e.g., duration, and other activities). This is indeed a natural occurrence, according to Ganster (2018) working hours are an aspect of working conditions that can vary both within, and between, jobs and that can potentially affect workers' well-being. The consistency of long working hours over time and their relationship with prosperity.

Table 5. Working Position and Working Effectiveness Management

Category	Dimensions of findings	Respondents
Work Sharing System	No Workers	4
	Based on Individual Expertise	6
	Based on Personality	3
	Based on Agreement with Workers	1
	Based on Work Experience	1
Method to maintain work effectiveness	Developing Technology on farming Installation	4
	Developing Technology and Cooperation	2
	Maintaining Communication and Cooperation	5
	Improving Worker Capacity	1
	Maintaining Communication with Suppliers	1
	Direct workers	1

Source: Primary Data Processed, 2023

Based on Table 5, it is found that the division of labor in hydroponic greenhouse farming in Malang Raya is carried out to maximize performance in farming. From the data in Table 5, it is known that there are 4 respondents who do not employ workers in carrying out their farming business and there are 11 respondents who have

workers and distribute labor based on; individual expertise, working experience, agreement, and workers' personality. On small-scale farms, the division of labor tends to be based on the time required to monitor the hydroponic installation, either in the morning or in the afternoon. However, for larger farms, the division of labor is based on the tasks and expertise of the workers themselves, both in terms of marketing and cultivation. This is consistent with the statement of Dominguez Folgueras (2022) that the division of labor is determined by economic exchange, time availability, expertise, and gender.

In the same table, it was found that the ways to maintain work effectiveness in hydroponic farming tend to vary. This is influenced by the number of workers and the working system applied in each farm. This is in line with the statement of Jia (2023) who said that agricultural development needs to solve its own problems related to the efficiency of agricultural production and the strength of agricultural development, in order to improve the efficiency of cultivation and operation of business entities and ensure the efficient allocation of resource elements and the efficiency of agricultural product supply.

CONCLUSIONS

Based on the research and the results of data analysis that has been carried out, it can be concluded that the characteristics of hydroponic greenhouse farms in the Malang Raya area can mostly be classified as Micro Enterprises. This conclusion is obtained from research data in the form of business turnover and the number of workers showing the characteristics of MSMEs based on PP No.7 of 2021.

Human resource management is still not well implemented because there are still many farming operations that do not have a clear division of labor. Most of the farms that are flourishing in this area do not have any clear organizational structure. This is also supported by the fact that there are still many farming businesses that have not implemented the provision of SOPs and training for the workers they have.

The allocation of labor for hydroponic greenhouse farming in the Malang Raya Area mostly comes from local workers who come from the family or relatives of the farm owner. Only a few farm operators open job vacancies for the public. As for the division of labor itself, it prioritizes the expertise of each worker, and the ways to achieve work effectiveness are very diverse. However, it is more about how each hydroponic farm owner develops the technology in their installation.

RECOMMENDATION

Suggestions to hydroponic greenhouse farm owners in the Malang Raya area are to increase the working capacity of their human resources by teaching workers about work SOPs, providing training from experts, and providing daily tasks that are carried out with the aim of improving work effectiveness on the farm being run. This is because, from several samples taken, farms with good human resource management have better work effectiveness and business turnover.

The weakness of this research lies in the author's lack of information on the number of respondents who do hydroponic farming in the Malang Raya area. Consequently, it only covers a small percentage of hydroponic greenhouse farms in the Malang Raya region. Furthermore, the author's limited access to larger farms in the region makes the data obtained less diverse. Therefore, for similar research in

the future, it is expected to conduct location mapping and apply for research permits to relevant parties in order to facilitate and increase the amount of observation data carried out.

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