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Does Healthy-Chilli Cultivation Increase Productivity and Trade Value for Farmers?

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ABSTRACT

Healthy chilli farming has the potential to increase both the output and income of farmers in improving farmer's welfare through the implementation iof Good Agricultural Practices (GAP) . The welfare of farmers encompasses more than just income and production, hence, the Farmer's Terms of Trade (FTT) serve as a reference point for household prosperity in Indonesia. This research aims to: (1) compare the productivity of chilli farmers, (2) examine the farmer's terms of trade, and (3) analyze the impact of productivity and other factors on the farmer's terms of trade associated with three farming methods: healthy, semi-healthy, and conventional farming systems. The study was conducted in Sleman Regency, Indonesia, a region that has been implementing healthy-chilli farming system since 2021. A total of 106 farmers were interviewed, distributed across 6 areas known for their significant chilli production. The respondents were selected through a simple random sampling approach. The FTT is assessed through household income and subsistence terms of trade. The comparison of farmer productivity was analyzed using a Kruskal-Wallis H test. The findings indicate that the productivity of healthy-farming is higher than other two chilli farming systems. The FTT for healthy- farming is higher and classified as prosperous, while others do not yet reach prosperous level. Moreover, subsistence terms of trade of healthy and conventional farming statistically different. The increase of FTT was significantly affected by productivity, planting area, and price of chilli, while the number of family member, non-family labor cost, and household expenditures can decrease the FTT.

Keywords*: farmer terms of trade, farmer income, farmer welfare, healthy-farming system, subsistence terms of trade*

BACKGROUND

Red chilli is a popular horticultural product among Indonesian. Chilli consumption in Indonesia has risen from 2.02kg per capita in 2020 to 2.4kg per capita in 2023 (BPS Indonesia, 2024).). This increase in consumption is a result of the expansion of the food industry that will affect

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an increased demand for chilli (Setyadi et al., 2020). Indonesian chilli production has increasing as shown in Figure 1, the production generally increased over the six-year period, despite minor fluctuations in 2021 and 2022.Yogyakarta Province contributes 35.3 thousand tons in 2022, as much as 2.5% of the Indonesian production (BPS Indonesia, 2024). Sleman Regency has a good potential for agriculture production, it produces 4.9 million tons of chilli in 2022 or 13% of Yogyakarta's production (BPS DIY, 2023) . However, the productivity goes up and down every year. There are many factors that influence chilli productivity, including unpredictable weather conditions, pest and plant disease, seeds quality, and farming system. Correspondingly, chilli productivity can be caused by the input quantities and combinations (Sonia et al., 2019). Chillies that were treated with biological agents (*Trichoderma* spp.) are grown better (Yanti et al., 2021). The decline in chilli productivity will certainly affect the farmer's income. Chilli has high economic value and cannot be separated from Indonesian consumption pattern; therefore, the welfare of chilli farmer can be an indicator of regional economic development.

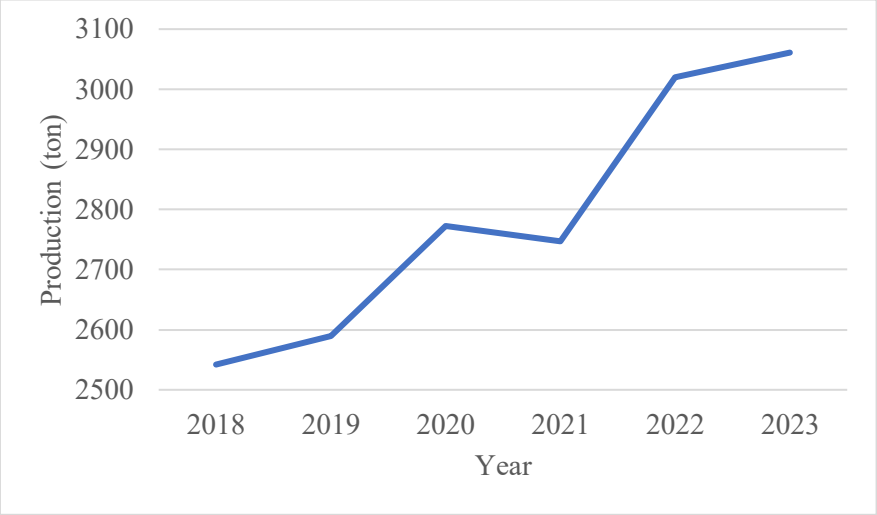

Figure 1. Annual Indonesia Chilli Production (in thousand tons).
Source: (BPS Indonesia, 2024)

Chilli has a relatively short shelf-life and highly perishable, whereby this natural character causes price fluctuation. The price fluctuation can affect farmers' income, moreover enhancing the income of farmers' households can lead to improved farmers' welfare (Lubis et al., 2024). Despite that, an increase in production and income does not always reflect the farmers' welfare, as it does not accurately represent their purchasing power (Junaidi & Jannah, 2020). Since the agricultural development focuses on enhancing farmer welfare, measurement tools to evaluate the evolution of farmer welfare is needed (Syaputri et al., 2024). The Farmer's Terms of Trade (FTT) is the more suitable method for assessing farmers' welfare. The FTT index, which considers farmers' income and expenditure is deemed more precise in evaluating the level of farmers' welfare (Sugiana et al., 2018). The farmers' economic development can be reflected through the FTT, that characterized as the ratio of the price that farmers receive to the price, they paid (BPS Indonesia, 2023). Furthermore, FTT

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encompasses various concepts, including barter, factorial, revenue, and subsistence (Chakraborty, 2020).

A decrease in chilli farming productivity can reduce overall production levels, potentially threatening farmer income and will negativety affecting farmers' welfare. Government policy is also needed to improve the farmers' household economy. Since 2021, Sleman Regional Government has developed a "healthy plant area" which used Good Agricultural Practices (GAP) farming system, including for chilli. The implementation of GAP leads to agricultural sustainability which aims to produce safe and good quality agricultural products while preserving the environment (Leong et al., 2020). In terms of efficiency, organic farming is more profitable because has lower total cost so that organic farming income is higher compared to non-organic farming (Anggita & Suprehatin, 2020). Yet, some farmers prefer to cultivate chilli in conventional way and are unwilling to apply healthy-farming system.

Implementing the "healthy plant area" is part of the Sleman local government's commitment to achieving environmental sustainability. The adoption towards this farming system is an important step in order to achieve increased production while reducing agriculture's environmental footprint (Mayfield et al., 2023). It is hoped that the result of this study can be considered by the government to establish policies that will support the welfare of chilli farmers, such as offering a training program or providing advance farming equipment. In general, investigating the welfare of chilli farmers is important to ensure that the agricultural sector—particularly in chilli production—can positively impact the rural development.

This study focused on the welfare of chilli farmers and also investigates the determinant of FTT of three different farming systems, namely healthy-farming, semi-healthy, and conventional-farming. The variations in expenses and earnings from different farming systems led to the initiation of this research. According to Lestari et al. (2019), the expenses for fertilizers associated with non-organic are higher compared to semi-organic farming system. Semi-organic chilli production will also be greater, resulting in higher income. A comparison of the productivity and FTT of healthy-farming system versus conventional-farming system can determine which farming systems are more effective regarding the usage of fertilizers, pesticides, and biological agents. Conventional-chilli farmers tend to use more chemical input compared to healthy-chilli farmers, resulting a higher variable cost. Chilli farming that uses a combination of organic and non-organic fertilizers produce 1.2 times higher and generate more income compared to those that rely on non-organic fertilizers (Ardian et al., 2017). The application of organic fertilizer positively impacts chilli yields, while increasing the use of pesticides is linked to reduced production (Karyani & Tedy, 2021). Futhermore, the amount of production significantly enchance the farmer's income (Wehfany et al., 2022)

Research related to farmer welfare or farmer welfare issues has frequently been conducted. However previous study generally emphasizes into a single welfare measurement, such as Bening et al. (2021) investigated FTT within the horticulture subsector, but did not examine farmers' productivity. Mazwan & Masyhuri (2019) and Sulaksana (2020) measure FTT through the subsistence concept and investigate the FTT determinants. On the other hand, Utami et al. (2023)

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assesses farmer welfare through the ratio of costs and benefits and the farming profitability. This study aims to address the following gaps: First, it considers varying farming system within the same commodity. Second, it examines the role of productivity and FTT in measuring welfare. Third, it into a new concept in attempt to increase the GAP adoption implemented by the Sleman government named "healthy plant area" including chilli as the commodity. Since there has been no prior research focused on healthy-chilli farming, this study specifically addresses this issue. Finally, this study aims to compare the productivity and the terms of trade of healthy-chilli farmers and conventional-chilli farmers in Sleman. This purpose can lead to assess whether the adoption of healthy-chilli farming can enhance both the farmers' output and income. Therefore, the farmers' welfare was analyzed not only from production but also from FTT.

RESEARCH METHODS

Study Area

This study was conducted in Sleman Regency, Yogyakarta Province. Sleman regency was chosen because it is one of the potential areas of chilli production and has a significant production. Furthermore, the government has launched a program named "healthy" farm area with chilli, rice, and egg as the priority commodity, as an action to increase the implementation of GAP. Sleman has varying altitudes ranging from 100-1000 meters above sea level and placed around the slopes of Mount Merapi (Pemkab Sleman, 2023). The temperature typically ranges from 18 - 30^0C and the rainfall ranges from 100-200mm/month (BPS Sleman, 2023). This climate conditions are suitable for chilli farming and can lead to produce good chillies, at low humidity and high temperatures will cause abscission of buds, flowers, and small fruits (Zewid et al., 2023). This study was conducted from September to November 2024 focusing on five districts: Ngemplak, Pakem, Sleman, Tempel, Turi, and Ngaglik. These sub-regencies were selected because they have significant production of chilli.

The population of chilli farmer known by doing interviews with key informants such as government officials in each district. The sample size was calculated using the formula by Lwanga & Lemeshow (H. H. Ahmed et al., 2024), resulting in a requirement of 106 farmers as the samples. Respondents involved in this study are chilli farmer and determined by random sampling method, whereas there are 3 farmers classification such healthy-chilli farmer (22 samples), Semi-healthy farmer (32 samples), and Conventional-Chilli farmer (52 samples). Data were collected through interviews and questionnaires; the farmer's classification is carried out after interviews. Healthy-chilli farmer refers to farmer that technically implement GAP and minimize the usage of chemical input, semi-healthy farmer implement GAP but still use a significant chemical input, while conventional-farmer do not implement GAP and use high dose of chemical input. The research framework includes farmer households' expenditure, total farmer households' income, and farm production cost.

Data Analysis

Farmer's productivity is measured as the ratio between total production and the plant area. While, production is determined by the total yield accumulated within one year. The FTT measured

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by two different methods, there are income terms of trade and subsistence terms of trade. The first method is used to determine the level of farmer's welfare in general way and considering the off-farm households' income, while the second is used to determine the on-farm subsistence level of farmer's households. The measurement of income terms of trade (ITT) is estimated by the following equation model (Sugiana et al., 2018; Tulong et al., 2019):

$$ITT = \frac{Yt}{Et} = \frac{(Ypt + Ynpt)}{Ept + Enpt}$$

ITT is Income Terms of Trade, Yt is total income, Et is total expenditure, Ypt is on-farm income, Ynpt is off-farm income, Ept is On-farm cost, while Enpt is non-farm cost. Furthermore, the measurement of subsistence terms of trade (STT) is estimated by following equation model (Alimah et al., 2021):

$$STT = \frac{\sum P_{xi}\, Q_{xi}}{(P_{yi}\, x\, Q_{yi}) + (P_{yj}\, x\, Q_{yj})}$$

Where STT is Subsistence Terms of Trade, P_{xi} is price of farming commodity, Q_{xi} is quantity of farming commodity, P_{yi} is price of consumption product, P_{yj} is price of farming input, Q_{yi} is quantity of consumption product, and Q_{yj} stand for quantity of farming input. Comparison of farmer's productivity and FTT was carried out using the non-parametric Kruskal-Wallis H-test. The H-test used to determine the significant differences and an alternative to the one-way ANOVA when the data do not meet the assumptions of normality (Kruskal & Wallis, 1952; Vargha & Delaney, 1998). The null hypothesis that the means of multiple groups are aqual, with the alternative hypothesis being that at least one mean differs from the others, if the significance value of H-test statistic is more than alpha (0.05), there is no significant difference between the farming systems. However, this H-test do not provide specific post hoc pair wise comparison (Lee & Lee, 2018) so that this paper uses a Mann-Whitney U test for seeking specific differences among farming systems.

Multiple linear regression analysis is employed to examine the effect of productivity and other factors on the FTT. In line with that, classical assumption test is carried out to ensure that the model meets the requirements of best linear unbiased estimator. The log-linear regression model used in this study follows the Cobb-Douglas function, which have been employed to asses the change of output with respect to various inputs. The inclusion of variabels is supported by previous empirical findings (Agustina et al., 2022; Shifa et al., 2019; Sulaksana, 2020). The model equation can be written as:

$$lnY = \beta 0 + \beta 1\, lnFP + \beta 2\, lnPA + \beta 3\, lnFM + \beta 4\, lnPC + \beta 5\, lnPP + \beta 6\, lnPO + \beta 7\, lnPNO + \beta 8\, lnLC + \beta 9\, lnHE + \beta 10\, DH + B11 DSH + e$$

Where Y is farmers' terms of trade, FP is farmers' productivity (ton/ha), PA is planting area (ha), FM is family member (person), PC is price of chili (Rp/kg), PP is price of pesticide (Rp/ml), PO is price of organic fertilizer (Rp/kg), PNO is price of non-organic fertilizer (Rp/kg), LC is non-family labor cost (Rp), HE is farmers' household expenditure (Rp), DH is dummy of healthy farming (Healthy farming=1, others=0), DSH is dummy of semi-healthy farming (Semi-healthy farming=1, others=0

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RESULT AND DISCUSSION

Production and Productivity

Observation result shows that 40% of farmers in Sleman are conventional-chilli farmers, while healthy and semi-healthy-chilli farmers respectively 21% and 30%. This illustrates that most farmers do not yet have an awareness of environmental sustainability. Chilli planting area of each healthy-farmers are 0.41 hectare in average, while each Semi-healthy and Conventional-farmers working on 0.24 and 0.16 hectare in average. Planting area differences can lead to different yields, farmer's production and chilli-farming productivity presented in Table 1.

Table 1. Farmer's Production and Chilli-Farming Productivity

Farming System	Production (tons)	Productivity (ton/ha)
Healthy	3.5	8.5
Semi-healthy	1.2	7.4
Conventional	1.7	7.2

Source: Processed Data, 2025.

Table 1 provides evidence that healthy farming produces the highest output per farmer and highest productivity per hectare, suggesting that healthy farming is the most efficient and effective method among the three farming systems. This result shows that implementation of healthy farming is potentially to increase farmers' income, which can enhance farmers' welfare. Semi-healthy farming shows the lowest production per farmer likely due to suboptimal use of production inputs, though its productivity is slightly better than the conventional farming. Moreover, conventional farming has the lowest productivity per hectare, indicating lower land efficiency compared to other farming systems. These results suggest that healthy farming could be the most sustainable and beneficial both for farmers and land use efficiency. This result prove that healthy-farming system can relatively lead to higher productivity, furthermore healthy-farmers have the potential to increase the income, while also providing health and safety product for human being and environment (Krasachat, 2023).

Table 2. Result of Statistical Test for Assessing Differences in Farming Productivity.

Test	Compared Group	p-value	Category
Kruskal-Wallis	All farming systems	0.040	Significantly different
Mann-Whitney U	Healthy and semi-healthy	0.022	Significantly different
	Healthy and conventional	0.030	Significantly different
	Semi-healthy and conventional	0.577	Not Significantly different

Source: Processed Data, 2025.

The Kruskal-Wallis test revealed a significant difference in productivity among healthy, semi-healthy, and conventional-farming. The post hoc comparison using the Mann-Whitney U test denoted that the productivity of healthy and semi-healthy farming is statistically different. Likewise, the

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productivity involving healthy and conventional farming showed similar result, however there is no significant difference in productivity was found between semi-healthy and conventional farming. After applying the Bonferroni correction to control for Type I error due to multiple comparisons, none of the pair wise differences remained statistically significant at the adjusted alpha level (0.0167). Despite this, there is an indication that comparison of healthy and semi-healthy tends to differ from other compared groups.

Farmer's Terms of Trade

Previous studies such a study conduct by Bening et al. (2021) and Agustina et al. (2022), the term of trade was usually measured using only one method. In this study, the FTT measurement method was carried out using two different methods to show the different result. Income FTT considering off-farm income into the calculations, while the subsistence FTT is only examine the on-farm revenue. Indonesia statistic bureau defines a category for FTT, if the value of FTT over 100 then the farmer categorized as prosperous and if the FTT smaller than 100 then the farmer has not yet prosperous.

Table 3. Farmer Terms of Trade and Percentage of Prosperous Farmers.

Farming System	Income Terms of Trade	Prosperous farmers	Subsistence Terms of Trade	Prosperous farmers	Average FTT
Healthy	108	50	108	50	108
Semi-healthy	94	41	65	16	80
Conventional	92	35	84	25	88

Source: Processed Data, 2025.

Table 3 show the level of FTT and the number of prosperous farmers presented in percent. The result of income FTT measurement method has higher value than subsistence FTT. These differences clearly show in semi-healthy and conventional FTT but not on the FTT of healthy farming, this outcome indicate that off-farm income has a large share in their total income. Furthermore, subsistence FTT of semi-healthy decrease 31% from income FTT, this means most of the semi-healthy farmers have another off-farm job and depend on off-farm income. The FTT of healthy-farmer for both FTT measurement is over 100, this means healthy-farmer has achieved prosperity. The FTT of semi-healthy and conventional-farming still smaller than 100, show that both farming systems has not been able to bring farmers to prosperity. Moreover, since there is no difference among FTT measurement of healthy farming this indicate that healthy farmer has a balanced and stable economic situation where prosperous farmers are benefiting optimally from the agricultural practices.This suggests that fostering healthy farming through GAP and GHP can improve both the

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productivity and economic well-being of farmers. However, to look forward the statistical difference of FTT

Table 4. Result of Statistical Test for Assessing Differences in FTT

Test	Compared Group	p-value	Category
for Income Terms of Trade			
Kruskal-Wallis	All farming systems	0.382	Not Significantly different
for Subsistence Terms of Trade			
Kruskal-Wallis	All farming systems	0.001	Significantly different
Mann-Whitney U	Healthy and semi-healthy	0.000	Significantly different
	Healthy and conventional	0.013	Significantly different
	Semi-healthy and conventional	0.064	Not Significantly different

Source: Processed Data, 2025.

The analysis denotes that the differences of income terms of trade among farming systems are not statistically significant. This implies that the ability of each farming system to convert agricultural income into household income is relatively similar and none shows a clear advantage in improving economic purchasing power. Since the test did not show a significant difference, no additional post hoc analysis is necessary. On the other hand, statistical H-test for subsistence terms of trade of three farming systems is significantly different, so that further post hoc test is necessary. Healthy farming has significantly different subsistence level than others, while there are no differences among semi-healthy and conventional farming. Still, the mean rank provide evidence that healthy farming has the highest level for both income and subsistence term of trade, so the adoption of healthy farming on a wider scale could also help reduce rural poverty. A significant result prove that the farming system has a huge impact on farmer's capacity to meet basic living needs (Sugiana et al., 2018). It suggests that healthy-farming are significantly better at achieving subsistence through their sustainable farming practices.

The Impact of Productivity and other Variables on Farmer's Terms of Trade

The changes in FTT value are influenced by several factors such as productivity, land area, commodity selling price, production cost, number of family members, and household expenditures (Djuliansah et al., 2019; Sari et al., 2019; Shifa et al., 2019; Sulaksana, 2020). The estimation in this regression model has passed the classical assumption test. The data residuals comply with the assumption of normality, where the significance value of Kolmogorov-Smirnov normality test is 0.200 greater than alpha (0.05), this indicate that the residuals are normally distributed (Bilon, 2023). Moreover, multicollinearity or heteroscedasticity were not detected in the model. The scatterplot does not show a spesific pattern, so that there is no heteroskedasticity and the variance is constant. The VIFa and tolerance value are used to examined the multicollinerity, the result of classical assumption test shown in Table 5. The VIFs value of each variable is less than 5.0 and the tolerance value are greater than 0.10, so that the is no perfect multicollinearity (Ahmed et al., 2024). The result of regression statistical test among FTT and its determinants shown in Table 6.

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Tabel 5. Result of Collinearity Test.

Variables	Tolerance	VIF
Dummy of Healthy-farming (DH)	0.649	1.542
Dummy of Semi-healthy farming (DSH)	0.757	1.321
Productivity (P)	0.615	1.626
Planting Area (PA)	0.476	2.101
Family Member (FM)	0.910	1.099
Price of Chilli (PC)	0.726	1.377
Price of Pesticide (PP)	0.827	1.209
Price of Organic Fertilizer (PO)	0.919	1.089
Price of Non-Organic Fertilizer (PNO)	0.888	1.126
Non-Family Labor Cost (LC)	0.691	1.446
Farmers' Household Expenditure (HE)	0.765	1.307

Source: Processed Data, 2025.

Table 6. Statistical Result for Productivity and Other Determinants Influencing FTT.

Variables	Coefficient	t-statistic	p-value
Constant	0.061	-1.685	0.097
Dummy of Healthy-farming (DH)	0.244**	2.440	0.017
Dummy of Semi-healthy farming (DSH)	0.044 ns	0.520	0.605
Productivity (P)	0.767***	8.313	0.000
Planting Area (PA)	0.578***	9.419	0.000
Family Member (FM)	-0.069***	-2.934	0.004
Price of Chilli (PC)	0.815***	5.784	0.000
Price of Pesticide (PP)	-0.034ns	-0.860	0.392
Price of Organic Fertilizer (PO)	0.002 ns	0.308	0.759
Price of Non-Organic Fertilizer (PNO)	0.017 ns	1.166	0.247
Non-Family Labor Cost (LC)	-0.035**	-2.009	0.048
Farmers' Household Expenditure (HE)	-0.201***	-2.926	0.004
R			0.817
Adjusted R-Squared			0.627
F-statistic			16.565
Probability of F-statistic			0.000

Source: Processed Data, 2025.

Note:

***) = significant at 99% confidence level

**) = significant at 95% confidence level

ns = not significant at any confidence level

The statistical results suggest that approximately 63% of the variability in FTT is explained by the independent variables, with a correction for model complexity. An R-squared value ranging

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from 0.51 to 0.99 can be considered as a well-fitting model, assuming that the majority of the independent variables have a significant effect on the dependent variables and that the model is free from multicollinearity (Ozili, 2022). The F test shows the effect of independent variables simultaneously, since the probability of F-statistic lower than alpha indicate that independent variables significantly affect the FTT. Furthermore, the partial test show that productivity, planting area, number of family member, chilli selling price, non-family labor cost, and household expenditures have significant impact on FTT.

Productivity of chilli farming has a significance value that lower than alpha, thus hypotheses null is rejected, this indicates that chilli productivity has a significant and positive effect on the FTT. The increase of productivity can improve farmer's terms of trade Djuliansah et al. (2019) and Agustina et al. (2022). Enchancing farming productivity is important to improving farmer welfare, 1% improvement of productivity will lead to 0.76% gain in FTT. These findings are in line with who stated that, productivity has a significant impact on FTT since an increase in chilli productivity can reduce the production costs which can led to better FTT (Liska et al., 2023).

An increase of chilli planting area will affect FTT because statistical result show that the significance of planting area is less than alpha. The positive coefficient implies that planting area is associated with an improvement of FTT. This finding indicates that extensification for chilli farming can be the one effective strategy to develop farmers' economy. The increasing of production scale may provide a benefit for farmer such as a higher total output. Moreover, higher planting area could also provide higher FTT that associated with improvement of farmers' welfare (Mazwan & Masyhuri, 2019). These are consistent with with Djuliansah et al. (2019); Shifa et al. (2019); Agustina et al. (2022); Liska et al. (2023) which stated that the narrower of the land area, the lower of the farmer's terms of trade and the increase of land area will positively affect farmer's terms of trade.

Number of family member has a negative coefficient and less than alpha, so that this variable has negative and significant effect on FTT. A rise of 1 percent of family member will decrease the FTT value to 0.07 percent. The size of family can provide benefits for farming as a family labor, however, an increase in family members also leads to higher farmers' household expenditure. (Mazwan & Masyhuri, 2019; Sulaksana, 2020).

Price of chilli has a significant and positive impact on FTT, higher chilli price will lead to higher purchasing power of farmer that associated with farmers' welfare (Wicaksana, 2023). The coefficient of chilli prices is highest than other variables, this finding indicate that the selling price of chilli is an important key in order to improving FTT value, so that it is necessary to stabilize the price of chilli. On the other hand, an excess supply of chilli during the harvest season could reduce the quality of chilli that led to a lower price of chilli, this condition can cause losses to farmer due to a lower revenue than can also decrease the FTT value (Oktaviani et al., 2021).

Input prices such as pesticide and fertilizer are not significantly affected FTT. This resuls differ from Wicaksana (2023) that stated if an increasing in pesticide prices will increase farmers' paid index and expenses without an increase in income will lead to losses and decrease the FTT. Furthermore, organic fertilizer does not affect FTT due to the fact that many farmers do not incur for

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organic fertilizers and the percentage of organic cost is less that 10 percent of total farming costs. Farmers produce organic fertilizers from the livestock by-product and carry out the fermentation process themselves, which keeps the low cost of organic fertilizer.

Non-family labor cost has a negative and significant impact on FTT, where 1 percent increase of this cost will decrease the FTT up to 0.04 percent. This negative impact due to the high allocation of this cost, which reach up to 20 percent of total costs. This result proved that an increase of non-family labor cost will affect the production cost paid by the farmers, a higher production cost will reduce the FTT value (Mazwan & Masyhuri, 2019).

Household expenditure of farmers has a lower coefficient value than alpha, moreover the coefficient is negative. This finding denotes that household expenditure has a significant and negative impact on FTT (Shifa et al., 2019). Provide evidence that household consumption contrary to FTT, where an increase of 1 percent household expenditure can reduce FTT up to 0.2 percent. Household expenditure has the highest negative coefficient value, this proved that farmers' reducing household expenditure can contribute more significantly on the FTT improvement. It is necessary to control the price changes in several items such as food and beverages, education, personal care, and other needs such as tobacco due to an inflation among these expenditure group (BPS Indonesia, 2025).

The dummy of healthy farming shows a positive and significant value, this implies that the FTT of healthy faming is clearly better than other farming systems. The implementation of GAP is potential to increase the farmer's output and could ensure the welfare of farmers (Kharel et al., 2022). On the other hand, semi-healhty farming does not show a significant result, mean that the FTT of semi-healthy farming and other farming systems are not significantly different. These findings proved that healthy farming provide a better livelihood security and making it more sustainable and welfare-enchancing system. Semi-healthy and conventional show the opposite in this regard, which raises concern about its viability as a primery source of livelihood.

CONCLUSION AND SUGGESTION

Healthy farming productivity is statistically higher than semi-healthy and conventional farming. The FTT measurement by income denotes higher value than the subsistence terms of trade. Half of healthy-farmers are prosperous from both FTT measurement, while other farming systems not reaches the welfare level yet. There is no significant difference of income terms of trade between all farming systems. Rather that, the subsistence terms of trade are significantly different among healthy farming and other farming systems. The findings indicate that productivity, planting area, and price of chilli were positively affect the FTT, while number of family member, non-family labor cost, and household expenditure were negatively affecting the FTT. The FTT of healthy farming is proved higher than others.

The government need to enchance monitoring of the use of high-quality seeds to increase productivity and also utilizing dryland areas in order to increase the planting area thorugh extensification. Price of Chilli has the higher contribution in FTT improvement, so it is necessary to stabilize Chilli prices, establish a regional level buffer stock system, and develop an early warning

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system from daily price monitoring. To reduce non-family labor cost, is is suggested that farmers need to adopt a rotating mutual system within the farmer groups, where members help each other to prepare and maintain the land. Moreover, for the purpose of reduce household expenditure it is necessary to stabilize the price of food, education need, and personal care due to the inflation of these expenses. It is recomemended to increase the agricultural extension related to the benefit of implementing GAP in order to extend "healthy" farming system, so that farmers can meet the higher productivity and better FTT. It is recoomended for future research to considering the internal factors such farming experience, spesify how long farmer's implement the GAP and the impact on FTT. In addition, future studies are needed to explore the reasons behind conventional farmers reluctance to adopt healthy-farming system.

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REFERENCES

Agustina, B., Yuliati, N., & Hendrarini, H. (2022). Factors That Effect the Exchange Rate of Large Chili Farmers, In the City of Malang, Indonesia. *Journal of Economics, Finance and Management Studies*, *5*(9), 2558–4. https://doi.org/10.47191/jefms/v5-i9-11

Ahmed, H. H., Astatike, H., Fekadu, S., & Mekonen, S. (2024). Analyzing Factors Affecting Farmers' Safe Pesticide Handling Practices in Southwest of Ethiopia: Implications for Policy. *Environmental Health Insights*, *18*. https://doi.org/10.1177/11786302241256495

Ahmed, I., Lakho, M. H., Buriro, R. A., & Khooharo, A. A. (2024). Evaluating agronomic factors influencing cotton yield using multivariate regression and model validation. *International Journal of Agricultural Extension*, *12*(03), 379–3788. https://doi.org/10.33687/ijae.012.003.5418

Alimah, F. N. A., Ibrahim Hasyim, A., & Widjaya, S. (2021). Analisis nilai tukar subsisten dan tingkat kesejahteraan petani cabai merah keriting diDesa Trimulyo Kecamatan Tegineneng Kabupaten Pesawaran. *Jurnal Ilmu Ilmu Agribisnis: Journal of Agribusiness Science*, *9*(1), 54–61. https://doi.org/http://dx.doi.org/10.23960/jiia.v9i1.4819

Anggita, A. H., & Suprehatin, S. (2020). Apakah Usahatani Padi Organik Lebih Menguntungkan? Bukti dari Desa Pringkasap Kabupaten Subang. *Jurnal Ekonomi Pertanian Dan Agribisnis*, *4*(3), 576–592. https://doi.org/10.21776/ub.jepa.2020.004.03.12

Ardian, R., Sudarta, W., & Rantau, I. K. (2017). E-Jurnal Agribisnis dan Agrowisata Perbandingan Pendapatan Usahatani Cabai Rawit dengan Menggunakan Pupuk Anorganik dan Pupuk

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): 244-258, March 2026

Campuran (Organik, dan Anorganik). *E-Jurnal Agribisnis Dan Agrowisata*, *6*(2), 240–248. http://ojs.unud.ac.id/index.php/JAA

Bilon, X. J. (2023). Normality and significance testing in simple linear regression model for large sample sizes: a simulation study. *Communications in Statistics: Simulation and Computation*, *52*(6), 2781–2797. https://doi.org/10.1080/03610918.2021.1916824

BPS DIY. (2023). *Provinsi Daerah Istimewa Yogyakarta dalam Angka 2023*.

BPS Indonesia. (2023). *Statistik Nilai Tukar Petani 2023*.

BPS Indonesia. (2024a). *Produksi Tanaman Sayuran Menurut Provinsi dan Jenis Tanaman*. BPS Indonesia. https://www.bps.go.id/id/statistics-table/3/ZUhFd1JtZzJWVVpqWTJsV05XTllhVmhRSzFoNFFUMDkjMw==/produksi-tanaman-sayuran-menurut-provinsi-dan-jenis-tanaman.html?year=2018

BPS Indonesia. (2024b). *Statistik Indonesia 2024*.

BPS Indonesia. (2025). *Berita Resmi Statistik*. https://www.bps.go.id/id/pressrelease/2025/02/03/2403/nilai-tukar-petani--ntp--januari-2025-sebesar-123-68-atau-naik-0-73-persen--harga-beras-premium-di-penggilingan-naik-0-82-persen-.html

BPS Sleman. (2023). *Indikator Iklim Sleman 2023*. Indikator Iklim Sleman 2023. https://slemankab.bps.go.id/id/statistics-table/2/MTA4IzI=/indikator-iklim-sleman.html

Chakraborty, A. (2020). From the Classical to Empiricists: A review of the terms of trade controversy Item Type Working Paper. *Journal of Economic Surveys*, *5*(34), 1111. https://doi.org/10.7275/28197694

Djuliansah, D., Insan Noor, T., Deliana, Y., & Meddy Rachmadi, dan. (2019). Unveil Factors That Influence The Soybean Of Farmer Exchange Rates (FER). *International Journal of Scientific & Technology Research*, *8*(10), 1279. www.ijstr.org

Junaidi, E., & Jannah, M. (2020). Dynamics of Economic Growth in Agriculture Sector and farme's term of trade in Indonesia. *Journal of Applied Economics in Developing Countries*, *5*, 48.

Karyani, T., & Tedy, S. (2021). Analysis of production factors to the curly red chili (Capsicum Annum L) farming by applying attractans (A Case in Pasirwangi Sub District, Garut Regency). *Mimbar Agribisnis*, *7*(1), 74–93. https://doi.org/http://dx.doi.org/10.25157/ma.v7i1.3935

Kharel, M., Dahal, B. M., & Raut, N. (2022). Good agriculture practices for safe food and sustainable agriculture in Nepal: A review. *Journal of Agriculture and Food Research*, *10*. https://doi.org/10.1016/j.jafr.2022.100447

Krasachat, W. (2023). The Effect of Good Agricultural Practices on the Technical Efficiency of Chili Production in Thailand. *Sustainability (Switzerland)*, *15*(1). https://doi.org/10.3390/su15010866

Kruskal, W. H., & Wallis, W. A. (1952). Use of Ranks in One-Criterion Variance Analysis. *Journal of the American Statistical Association*, *47*(260), 583–621.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): 244-258, March 2026

Lee, S., & Lee, D. K. (2018). What is the proper way to apply the multiple comparison test? *Korean Journal of Anesthesiology*, *71*(5), 353–360. https://doi.org/10.4097/kja.d.18.00242

Leong, W. H., Teh, S. Y., Hossain, M. M., Nadarajaw, T., Zabidi-Hussin, Z., Chin, S. Y., Lai, K. S., & Lim, S. H. E. (2020). Application, monitoring and adverse effects in pesticide use: The importance of reinforcement of Good Agricultural Practices (GAPs). In *Journal of Environmental Management* (Vol. 260). Academic Press. https://doi.org/10.1016/j.jenvman.2019.109987

Lestari, F. N., Rianse, I. S., & Fyka, S. A. (2019). Analisis perbedaan pendapatan usahatani sawi semi organik Dan non organik di Desa Aunupe Kecamatan Wolasi. *Jurnal Ilmiah Agribisnis*, *4*(5), 111–115. http://dx.doi.org/10.33772/jia.v4i5.7914

Liska, Novita, I., & Masithoh, S. (2023). Analisis nilai tukar petani cabai (Capsicum annum l.) dan faktor -faktor yang mempengaruhinya pada masa pandemi COVID-19. *Jurnal AgribiSains*, *9*(1), 61–67. https://doi.org/https://doi.org/10.30997/jagi.v9i1.8257

Lubis, W., Nadia, R., Gurning, S., Intan, D. R., Fahmi Purba, K., Trisna, N., & Kabeakan, M. B. (2024). Kontribusi pendapatan usaha kelompok tani cabai merah dalam peningkatan kesejahteraan anggota kelompok tani Desa Sidodadi Ramunia, Kecamatan Beringin, Kabupaten Deli Serdang. *Jurnal Pertanian Agros*, *26*(1), 4895–4900.

Mayfield, H. J., Eberhard, R., Baker, C., Baresi, U., Bode, M., Coggan, A., Dean, A. J., Deane, F., Hamman, E., Jarvis, D., Loechel, B., Taylor, B. M., Stevens, L., Vella, K., & Helmstedt, K. J. (2023). Designing an expert-led Bayesian network to understand interactions between policy instruments for adoption of eco-friendly farming practices. *Environmental Science and Policy*, *141*, 11–22. https://doi.org/10.1016/j.envsci.2022.12.017

Mazwan, M. Z., & Masyhuri, M. (2019). Factors Affecting Farmer's Exchange Rate of Sugar Cane Farmer Plasma in PTPN XI. *Agro Ekonomi*, *29*(2), 323. https://doi.org/10.22146/ae.36525

Oktaviani, S., Rofatin, B., & Nuryaman, H. (2021). Faktor-faktor yang mempengaruhi nilai tukar petani subsektor hortikultura di Indonesia tahun 2014-2018. *Jurnal Agristan* 3(1).

Ozili, P. K. (2022). The acceptable R-square in empirical modelling for social science research. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4128165

Pemkab Sleman. (2023). *Geografis Kabupaten Sleman*. Geografis Kabupaten Sleman. https://slemankab.go.id/profil-kabupaten-sleman/geografi/letak-dan-luas-wilayah/

Sari, P. N., Hilmi, Y. S., & Hariswanti, W. S. (2019). Kelayakan dan Nilai Tukar Petani Padi Organik di Kabupaten Sleman. *Agriekonomika*, *7*(2), 120. https://doi.org/10.21107/agriekonomika.v7i2.3928

Setyadi, A., Setiadi, A., & Ekowati, T. (2020). Analisis faktor-faktor produksi yang mempengaruhi produksi cabai merah keriting (Capsicum Annum L) di Kecamatan Sumowono Kabupaten Semarang. *Jurnal Ekonomi Pertanian Dan Agribisnis*, *4*, 850–869. https://doi.org/10.21776/ub.jepa.2020.004.04.14

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): 244-258, March 2026

Shifa, L. K., Budiraharjo, K., & Roessali, W. (2019). Analisis nilai tukar petani bunga krisan pada anggota kelompok tani gemah ripah di Dusun Clapar Desa Duren Kecamatan Bandungan Kabupaten Semarang. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, *13*(3), 355. https://doi.org/10.24843/soca.2019.v13.i03.p06

Sugiana, I. G. N., Sadguna, D. N., Tonga, Y., & Kaca, I. N. (2018). The Study on Farmers Welfare. *International Journal of Life Sciences (IJLS)*, *2*, 29. https://doi.org/10.29332/ijls.v2n1.92

Sulaksana, J. (2020). Analysis of Factors Affecting the Farmer's Term of Trade of Fruit Farmers. *IOP Conference Series: Earth and Environmental Science*, *466*(1). https://doi.org/10.1088/1755-1315/466/1/012017

Syaputri, F. D., Azwardi, & Sukanto. (2024). Determinant of Farmers Welfare in Indonesia. *Agrisocionomics*, *8*(3), 954–967. http://ejournal2.undip.ac.id/index.php/agrisocionomics

Tulong, V. A., Ngangi, C. R., Tangkere, E. G., Sosial, J., Fakultas, E. P., Universitas, P., & Ratulangi, S. (2019). Nilai tukar pendapatan rumah tangga petani padi di Desa Tolok Kecamatan Tompaso Kabupaten Minahasa. *Journal of Agribusiness and Rural Development*, *1*(1), 71–79. https://doi.org/10.35791/agrirud.v1i1.23619

Vargha, A., & Delaney, H. D. (1998). The Kruskal-Wallis Test and Stochastic Homogeneity. In *Source: Journal of Educational and Behavioral Statistics* (Vol. 23, Issue 2).

Wehfany, F. Y., Timisela, N. R., & Luhukay, J. M. (2022). Analisis Faktor Yang Mempengaruhi Pendapatan Usahatani Cabai Rawit (Capsicum frutescens L.). *Agrica*, *15*(2), 123–133. https://doi.org/10.31289/agrica.v15i2.7314

Wicaksana, B. E. (2023). Analisis Pengaruh Luas Lahan, Produktivitas, Harga Beras, Harga Pupuk dan Harga Pestisida terhadap Kesejahteraan Petani di Kabupaten Tangerang. *Jurnal Social Economic of Agriculture*, *12*(1), 41–49. https://doi.org/10.26418/j.sea.v10i2.59499

Zewid, I., Haroun, A., Adam, M., Nigussie, G., & Zewdia, I. (2023). Research Achievements Of Hot Pepper (Capsicum Species) and It Agro-Ecological Requirements in Ethiopia a Review. *Journal of Farming*, *1*(1), 11–18.