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Farmers Empowerment through Rice Production Improvement Program by the Food Security and Agriculture Service of Kubu Raya District, West Kalimantan Province

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Abstract

Rice production in Kubu Raya Regency continues to decline from year to year, one of the causes is the less than optimal empowerment of farmers by the Food Security and Agriculture Service of Kubu Raya Regency. Therefore, this study was conducted to analyze farmer empowerment through a rice production increase program by the Food Security and Agriculture Service of Kubu Raya Regency, as well as to identify inhibiting factors and efforts made to optimize it. The method used is qualitative descriptive, data collection techniques are semi-structured interviews with purposive sampling and supported by passive participant observation and documentation. The results of the study indicate that farmer empowerment through a rice production increase program by the Food Security and Agriculture Service (DKPP) of Kubu Raya Regency is seen in 3 (three) dimensions, namely enabling, strengthening, and supporting. From these three dimensions, it was found that farmer empowerment through a rice production increase program by the DKPP was quite good, but still not optimal. This can be seen from the distribution and participation of farmers in financial services that have not been maximized, as well as the lack of agricultural extension workers in the field. The obstacles to this empowerment include the low level of farmer economy, low Farmer Exchange Rate (NTP) for food crops, uncertain climate and weather conditions, difficult to reach geographical conditions, and limited budget owned by the agency. The efforts that have been made by the agency include providing direct training and counseling to farmers, education on rice cultivation through seminars, maximizing the provision of assistance that can reduce farmer production costs, maximizing assistance to farmers, maximizing the role of field agricultural extension workers to provide direct counseling to farmers, organizing seminars and training, and allocating budgets according to established priorities.

Keywords: Rice Cultivation, Empowerment, Rice Production

Introduction

Empowerment plays a very crucial role in improving the quality of human resources, and is the key for Indonesia to progress by utilizing all the potential of its natural resources. Among these potentials, the agricultural sector is a very strategic element, playing a vital role in ensuring food security in Indonesia. In meeting their basic needs, Indonesian people are very dependent on agriculture, especially on rice commodities. This dependence can be seen from the consumption of rice as a staple food, thus providing a reason for the Indonesian Government to pay special attention to the development of rice cultivation (Macrae & Reuter, 2020; Rachman et al., 2022).

The Indonesian proverb that says *"you haven't eaten if you haven't eaten rice"* reflects the high dependence of society on rice consumption. Therefore, the government is required to continue to pay attention to rice production in Indonesia in order to meet the needs of the community. Active participation from local governments in each province and district/city, especially in

potential rice-producing areas, is expected to increase local rice production, to ensure the fulfillment of basic needs of the community in each region (Ar-Rozi et al., 2024; Handayani et al., 2020; Rachman et al., 2023).

One of the potential rice-producing areas is West Kalimantan Province. According to Sembiring (2024), the West Kalimantan Province Food Crops and Horticulture Service (TPH) recorded an increase in rice production in 2023 of 1.51 percent from the 2022 Food Crop Statistics Figures (ATAP), reaching 731,226 tons of GKG. The data comes from rice supplies in various regions, including Kubu Raya Regency. Reported from the antaranews.com website, the Governor of West Kalimantan Province stated his commitment to strengthening food security in West Kalimantan by focusing on agriculture in Sambas and Kubu Raya Regencies. Currently, these two areas are the centers of rice production in West Kalimantan. Based on data on the area of agricultural land in Kubu Raya Regency in 2020, the area of rice fields there reached 28,674.32 Ha. With such a large area of rice fields, rice production in this area is relatively low (Xin et al., 2020; Yuan et al., 2021; Sun et al., 2020). This is because most of the land is marginal land, which has a lower production level than ordinary land.

Marginal land refers to areas with low to very low potential for agricultural crop production, or can be explained as land that has low quality due to various limiting factors (Tufaila et al., 2014; Csikós & Tóth. 2023; Ahmadzai et al., 2021). According to Suprapto (2009) in Indonesia marginal land is found in both wetlands and dry land. Wetlands in the form of peatlands, acid sulfate lands and tidal swamps covering an area of 24 million ha, while dry dry land in the form of Ultisol soil 47.5 million ha and Oxisol 18 million ha. From this definition it can be seen that marginal land can also be found in Kubu Raya Regency, especially tidal rice fields. Tidal rice fields are included in marginal land due to the many limiting factors on the land, such as irregular irrigation. The comparison of the area of tidal rice fields and the area of irrigated rice fields which are non-marginal land is very different in Kubu Raya Regency. This can be seen from the following table 1:

Table 1. Agricultural Land Area of Kubu Raya Regency in 2020

Subdistrict	Land Area (Ha)	Irrigated Rice Fields	Tidal Rice Fields	Amount
Ampar Stone		513.86	5,098.57	5,612.43
Stretched Out		-	1,167.64	1,167.64
Fort		313.44	5,026.98	5,340.42
Pakedai Bay		26.00	2,288.46	2,314.46
Kakap River		-	8,094.34	8,094.34
Taste of Glory		-	915.09	915.09
Great River		-	3,871.72	3,871.72
Ambawang River		-	513.71	513.71
Kuala Mandor B		-	739.50	739.50
Amount		**853.30**	**27,716.07**	**28,571.31**

Source: Department of Food Security and Agriculture, 2021

The area of tidal rice fields which are part of marginal land, is quite large in Kubu Raya Regency. From Table 1, it can be seen that 27,716.27 Ha or around 97% of the total area of rice fields are tidal rice fields which are included in marginal land, a very significant amount and far different from the area of irrigated rice fields which only reaches 853.30 Ha or around 3%. According to an explanation from one of the Agricultural Infrastructure and Facilities Analysts at the Kubu Raya Regency Food Security Service, optimization of tidal rice fields is

important so that the rice plants planted there can be produced optimally. Furthermore, he highlighted that optimization of the land requires quite large funding, and until now, the government budget is still insufficient to meet the funding needs.

According to Giller et al. (2021) and Stringer et al. (2020), large funding makes it difficult for farmers to optimize the land. Farmers are still unable to re-cultivate marginal land effectively because the economic level of farmers in Kubu Raya Regency is still classified as lower middle class. Furthermore, according to information from one of the agricultural infrastructure and facilities analysts at the Food Security and Agriculture Service of Kubu Raya Regency, this problem is one of the driving factors for rice farmers to switch professions to become plantation farmers and rice fields are converted into plantation land.

The conversion of rice fields into plantations has an impact on the decreasing potential of rice fields, furthermore rice production in Kubu Raya Regency has also automatically decreased. This can be seen from the following table 2:

Table 2. Planted Area, Harvested Area and Rice Production in Kubu Raya Regency 2019-2022

Year	Planted Area (Ha)	Harvested Area (Ha)	Rice Production (Tons)
2019	34,375.8	38,449.5	116,455
2020	31,223.6	33,371.4	102,383
2021	31,661.0	28,228.0	85,305
2022	23,772.8	24,370.0	70,332

Source: Food Security and Agriculture Service, Kubu Raya Regency, processed by the author, 2023

The planted area and harvested area of rice plants continue to decrease from year to year. This can be seen from the data obtained from the Food Security and Agriculture Service of Kubu Raya Regency , where in 2019 the planted area of rice plants was 34,375.8 Ha while the harvested area was 38,449.5 Ha, decreasing in 2020 with a planted area of 31,223.6 Ha and a harvested area of 33,371.4, then in 2021 the planted area experienced an increase of 31,661 Ha while the harvested area continued to decrease to 28,228 Ha, the planted area and harvested area continued to decrease until in 2022 the planted area was only 23,772.8 Ha and the harvested area was 24,370. The reduction in planted area and harvested area has an impact on the amount of rice production produced during one year (Hussain et al., 2020; Pickson et al., 2021; Goswami et al., 2020). When viewed from Table 2, the amount of rice production tends to be directly proportional to the planted area and harvested area. However, in 2021, the planted area was not directly proportional to the amount of rice production. This is due to the difference in the recording time of planted area, harvested area, and rice production per year which was carried out in December. The rice planting time is divided into two seasons, namely the gadu season (planting in April, harvesting in September) and the rendeng season (planting in October, harvesting in March). Due to the difference in seasons, the recording of planted area is sometimes more than the harvested area, and vice versa (Shang et al., 2020; Behzad et al., 2023). Regardless of the difference in seasons, the data shows that the planted area and harvested area always decrease every year in Kubu Raya Regency.

In addition to the problems of land, funding, and the decreasing area of rice fields, other inhibiting factors for rice production in Kubu Raya Regency, as identified in the agricultural extension program of Kubu Raya Regency , are the behavioral problems of farmers who still plant rice in conventional ways. Many farmers do not yet understand the use of modern technology in planting rice, although agricultural technology can help them in cultivating rice plants more effectively and efficiently (Campenhout, 2021; Mallareddy et al., 2023; Mao et al.,

2021). The results obtained after harvest can also be maintained in quality by applying modern agricultural technology.

The use of agricultural technology aims to increase rice plant productivity. According to Siregar et al. (2023), rice plant productivity refers to the amount or yield of the harvest produced per unit area of agricultural land. Rice plant productivity is also influenced by several other factors, one of which is balanced fertilization. According to Selim (2020) and Barłóg et al. (2022), fertilization aims to add nutrients from outside to the soil so that the level of availability increases. The addition of nutrients is carried out based on the soil nutrient status or according to the target crop productivity to be achieved (Scavo et al., 2022; Ahmed et al., 2021). From this understanding, it is known that balanced fertilization has an important role in achieving the desired productivity. Unfortunately, in Kubu Raya Regency, based on the agricultural extension program of Kubu Raya Regency, farmers have only carried out simple fertilization and have not implemented balanced fertilization.

The lack of understanding of farmers on the importance of balanced fertilization is one of the factors that fertilization is still carried out simply by farmers in Kubu Raya Regency. This is also one of the factors in the decreasing amount of rice production. This is the reason why farmer extension workers are needed to empower farmers to be independent and have knowledge and skills in rice cultivation.

Farmer empowerment is very important to overcome existing problems by maximizing all efforts that can be made. Empowerment itself is one of the four functions of government. Adams in Handono et al. (2020) defines empowerment as a process or container to enable individuals, groups, or communities to manage situations and conditions to achieve desired goals, with the aim of improving their quality of life. In the context of farmer empowerment, this means empowering farmers to be able to manage their farms well to achieve maximum yields and improve their quality of life. Farmers in Kubu Raya Regency, especially rice farmers, are encouraged to be independent in managing their farms to achieve maximum yields. This is very important considering the existing problems and the allocation of funds from the government which is still insufficient to help farmers.

From the background of the problem, the author is interested in conducting a study entitled Empowering Rice Farmers. Through the Rice Production Increase Program by the Food Security and Agriculture Service of Kubu Raya Regency, West Kalimantan Province.

Methods

This study uses a descriptive qualitative approach with an inductive method. This method aims to explore and understand the meaning that emerges from social or humanitarian phenomena through empirical observation. The concept of empowerment is the main focus, with three of the five dimensions of empowerment analyzed: enabling, strengthening, and supporting. Data were collected from primary sources, including interviews and field observations, as well as secondary sources such as data from the Central Bureau of Statistics and related literature. The study was located in Kubu Raya Regency, specifically in the Food Security and Agriculture Service and three selected villages in the area.

Data collection techniques include semi-structured interviews, direct observation, and documentation. Researchers collected data through purposive sampling methods to determine key informants who could provide in-depth insights related to the research topic. The collected data were analyzed using triangulation to check credibility, with a combination of interviews, observations, and documentation to produce a comprehensive understanding of farmer empowerment in the rice production improvement program.

Results and Discussion

Inhibiting Factors in Farmer Empowerment through the Rice Production Increase Program by the Food Security and Agriculture Service of Kubu Raya Regency

In realizing empowered and independent farmers to increase rice production in Kubu Raya Regency, there are certainly obstacles that can slow down or even thwart this goal. This also applies to the Empowerment of Farmers. Through the Rice Production Increase Program by the Food Security and Agriculture Service of Kubu Raya Regency. The inhibiting factors can be divided into 2 (two) factors, namely internal factors and external factors. The author can explain both factors below:

Internal Inhibiting Factors

Lack of Number of Field Agricultural Extension Workers

Field agricultural extension workers play a very important role in empowering farmers and increasing rice production. In Law Number 16 of 2006 concerning the Agricultural, Fisheries, and Forestry Extension System, Article 3 point a, explains that the purpose of extension is to strengthen the development of advanced and modern agriculture, fisheries, and forestry in a sustainable development system. Continued in point e, it explains that the purpose of extension is to develop advanced and prosperous human resources, as the main actors and targets of agricultural, fisheries, and forestry development.

The importance of agricultural extension workers can also be seen from the results of the author's research which shows that many programs from the Food Security and Agriculture Service of Kubu Raya Regency cannot be implemented optimally due to the lack of agricultural extension workers in the field in Kubu Raya Regency, starting from the lack of supervision of farmers, the lack of direct guidance for farmers, to the less than optimal data collection on farmers who need assistance.

The shortage of field agricultural extension workers can be seen from the total number in Kubu Raya Regency. There are only 62 field agricultural extension workers in Kubu Raya Regency, this is clearly not comparable to the number of villages, which is 122 villages. From these data it can be seen that 1 (one) field agricultural extension worker has the burden of handling around 2 (two) villages. With an area of 8,558.37 km^2, this is clearly an obstacle for field agricultural extension workers to be able to carry out their duties optimally.

Low Economic Level of Farmers and Lack of Financial Services

The low level of farmers' economy makes it difficult for farmers to improve the quality of their agriculture. With a low economic level, farmers cannot get quality fertilizers and seeds, as well as modern technology. This can actually be overcome by the existence of agricultural financial services, such as agricultural cooperatives and business capital loans. However, in Kubu Raya Regency itself, agricultural financial services are rare. Of the 122 villages in Kubu Raya Regency, there is only 1 (one) village that has financial services in the form of agricultural cooperatives, namely in Sungai Kakap Village, Sungai Kakap District. This is clearly an obstacle for farmers to be able to develop their rice cultivation.

Low Farmer's Exchange Rate (NTP) for Food Crops

NTP refers to the ratio between the price index of agricultural products received by farmers (It) and the price index issued for production costs (Ib). NTP in Kubu Raya Regency itself can be seen from the following table:

Table 3. Farmer Exchange Rate (NTP) Kubu Raya Regency January 2023

Sector	It (%)	Ib (%)	NTP (%)
Crops	102.61	109.15	94.01
Horticultural Plants	114.55	108.49	105.59
People's Plantation Crops	187.46	108.29	173.11

Source: Department of Food Security and Agriculture of Kubu Raya Regency, 2024

Information: NTP > 100%, farmers have surplus, NTP = 100%, farmers break even NTP < 100%, farmers have a deficit

From the table above, it can be seen that agricultural crops have an NTP of 94.01%, while horticultural crops have an NTP of 105.59%, and people's plantation crops 173.11%. With an NTP of less than 100% indicating that farmers in the food crop sector in Kubu Raya Regency are experiencing losses, farmers' income is smaller than farmers' expenses. This is different from the horticultural and household plantation crop sectors, which have an NTP of more than 100%, indicating that farmers in this sector are making a profit from their agriculture.

This can be caused by the absence of regulations on the determination of production capital prices, such as fertilizers, seeds, and agricultural machinery, while the selling price is set by the government so that it can be affordable for the community. The high cost of production that is not comparable to the income obtained has caused many farmers to switch to planting horticultural crops or people's plantation crops. Thus, rice production can continue to decrease, and can cause a decrease in farmers' motivation to continue cultivating farmers.

Suboptimal Agricultural Facilities Assistance

Agricultural facilities such as agricultural tools, fertilizers, and seeds are important components in the process of effective and efficient agricultural production. However, the lack of agricultural facility assistance can hinder farmers in optimizing their land and increasing yields. In Kubu Raya Regency itself, the assistance provided is still below 50% in the last 3 (three) years. This makes farmers unable to cultivate their rice optimally.

External Inhibiting Factors

Unpredictable Climate and Weather Conditions

Extreme weather fluctuations such as floods, droughts, or changes in seasonal patterns can disrupt rice production. These external climate and weather uncertainties can hinder farmers' efforts to plan and manage production effectively. In Kubu Raya Regency itself, in 2021 there was a prolonged rainy season, which caused many agricultural lands to experience flooding. The flood caused rice in several agricultural lands to die. Because of this, rice production in Kubu Raya Regency has decreased, in addition, pest growth has become more difficult to control.

Difficult to Reach Geographical Conditions

Kubu Raya Regency has an area of 8,558.37 $km^{2,}$ with 9 (nine) sub-districts and 122 villages, and there are 3 (three) large rivers that divide Kubu Raya Regency into 3 (three) parts, namely the northern, central, and southern parts. In the northern part there are 5 (five) sub-districts, namely Sungai Raya Sub-district which is the center of the Regency, Rasau Jaya Sub-district, Sungai Kakap Sub-district, and Sungai Ambawang Sub-district. In the central part there are Teluk Pakedai Sub-district, Kubu Sub-district, and Terentang Sub-district, as well as Batu Ampar Sub-district which is divided into the central and southern parts.

With the existence of a river that stretches and divides Kubu Raya Regency, access must use a small boat to cross the river. In addition, development in Kubu Raya Regency is still focused around the center of the regency, namely in the northern part of the regency, while for the central and southern parts there are still many roads that have not been built. So to access the central and southern areas, in addition to having to cross the river, you also have to pass through plantation roads that are still in the form of red-yellow podzolic soil, which when it rains this road is difficult to pass. This is clearly an obstacle for agricultural extension workers in the field to be able to record and access areas that must be given extension and assistance.

Budget Limitations from Local Government

Farmer empowerment requires significant costs to implement the various programs, activities, and services needed to support farmers in increasing their capacity, technology, and access to the necessary resources. To realize optimal farmer empowerment, investment is needed in various aspects, starting from access to modern agricultural tools and machinery that can increase productivity and efficiency in the production process, training and education programs, development of superior rice varieties, and procurement of agricultural inputs such as seeds, fertilizers, pesticides, and other production materials. Therefore, budgeting and subsidies from the government are needed to help farmers become empowered.

Secretary of the Food Security and Agriculture Service (DKPP) of Kubu Raya Regency stated that currently, assistance for farmers comes mostly from the central government, while budgeting from the Regional Government itself is still relatively small. This statement is also supported by the data in table 4.3, which shows that the assistance given to farmers mostly comes from the APBN or the central government. This causes farmer empowerment in Kubu Raya Regency to not be implemented optimally by DKPP. In addition, the lack of budget can also be seen from the lack of agricultural extension workers in the Food Security and Agriculture Service of Kubu Raya Regency.

Efforts to Optimize Farmer Empowerment through the Rice Production Increase Program by the Food Security and Agriculture Service of Kubu Raya Regency

The Food Security and Agriculture Service (DKPP) of Kubu Raya Regency periodically evaluates each program period, aiming to improve the program and accommodate the ever-changing dynamics of society. Several efforts have been made by DKPP to anticipate and overcome obstacles that arise during the implementation of this empowerment, thus ensuring its sustainability and effectiveness in increasing rice production and farmer welfare.

Efforts to overcome internal inhibiting factors are as follows:

Providing direct training and counseling to farmers through training and counseling, as well as education about rice cultivation through seminars. The technique is to invite representatives of all farmer groups or farmer group associations, who will later be given training and counseling, as well as education about rice cultivation. It is hoped that these representatives can deliver training and counseling, as well as education to their members.

Maximizing the provision of assistance that can reduce farmers' production costs. This is done with the aim of easing the burden on farmers and also increasing the NTP. In addition, the government also has a policy for State Civil Apparatus at DKPP to buy local rice. This policy is intended to encourage local rice consumption among State Civil Apparatus (ASN) at DKPP, thereby creating consistent demand for local rice products. With steady demand from ASN, the local rice market will become more stable. This is expected to reduce price fluctuations and risks faced by farmers, as well as create a more sustainable business environment for them.

To improve the availability of financial services, there is not much that DKPP can do. So far, the Department can only provide education to farmers about the importance of agricultural cooperatives and agricultural insurance. This is done to encourage farmers to form their own agricultural cooperatives independently, which later the cooperative is expected to accommodate the sale of agricultural products.

Efforts to overcome external inhibiting factors are as follows:

The Food Security and Agriculture Service (DKPP) of Kubu Raya Regency maximizes assistance in the form of water pumps to regulate water supply. This allows farmers to pump water into their fields during the dry season and pump water out of the fields during the rainy season. However, this effort has not been fully implemented due to the limited budget available.

To overcome the challenges faced due to difficult geographical conditions, DKPP is currently limited in the options that can be taken. One step that can be taken is to maximize the role of field agricultural extension workers to provide direct extension to farmers. In addition, the agency also organizes seminars and training by inviting representatives from farmer groups or farmer group associations.

In the face of budget constraints, the Agency allocates the budget according to the priorities that have been set. This approach aims to improve sectors that are considered more important and provide assistance to farmers who are considered to have more urgent needs. In addition, the policy of requiring ASN to buy rice produced by local farmers can help create a stable and guaranteed market for local agricultural products. This can reduce the pressure on the government budget that must be allocated for subsidies or direct assistance to farmers. In addition, this policy can also directly increase farmers' incomes, because they can sell their products at better prices than if they had to rely on conventional markets. Thus, this policy not only helps increase farmers' economic independence, but can also reduce the burden on the government budget in the long term.

Conclusion

This study shows that farmer empowerment in Kubu Raya Regency through a rice production increase program by the Food Security and Agriculture Service still faces various obstacles. Although there are efforts to increase production through training and extension, challenges such as the small number of agricultural extension workers, limited budget, and land conditions which are mostly marginal land are the main obstacles. In addition, low access to financial services by farmers also worsens the situation, making it difficult for farmers to access the production facilities needed to increase yields.

These empowerment efforts show that, although the program has been implemented by considering the dimensions of enabling, strengthening, and supporting, its effectiveness has not been optimal. As a solution, the agency has taken several steps such as training, seminars, and providing agricultural facilities to reduce the burden of farmer production. In addition, the use of local policies to increase demand for local rice is expected to support price stability. However, to achieve economic independence for farmers and increase rice production, a larger budget allocation and an increase in the number of field extension workers are needed so that the empowerment program can be sustainable and more effective.

References

Ahmadzai, H., Tutundjian, S., & Elouafi, I. (2021). Policies for sustainable agriculture and livelihood in marginal lands: a review. *Sustainability, 13*(16), 8692. https://doi.org/10.3390/su13168692

Ahmed, U., Lin, J. C. W., Srivastava, G., & Djenouri, Y. (2021). A nutrient recommendation system for soil fertilization based on evolutionary computation. *Computers and Electronics in Agriculture*, *189*, 106407. https://doi.org/10.1016/j.compag.2021.106407

Ar-Rozi, A. M., Suryani, E., Adawiyah, C. R., Dabukke, F. B., & Sarwani, M. (2024). Strategy to accelerate the implementation of sustainable food agricultural land protection regulations. In *BIO Web of Conferences* (Vol. 119, p. 05002). EDP Sciences. https://doi.org/10.1051/bioconf/202411905002

Barłóg, P., Grzebisz, W., & Łukowiak, R. (2022). Fertilizers and fertilization strategies mitigating soil factors constraining efficiency of nitrogen in plant production. *Plants*, *11*(14), 1855. https://doi.org/10.3390/plants11141855

Behzad, H. M., Arif, M., Duan, S., Kavousi, A., Cao, M., Liu, J., & Jiang, Y. (2023). Seasonal variations in water uptake and transpiration for plants in a karst critical zone in China. *Science of The Total Environment*, *860*, 160424. https://doi.org/10.1016/j.scitotenv.2022.160424

Campenhout, B. V. (2021). The role of information in agricultural technology adoption: Experimental evidence from rice farmers in Uganda. *Economic Development and Cultural Change*, *69*(3), 1239-1272.

Csikós, N., & Tóth, G. (2023). Concepts of agricultural marginal lands and their utilisation: A review. *Agricultural Systems*, *204*, 103560. https://doi.org/10.1016/j.agsy.2022.103560

Giller, K. E., Delaune, T., Silva, J. V., Descheemaeker, K., van de Ven, G., Schut, A. G., ... & van Ittersum, M. K. (2021). The future of farming: Who will produce our food?. *Food Security*, *13*(5), 1073-1099. https://doi.org/10.1007/s12571-021-01184-6

Goswami, S. B., Mondal, R., & Mandi, S. K. (2020). Crop residue management options in rice–rice system: a review. *Archives of Agronomy and Soil Science*, *66*(9), 1218-1234. https://doi.org/10.1080/03650340.2019.1661994

Handayani, I. G. A. K. R., & Karjoko, L. (2020, May). Space Planning Oriented Toward the Realization of Sustainable Food Agriculture Land in Banyumas Regency. In *International Conference on Law, Economics and Health (ICLEH 2020)* (pp. 741-747). Atlantis Press. https://doi.org/10.2991/aebmr.k.200513.140

Handono, S. Y., Hidayat, K., & Purnomo, M. (2020). *Pemberdayaan Masyarakat Pertanian*. Universitas Brawijaya Press.

Hussain, S., Huang, J., Huang, J., Ahmad, S., Nanda, S., Anwar, S., ... & Zhang, J. (2020). Rice production under climate change: adaptations and mitigating strategies. *Environment, climate, plant and vegetation growth*, 659-686. https://doi.org/10.1007/978-3-030-49732-3_26

Macrae, G., & Reuter, T. (2020). State of the grain: grain of the state: The political and moral economy of rice in Indonesia. In *Shifting States* (pp. 78-94). Routledge. https://doi.org/10.4324/9781003086673

Mallareddy, M., Thirumalaikumar, R., Balasubramanian, P., Naseeruddin, R., Nithya, N., Mariadoss, A., ... & Vijayakumar, S. (2023). Maximizing water use efficiency in rice farming: A comprehensive review of innovative irrigation management technologies. *Water*, *15*(10), 1802. https://doi.org/10.3390/w15101802

Mao, H., Zhou, L., Ying, R., & Pan, D. (2021). Time Preferences and green agricultural technology adoption: Field evidence from rice farmers in China. *Land Use Policy*, *109*, 105627. https://doi.org/10.1016/j.landusepol.2021.105627

Pickson, R. B., He, G., & Boateng, E. (2021). Impacts of climate change on rice production: evidence from 30 Chinese provinces. *Environment, Development and Sustainability*, 1-19. https://doi.org/10.1007/s10668-021-01594-8

Rachman, B., Ariningsih, E., Sudaryanto, T., Ariani, M., Septanti, K. S., Adawiyah, C. R., ... & Yuniarti, E. (2022). Sustainability status, sensitive and key factors for increasing rice production: A case study in West Java, Indonesia. *Plos One*, *17*(12), e0274689. https://doi.org/10.1371/journal.pone.0274689

Rachman, L. M., Saleh, A., Wetik, J. D., Palahudin, P., Ardiana, A., & Chaniago, E. (2023, May). Land consolidation challenges to improve farm management through the establishment of rice estate community. In *AIP Conference Proceedings* (Vol. 2596, No. 1). AIP Publishing. https://doi.org/10.1063/5.0119441

Scavo, A., Fontanazza, S., Restuccia, A., Pesce, G. R., Abbate, C., & Mauromicale, G. (2022). The role of cover crops in improving soil fertility and plant nutritional status in temperate climates. A review. *Agronomy for Sustainable Development*, *42*(5), 93. https://doi.org/10.1007/s13593-022-00825-0

Selim, M. M. (2020). Introduction to the integrated nutrient management strategies and their contribution to yield and soil properties. *International Journal of Agronomy*, *2020*(1), 2821678. https://doi.org/10.1155/2020/2821678

Sembiring, M. Y. (2024). Historical institutionalist analysis of low-carbon energy transition in the Philippines and Indonesia. https://doi.org/10.32657%2F10356%2F180851

Shang, J., Liu, J., Poncos, V., Geng, X., Qian, B., Chen, Q., ... & Walters, D. (2020). Detection of crop seeding and harvest through analysis of time-series Sentinel-1 interferometric SAR data. *Remote Sensing*, *12*(10), 1551. https://doi.org/10.3390/rs12101551

Siregar, S. D., Toni, N., & Ariesa, Y. (2023). Impact of dividend policy, capital structure, and profitability on consumer goods firm value: Role of firm size (2013-2022). *Journal of Economics and Business Letters*, *3*(4), 38-48. https://doi.org/10.55942/jebl.v3i4.234

Stringer, L. C., Fraser, E. D., Harris, D., Lyon, C., Pereira, L., Ward, C. F., & Simelton, E. (2020). Adaptation and development pathways for different types of farmers. *Environmental Science & Policy*, *104*, 174-189. https://doi.org/10.1016/j.envsci.2019.10.007

Sun, H., Feng, Y., Xue, L., Mandal, S., Wang, H., Shi, W., & Yang, L. (2020). Responses of ammonia volatilization from rice paddy soil to application of wood vinegar alone or combined with biochar. *Chemosphere*, *242*, 125247. https://doi.org/10.1016/j.chemosphere.2019.125247

Suprapto, T. (2009). *Pengantar teori & manajemen komunikasi*. Media Pressindo.

Tufaila, M., Laksana, D. D., & Alam, S. (2014). Aplikasi kompos kotoran ayam untuk meningkatkan hasil tanaman mentimun (Cucumis sativus L.) di tanah masam. *Jurnal Agroteknos*, *4*(2), 244107.

Xin, F., Xiao, X., Dong, J., Zhang, G., Zhang, Y., Wu, X., ... & Li, B. (2020). Large increases of paddy rice area, gross primary production, and grain production in Northeast China

during 2000–2017. *Science of the Total Environment*, *711*, 135183. https://doi.org/10.1016/j.scitotenv.2019.135183

Yuan, S., Linquist, B. A., Wilson, L. T., Cassman, K. G., Stuart, A. M., Pede, V., ... & Grassini, P. (2021). Sustainable intensification for a larger global rice bowl. *Nature communications*, *12*(1), 7163. https://doi.org/10.1038/s41467-021-27424-z