



UDC 332

## COMPARISON OF FARMERS' INCOME BEFORE AND AFTER THE HORTICULTURE FOOD ESTATE PROGRAM IN BANSARI DISTRICT OF TEMANGGUNG REGENCY, CENTRAL JAVA PROVINCE, INDONESIA

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### ABSTRACT

Agricultural commodities play a significant role in the national economy, yet farmers face challenges with still limited income. The purpose of this research is to analyze the income of farmers before and after the Horticulture Food Estate program in Bansari District, Temanggung Regency, Central Java Province. This research employs a quantitative method with a survey approach. Bansari District, Temanggung Regency, Central Java Province, was chosen as the research location as it is a pioneering area for the food estate program with the largest planting area for shallots, garlic, and chili. The study respondents totaled 247, selected using proportional sampling from a total population of 649, consisting of 164 shallot farmers, 46 chili farmers, and 37 garlic farmers. The data analysis used is the Wilcoxon signed-rank test. The results showed that there was a difference in farmers' income before and after the food estate program. Shallot farmers' income increased from IDR 22,054,939 to IDR 45,514,433, an increase of 106.37%, garlic farmers' income increased from IDR 28,404,730 to IDR 29,343,919, an increase of 3.31%, and chili farmers' income increased from IDR 20,123,696 to IDR 26,195,524, an increase of 30.17%. The overall income of farmers before the Food Estate program was IDR 22,646,458, which increased to IDR 39,494,276 after the program. Overall, there was an increase in farmers' income by 74.39% with a farming scale of 1 hectare.

### KEY WORDS

Food estate, income, horticultural commodities.

The agricultural sector in Indonesia is crucial for the livelihood of the people and economic growth (Soemarwoto, 2005). Sustainable development is necessary to address population growth and technological advancements (Sumardjo, 2010). The Food Estate program launched by the government aims to increase food production and farmers' welfare through production efficiency, land expansion, and supply chain integration from upstream to downstream (PPN/Bappenas, 2020; Setiawan, 2021). This program is expected to reduce production costs, increase farmers' income, and provide better market access (Hidayat, 2021; Sunaryo, 2020).

The Food Estate is a government program aimed at strengthening national food security through more efficient and sustainable agricultural land management (Ministry of Agriculture, 2023). This program involves the development of integrated agricultural areas that include various main food commodities such as rice, corn, soybeans, and horticultural products like shallots, garlic, and chili (Central Statistics Agency, 2023). The Food Estate combines aspects of production, processing, and distribution within one area to increase productivity and farmers' income (Coordinating Ministry for Economic Affairs, 2023). The main goals of the Food Estate program are to increase food production, enhance farmers' income, manage land sustainably, and strengthen national food security by reducing dependence on food imports (Fakhrurrazi et al., 2022; Utomo, 2023).

Factors influencing farmers' income include commodity prices, production costs, land productivity, technology and innovation, weather and climate conditions, market access, government policies, and land management (Simatupang, 2011; Soekartawi, 2005). This research is expected to provide a clear picture of the impact of the Food Estate program on farmers' income and the factors that influence the success of the program.



The Food Estate also offers modern agricultural technology and more efficient management, allowing farmers to produce quality products at competitive prices (Simamora, 2010; Siregar, 2019). Farmers gain access to capital, superior seeds, fertilizers, and modern agricultural equipment at more affordable costs, which can support their farming activities (Siregar, 2019). A case study in Central Kalimantan shows that farmers participating in the Food Estate experienced a 30% increase in income (Rahmawati, 2022). This demonstrates that the Food Estate not only increases overall food production but also directly enhances the economic well-being of farmers (Nugraha & Widodo, 2021).

The Food Estate development strategy includes cluster-based food production, multi-commodity cultivation, mechanization, downstream production, and the development of farmer corporations (Ministry of National Development Planning/Bappenas, 2020). The development of the Food Estate began in Central Kalimantan, North Sumatra, and East Nusa Tenggara since 2020 and will be expanded to other areas, including West Papua, Central Sulawesi, and West Kalimantan (Ministry of National Development Planning/Bappenas, 2020). Farmers' attitudes significantly influence the success of the program, which can be affected by land ownership, access to resources, education, and economic support (Jatmiko & Sari, 2023). In Central Java, the development of a horticulture-based Food Estate focusing on farmer corporations is carried out in Temanggung Regency, with a focus on shallots, chilies, and garlic (Ministry of Agriculture, 2022). This research aims to analyze farmers' income before and after the Food Estate program.

## METHODS OF RESEARCH

This research was conducted in Bansari District, Temanggung Regency. This location was selected using purposive sampling because it is a pioneer of the Food Estate program with the largest planting area for shallots, chilies, and garlic. The research was conducted from November to December 2023. The study population consisted of 649 people, with a proportional sampling technique yielding 247 respondents, including 164 shallot farmers, 46 chili farmers, and 37 garlic farmers (Isaac & Michael, 1981). Data collection was carried out using questionnaires and structured interviews (Radjab & Jam'an, 2017). Farmers' income is calculated using the formula:  $\pi = TR - TC$ . In this formula,  $\pi$  ( $\pi$ ) represents farm income in Rupiah (IDR). Total revenue or TR (Total Revenue) is also expressed in Rupiah (IDR), while total cost or TC (Total Cost) represents the overall production costs incurred, also expressed in Rupiah (IDR). Total cost consists of fixed costs and variable costs. Total cost (TC) is calculated using the formula:  $TC = FC + VC$ , where FC is fixed cost and VC is variable cost, both in Rupiah (IDR). Revenue (TR) is the result of multiplying the production obtained by the selling price. The formula for calculating revenue is:  $TR = P \times Q$ , where TR is revenue in Rupiah (IDR), P is the price per kilogram (IDR/kg), and Q is the amount of production in kilograms (kg). By understanding these formulas, farmers can calculate their net income after deducting all incurred costs from the total revenue obtained. Hypothesis testing uses the income comparison test before and after the Food Estate program on data that is not normally distributed, namely the Wilcoxon signed-rank test (Ghozali, 2018; Harlan & Johan, 2018).

## RESULTS AND DISCUSSION

Understanding the distribution of age and gender among farmers can aid in designing appropriate training and extension programs. For instance, different age groups may require different approaches in adopting agricultural technology or new agronomic practices. Education level and marital status are used to tailor educational programs and other interventions relevant to the farmers' educational background and socioeconomic conditions. Below is a profile overview of farmers based on several key variables such as age, gender, education level, marital status, length of business, and land area.

The profile of farmers in Bansari District, Temanggung Regency, shows a diverse picture based on age and gender. In the age category, the group aged 41-50 years



dominates, with the majority of active farmers planting shallots, garlic, and chilies. The younger age group (21-30 years) has limited contribution, especially in planting garlic and chilies. On the other hand, farmers over the age of 50 show a decrease in contribution to garlic and an increase in chili crops. Overall, farming in this district is dominated by men, who make up more than 99% of the total farmers. Meanwhile, female farmers play a limited role with relatively low contributions. This condition relates to farmers' income, where the age and gender of farmers affect their income levels. Other studies show that farmers aged 41-50, who are more experienced and have better access to agricultural resources, tend to have higher incomes than other age groups (Purba, 2023). Additionally, male dominance in the agricultural sector also contributes to income disparities, with men typically having better access to capital and land (Ferdinand, 2023). Younger age groups and women with limited access to resources and experience tend to have lower incomes.

Table 1 – Characteristics of Farmers in Bansari District, Temanggung Regency

Description	Farmers						Total	
	Shallots		Garlic		Chilies		n	%
	n	%	n	%	n	%		
Age								
21-30	7	4,30	-	-	-	-	7	2,80
31-40	54	32,90	17	45,90	8	17,40	79	32,00
41-50	64	39,00	17	45,90	25	54,30	106	42,90
>50	39	23,80	3	8,10	13	28,30	55	22,30
Gender								
Male	162	98,80	37	100,00	46	100,00	245	99,20
Female	2	1,20	-	-	-	-	2	0,80
Education								
Not Completed Elementary School	15	9,10	1	2,70	1	2,20	17	6,90
Elementary School	59	36,00	4	10,80	19	41,30	82	33,20
Junior High School	35	21,30	15	40,50	9	19,60	59	23,90
Senior High School	49	29,90	15	40,50	14	30,40	78	31,60
Bachelor's Degree (S1)	6	3,70	2	5,40	3	6,50	11	4,50
Marital Status								
Married	156	95,10	37	100,00	44	95,70	237	96,00
Single	5	3,00	-	-	-	-	5	2,00
Widow/Widower	3	1,80	-	-	2	4,30	5	2,00
Length of Farming								
1-10 Years	44	26,80	6	16,20	7	15,20	57	23,10
11-20 Years	70	42,70	24	64,90	28	60,90	122	49,40
> 20 Years	40	24,40	7	18,90	11	23,90	58	27,50
Land Area								
0 – 1 Hectares	158	96,30	36	97,30	45	97,80	239	96,80
>1 – 2 Hectares	4	2,40	1	2,70	-	-	5	2,00
>2 – 3 Hectares	2	1,20	-	0,00	-	-	2	0,80
>3 – 4 Hectares	-	0,00	-	0,00	1	2,20	1	0,40
Total	164	100,00	37	100,00	46	100,00	246	100,00

Source: Processed Primary Data, 2024.

The profile of farmers in Bansari District, Temanggung Regency, is also detailed based on education level and marital status. Regarding education, around 6.9% of farmers did not complete elementary education but remain active in farming, primarily growing shallots. The group with an elementary school background (33.2%) tends to dominate in shallot and chili production, while those with junior high school education (23.9%) are more associated with garlic production. Farmers who have completed senior high school (31.6%) have a balanced distribution in shallot and garlic production, whereas farmers with a bachelor's degree (S1) (4.5%) focus more on shallot farming.

Meanwhile, the profile of farmers is also influenced by marital status, with 96% of respondents in this study being married, primarily focusing on shallot farming. Unmarried farmers (2%) are more inclined to engage in shallot farming, while widowed farmers (2%) grow shallots and chilies. Despite variations in education level and marital status, farming remains the main activity in this community, with shallots playing a significant role in the agricultural portfolio of farmers in Bansari District.



Previous research indicates that the education level of farmers has a significant impact on their productivity and income. Farmers with higher education levels tend to have better access to agricultural technology and market information, which can enhance their efficiency and profits (Sutrisno, 2020). Marital status also affects the distribution of tasks and responsibilities within farming families, which in turn can influence agricultural productivity (Wahyudi, 2021).

The research found evidence that the majority of farmers (96.8%) manage land areas of up to 1 hectare, indicating that most farmers in this district have relatively small-scale operations. However, a small group of farmers with land areas larger than 1 hectare (2-3 hectares and >3-4 hectares) shows variability in operation scale, which may face different challenges and opportunities in managing their farms.

The length of farming experience and the size of the managed land are also closely related to farmers' ability to adopt better agricultural practices and diversify crops, which can enhance their income and the sustainability of their operations (Fauzi, 2022). This analysis provides a more comprehensive overview of the farmers' profiles in Bansari District, considering the history of their farming operations and land scale. The implications for the types of crops produced and the sustainability of agricultural operations can be an important reference for designing sustainable agricultural policies and supporting local agricultural development.

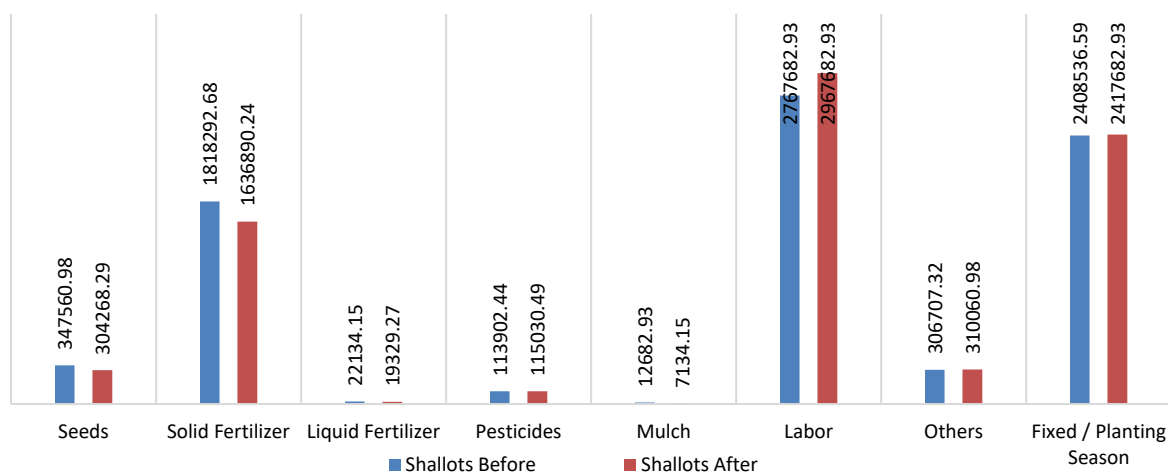


Figure 1 – Production Costs (IDR) Before and After the Food Estate Program for Shallot Farmers in Bansari District, Temanggung Regency.

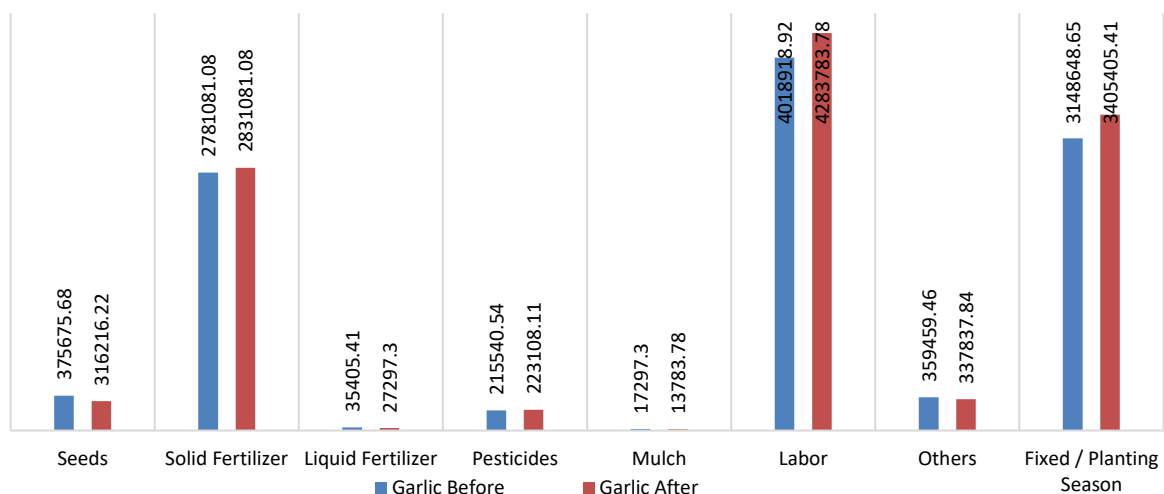


Figure 2 – Production Costs (IDR) Before and After the Food Estate Program for Garlic Farmers in Bansari District, Temanggung Regency



Figure 1 shows that there are some increases and decreases in various cost components. A decrease in costs for some components such as seeds and solid fertilizers indicates efficiency, while an increase in costs for other components such as liquid fertilizers and labor may reflect changes in strategy or additional needs in the production process.

Figure 2 shows the changes in garlic production costs in Bansari District, Temanggung Regency. Some costs have increased, such as the costs of solid fertilizers and labor, while others have decreased, such as the costs of seeds and liquid fertilizers. These increases and decreases can be attributed to various factors such as price changes, more efficient usage, or changes in strategy in the production process.

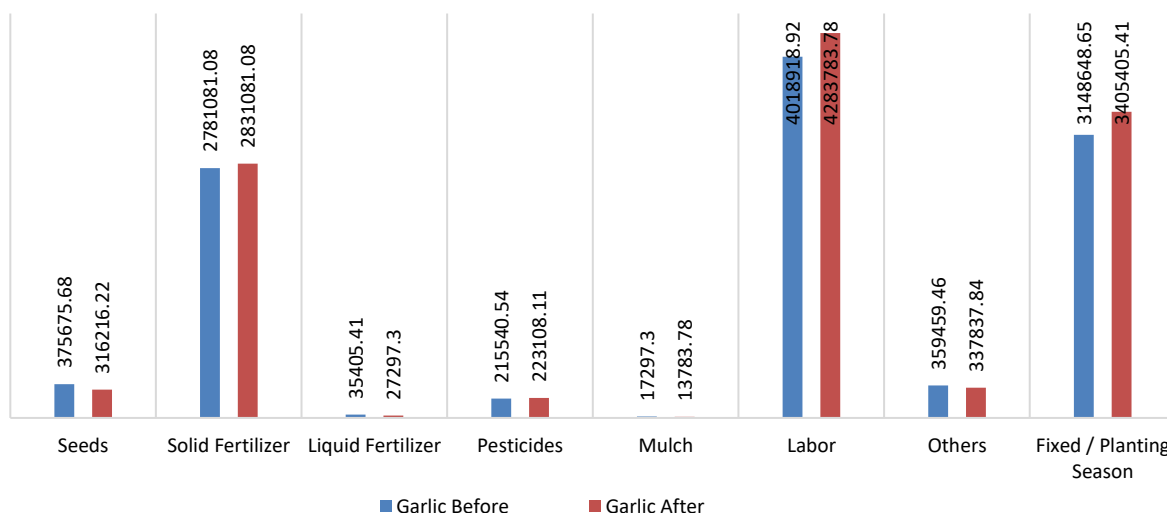


Figure 3 – Production Costs (IDR) Before and After the Food Estate Program for Chili Farmers in Bansari District, Temanggung Regency

Figure 3 shows various changes in production costs for chili before and after the food estate program. Some costs have increased, such as the costs of solid fertilizers, pesticides, and labor, while other costs have decreased, such as the costs of seeds, liquid fertilizers, and fixed costs per planting season. These increases and decreases can be attributed to various factors such as price changes, more efficient usage, or changes in strategy in the production process.

The research results concerning data related to seeds, fertilizers, pesticides, mulch, labor, costs, and farmers' revenue and income for shallots, garlic, and chilies. The use of free seeds, fertilizers, pesticides, and mulch showed an increasing or stable trend, indicating greater or consistent support from the free program. The use of seeds per kilogram for garlic increased from 245.95 kg to 254.05 kg. The price of seeds and solid fertilizers slightly increased for shallot and chili farmers but remained stable or slightly decreased for garlic farmers. The total cost of seeds decreased after adjustments, especially for chili farmers, whose seed costs dropped from IDR 389,130.43 to IDR 243,478.26.

The use of solid and liquid fertilizers did not show changes in usage quantity. The price of solid and liquid fertilizers slightly increased or remained stable, with the total cost of solid fertilizers showing slight decreases or increases depending on the commodity. The use of pesticides per liter did not change much; however, there was a slight increase in pesticide costs for all commodities after adjustments. The use of mulch remained stable, but the cost for mulch slightly increased for chili farmers. Labor costs showed an increase, with the number of hired laborers slightly increasing. The duration of labor hiring remained relatively stable, and daily wages increased for all commodities.

Total production showed an increase, especially for shallot farmers, whose production rose from 2.073 tons to 3.628 tons. The selling price per kilogram remained stable or slightly increased for all commodities. Farmers' total revenue increased, particularly for shallot farmers, whose revenue increased from IDR 30,632,926.83 to IDR 54,079,706.95. Farmers'



total costs did not show significant changes, but their income increased after adjustments, with the greatest increase occurring for shallot farmers.

Based on the research results, there was a decrease in the selling price of garlic after the food estate program, which could be attributed to several factors. The food estate program is designed to increase agricultural production more efficiently. If this program successfully boosts garlic production significantly, the supply of garlic in the market could increase. This excess supply can pressure the selling price down as supply exceeds demand. Even if production increases, if the demand for garlic remains the same or even decreases, prices tend to fall. For instance, if consumers switch to other alternatives or there is a change in consumption patterns, the demand for garlic may decrease. The data shows an increase in some input costs, such as pesticide costs. Although these costs increased, if not offset by an increase in the selling price, there might be pressure to lower the selling price to match the existing market purchasing power.

Overall, the data indicates an increase in the use of inputs, production, revenue, and farmers' income for shallots, garlic, and chilies after various adjustments and interventions. This suggests effective support or subsidy programs and improved efficiency in the use of agricultural resources. The farmers' income per planting season before the implementation of the Food Estate program in Bansari District, Temanggung Regency, is summarized in the following table.

Table 2 – Analysis of Farmers' Income per Planting Season Before and After the Implementation of the Food Estate Program in Bansari District, Temanggung Regency

	Production Cost (IDR)	Production (Ton)	Revenue (IDR)	Income (IDR)
<b>Before:</b>				
Shallots	8.577.988	2.073	30.632.927	22.054.939
Garlic	12.011.487	2.730	40.416.216	28.404.730
Chillies	7.150.218	1.813	27.273.913	20.123.696
<b>Total</b>	<b>8.826.417</b>	<b>2.123</b>	<b>31.472.875</b>	<b>22.646.458</b>
<b>After:</b>				
Shallots	8.565.275	3.628	54.079.707	45.514.433
Garlic	12.483.108	2.814	41.827.027	29.343.919
Chillies	7.179.565	2.228	33.375.090	26.195.524
<b>Total</b>	<b>8.894.089</b>	<b>3.245</b>	<b>48.388.365</b>	<b>39.494.276</b>

Source: Processed Primary Data, 2024.

Farmers' income before the implementation of the Food Estate program in Bansari District, Temanggung Regency, reveals a detailed picture of production and financial performance for shallots, garlic, and chilies. The study results show that garlic stands out as the crop with the highest net income, reaching IDR 28,404,730. This is obtained from production costs of IDR 12,011,487 for a production of 2.730 tons. Meanwhile, shallots and chilies also contribute with net incomes of IDR 22,054,939 and IDR 20,123,696, respectively. These results can serve as valuable insights for farmers and stakeholders for strategic decision-making in optimizing production and income.

Production costs and revenue can provide indications of efficiency and profitability in a single production process. Although chilies have lower production costs compared to shallots and garlic, their revenue remains high, reaching IDR 27,273,913. This illustrates the economic potential and competitiveness of chili crops in the local market. Additionally, this information provides a foundation for developing more efficient and effective management strategies, including potential crop diversification or improved cultivation techniques to increase net income for chili farmers.

The analysis reveals that garlic provides the highest net income, followed by shallots and chilies. Despite having lower production costs compared to shallots and garlic, chilies still generate high net income. The descriptive results of these aspects can be used as references in further planning and management to increase production cost efficiency and optimize farmers' income in Bansari District.

Overall, the production results from the three types of crops reached 3.245 tons, with total production costs of IDR 8,894,089 and revenues of IDR 48,388,364.57. The net income



of farmers after the implementation of the Food Estate program increased to IDR 39,494,276. This result provides a positive picture of the direct effect of the Food Estate program on the welfare of farmers in Bansari District, Temanggung Regency, creating opportunities for economic growth and increased income in the agricultural sector. The success of the Food Estate program on farmers' income is evident from the analysis of the difference in farmers' income (shallots, garlic, and chilies) before and after the implementation of the Food Estate program, where income after the Food Estate program is higher compared to before the program.

Table 3 – Difference in Income Before and After Implementation of Food Estate Program for Minced Garlic, Onion and Chili Farmers

Farmers	Income Before (IDR)	Income After (IDR)	p-Value
Shallots	22.054.939	45.514.433	0,000
Garlic	28.404.730	29.343.919	0,629
Chillies	20.123.696	26.195.524	0,000
Total	22.646.458	39.494.276	0,000

Source: Processed Primary Data, 2024.

Based on a comparison of income before and after the implementation of the Food Estate program among red onion, garlic, and chili farmers in Brambang District, there is a significant difference in income. For red onion farmers, there was a substantial increase from IDR 22,054,939 to IDR 45,514,433, with a p-value of less than 0.001 ( $p < 0.001$ ). This indicates that the implementation of the Food Estate program positively impacts the income of red onion farmers in Bansari District, Temanggung Regency.

For garlic farmers, there was no statistically significant difference in income ( $p = 0.629$ ). Although income increased from IDR 28,404,730 to IDR 29,343,919, this difference is not statistically significant. Certain factors may influence these results, such as variability in soil conditions, weather, or other factors affecting garlic production. On the other hand, for chili farmers, there was a significant income increase from IDR 20,123,696 to IDR 26,195,524, with a p-value of less than 0.001 ( $p < 0.001$ ). This indicates that the implementation of the Food Estate program also has a significant positive impact on the income of chili farmers in Bansari District, Temanggung Regency.

Overall, the comparison of total income from the three types of crops (red onions, garlic, and chili) before and after the Food Estate program shows an increase. The total income of farmers rose from IDR 22,646,458 to IDR 39,494,276, with a p-value of less than 0.001 ( $p < 0.001$ ). This result shows that the Food Estate program has a positive impact on farmers' income in Bansari District, Temanggung Regency, as evidenced by the increase in their income after the program's implementation. Purba (2023) mentions that the Food Estate program has been beneficial for red onion farming.

The Food Estate program often provides access to larger land areas or improves land use efficiency, allowing red onion farmers to scale up production. The program also offers better agricultural technology, such as superior seed varieties, more efficient irrigation systems, and access to more effective fertilizers and pesticides. These technologies can improve crop yields and the quality of red onions, thereby increasing income (Permana & Subekti, 2022). Food Estate programs typically include agreements with markets or distributors to purchase the harvest at profitable prices. This can ensure price stability and reduce the risk of price fluctuations often faced by smallholder farmers (Santoso & Lestari, 2023). With technological support and knowledge, farmers have started to utilize by-products or process red onions into value-added products such as fried onions or onion paste, which can be sold at higher prices (Handayani & Pratama, 2023).

The relatively modest improvement in garlic compared to other commodities in the study may be due to several factors. Garlic requires more specific soil and weather conditions compared to red onions and chilies. Variability in these conditions was not fully addressed by the Food Estate Program, leading to a less significant increase in income (Wijaya & Gunawan, 2023). Despite the increase, garlic's economies of scale are more limited compared to other commodities. Farmers had already reached their optimal



production limits before the program, making further increases more challenging (Handayani & Pratama, 2023). The garlic market is often more volatile and can be influenced by cheaper imports, leading to tighter competition and more unstable prices for local farmers (Nugroho & Rahmawati, 2022).

Like red onions, chili farmers also benefited from access to better agricultural technology and adequate production facilities following the Food Estate Program. This allowed farmers to increase production and improve the quality of their harvests, which can be sold at higher prices (Permana & Subekti, 2022). Chilies have high and stable market demand, especially in Indonesia, where they are a staple ingredient in many dishes (Nugroho & Rahmawati, 2022). The Food Estate Program may also create more efficient distribution channels and reduce distribution costs, thereby increasing farmers' profit margins (Santoso & Lestari, 2023). The program might also encourage farmers to experiment with different chili varieties or develop processed products such as chili powder or chili sauce, which have higher added value and can be sold at a premium price (Handayani & Pratama, 2023).

The Food Estate Program may include components that enhance farmers' access to markets and expand distribution networks, helping them sell products at better prices and in larger volumes (Nugroho & Rahmawati, 2022). Farmers receive training and technical guidance to adopt more efficient and productive agricultural practices. This includes the use of new technologies, improved land management practices, and more effective marketing strategies (Santoso & Lestari, 2023). The program also provides financial support or easier access to credit, enabling farmers to invest in agricultural technology, purchase necessary inputs, and increase their production capacity without facing significant financial constraints (Handayani & Pratama, 2023).

## CONCLUSION

The Food Estate Program has successfully increased the income and production of its participants. The income of red onion farmers increased by 106.37%, garlic farmers' income increased by 3.31%, and chili farmers' income increased by 30.17%. Overall, the income of farmers (red onions, garlic, and chilies) after the implementation of the Food Estate Program showed an increase of 74.39%, with an average business scale of 1 hectare.

Expansion of Supporting Programs: it is advisable to expand programs that support the increase of farmers' income, including training and access to more efficient agricultural technology.

Encouragement of Crop Diversification: promote crop diversification and provide specific support to red onion farmers, who have derived significant benefits from the Food Estate Program.

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