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DIVERSIFICATION OF HORTICULTURAL FARMING IN FACING THE COVID-19 PANDEMIC: A CASE STUDY IN SIGI BIROMARU DISTRICT, CENTRAL SULAWESI

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ABSTRACT

Efforts to use land through cropping patterns or crop rotation, better known as farm diversification can be an alternative for farmers to maintain their farming during the COVID-19 pandemic. This pandemic affected commodity changes or changes in cropping patterns on farms cultivated by farmer. This study aims to analyze and describe the pattern of horticultural farming and the level of farmers' incomes. The research was conducted in three villages in Sigi Biromaru District, namely Jono Oge Village, Lolu Village, and Sidera Village. The results show that there are no differences in the cropping patterns carried out by farmers in the pre-pandemic and pandemic periods. The cropping patterns include intercropping, multiple cropping, and relay cropping. The highest income per year is obtained by Jono Oge Village at IDR 12,054,600.00, followed by Lolu Village at IDR 8,099,262.40 and Sidera Village was IDR 4.416.600.00.

Keywords*:* COVID-19, Diversification, Income.

INTRODUCTION

The diversification program for farming in Indonesia has been launched by the government since Pelita I (1974 – 1978) which aims to increase farmers' income, expand employment opportunities, and also to reduce poverty. This program has a very high urgency to overcome various obstacles and problems faced by farmers, such as relatively small arable land area and simple farm management, lack of knowledge and skills, and low ability to apply agricultural technology in farming (Damanhuri, 2017). The importance of this program in dealing with disasters can also be relied on by farming actors.

Yoshida, et.al. (2019) states that small farmers are more likely to diversify their businesses than large ones. This implies that farm diversification is important because it can maximized the multifunctionality of farms. Furthermore, advanced diversification has a positive impact not only on the economic viability of farms, but also on their social

performance. These findings have suggesting that a more balanced promotion of the diversification is crucial to building a sustainable agriculture.

The occurrence of non-natural disasters globally, also known as the Corona Virus Disease 19 (COVID-19) pandemic, has had a huge impact on several important sectors in Indonesia, one of which is the agricultural sector. This has changed in farmers' income levels, changes in farming commodities, and even changes in how to cultivate farmland which are the real effects on agricultural farming during the COVID-19 pandemic (Sedana, 2020).

Sigi Biromaru District is one of the sub-districts in Sigi Regency which is the largest producer of horticultural commodities. Cultivated plants include shallots, chilies, potatoes, cabbage, *petai*, and tomatoes as shown in the Table 1, table of land area for horticultural commodities.

Horticultural crop production in Sigi Biromaru District reaches 22,850 tons in 2016. This total production is the highest among 14 others sub-districts (Table 1), which is certainly related to the techniques or cropping patterns used by farmers. It is assumed that the more types of commodities are planted, the total production of horticultural crops will also increase (Muhyiddin, 2020).

During the COVID-19 pandemic, it is suspected that there will be changes in commodities or in cropping patterns of cultivated farms by farmers. This is due to the preference of farmers to arrow commodities with faster harvests and higher prices. This has occurred during the H1N1 flu pandemic, MERS, and other flu viruses that take place in the world (Mastronardi et.al., 2020).

Table 1. Land area and production of horticultural commodities in Sigi Regency, Central Sulawesi, 2016.

Districts	Land Area (Ha)						Production (Ton/Ha)
	Onion	Chili	Potato	Cabbage	Petai	Tomat	
Pipikoro	0	7	0	0	0	2	-
Kulawi Selatan	0	12	0	0	0	0	-
Kulawi	0	1	0	0	14	1	-
Lindu	2	13	0	0	8	10	210,00
Nokilalaki	11	16	0	11	11	11	366,00
Palolo	13	14	0	12	11	22	610,00
Gumbasa	5	3	0	0	0	2	314,00
Dolo Selatan	0	40	0	0	0	6	-
Dolo Barat	0	23	0	0	10	6	-
Tanambulava	13	11	0	3	5	8	150,00
Dolo	42	33	0	0	8	33	3.975,00
Sigi Biromaru	457	200	0	4	53	208	22.850,00
Marawola	0	44	0	0	26	47	-
Marawola Barat	0	0	0	0	0	0	-
Kinovaro	0	31	0	0	0	41	-
Sigi Regency	543	448	0	30	146	397	28.475,00

Source : BPS Sigi 2016.

Therefore, it is important to study the diversification of horticultural crop farming in the face of the COVID-19 pandemic. First of all, the cropping pattern or the rotation of horticultural crops carried out by farmers for each selected village will be investigated. Furthermore, to see the difference in the income of each villages, the total income from the production of cultivated horticultural crops will be calculated. In doing so, the difference in the income of each village for horticultural crops will be known.

State of Problems.

Based on the background, the formulation of the problem in this study states as follows:

1. What is the cropping pattern or rotation of horticultural crops cultivated by farmers in Sigi Biromaru District?
2. How much income earned by horticultural farmers in Sigi Biromaru District?

RESEARCH METHOD

Place and time of research.

This research was conducted in three villages in Sigi Biromaru District, Central Sulawesi Province namely Jono Oge Village, Lolu Village and Sidera Village. The selection of location is done purposively. The research conducted from April to September 2021.

Respondent Determination Technique

This research is a descriptive research type, using several qualitative and quantitative techniques. Qualitative techniques are used to collect, process, classify and to obtain information about cropping patterns or farming diversification in the research site. Meanwhile, quantitative techniques are used in the analysis of farm income for horticultural crop commodities to obtain profitable farming priorities.

The number of respondents in this study is 50 horticultural farmers over the three villages. In addition, this study also involved key informants which is the heads of Lolu Village, Jono Oge Village, and Sidera Village in concerns as community's leader who knows better the conditions of the people in the research area.

Data Collection Techniques.

The research used primary and secondary data. The primary data collected through interviews with farmers using a questionnaire guide, as well as observation with predetermined informants. While secondary data was obtained through literature reviews, books, and related journals.

Data Processing and Analysis Techniques.

Data analysis includes descriptive and economic analysis related to farm diversification. Descriptive analysis is a conducted analysis to assess the characteristics of data, whereas economic analysis uses cost analysis, revenue analysis, and income analysis.

The amount of farming income is calculated by measuring the overall costs sacrificed using the formula as follow:

$$\mathbf{TC = TFC + TVC}$$

TC : *Total Cost* (IDR)
TFC : *Total Fixed Cost* (IDR)
TVC : *Total Variable Cost* (IDR)

Farming is revenue analysis is all product value produced from a farm in a certain period, one planting season, or in one year of farming activities. According to (Suratiyah, 2009) the formula for calculating farming revenue is as follows:

$$\mathbf{TR = P \cdot Q}$$

TR : Total Revenue (IDR)
Q : The quantity of the product (Kg)
P : The price of the product (IDR/Kg)

RESULTS

Characteristics of The Diversification of Farming in Sigi Biromaru District. Over the three villages in the research areas (Lolu Village, Sidera Village, and Jono Oge Village) shows that the the type of horticultural commodities planted by the farmers are tomatoes, chilies, shallots, eggplant, celery, long beans, kale, basil, and spinach. Moreover, figure 1 shows that the most cultivated commodity by all villages is Chili.

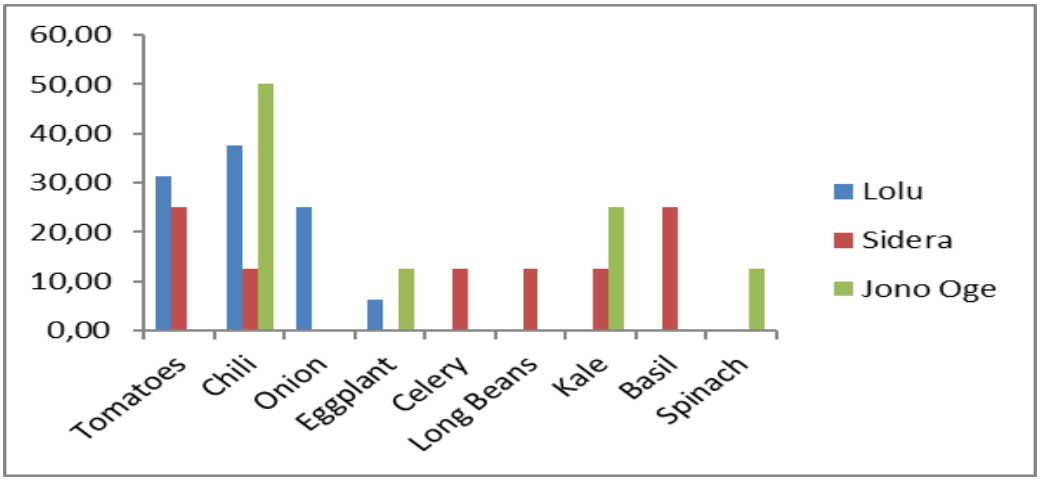

Figure 1. Types of Cultivated Commodities.

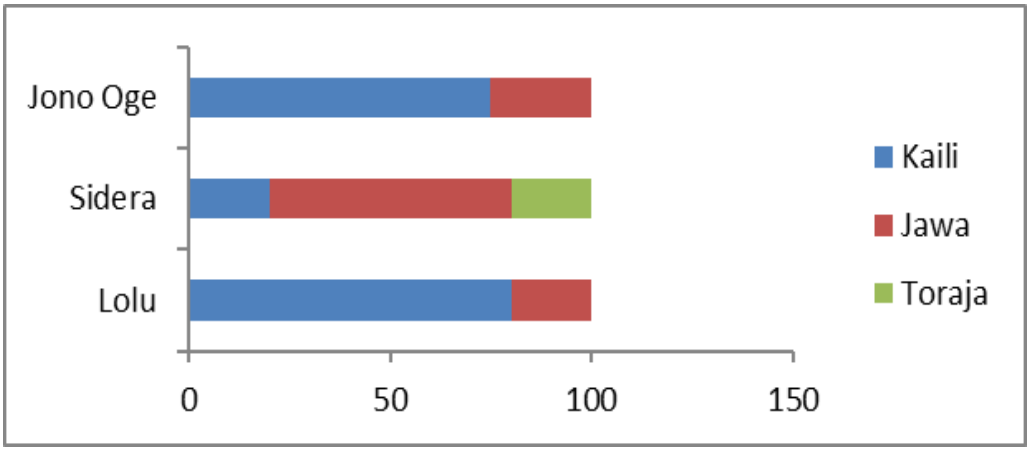

Figure 2. Farmers with ethnic group in Sigi Biromaru District

Based on the results from interviews and data obtained, it found out that the selection of the type of commodity cultivated by farmers is influenced by each ethnic group of origin. This is in line with Fataki's research (2017) which found that 56.25 percent of farmers will plant crops according to the habits brought from their hometown/tribe of origin. It is known that 73.50 percent of Kaili farmers plant chilies and tomatoes while the remaining 27.50 percent, while Jawa and Toraja farmers choose to plant other types of commodities besides chili and tomatoes. Based on Figure 2, it is known that Kaili farmers are mostly domiciled in Jono Oge Village and Lolu Village, while in Sidera Village it is more likely dominated by Jawa and a small part by the Toraja farmers.

Characteristics of Diversification of Farming in the face of COVID-19.

The types of diversification in Sigi Biromaru District are intercropping, multiple cropping, and relay cropping.

Intercropping is a form of mixed cropping of two or more types of plants that are planted at the same time or almost close together. Intercropping at the research area consists of tomato and chili plants (Figure 3). Based on the research of Sujitno, et al (2018), tomato and chili plants have appropriate and complementary morphological and physiological properties so that the resulting product is higher than single planting. This study also shows that the profit obtained is higher with an R/C value of 2.6. Based on this consideration, most of the farmers has intercropped for tomato and chili plants.

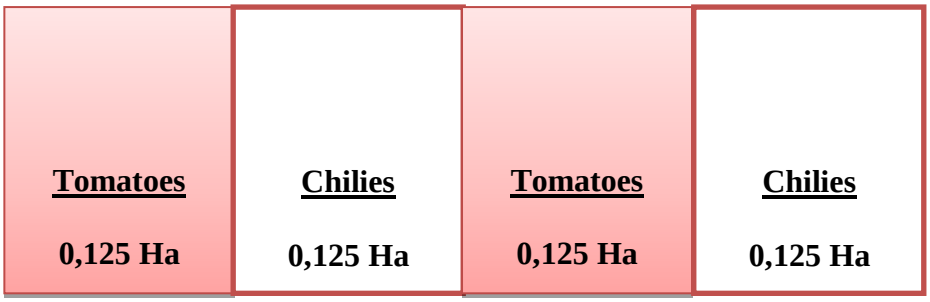

Figure 3. Intercropping Pattern Tomatoes – Chilies

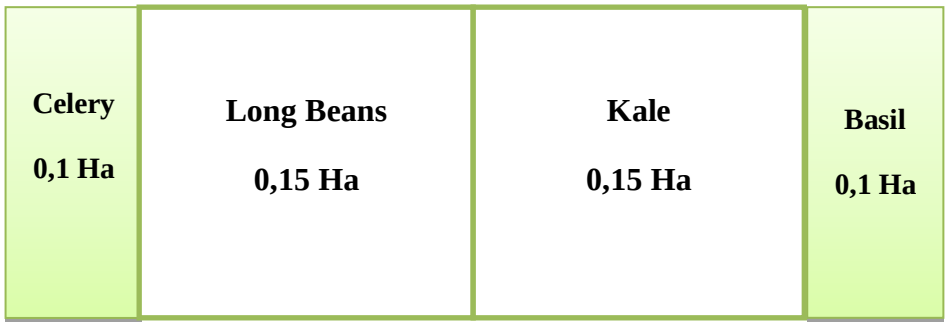

Figure 4. Multiple cropping Pattern Celery-Long Beans-Kale-Basil.

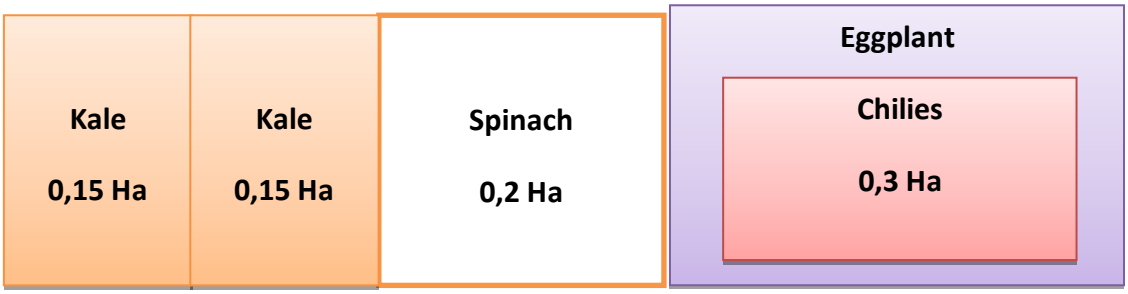

Figure 5. Relay cropping pattern Kale – Kale – Bayam dan Cabai – Terung.

Figure 4 reveals the fact that in the research area there are also other types of cropping, namely multiple farming cropping with four plant variants. As it states in the definition, multiple cropping is planted for a year or more that consists of one or several types of plants on the same land for several times. The advantage of this type of farming is that the yields will be more diverse, therefore the income of farmers will also higher compares to the planting of one type crop. By implementing this cropping system, it helps farmer to choose what types of crops with a high selling for better and higher income.

In addition to the 4 types of cropping, there is also a relay cropping model as shown in Figure 5. Relay cropping shows a combined cropping system with more than 3 types of plants in one field. The use of relay cropping is not carried out by many farmers considering the capital used in one planting season is also not large so that the number of plants planted is also limited.

Furthermore, the results also show that there are no differences in cropping patterns before the COVID-19 pandemic and during COVID-19 periods. Some impact of COVID-19 which are felt by farmers is in the sales or selling process. In addition, there is a decreasing product sale, delays in collecting traders to buy products, damage to the products produced

because there were no buyers, and no product processing or adding value.

Characteristics of Diversification of Farming in Lolu Village.

Based on Figure 6, it is known that 37.50 percent of farmers in Lolu Village planted chili 31.25 percent planted tomatoes, 25.00 percent shallots and the remaining 6.25 percent were planted eggplant. In contrast to Lolu Village, Sidera Village is dominated by tomato and basil as planted commodities around 25.00 percent, 12.50 percent of planted commodity is chili, celery, long beans, and kale.

In addition, as it can be seen on Figure 7, that there is a very striking difference of planted commodities, which is 50.00 percent dominated by chili. As well as 25.00 percent of the farmers planted kale and the remaining 12.50 percent for eggplant and spinach.

Farming Income

Moreover, the result shows that the highest income of farmer's farming in the research area is in Jono Oge Village with an average income of IDR 12,054,600 per year. It followed by Lolu Village at IDR 8,099,262.40 and the lowest average income is in Sidera Village of IDR 4,416,600.00 per year (Figure 8).

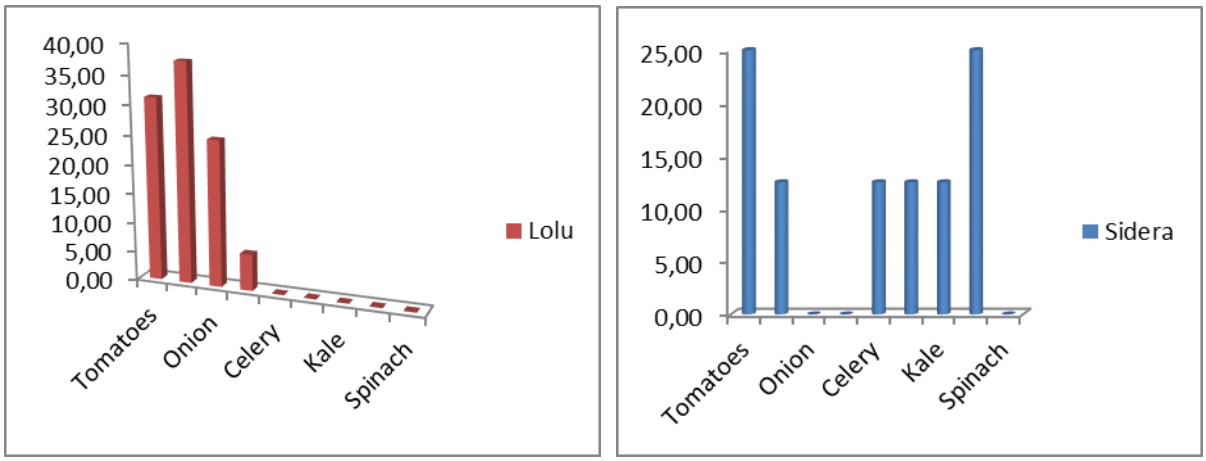

Figure 6. Percentage of horticultural commodities cultivated in Lolu and Sidera Village

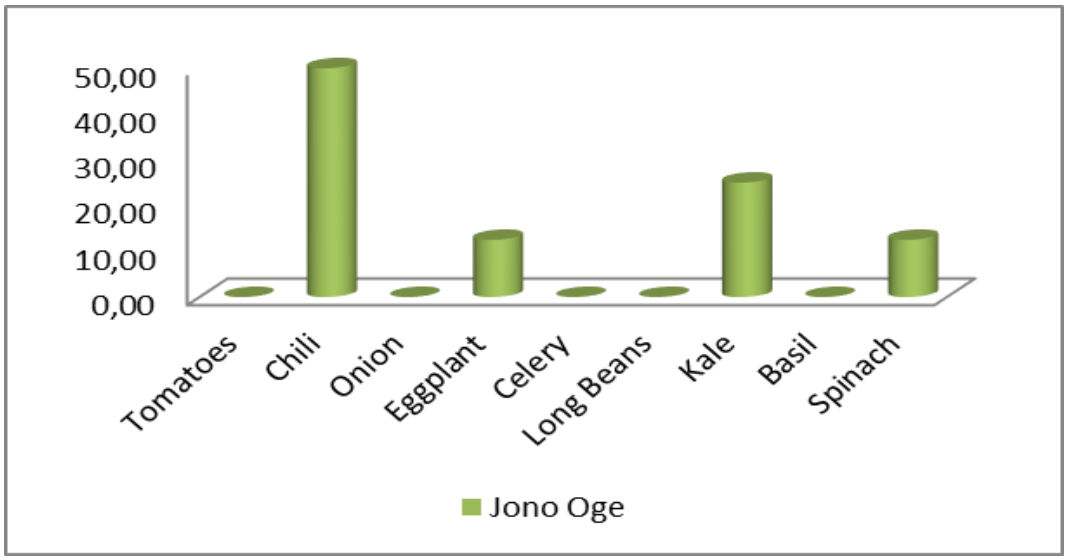

Figure 7. Percentage of horticultural commodities cultivated in Jono Oge Village

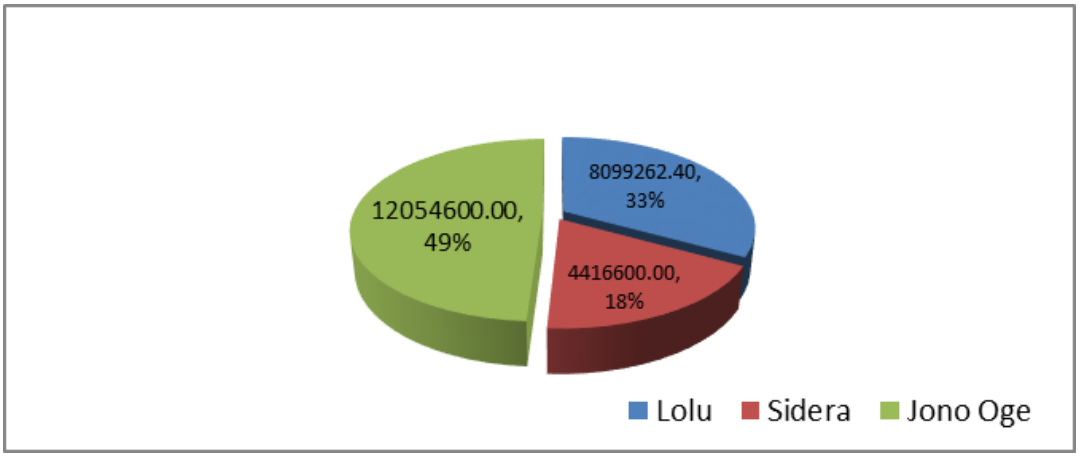

Figure 8. Income per April 2020 – April 2021 for each village

This high level of income is closely related to the types of crops grown by farmers in the research area. As shown in Figure 7, there are 50 percent of farmers in Jono Oge Village cultivated chili and other villages such as Lolu and Sidera cultivated chili for 37.5 , and 12.50 percent respectively. During the period the price of chili reaches IDR 40,800 per kilogram. This increasing price of chili has greatly affected the profits of farmers who carry out various farming systems or diversify farming.

As reported by Anwarudin, et al. (2015), shows that the price of chili is always higher than the average price of other horticultural commodities. In addition, chili plant is easier to be cultivated and available in many kinds of chili varieties. Therefore, the income of farmers who cultivate chili is higher than others.

CONCLUSION

Based on the results, it can be concluded that:

1. Cropping patterns carried out by farmers in Sigi Biromaru District are intercropping, multiple cropping, and relay cropping. Jono Oge and Lolu Village cultivate horticultural crops which it dominated by chili plants at 50 percent and 37.50 percent, respectively. Meanwhile, Sidera Village is dominated by tomato and basil plants by 25 percent. In addition, other crops cultivated by each village are tomatoes, kale, eggplant, spinach, shallots, celery, and long beans.
2. The highest income of farmers in Sigi Biromaru District is in Jono Oge Village with an average income of IDR 12,054,600.00, followed by Lolu Village at IDR 8,099,262.40 and the lowest average income is in Sidera Village of IDR 4,416,600.00 per year.

SUGGESTION

Based on the conclusions, what can be suggested by the author's team are:

1. Farmers can carry out a multiple cropping patterns with chili plants as the dominant crop, therefore can increase further farmers' income.
2. Expanding farmers networking in order to monitor the prices of horticultural commodities that have stable price fluctuations, so that, the selection of plants to be cultivated is more planned.

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