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SCARCITY OF SUBSIDIZED FERTILIZER AND WEATHER FACTORS: IMPLICATIONS FOR AGRICULTURAL PRODUCTIVITY AND FOOD SECURITY IN PROBOLINGGO REGENCY

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Abstract :

Probolinggo Regency is an agricultural area where the majority of the population works as farmers. However, the agricultural sector in this area faces major challenges due to the scarcity of subsidized fertilizers and unpredictable weather changes. This study aims to analyze the scarcity of subsidized fertilizers and weather factors on agricultural productivity and food security in Probolinggo Regency, as well as to evaluate sharia-based economic solutions that can be applied to improve farmer welfare. The research method used is a qualitative approach with a case study method. Data were collected through in-depth interviews with farmers, fertilizer distributors, and Bulog officials, as well as field observations and documentation studies. The results of the study indicate that the uneven distribution of subsidized fertilizers and high prices of non-subsidized fertilizers causes many farmers to have difficulty meeting their fertilization needs, thus negatively impacting agricultural productivity. In addition, the phenomenon of climate change has had a significant impact on the agricultural sector, especially the food crop subsector in Indonesia. Weather uncertainty, increased frequency of natural disasters such as floods and droughts, and changes in planting season patterns have caused a substantial decline in land productivity. This impact not only threatens national food security, but also causes a spike in the price of basic commodities that burden consumers and widen the gap in access to food. On the other hand, farmers as the main actors also experience income instability due to uncertain harvest results, increasing production costs, and vulnerability to crop failure, which worsens their socio-economic conditions. This instability has the potential to trigger social problems such as urbanization, disguised unemployment, and declining interest of the younger generation in the agricultural sector. Therefore, climate change is not only an ecological challenge, but also a threat to the socio-economic stability of agrarian communities. This study aims to analyze the impact of climate change on food crop production and identify relevant adaptive policies to maintain the sustainability of the agricultural sector in Indonesia. To overcome this challenge, adaptation strategies are needed such as better management of fertilizer distribution, the use of agricultural technology that is more adaptive to climate change, and the application of sharia economic principles to create a just and sustainable agricultural system.

Keywords : *fertilizer shortages, weather factors, agricultural productivity, food security*

Abstract :

Kabupaten probolinggo merupakan daerah agraris yang mayoritas pendudunya

berprofesi sebagai petani. Namun, sector peranian di daerah ini menghadapi tantangan besar akibat kelangkaan pupuk subsidi dan perubahan cuaca yang tidak menentu. Penelitian ini bertujuan untuk menganalisis kelangkaan pupuk subsidi serta faktor cuaca terhadap produktivitas pertanian dan ketahanan pangan dkabupaten probolinggo, serta mengevaluasi solusi berbasis ekonomi syariah yang dapet diterapkan untuk meningkatkan kesejahteraan petani. Metode penelitian yang di gunakan adalah pendekatan kualitatif dengan metode studi kasus. Data dikumpulkan melalui wawancara mendalam dengan petani, distributor pupuk, dan pejabat bulog, serta observasi lapangan dan studi dokumentasi. Hasil penelitian menunjukkan bahwa distribusi pupuk subsidi yang tidak merata serta harga pupuk nonsubsidi yang tinggi menyebabkan banyak petani kesulitan memenuhi kebutuhan pemupukan, sehingga berdampak negatif dari produktivitas pertanian. Selain itu Fenomena perubahan iklim telah memberikan dampak signifikan terhadap sektor pertanian, khususnya subsektor tanaman pangan di Indonesia. Ketidakpastian cuaca, peningkatan frekuensi bencana alam seperti banjir dan kekeringan, serta perubahan pola musim tanam menyebabkan penurunan produktivitas lahan secara substansial. Dampak ini tidak hanya mengancam ketahanan pangan nasional, tetapi juga menyebabkan lonjakan harga komoditas pokok yang membebani konsumen dan memperluas kesenjangan akses terhadap pangan. Di sisi lain, petani sebagai pelaku utama turut mengalami ketidakstabilan pendapatan akibat hasil panen yang tidak menentu, meningkatnya biaya produksi, dan kerentanan terhadap gagal panen, yang memperparah kondisi sosial ekonomi mereka. Ketidakstabilan ini berpotensi memicu persoalan sosial seperti urbanisasi, pengangguran terselubung, serta menurunnya minat generasi muda terhadap sektor pertanian. Oleh karena itu, perubahan iklim bukan hanya tantangan ekologis, tetapi juga ancaman terhadap stabilitas sosial ekonomi masyarakat agraris. Studi ini bertujuan untuk menganalisis dampak perubahan iklim terhadap produksi tanaman pangan dan mengidentifikasi kebijakan adaptif yang relevan untuk menjaga keberlanjutan sektor pertanian di Indonesia. Untuk mengatasi tantangaan ini, diperlukan strategi adatasi seperti pengelolaan distribusi pupuk yang lebih baik, penggunaan teknologi pertanian yang lebih adaptif terhadap perubahan iklim, serta penerapan prinsip ekonomi syariah untuk menciptakan system pertanian yang berkeadilan dan berkelanjutan.
Keywords: *kelangkaan pupuk, faktor cuaca, produktvitas pertanian, ketahanan pangan*

INTRODUCTION

Probolinggo Regency is known as an agricultural area, where the majority of the population works as farmers. Agriculture is a source of local economy, so that any disruption in this sector can have a significant impact on their welfare. However, in recent years the agricultural sector in Probolinggo Regency has faced major challenges that affect agricultural stability and food security. One of the main problems faced by farmers is the scarcity of subsidized fertilizers and unpredictable changes in weather conditions. Both factors contribute to the decline in agricultural productivity which ultimately affects food security in the Probolinggo Regency area. (Muhtarom 2023)

Subsidized fertilizers play a crucial role in increasing farmers' harvests. However, a less than optimal distribution system often causes an imbalance in their availability. As a result, many farmers have difficulty obtaining subsidized fertilizers in sufficient quantities and at the right time. This condition forces them to switch to non-subsidized fertilizers which are more expensive, thus increasing production costs and reducing their profit margins. (Rifan 2024)

Table 1 Allocation of subsidized fertilizer from the previous year in Probolinggo district.

year	Total Allocation	Urea (Tons)	NPK (Tons)	Organic (Tons)
2023	54,405	31.011	23,394	-
2024	32,334	18,452	13,882	-
2025	62,732	30,000	28,360	4.372

Source: Radar Bromo

The decrease in the allocation of subsidized fertilizers from year to year is caused by various factors, including the reduction in agricultural land area, changes in subsidy policies, and evaluation of previous subsidized fertilizer distribution. (Rofiq 2023)

In addition to the scarcity of fertilizer, increasingly unpredictable weather conditions are also a serious threat to agricultural stability in Probolinggo Regency. With a tropical climate that is increasingly influenced by global climate change, the Probolinggo area is increasingly experiencing weather anomalies. Unpredictable rainfall and prolonged periods of drought are major challenges in the agricultural production cycle. This condition not only reduces crop yields, but also increases the risk of crop failure which has an impact on community food security. The combination of weather uncertainty and limited access to subsidized fertilizers creates double pressure on farmers, which ultimately weakens the resilience of the agricultural sector in the Probolinggo Regency area. (Suprapto 2022)

Several previous studies have highlighted the importance of fertilizer availability in supporting agricultural sustainability. According to Firmansyah (2023), fertilizer has a strategic role in increasing agricultural productivity, so the government is trying to optimize subsidy policies through distribution management, pricing, and efficiency of fertilizer use. In addition, other studies show that the impact of climate change on the agricultural sector is very significant, and to reduce this risk, a more comprehensive adaptation strategy is needed. Some steps that can be taken include developing plant varieties that are more resistant to extreme weather, optimizing water use and implementing policies that support the sustainability of the agricultural sector. (Muhtarom, et al 2023)

In 2025, Probolinggo Regency received an allocation of 62,732 tons of subsidized fertilizer, consisting of 30,000 tons of Urea, 28,300 tons of NPK, and 4,300 tons of organic fertilizer. The five sub-districts with the highest allocations were Tongas (6,300 tons), Bantaran (4,700 tons), Gading (4,100 tons), Lumbang (4,099 tons), and Tiris (3,772 tons). The highest retail price (HET) was set at IDR 2,250/kg for Urea, IDR 2,300/kg for NPK, and IDR 800/kg for organic fertilizer. However, the distribution of subsidized fertilizers faced challenges such as a decrease in allocation of up to 52% compared to the previous year, uneven distribution, and sales practices above the HET. To obtain subsidized fertilizer, farmers must be registered in the Simluhtan system, have a maximum of 2 hectares of land, and plant strategic commodities such as rice, corn, soybeans, and others. This data reflects the importance of monitoring and equalizing fertilizer distribution to support the sustainability of agricultural production in the region. (Iqbal 2025)

This study aims to analyze the scarcity of subsidized fertilizers and weather factors on agricultural productivity and food security in Probolinggo Regency. In

addition, this study also evaluates solutions based on sharia economic principles that are oriented towards justice, sustainability, and farmer welfare. This approach is in line with the concept of taakkal and maslahah in Islamic teachings, which emphasize the importance of balance between human effort and dependence on God's provisions and how policies based on social justice can improve farmer welfare while maintaining food security.

Based on the explanation above , the selection of this topic is motivated by the dependence of farmers in Probolinggo Regency on subsidized fertilizers to increase their harvest yields. Prolonged fertilizer shortages, coupled with unpredictable weather conditions, can cause a decrease in agricultural productivity which has an impact on community food security. The lack of research that specifically discusses the relationship between fertilizer scarcity and weather factors with food security makes this study important. It is hoped that the results of this study can provide useful insights for policy making related to more effective fertilizer distribution and climate risk mitigation strategies, in order to support agricultural sustainability and improve the welfare of farmers in Probolinggo Regency.

RESEARCH METHODS

This study adopted a qualitative approach with a case study method to deeply understand the impact of subsidized fertilizer shortages and changes in weather conditions on agricultural productivity and food security in Probolinggo Regency. Data collection techniques were carried out through several methods, including in-depth interviews with 20 farmers, fertilizer distributors, and officials of Perum BULOG Kancab Probolinggo to explore their experiences and challenges related to fertilizer availability and climate change. In addition, field observations were conducted to directly observe agricultural conditions, fertilizer distribution patterns, and adaptation strategies implemented by farmers in dealing with these obstacles. Documentation studies were also used as part of the data collection method by reviewing various government policies, agricultural statistical reports, and literature related to food security and agricultural productivity. The collected data were then analyzed descriptively with a thematic approach, namely identifying the main patterns related to the problems of fertilizer scarcity, weather factors, and their implications for the agricultural sector and food security. To ensure the validity and reliability of the data, this study applied a triangulation technique that included triangulation of sources, methods, and theories. Source triangulation is done by comparing information from various sources to avoid subjective bias, while method triangulation is applied by combining interviews, observations, and documentation studies so that the results obtained are stronger and more credible. In addition, theory triangulation is used by linking the findings with relevant academic concepts, so that a more objective, holistic, and in-depth understanding of the phenomenon being studied is obtained. (Amalia 2022)

RESULTS AND DISCUSSION

Scarcity of Subsidized Fertilizer and Its Impact on Agricultural Productivity

Subsidized fertilizers play a crucial role in maintaining the sustainability of the agricultural sector in Probolinggo Regency. However, in recent years, farmers

have faced major challenges related to fertilizer shortages that have worsened their agricultural conditions. One of the main factors causing this problem is the uneven distribution of fertilizers, making it increasingly difficult for farmers to access subsidized fertilizers. Based on interviews with a number of farmers in Probolinggo Regency, many of them complained about the difficulty of obtaining subsidized fertilizers, both in terms of quantity, quality, and increasingly unaffordable prices. This uncertainty forces most farmers to look for other alternatives that are often more expensive and less efficient. (Firmansyah et al. 2023)

Some of the main factors contributing to the fertilizer shortage include suboptimal distribution, rising prices of non-subsidized fertilizers, and speculative practices such as hoarding and price manipulation by certain individuals. An inappropriate fertilizer allocation system often causes an imbalance in supply between regions, where some areas receive insufficient amounts of fertilizer. As a result of this shortage, farmers are forced to buy non-subsidized fertilizers which are much more expensive, significantly increasing their production costs. In addition, allegations of hoarding by several fertilizer agents have worsened the situation, causing stocks on the market to become increasingly limited. The impact of this condition is very much felt by farmers, especially those who cannot afford to buy sufficient amounts of non-subsidized fertilizers. Some farmers end up reducing the dosage of fertilizer or even not using it at all. using fertilizer at all, which results in suboptimal plant growth and decreased harvest yields. (Rofiq 2023)

Field observations show that many farmers in Probolinggo Regency do not receive subsidized fertilizer according to the area of land they cultivate. This causes them to have to buy non-subsidized fertilizer to meet the nutritional needs of their plants. For example, in one hectare of rice fields that ideally require one quintal of fertilizer, farmers only receive half a quintal of subsidized fertilizer, so they have to buy the rest of their needs at a more expensive non-subsidized price. This imbalance not only increases the economic burden on farmers but also hampers overall agricultural productivity, especially for small farmers who have limited capital to buy additional fertilizer.

From the perspective of plant growth theory, Liebig's Law of the Minimum proposed by Von Liebig (1840) explains that plant growth depends on the nutrients available in the smallest amounts. If one of the essential elements such as nitrogen (N), phosphorus (P), or potassium (K) is in deficit due to fertilizer scarcity, plant growth will be hampered and crop yields will decrease even though other elements are abundant. This concept is very relevant in the context of agriculture in Probolinggo Regency, where the limited availability of subsidized fertilizers causes an imbalance of nutrients in the soil, which ultimately reduces the productivity of agricultural land. In addition, Malthusian theory highlights that human population growth increases exponentially, while food production only increases arithmetically. If there is no proper management strategy, including a more effective fertilizer policy and more equitable distribution, the imbalance between population and food availability has the potential to trigger a food crisis in the future. (Nurul Arifin 2023)

Weather Factors and Their Influence on Agricultural Yields

In addition to the problem of scarcity of subsidized fertilizers, weather

factors are also a major challenge for farmers in Probolinggo Regency. Based on data from the Meteorology, Climatology, and Geophysics Agency (BMKG), in the last five years this region has experienced quite extreme fluctuations in rainfall. Unpredictable changes in weather patterns, such as shorter rainy seasons and longer dry seasons, have a negative impact on agricultural productivity. Farmers who do not have access to adequate irrigation systems are the most affected group, because the water supply for their crops becomes unstable. As is known, rice plants, which are one of the main commodities in Probolinggo Regency, are highly dependent on water availability. When rainfall is uncertain, farmers have difficulty getting enough water to support the growth of their crops, which ultimately threatens the stability of agricultural production and food security in the area. (Zul Erianto, et al, 2024)

Disruptions in the supply chain due to extreme weather conditions also contribute to increasing food prices, which indirectly worsens people's food security. In addition, increasingly extreme weather changes also exacerbate the water crisis in agricultural areas. To face this challenge, more effective adaptation strategies are needed, such as developing crop varieties that are more resistant to climate change, optimizing water use through more efficient irrigation systems, and implementing sustainable agricultural practices. Government policies that support food security are also urgently needed to ensure the availability and equal access to food for all levels of society. Without proper mitigation efforts, the imbalance between water availability and agricultural needs can further worsen the condition of the agricultural sector in Probolinggo Regency. (Zul Erianto, et al, 2024)

Field observations show that the uncertainty of rainfall makes it increasingly difficult for farmers to manage their land. When the water supply is unstable, many farmers have difficulty irrigating their crops, especially those who depend on rainwater. Rice plants, for example, require a large supply of water to grow optimally. However, with uncertain rainfall, many agricultural lands experience water shortages, resulting in decreased harvest productivity. If this condition continues without proper anticipatory steps, food security in Probolinggo Regency could be increasingly threatened. Therefore, the development of adaptation technology to climate change is an important aspect that must be considered. Increasing access to crop varieties that are more resistant to drought, implementing water-saving irrigation systems, and utilizing modern technology in agricultural management are strategic steps that must be implemented immediately. In addition, education and assistance to farmers regarding cultivation techniques that are more adaptive to climate change are also very necessary so that they can better face production challenges. Agricultural infrastructure must also be improved, especially in the construction of reservoirs and management of more efficient irrigation systems to minimize the negative impacts of prolonged drought.

According to the Intergovernmental Panel on Climate Change (IPCC, 2014), climate change has a major impact on the agricultural sector through various mechanisms. One of them is changes in rainfall patterns, where longer dry seasons or excessive rainfall can inhibit plant growth. In addition, rising temperatures due to global warming also contribute to increased water evaporation rates, which ultimately cause heat stress in plants. Another factor that is no less important is the

increasing attack of pests and plant diseases due to climate change. Changes in temperature and humidity create more favorable conditions for the development of pests and plant pathogens, which can damage agricultural yields on a large scale. In line with the findings of Lobell et al. (2011), extreme weather changes that occur in Probolinggo Regency, such as prolonged drought and unexpected floods, can directly inhibit plant growth and cause significant decreases in crop yields. Therefore, without appropriate adaptation and mitigation efforts, the impact of climate change on the agricultural sector in this region has the potential to worsen in the future.

Implications for Agricultural Productivity and Food Security

The scarcity of subsidized fertilizers and unpredictable weather conditions have a major impact on food security in Probolinggo Regency. One of the main consequences of this problem is the decline in local agricultural production. When the harvest decreases, the availability of food on the market becomes limited, which ultimately triggers an increase in the price of food commodities. This impact is not only felt by consumers, but also affects the welfare of farmers. Farmers who experience a decline in harvest yields and have to bear increasingly high production costs face the risk of prolonged financial difficulties. In more extreme conditions, some farmers are even forced to look for alternative livelihoods or sell their agricultural land because they are unable to survive in an increasingly difficult situation. If this trend continues without appropriate intervention, the agricultural sector in Probolinggo Regency is feared to experience a significant decline in the next few years. (Mustikaningrum 2025)

In addition to the direct impact on the agricultural sector, the decline in food production also has a negative effect on the agricultural-based trade and industry sectors. When the supply of raw materials from the agricultural sector is limited, the food processing industry faces obstacles in production. This can disrupt the food supply chain, which not only affects business actors in this sector, but also consumers who find it increasingly difficult to obtain food products at stable prices. This condition has the potential to cause inflation in food prices, which has a broad impact on people's purchasing power and regional economic stability. If no efforts are made to increase the resilience of the agricultural sector to the various challenges that exist, the imbalance between food demand and supply will continue and worsen. (Santoso & Mulyadi 2022)

Field observations show that one of the biggest challenges faced by farmers is unpredictable changes in weather patterns. Unstable rainfall makes it difficult for farmers to determine the right planting time. If crops are planted too early before sufficient rainfall occurs, there is a risk that the crops will experience drought and fail to grow. Conversely, if planting is done too late, the crops are at risk of not getting enough water during their critical growth phase. In addition, high-intensity rain can also be a threat to agriculture. Plants that are exposed to excessive water are susceptible to root rot, which can cause large-scale crop failure. Not only that, the strong wind phenomenon that often accompanies the rainy season is also a threat to commodities such as rice and corn, because these plants are easily knocked down by strong winds. Therefore, farmers need a more effective adaptation strategy to reduce the risks caused by weather uncertainty.

In the context of this research, the role of the Logistics Affairs Agency (BULOG) is very relevant in maintaining the stability of agricultural output and food security in Probolinggo Regency. As an institution responsible for managing national food reserves, BULOG has a strategic role in ensuring that food availability is maintained amidst various challenges, such as fertilizer shortages and extreme weather conditions. BULOG not only functions as a provider of food reserves, but also plays a role in stabilizing the prices of major commodities in the market, so that price spikes caused by decreased production can be minimized. The existence of BULOG is very crucial in ensuring that the community continues to have access to sufficient, affordable, and quality food even though local production is constrained.

The results of the study show that one of the steps taken by BULOG to maintain price stability and food supply in Probolinggo Regency is through the Food Supply and Price Stabilization (SPHP) rice procurement program. This program aims to control fluctuations in rice prices on the market, especially when there are supply disruptions that cause price spikes. Through this program, BULOG seeks to maintain the availability of rice at more affordable prices for the community, so that the impact of price increases due to production instability can be suppressed. In addition, this program also aims to prevent price speculation that is often carried out by large traders, which can harm consumers. In its implementation, BULOG also collaborates with local farmers through a mechanism for absorbing harvest results every year as part of the national rice reserves. Thus, this program not only helps stabilize food prices, but also provides market guarantees for farmers, so that they have certainty in marketing their crops without having to worry about uncertain price fluctuations. (Penuelas, et al, 2023)

CONCLUSION

This study highlights the impact of subsidized fertilizer scarcity and weather factors on agricultural productivity and food security in Probolinggo Regency. The scarcity of subsidized fertilizer is caused by uneven distribution, rising prices of non-subsidized fertilizers, and hoarding practices by certain individuals. Meanwhile, uncertain weather factors, such as unstable rainfall and prolonged drought, further worsen agricultural conditions and increase the risk of crop failure. The combination of these two factors has a significant impact on farmer welfare and food stability in Probolinggo Regency. Farmers who have difficulty obtaining subsidized fertilizer must switch to more expensive non-subsidized fertilizers or reduce fertilizer doses, resulting in decreased yields. In addition, extreme changes in weather patterns also disrupt agricultural productivity, worsen the water crisis, and increase uncertainty about planting times.

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