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Original Article

A Study of Fertilizer Subsidies, Land Area, and Rice Farmers' Income: Evidence from Babahrot, Southwest Aceh, Indonesia

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Abstract: This study seeks to identify the fertilizer subsidies and land area on rice farmers' income, using a case study of Babahrot, Southwest Aceh, Indonesia. The study employs quantitative methods, utilizing a survey questionnaire. The study population comprises all rice farmers in Babahrot, totaling 1,569 farmers in 2023. A sample of 95 respondents was selected using the Slovin formula, with a 10 percent margin of error, to ensure representativeness. Data were collected through a quantitative approach using primary data obtained directly from respondents via field surveys, observations, structured interviews, and questionnaires. The study employs one dependent variable, farmers' income, and two independent variables, fertilizer subsidies and land area. Fertilizer subsidies are measured using indicators of price accuracy, quantity accuracy, timeliness, location accuracy, and type accuracy. Land area is measured in hectares based on owned and rented rice fields. Farmers' income is assessed through indicators including gross income, net income, productivity, selling price, and production costs. All variables were measured using a Likert scale ranging from 1 to 5. Data analysis was conducted using descriptive statistical methods, including frequency distributions and percentages, to provide a comprehensive overview of farmers' characteristics, perceptions, and economic conditions. The results indicate that farmers generally perceive subsidized fertilizer as effective and of comparable quality to non-subsidized fertilizer, while land area is widely recognized as a key determinant of income levels. However, small landholdings and limited income remain significant challenges, highlighting the need for policies that enhance land-use efficiency, agricultural productivity, and farmers' welfare in rural rice-producing areas.

Keywords: Fertilizer Subsidies; Land Area; Rice Farmers' Income; Southwest Aceh context.

1. Introduction

Rice farmers' income is a key element in assessing their economic success and understanding rural welfare (Hanawiyah, 2023). Various factors influence this income. Agricultural productivity, which encompasses efficient farming practices such as selecting superior varieties, utilizing appropriate fertilizers, managing water effectively, and controlling pests and diseases, plays a crucial role in enhancing farmers' income (Sari & Aslikhah, 2017). In addition, rice prices in local markets also have a significant impact on farmers' income, as price fluctuations can affect the extent to which they receive adequate earnings. Furthermore, production costs, including seeds, fertilizers, pesticides, fuel, and labor, are important considerations in managing farmers' income (Riefqi et al., 2017). Other factors affecting farmers' income include access to resources such as land, water, and agricultural equipment, as well as climate change, agricultural policies, and socioeconomic aspects. Rice farmers' income also has implications for food and nutrition security and family welfare (Nursahada, 2020). Therefore, rice farmers' income is an important parameter in efforts to promote sustainable agriculture and support the welfare of rural communities. The low income of rice farmers is caused by several factors, including the high cost of agricultural production inputs such as fertilizers and limited land area (Sari & Fahmi, 2018).

Aceh Barat Daya Regency is one of the regencies in Aceh Province that has considerable agricultural potential. Its total area reaches 3,927.86 km², with most of it consisting of agricultural land. Babahrot District is one of the districts in Aceh Barat Daya Regency, with an area of approximately 129.52 km². Most of this area is used as paddy fields. This district is also the rice granary of Aceh Barat Daya Regency, with annual rice production reaching approximately 9,000 tons. Based on the researcher's preliminary observations through interviews with several local farmers in Babahrot District, Aceh Barat Daya Regency, farmers stated that their income from rice harvests has declined in recent years. This decline is caused by several factors, including a decrease in the price of dry unhusked rice (Gabah Panen Kering/GPK), which previously reached IDR 6,000 per kilogram but has now fallen to IDR 5,400 per kilogram. In addition, farmers reported that fertilizer costs have increased significantly, making them disproportionate to the GPK price.

Figure 1. Map of Aceh province, Indonesia

Farmers are using larger quantities of fertilizer and incurring higher production costs to maintain land productivity. The cost of obtaining high-quality fertilizer has also increased. This situation places pressure on farmers in Babahrot District, as they must incur higher production costs. Capital constraints are also commonly faced by small-scale rice farmers. Therefore, various efforts are needed to increase rice farmers' income, one of which is through optimizing well-targeted agricultural subsidy policies, such as fertilizer subsidies. Fertilizer subsidies are a government program that provides financial support or subsidies to farmers, enabling them to purchase fertilizer at prices lower than market prices (Zulaiha et al., 2018). Fertilizer subsidies aim to reduce farmers' production costs because subsidized fertilizer prices are lower than market prices (Dahiri & Prasetyo, 2018). With more efficient production costs, it is expected that crop yields and farmers' income will increase. Fertilizer subsidies have long been provided by the Indonesian government to rice farmers since the 1970s (Agustian et al., 2017).

The main objective of fertilizer subsidies is to ensure the availability of fertilizer at affordable prices for farmers, thereby reducing production costs and increasing rice productivity. The types of fertilizer subsidized include Urea, SP-36, ZA, and NPK (Siagian et al., 2023). Subsidies are provided in the form of a price difference between subsidized fertilizer and market prices. For example, the price of subsidized Urea is IDR 2,300 per kilogram, while the market price can reach IDR 3,500 per kilogram. The difference of IDR 1,200 per kilogram represents the government's fertilizer subsidy. In addition to fertilizer subsidies, land area is one of the most fundamental factors in agriculture. According to Gumma et al. (2014) and Liu et al. (2013), rice farmland area can be defined as the area or region used to cultivate and produce rice. Rice farmland may consist of paddy fields, dry fields, or other agricultural areas planted with rice crops. Therefore, the area of rice farmland is crucial in determining rice production and food availability in a region. Consequently, effective and efficient agricultural land management is necessary to increase rice production and improve farmers' welfare and income levels.

2. Literature Review

Previous empirical studies have extensively examined the role of fertilizer subsidies, production costs, land area, and other agricultural inputs in influencing rice farmers' income and productivity. Overall, the literature suggests that fertilizer subsidies play a significant role in reducing production costs and enhancing farmers' economic welfare, although the magnitude and significance of their effects vary across regions and methodological approaches. Larasati et al. (2022) analyzed the use of subsidized fertilizer in Tanjung Lago District using statistical analysis and found that subsidized fertilizer reduced production costs by up to 34 percent, which directly contributed to an increase in farmers' income. This finding confirms the cost-efficiency function of fertilizer subsidies as a key policy instrument to support farmers' profitability. Similarly, Larasati et al. (2022), employing a quantitative regression approach in Simpur District, Hulu Sungai Selatan Regency, demonstrated that the implementation of fertilizer subsidy distribution was highly effective in increasing farmers' income and improving their overall welfare. These results underscore the importance of effective subsidy distribution mechanisms in ensuring the success of policy.

Qualitative evidence also supports the positive impact of fertilizer subsidies. Sari & Fahmi (2018), using a descriptive qualitative and phenomenological approach in Megaluh District, Jombang, found that fertilizer subsidies reduced farmers' production costs by approximately 14 percent per hectare, which subsequently increased their income. Although the reduction percentage was smaller compared to other regions, the study emphasized that even moderate cost savings can have a significant impact on farmers' livelihoods, especially for small-scale producers. The indirect effect of fertilizer subsidies on farmers' income has also been highlighted in several studies. Setyawati & Yasa (2018), through path analysis in Jatiluwih Village, Bali, revealed that fertilizer subsidies did not directly affect farmers' income but had a significant indirect effect through reduced production costs. This finding suggests that subsidies primarily function as a cost-reduction mechanism rather than as a direct income-enhancing tool, reinforcing the importance of production efficiency in generating agricultural income.

Further evidence from Suparmin et al. (2022), who applied a multiple regression Cobb–Douglas model in Narmada District, showed that expenditure on subsidized urea fertilizer, as well as total urea fertilizer costs (both subsidized and non-subsidized), had a significant impact on rice farming income. This suggests that fertilizer input remains a crucial determinant of farm profitability, and that access to subsidized fertilizer can have a significant impact on farmers' financial outcomes. Studies conducted in Aceh Province provide particularly relevant insights for the present research. Nursahada (2020), using multiple linear regression analysis in Babahrot District, Aceh Barat Daya Regency, found that fertilizer subsidies, harvested land area, and rice production significantly influenced farmers' income both partially and simultaneously. This study underscores the combined importance of input subsidies, land availability, and output levels in determining

farm income. In a broader regional analysis, Fahmid et al. (2022) examined the effects of fertilizer prices, government-set rice prices, planted area, and harvested area on rice production in Indonesia. Their findings indicated growth projections for rice production and key agricultural variables over the 2021–2025 period, highlighting the strategic role of fertilizer pricing and land expansion in sustaining agricultural growth.

However, not all studies report uniformly positive effects. Ayalew et al. (2025) and Benson & Mogues (2018), employing both quantitative and qualitative descriptive methods. The study found that shortages of subsidized fertilizer had a significant negative impact on rice productivity. The study emphasized that while subsidized fertilizer is essential, scarcity and distribution problems can undermine productivity gains, indicating the need for improved supply chain management. Meanwhile, Rahayu (2021) found that fertilizer costs had a positive but statistically insignificant effect on farmers' income in Serading Village, Moyo Hilir District. This suggests that in certain contexts, fertilizer expenditure alone may not be sufficient to significantly raise income, possibly due to small landholdings or low output prices.

Lastly, Salam et al. (2024) examined the influence of planting systems, fertilization costs, and land area costs on rice farming income in Bantaen Regency and Baihaqi et al. (2021) focuses on Aceh provience. Their results showed that fertilization costs had a highly significant effect on income, whereas land area costs did not significantly influence income (Baihaqi et al., 2021; Salam et al., 2024). This finding contrasts with several other studies and suggests that land area may not always be the dominant factor, particularly when productivity and input efficiency are more decisive. Thus, the existing literature consistently demonstrates that fertilizer subsidies play an important role in reducing production costs and enhancing rice farmers' income, either directly or indirectly. Land area and production levels also emerge as key determinants, although their effects vary across regions and farming systems. The mixed findings regarding the significance of fertilizer costs and land area suggest the presence of contextual factors, including the availability of subsidies, land size, productivity levels, and market prices. These variations highlight the need for location-specific studies, particularly in rice-producing regions such as Babahrot District, Aceh Barat Daya Regency, to better understand the combined effects of fertilizer subsidies and land area on farmers' income.

3. Materials and Methods

This This study is designed to remain well-focused and clearly directed; therefore, its scope is limited to issues directly related to the research problem, namely the effect of fertilizer subsidies and land area on rice farmers' income, with a case study of rice farmers in Babahrot District, Aceh Barat Daya Regency. The population of this study comprises all rice farmers in Babahrot District, totaling 1,569 farmers, as reported in *2023*. Population is defined as a generalization area consisting of objects or subjects with certain characteristics, as determined by the researcher, that are to be studied and from which conclusions are drawn (Sugiyono, 2013). The sample represents a portion of the population with similar characteristics (Nasir & Sukmawati, 2023). In this study, the sample consisted of rice farmers in Babahrot District. The sample size was determined using the Slovin formula with a 10 percent margin of error, resulting in a calculated sample size of 94.08, which was rounded up to 95 respondents. Data collection employed a quantitative approach, using primary data obtained directly from respondents through field surveys, observations, structured in-depth interviews, and questionnaires administered directly to farmers. According to Sugiyono (2013), primary data are data sources that provide information directly to the data collector.

In this study, such data were collected directly from the research subjects. The study employs operational variables to measure the concepts examined, comprising one dependent variable and two independent variables. The dependent variable (Y) is farmers' income, while the independent variables include fertilizer subsidies (X1) and land area (X2). Fertilizer subsidies are defined as government payments or financial support provided to producers, distributors, consumers, or the public in specific agricultural sectors, measured in units such as percentages, kilograms, or tons, with indicators including price accuracy, quantity accuracy, timeliness, location accuracy, and type accuracy. Land area refers to the land used for agricultural activities, measured in hectares, and includes indicators such as land planted with rice (owned or rented), owned land area, and rented land area. Farmers' income is defined as earnings derived from production factors or productive services, measured in Indonesian rupiah per hectare, with indicators including gross income, net income, productivity, selling price, and production costs. All variables were measured using a Likert scale ranging from 1 to 5 (Sugiono et al., 2020). The data analysis in this study is quantitative in nature and employs descriptive statistical analysis to provide an overview of the data through measures such as frequency, percentage, mean, and standard deviation values, thereby presenting the data effectively.

4. Results

4.1. General Overview of the Research Location

Babahrot Subdistrict is one of the subdistricts located in the southern part of Southwest Aceh Regency (ABDYA), Aceh Province. Geographically, this area is situated in an inland region with varied topography, ranging from lowlands to hilly areas that form part of the Bukit Barisan mountain range. The subdistrict directly borders other subdistricts within the regency and holds strategic significance from an agricultural perspective. Most of the population of Babahrot Subdistrict belongs to the Acehnese ethnic group, with farming as their main livelihood, particularly wet-rice (paddy) farming. The community lives in close-knit social units with strong kinship ties and continues to uphold traditional customs and religious values. Population density is relatively low, with settlements generally dispersed following river flows and rice field areas.

As an agrarian region, Babahrot Subdistrict relies heavily on the agricultural sector as the backbone of its economy. Extensive rice fields and the presence of supporting irrigation systems are key factors in determining agricultural activities. Rice is the primary crop cultivated by farmers, alongside secondary crops and other horticultural commodities. The community's economic activities are highly dependent on planting seasons and harvest yields, with lifestyles that remain relatively simple and traditional. In terms of infrastructure, Babahrot Subdistrict is served by a main road that connects it to other subdistricts and the regency capital. However, road conditions leading to several villages still require further attention. Educational and healthcare facilities are available, although their number and variety remain limited. Access to information and agricultural technology also needs to be improved to support the modernization of the agricultural sector. Several challenges faced by farmers in Babahrot Subdistrict include: (i) Limited land availability due to inheritance systems that lead to increasingly fragmented land ownership. (ii) Fluctuations in agricultural input prices, especially fertilizers, which are often unaffordable without government subsidies. (iii) Dependence on traditional farming patterns with suboptimal productivity. (iv) Limited access to technology and capital, which hampers innovation and the expansion of farming scale

4.2. Distribution of Respondents

Table 1. Result of Demography Profile of Respondents

Demographic	Category	Frequency	Percentage (%)
Gender	Male	63	66
	Female	32	34
Age	25–40 years	42	44
	41–50 years	24	25
	51–60 years	16	17
	61–70 years	13	14
Highest Level of Education	Elementary School	17	18
	Junior High School	53	56
	Senior High School	25	26
Land Area	0.5–1 hectare	63	66
	1.5–2 hectares	32	34

Table 1 presents the characteristics of the respondents, providing an overview of the demographic and socioeconomic profile of the study participants, including their gender, age, educational attainment, and land ownership. These characteristics are important for understanding the context of the research findings, particularly in relation to agricultural behavior, productivity, and decision-making. The gender distribution shows that most respondents are male, accounting for 63 individuals, or 66% of the total sample, while female respondents comprise 32 individuals, or 34%. This distribution reflects the dominant role of men in agricultural activities, particularly in land management and decision-making regarding farming. Although women also participate in farming, their involvement is often complementary, such as in post-harvest activities or household-based agricultural tasks. The gender imbalance suggests that agricultural production and land ownership in the study area remain largely male-dominated, which may influence access to resources, training, and agricultural support programs.

In terms of age structure, most respondents fall within the productive age groups. Respondents aged 25–40 years constitute the largest proportion, with 42 individuals (44%), followed by those aged 41–50 years at 24 individuals (25%). Older age groups, specifically those aged 51–60 years and 61–70 years, comprise 16 respondents (17%) and 13 respondents (14%), respectively. This distribution suggests that farming activities in the study area are primarily carried out by individuals who are still physically capable. The presence of a substantial proportion of younger farmers suggests potential openness to innovation and adoption of improved agricultural practices, although this potential may be constrained by limited access to education, capital, or technology. Regarding educational attainment, most respondents have relatively low levels of formal education. Most respondents completed junior high school (SMP), totaling 53 individuals (56%), followed by senior high school graduates (SMA) with 25 individuals (26%). Meanwhile, only 17 respondents (18%) have completed elementary school (SD). The absence of respondents with higher education indicates that farming in the area is largely undertaken by individuals with limited formal academic backgrounds. This educational profile may affect farmers' ability to adopt modern farming technologies, understand extension materials, and manage farm finances effectively. However, practical farming experience and local knowledge may partially compensate for limited formal education.

In terms of land area ownership, most respondents operate relatively small-scale farms. A total of 63 respondents (66%) cultivate land areas ranging from 0.5 to 1 hectare, while 32 respondents (34%) manage land areas between 1.5 and 2 hectares. This pattern reflects the prevalence of smallholder farming systems, which are often associated with land fragmentation resulting from inheritance practices. Small landholdings may limit economies of scale, reduce income potential, and increase vulnerability to production risks such as climate variability and price fluctuations. Thus, the results indicate that the respondents are predominantly male, within productive age ranges, have modest levels of education, and operate small landholdings. These characteristics suggest that while there is significant human resource potential in terms of labor availability and farming experience, structural constraints such as limited education and small land size may hinder productivity growth and technological adoption. Therefore, policy interventions should focus on improving access to agricultural education, extension services, and land-use efficiency to enhance farmers' welfare and agricultural sustainability.

4.3. Descriptive Statistics Analysis

Table 2. Result of Descriptive Statistics for Subsidized Fertilizer

Indicator	Response Category	Statistics	1	2	3	4	5
The existence of fertilizer subsidies can increase farmers' income	Strongly Agree	Frequency (F)	29	9	8	21	16
		Percentage (%)	31	9	8	22	17
The existence of fertilizer subsidies can help improve farmers' income	Agree	Frequency (F)	53	71	42	47	64
		Percentage (%)	56	75	44	49	67
The fertilizer subsidy program implemented by the government is appropriately targeted	Less Agree	Frequency (F)	13	15	34	17	9
		Percentage (%)	14	16	36	18	9
The fertilizer subsidies provided by the government can increase farmers' fertilizer productivity	Disagree	Frequency (F)			10	8	3
		Percentage (%)			11	8	3
The quality of subsidized fertilizer provided by the government is equivalent to non-subsidized fertilizer	Strongly Disagree	Frequency (F)			1	2	3
		Percentage (%)			1	2	3

Table 2 shows that the existence of fertilizer subsidies can increase farmers' income. Of the 29 respondents (31%), 29 stated that they strongly agree, 53 respondents (56%) agree, and 13 respondents (14%) somewhat disagree. No respondents expressed disagreement or strong disagreement. This result suggests that most respondents view fertilizer subsidies as an effective policy instrument for enhancing farmers' income. The absence of negative responses suggests a strong level of acceptance and perceived benefit of the subsidy program among farmers. For the statement regarding the existence of fertilizer subsidies helping to improve farmers' income, 9 respondents (9%) strongly agree, 71 respondents (75%) agree, and 15 respondents (16%) somewhat disagree, with no respondents indicating disagreement or strong disagreement. These findings reinforce the previous result, showing a dominant positive perception that fertilizer subsidies play a supportive role in easing production costs and stabilizing farmers' income levels.

For the third statement concerning whether the fertilizer subsidy program implemented by the government is appropriately targeted, 8 respondents (8%) strongly agree, 42 respondents (44%) agree, 34 respondents (35%) somewhat disagree, 11 respondents (11%) disagree, and 1 respondent (1%) strongly disagrees. This distribution indicates a more varied perception among respondents. Although more than half of the respondent's express agreement, a considerable proportion expresses doubt or dissatisfaction. This suggests that while the subsidy program is generally perceived as beneficial, its targeting and distribution mechanisms may not fully meet farmers' expectations. For the fourth statement regarding whether government-provided fertilizer subsidies can increase farmers' fertilizer productivity, 21 respondents (22%) strongly agree, 47 respondents (49%) agree, 18 respondents (19%) somewhat disagree, 8 respondents (8%) disagree, and 2 respondents (2%) strongly disagree. These results indicate that most respondents believe fertilizer subsidies contribute positively to productivity by enabling farmers to access sufficient inputs. However, the presence of dissenting responses suggests that productivity gains may vary depending on factors such as fertilizer quality, timing of distribution, and farming practices.

For the fifth statement regarding whether the quality of subsidized fertilizer provided by the government is equivalent to non-subsidized fertilizer, 16 respondents (17%) strongly agree, 64 respondents (67%) agree, 9 respondents (9%) somewhat disagree, 4 respondents (4%) disagree, and 3 respondents (3%) strongly disagree. This finding indicates that most respondents perceive subsidized fertilizer as having comparable quality to non-subsidized fertilizer, supporting confidence in the effectiveness of the subsidy program. Nonetheless, the existence of negative responses highlights lingering concerns among a small proportion of farmers regarding the consistency of fertilizer quality.

Table 3. Result of Descriptive Statistics for Land Area

Indicator	**Response Category**	**Measure**	**1**	**2**	**3**	**4**	**5**
The size of the harvested land I own determines the amount of income	Strongly Agree	Frequency (F)	17	27	16	13	25
		Percentage (%)	18	28	17	14	26
The larger the harvested land area, the greater the income	Agree	Frequency (F)	60	45	58	59	54
		Percentage (%)	63	47	61	62	57
Harvest land area affects the magnitude of maintenance costs	Less Agree	Frequency (F)	18	23	21	22	10
		Percentage (%)	19	24	22	23	11
Harvest land area affects total production costs	Disagree	Frequency (F)				1	5
		Percentage (%)				1	5
Soil moisture affects income	Strongly Disagree	Frequency (F)					1
		Percentage (%)					1

Table 3 shows that the size of harvested land owned is widely perceived as an important determinant of farmers' income. For this statement, 17 respondents (18%) strongly agree and 60 respondents (63%) agree, while 19 respondents (20%) somewhat disagree. No respondents expressed disagreement or strong disagreement. These results indicate that the majority of respondents recognize land size as a key factor influencing income, underscoring the importance of land ownership in agricultural earnings. Similarly, respondents expressed strong agreement with the statement that larger harvested land areas lead to higher income. A total of 27 respondents (28%) strongly agree and 45 respondents (47%) agree, while 24 respondents (25%) somewhat disagree, with no negative responses recorded. This pattern suggests a prevailing belief that income increases in line with land size, supporting the concept of scale effects in agricultural production.

Regarding cost-related aspects, most respondents acknowledge that harvested land area affects maintenance costs. Specifically, 16 respondents (17%) strongly agree and 59 respondents (61%) agree, while 21 respondents (22%) somewhat disagree, with no respondents indicating disagreement or strong disagreement. This finding suggests that farmers are aware that expanding the land area requires greater maintenance inputs, such as labor, fertilizer, and irrigation, which in turn increase operational costs. A similar perception is observed regarding production costs. For the statement that harvested land area influences total production costs, 14 respondents (15%) strongly agree and 59 respondents (61%) agree, while 22 respondents (23%) somewhat disagree and only 1 respondent (1%) disagrees. No respondents strongly disagree. These results indicate a dominant view that land size is closely linked to production costs, although a small proportion of respondents may experience relatively stable costs due to efficiency gains or shared input use.

In addition to land size, soil conditions are also considered influential. For the statement regarding the effect of soil moisture on income, 25 respondents (26%) strongly agree and 54 respondents (56%) agree, while 11 respondents (11%) somewhat disagree, 5 respondents (5%) disagree, and 1 respondent (1%) strongly disagrees. This suggests that most respondents acknowledge the role of soil moisture in determining crop yields and, consequently, income levels. Overall, the average level of agreement across all statements ranges from approximately 78% to 82%, indicating that most respondents acknowledge the significant role of harvested land area (X2) in determining income and production costs. These findings reflect a generally positive perception of land size as a primary driver of agricultural productivity and economic outcomes.

Nevertheless, the presence of a small proportion of respondents expressing lower levels of agreement or disagreement highlights variability in individual experiences. Such differences may be influenced by external factors, including soil fertility, land management practices, climatic conditions, or farmers' personal experience and efficiency levels. Therefore, while land area is widely perceived as a critical factor, it should be considered in conjunction with other agronomic and socio-economic variables when formulating agricultural development policies and intervention strategies.

Table 4. Result of Descriptive Statistics for Income

Indicator	Response Category	Measure	1	2	3	4	5
Income obtained from rice production is sufficient to meet daily needs	Strongly Agree	Frequency (F)				1	29
		Percentage (%)				1	31
Income I earn meets my expectations	Agree	Frequency (F)	3	3	5	6	53
		Percentage (%)	3	3	5	6	56
Income I earn can be used for savings or investment	Less Agree	Frequency (F)	24	17	3	15	13
		Percentage (%)	25	18	3	16	14
My income increases every year	Disagree	Frequency (F)	63	54	25	43	
		Percentage (%)	66	57	26	45	

High income influences the size of harvested land area	Strongly Disagree	Frequency (F)	5	21	62	30
		Percentage (%)	5	22	65	32

Table 4 illustrates respondents' perceptions of income derived from rice production. For the statement that income from rice production is sufficient to meet daily needs, no respondents (0%) strongly agree, while only 3 respondents (3%) agree. In contrast, 25 respondents (26%) somewhat disagree, 63 respondents (66%) disagree, and 5 respondents (5%) strongly disagree. This distribution suggests that most respondents consider their current income insufficient to cover their basic daily necessities. Similarly, responses to the statement regarding whether the income earned meets personal expectations show predominantly negative perceptions. No respondents (0%) strongly agree, 3 respondents (3%) agree, 17 respondents (18%) somewhat disagree, 55 respondents (57%) disagree, and 21 respondents (22%) strongly disagree. These findings suggest that most farmers feel their income falls short of what they expect from their farming activities.

For the statement concerning whether income can be allocated for savings or investment, responses are even more unfavorable. No respondents (0%) strongly agree, only 5 respondents (5%) agree, while 3 respondents (3%) somewhat disagree, 26 respondents (27%) disagree, and 62 respondents (65%) strongly disagree. This result indicates that most farmers are unable to generate surplus income beyond meeting basic needs. Regarding income growth over time, perceptions tend to be negative as well. Only 1 respondent (1%) strongly agree and 6 respondents (6%) agree that their income increases annually, while 15 respondents (16%) somewhat disagree, 44 respondents (46%) disagree, and 30 respondents (31%) strongly disagree. This suggests that most respondents do not experience consistent income growth from rice farming.

In contrast, responses to the statement regarding the influence of income on harvested land area show a strong positive tendency. A total of 29 respondents (30%) strongly agree and 53 respondents (55%) agree, while 14 respondents (15%) somewhat disagree, with no respondents expressing disagreement or strong disagreement. This suggests a broad consensus that higher income is closely linked to the size of harvested land. Thus, the findings indicate that rice farmers' current income is generally perceived as insufficient to meet their daily needs and personal expectations, and it does not provide adequate opportunities for saving or investment. However, harvested land area is widely recognized as a key factor influencing income levels. These results underscore the importance of improving agricultural productivity and land management efficiency as essential strategies for enhancing farmers' welfare.

5. Discussion

The findings of this study reveal that rice farmers in Babahrot District are predominantly male, within productive age groups, possess relatively low educational attainment, and cultivate small landholdings, a demographic profile commonly observed in rural agricultural communities in developing regions. While the dominance of productive-age farmers suggests strong labor availability and accumulated farming experience, limited formal education and fragmented land ownership remain key structural constraints that may inhibit productivity growth and the adoption of modern agricultural technologies (Duflo et al., 2011; Feder et al., 1985). This condition highlights the need for targeted policy interventions that enhance agricultural extension services, farmer training programs, and land-use efficiency, thereby translating human resource potential into improved economic outcomes.

Moreover, farmers' generally positive perception of subsidized fertilizer quality, viewed as comparable to non-subsidized alternatives, reinforces confidence in the effectiveness of Indonesia's fertilizer subsidy policy as a tool to support smallholder production (Goyal & Nash, 2017; Rachman & Sudaryanto, 2010). However, the persistence of negative perceptions among a minority of respondents suggests concerns related to fertilizer consistency and distribution, which, if unaddressed, may weaken trust in subsidy implementation and reduce optimal input use. In relation to land area, the results indicate that most farmers perceive land size as a primary determinant of agricultural productivity and income, aligning with empirical evidence that landholding size significantly influences economies of scale, output levels, and farm profitability (Barrett et al., 2010; Huddle, 1987).

Nonetheless, variations in individual responses highlight that land area alone does not guarantee higher income, as productivity is also shaped by soil fertility, farm management practices, climatic conditions, and farmer efficiency. Finally, the perception that current income levels are insufficient to meet daily needs and allow for savings or investment reflects the persistent vulnerability of smallholder rice farmers, despite their

reliance on agriculture as a primary source of livelihood. The strong recognition of harvested land area as a key driver of income suggests that policies aimed at improving land productivity, input efficiency, and post-harvest management are essential for enhancing farmers' welfare and promoting sustainable agricultural development in the region.

6. Conclusions and Policy Implications

This study examined the relationships between fertilizer subsidies, land area, and rice farmers' income in Babahrot District, Southwest Aceh, Indonesia. The findings indicate that rice farming in the study area is predominantly managed by male farmers of productive age, yet characterized by relatively low educational attainment and small landholdings. While this demographic profile suggests considerable labor potential and accumulated farming experience, structural constraints, particularly limited education and fragmented land ownership, continue to restrict productivity growth and technological adoption. The generally positive perception of subsidized fertilizer quality reflects farmers' confidence in the government subsidy program and supports its role in maintaining input affordability for smallholders. However, the presence of negative perceptions among a minority of farmers highlights ongoing concerns regarding the consistency of fertilizer quality and the effectiveness of distribution. Furthermore, land area is widely recognized by farmers as a critical determinant of productivity and income, although variations in individual experiences suggest that land size alone is insufficient to guarantee higher welfare outcomes. Importantly, the perception that current income levels remain inadequate to meet daily needs and enable savings or investment underscores the persistent vulnerability of small-scale rice farmers. Overall, the results emphasize that improving land productivity, input efficiency, and human capital development is essential for enhancing farmers' income and promoting sustainable agricultural development in Babahrot District.

The findings of this study offer several important policy implications for enhancing agricultural development and improving rural welfare. First, while fertilizer subsidies remain a vital instrument for supporting smallholder rice farmers, policymakers should strengthen monitoring mechanisms to ensure consistent fertilizer quality, timely distribution, and equitable access. Enhancing transparency and supply chain supervision can help maintain farmers' trust and maximize the productivity impacts of subsidy programs. Second, given the predominance of small landholdings, policies should prioritize land-use efficiency rather than land expansion. This may include promoting improved cultivation techniques, precision farming practices, integrated soil fertility management, and the adoption of high-yield and climate-resilient rice varieties. Third, the relatively low educational levels among farmers underscore the need to intensify agricultural extension services, farmer field schools, and capacity-building programs that focus on farm management, post-harvest handling, and financial literacy. Strengthening human capital is critical for improving decision-making, technology adoption, and income diversification. Finally, to address income vulnerability, agricultural policies should be complemented by broader rural development strategies, such as improving market access, strengthening farmer cooperatives, and facilitating access to affordable credit and crop insurance. By integrating input subsidies with human capital development and productivity-enhancing interventions, policymakers can foster a more inclusive, resilient, and sustainable rice farming sector in Southwest Aceh.

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