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Analysis of the economic benefits of cassava farming using Cassava NPK fertilizer 17-6-25 Pusri in Tulang Bawang Regency

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Abstract

Specific fertilizers are fertilizers that are specially formulated for certain crops such as NPK Cassava 17-6-25 fertilizer created by PT Pupuk Sriwidjaja Palembang to increase the production of cassava plants which has a direct impact on increasing farmers' income. This study aims to analyze the economic benefits of cassava farming before the implementation of the Demonstration Plot compared to after the implementation of the Demonstration Plot with the use of Cassava NPK fertilizer with a balanced fertilization application. This research will be carried out in Tulang Bawang Regency, Lampung Province in September 2025. Farmers were sampled using a simple random sampling method with a total of 70 samples. The data collected in this study includes primary data and secondary data. The analysis method used is the R/C Ratio. The results showed that the balanced use of Cassava NPK fertilizer was able to increase productivity higher than the use of ordinary NPK fertilizer, with a percentage of 56.65%. This shows that the use of cassava NPK fertilizer provides better economic benefits.

Keywords: Cassava Farming; Crop Yields; Productivity; R/C Ratio; Spesific Fertilizer

1. Introduction

Food is a very basic human need because it affects its existence and survival, both in terms of quantity and quality (1). Given such a high level of importance, basically food is one of the basic human needs that is fully human rights that are the human rights of every Indonesian people (2). The availability of sufficient, safe, quality and nutritious food is the main requirement that must be met in an effort to create people with dignity and dignity and have a quality human resource base. Cassava is known as one of the alternative food sources that can meet the needs of carbohydrates people (2), especially in areas that are less able to access other food sources. Cassava is often used as a staple food, especially in rural areas. With its good resistance to extreme climatic conditions and the ability to grow in less fertile soils, cassava is an ideal choice for agriculture in remote areas. Therefore, cassava has a vital role in supporting food security, especially in times of food crisis.

Apart from being a source of food, cassava also serves as a source of income for many farmers (3). In the traditional farming system, many farmers depend on their cassava harvest for their livelihood (4). With the increasing market demand for cassava, both for direct consumption and as an industrial raw material, the potential profits of this agricultural business are getting bigger (5). Processed cassava products, such as tapioca flour and chips, are also increasingly in demand, opening up opportunities for farmers to increase their income (6).

The availability of raw materials is very important in the supply of raw materials for the tapioaka industry (7). Deficiency raw materials will interfere with production. The quality of raw materials is also very important in the tapioca industry (7). Because the quality of raw materials determines the quality of the tapioca flour produced. Proper

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harvest and post-harvest management is required to continue to produce sufficient quantities of high-quality tapioca raw materials. Harvest and post-harvest management are all activities related to harvesting and post-harvest. Crop management can be done by forming a harvesting organization, determining labor needs, setting harvesting standards, and arranging transportation.

According to the Lampung Provincial Food Security the largest cassava production centers in Indonesia include Lampung Province, East Java, Central Java, West Java, and North Sumatra. However, in the last five years, cassava production in Lampung Province has decreased. Although the average productivity of cassava in Lampung Province is higher than the productivity of cassava nationally (8). Cassava productivity in Lampung Province has decreased from 2017 to 2021. This shows that there are problems in cassava farming in Lampung Province. The decline in production was partly due to the narrowing of the land area in 2019 which fell to 199,385 ha. The decline in cassava productivity was caused by cassava prices, cassava harvest area and urea fertilizer prices, the results obtained in the study.

Ministry of Agriculture of Lampung Province (2012) state that potential production of cassava plants in Lampung Province for varieties UJ-3 (Thailand) and UJ-5 (Cassesart) can reach an average productivity of 35-40 tons/ha (Thailand) and 45-60 tons/ha (Cassesart), while the average cassava productivity in Lampung Province only reached 24,721 tons/ha in 2019 (8). The data shows that the allocation of production factors has not been efficient and the lack of ability of farmers to manage their farms. In line with research (9). which states that the average farmer has not optimally allocated production factors by cassava farmers is still not in accordance with the recommendations that have been set. Therefore, cassava productivity in Lampung Province needs to be increased by using optimal production factors and one of them is from the cassava farming on farm process.

PT Pupuk Sriwidjaja Palembang through its research creates innovative products, one of which is by creating fertilizers with a special formula, namely NPK compound fertilizers specific to the needs of certain types of plants. The product was created to meet the nutrient needs of plants according to their needs. One of the fertilizer innovation products produced is Cassava NPK Fertilizer which has been commercialized in early 2022. One of the reasons for the formation of the NPK fertilizer formula is because this cassava or cassava plant is one type of food crop that is expected to be a diversification of food crops in Indonesia. The selection of the location of the plot demonstration in the Central Lampung Regency area of Lampung Province is in line with the high planting area. The results of the demonstration plot in the region stated that cassava production or harvest using Cassava NPK and farming assistance significantly increased the yield

In connection with this, this study was conducted to examine analyze of farmers' economic benefits on the use of Cassava NPK fertilizer produced by PT Pupuk Sriwidjaja Palembang. The novelty in this study is that it was carried out on the first sample that used Cassava NPK fertilizer commercially (on a farming scale). The results of the research are expected to be able to be a reference for the development of technology adoption in the form of fertilizer as an effort to realize the effectiveness of cassava farming.

2. Material and methods

2.1. Place and Time

This research will be carried out on farmers who use Cassava NPK fertilizer where previously a trial has been carried out with the demonstration plot method (plot demonstration), namely comparative testing with cassava farming land that uses Cassava NPK fertilizer and farming land that uses traditional fertilization of farmers in Tulang Bawang Regency, because based on BPS data reference indicates that Tulang Bawang Regency is one of the areas that has cassava harvest land in Lampung Province in September 2025.

2.2. Research Methods

The research method was carried out through quantitative and qualitative research by conducting surveys to farmers, survey approaches through questionnaires and interviews were chosen because this study aims to collect primary data from respondents. Secondary data using a literature review of previous research and with existing secondary data.'

2.3. Sample Withdrawal Method

The population in this study is all farmers in Tulang Bawang Regency with a total of 67,048 people. The sample extraction method used in this study is purposive random sampling to 0.1% of the total population. If the population is very large, taking 0.1 percent is enough to get an accurate representation without requiring excessive resources. A total of 0.1% of the sample was 67 people which were then rounded up to 70 farmers in Tulang Bawang Regency. Random

sampling technique. This technique involves dividing the population into homogeneous groups that each have the same subject and characteristics (10). In this study, the population will be divided into several groups, namely farmers who have used Cassava NPK.

2.4. Data Processing Methods

Data analysis is carried out using quantitative and qualitative analysis methods, data obtained from the field is then processed, analyzed and described descriptively. To answer the first and second objectives, data processing is carried out using inferential statistical analysis based on the following indicators:

Table 1 Economic Profit Indicators

Indicators	Information
Net Income (Rp/Year) (11)	The difference between total income and household expenses. Measured by: Net Income = Gross Income – Expenses and Expenses
Production Costs (Rp/Year) (12)	Cassava farming production costs consist of various costs incurred to plant, maintain, and harvest cassava plants (Fixed and variable costs)
Production Rate (Kg/Ha) (12)	Refers to the amount of *output* (crop yield) produced in a given period, which is measured using land area.

3. Results

3.1. Region Characteristics

Tulang Bawang Regency is one of the agricultural production centers in Lampung Province that has great potential in the development of cassava commodities. The region is dominated by lowlands with relatively fertile ultisol and alluvial soil types, suitable for tuber crops such as cassava. The tropical climate with uniform rainfall throughout the year makes Tulang Bawang a potential area for intensive and sustainable cassava farming. This research is focused on several main sub-districts, namely Banjar Agung, Banjar Baru, Banjar Margo, Menggala Tengah, and Bandar Agung, which have a significant role in the cassava supply chain both as an industrial raw material and household consumption.

Figure 1 Map of the Research Location

Several districts in Tulang Bawang Regency exhibit characteristics highly supportive of cassava development, strengthened by farmer institutions and partnerships. Banjar Agung District demonstrates relatively high productivity

due to strong farming traditions and the active role of farmer groups in facilitating input procurement and technical assistance. Banjar Margo District has shown significant progress in cassava intensification, driven by farmers' openness to innovation, favorable soil conditions, and local initiatives in cassava product diversification. Banjar Baru District functions as an important supplier of cassava raw materials for small and medium industries, with productivity improvements associated with enhanced farmer capacity in balanced fertilization practices.

Menggala Tengah District benefits from good infrastructure access, enabling more intensive cultivation practices and stronger integration with private-sector crop absorption. Meanwhile, Tulang Bawang and Bandar Agung Districts possess varied land conditions that require adaptive planting strategies. Despite challenges such as limited capital and irrigation, farmers in these areas continue to increase productivity through collaboration with agricultural agencies and private partners.

Overall, the study locations share a household-based farming system with high family labor intensity. Differences in productivity and cost efficiency are largely influenced by farmers' access to fertilizers, extension services, and company partnerships, particularly with PT Pusri. The adoption of balanced fertilization has significantly improved yields and economic efficiency, indicating strong potential for the development of cassava agribusiness clusters supporting food, energy, and bio-industry sectors.

3.2. Respondent Identities

Respondent characteristics are attributes possessed by individuals who are sampled in a study. These respondent characteristics function to provide an overview of the respondent's condition, including demographic and socioeconomic aspects. In this study, the characteristics of the respondents were classified based on gender, age, number of family members, farming experience, and land area owned by the respondents.

Table 2 Characteristics of Farmers Who Use Cassava NPK in the Regency Tulang Bawang

Variable	Sum	Percentage (%)	Description
Gender			
Man	93	95,88	
Woman	4	4,12	
Age			
24-35 Years	21	21,65	Min: 24
>35-45 Years	33	34,02	Max: 73
>45-55 Years	27	27,84	Stdv: 10.53
>55-65 Years	13	13,40	
>65 Years	3	3,09	
Farming Experience			
0-5 Years	14	14,43	Min: 2
>5-10 Years	14	14,43	Max: 40
>10-15 Years	18	18,56	Stdv: 8.92
>15 Years	51	52,58	
Land			
0-2 Ha	83	85,57	Min: 0.25
3-4 Ha	7	7,22	Max: 15
>4 Ha	7	7,22	Stdv: 2.08

Based on Table 1. it is known that the majority of respondents are male (95.88%), while women are only 4.12%. The dominance of male farmers reflects segregation Gender Where it is assumed that men have greater and stronger energy

in cultivating agricultural land than women farmers (10)(13). In addition, the dominance of men in farming because it is considered that this job requires physical strength. In the perspective of socio-cultural character, dominance Gender This can be influenced by traditional norms and the division of roles in agrarian societies (14).

The age range of respondents between 24 to 73 years old, with a standard deviation of ±10.53. The largest group is in the range >35–45 years (34.02 %) and >45–55 years (27.84 %). This age category includes productive age (15–64 years), which according to the theory Demographic Transition Supporting productivity potential if supported by quality human resources (15).

More than half of the respondents had >15 years of farming experience (52.58%). The length of time the farmer has been in farming shows that the farmer has the ability and expertise to carry out farming activities, so that it tends to influence the decisions made by farmers in their farming. This is in accordance with the research conducted (16). That through experience, farmers have the ability to produce good production and the ability to overcome problems in farming.

The majority of farmers have 0 to 2 hectares of land (85.57%) and few have land of more than 4 hectares (7.22%). These results show that farmers who use cassava NPK have enough land to develop their farming. Land area is an important socio-economic factor, the more land that farmers have, the greater the agricultural yield obtained so that the potential income of the farmer is also higher (16).

3.3. Analysis of the Economic Profit of Cassava Farming

The demonstration plot activity was carried out on an area of 1 hectare to see firsthand the difference in yield and profit between the usual cassava planting method and the planting method using Pusri Cassava NPK Fertilizer and balanced fertilization. The goal is for farmers to be able to compare the results obtained from the use of fertilizers according to the recommendations with their previous methods. Before the demonstration plot was carried out, farmers at the activity site generally used makeshift fertilizers such as Urea and Phonska, without paying attention to the balance of nutrients needed by cassava plants. As a result, the yield is not optimal and the profit is also not optimal. Through this demonstration plot activity, farmers began to try a balanced fertilization system using Pusri Cassava NPK Fertilizer (17-6-25) combined with Urea according to plant needs, and continued to use manure and dolomite to improve soil conditions.

Table 3 Comparison of Economic Advantages Before and After the Demonstration Plot Using Balanced Cassava NPK Fertilizer

Description			**Habits of Farmers (Before the Demo Plot)**				**Farming of Cassava NPK Fertilizer (After the Demo Plot)**			
			Vol	Unit	Price	Cost (Rp)	Vol	Unit	Price	Cost (Rp)
A	Income		28.800	Kg	1.000	28.800.000	45.000	Kg	1.000	45.000.000
B	Production Costs									
	1	Seed	75	Tie	10.000	750.000	75	Tie	10.000	750.000
	2	Basic Fertilizer								
		Manure	7.000	Kg	200	1.400.000	7.000	Kg	200	1.400.000
		Dolomite	500	Kg	800	400.000	500	Kg	800	400.000
	3	Fertilizer								
		Urea					100	Kg	9.000	900.000
		NPK 17-6-25					500	Kg	12.000	6.000.000
		Phonska (15-10-12)	400	Kg	2.300	920.000				
		Urea Subsidized	400	Kg	2.250	900.000				

	4	Pesticides/Fungicides	1	Parcel	1.500.000	1.500.000	1	Parcel	1.500.000	1.500.000
	5	Labor/Services								
		Land Clearing	1	Parcel	3.000.000	3.000.000	1	Parcel	3.000.000	3.000.000
		Land Management	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Basic Fertilizer Application	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Planting Cassava Seeds	5	HOK	100.000	500.000	5	HOK	100.000	500.000
		Follow-up Fertilization I	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Follow-up Fertilization II	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Pesticide Spraying	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Weeding	10	HOK	100.000	1.000.000	10	HOK	100.000	1.000.000
		Harvest	20	HOK	100.000	2.000.000	20	HOK	100.000	2.000.000
		Unexpected Charges (5%)	1		375.000	375.000	1		375.000	375.000
C	Profit/Profit					11.055.000				22.175.000
D	R/C Ratio					1,62				1,97
	B/C Ratio					0,62				0,97
E	Difference		11.120.000							
F	Production Increase (%)		56,25							
G	Increased Profit (%)		100,60							

The results show considerable changes. Cassava production increased from around 28.8 tons per hectare to 45 tons per hectare, or an increase of around 56.25%. This increase in yield has a direct impact on increasing farmers' income. The net profit which was previously around IDR 11 million per hectare increased to more than IDR 22 million per hectare, or more than doubled. In addition, the R/C ratio and B/C ratio also increased, which means that farming businesses become more efficient and profitable after using fertilizers from PT Pupuk Sriwidjaja Palembang with a balanced fertilization system. The increase not only reflects the direct impact of the use of Cassava NPK fertilizer, but also shows improvements in input efficiency and land productivity. With the right fertilization dose as recommended by PT Pupuk Sriwidjaja Palembang, cassava plants are able to absorb nutrients more optimally so that tuber growth is more uniform and the harvest weight increases. In addition, the quality of the crop also tends to be better with larger tuber sizes and higher starch content, so the selling value increases. This strengthens the evidence that the application of balanced fertilization technology can be an effective strategy in increasing the competitiveness of cassava farming while supporting production sustainability at the farmer level. The following table shows a complete comparison of the results of cassava farming before and after the implementation of the demonstration plot on an area of 1 hectare:

4. Discussion

Implementation of PT Pusri's Cassava NPK Fertilizer has brought significant changes to the productivity and efficiency of cassava farming. Before the use of these fertilizers, farmers' cassava production was still moderate and tended to depend on old habits that did not pay attention to the balance of nutrients. After the implementation of the balanced fertilization system formulated by PT Pusri, productivity increased markedly with more uniform yields, larger tuber sizes, and higher starch content. This increase shows that the availability of appropriate and measurable nutrients is able to optimize the vegetative and generative growth of cassava plants, so that crop yields are maximized without the need for land expansion (17)(18).

From an economic perspective, the increase in productivity has a direct impact on increasing farmers' income. With higher harvest volumes and better tuber quality, the value of farmer receipts increases significantly. Meanwhile, the increase in production costs remained within reasonable limits as most cost components such as labor, pesticides, and land management did not experience significant changes (19). The additional costs only come from the use of non-subsidized compound fertilizers of higher value, but the benefits far outweigh the costs incurred. This indicates that investing in balanced fertilizers provides more efficient results compared to conventional fertilization practices (20).

From the results of the calculation of business efficiency, the application of Cassava NPK fertilizer has been proven to significantly increase the ratio of receipts to costs. Every expenditure made by farmers provides greater returns than before, reflecting increased financial and technical efficiency in farm management. In other words, this balanced fertilization system is not only profitable in terms of yield, but also more efficient in terms of capital and labor use (21). This strengthens the position of Cassava NPK fertilizer as an agribusiness innovation that is able to improve the welfare of farmers while maintaining land sustainability.

Overall, the application of balanced fertilization technology developed by PT Pusri has proven to have a positive impact both agronomically and economically.

5. Conclusion

The results of the use of demonstration plots and data collection in farmers showed that the balanced use of Cassava NPK fertilizer was able to increase productivity higher than the use of ordinary NPK fertilizer, with a percentage of 56.65%. This shows that the use of cassava NPK fertilizer provides better economic benefits.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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