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# Strategies to Achieve Food Sovereignty (Rice): Lesson from Agricultural Development in Bali Province, Indonesia

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## ABSTRACT

In Indonesia and several developing countries, the agricultural sector plays a very significant role in economic development. Food (rice) in Indonesia is the most basic need because it is the main staple food. Currently, Indonesia's food security has been achieved but is still determined by rice imports from several countries. Therefore, the development strategy is directed at realizing food sovereignty. Various problems and challenges to increase the productivity and quality of rice in Indonesia due to the influence of climate change. degradation of forest function as a buffer for irrigation water, pest and disease attacks, and also the conversion of rice fields. This study aims to describe the various problems and challenges faced by farmers in realizing food sovereignty, and to formulate strategies towards food sovereignty. The results of study pointed out that some of the problems and challenges faced by farmers related to achieving rice sovereignty are related to: (i) degradation of natural resources; (ii) Limited access to agricultural inputs and tools/machines; (iii) Limited access to knowledge and skills related to agribusiness. Several strategies need to be carried out by farmers, the government, and other stakeholders to achieve food sovereignty. Some of them are: Ensuring the availability of irrigation water; controlling the conversion of rice fields; smart farming: increasing productivity and product quality; improving the quality of human resources; Inclusive agricultural business; and developing an agribusiness system, farmer protection and empowerment, and food diversification. In the future, integration and synergy efforts between sectors are needed to build a strong agricultural ecosystem from upstream to downstream so that food sovereignty can be achieved more easily and quickly.

**Keywords:** Agriculture, productivity, food security, food sovereignty, agribusiness

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## 1. INTRODUCTION

In developing countries including Indonesia, the role of the agricultural sector is very significant in national and regional economic development (Trentinaglia et al, 2023; Kaya et al. 2013; Christiaensen and Martin, 2018). The agricultural sector plays a role in providing food, food ingredients for humans, and animal feed, providing raw materials for the industrial sector, becoming consumers of products produced by upstream and downstream industries (Sedana et al, 2025)). In addition, the agricultural sector also plays a role in providing employment opportunities and sources of income for farmers and non-farmers (Sedana, 2023). Therefore, the role of the agricultural sector is very strategic in supporting the national economy, especially in realizing food security, food independence and food sovereignty which also supports the achievement of sustainable development goals (SDGs), such as overcoming hunger and poverty. Increasing the competitiveness of agricultural products is one of the triggers for encouraging the growth of downstream agro-industry (processing, storage, transportation and marketing industries) in order to realize the goals of agriculture and economic development at the national level.

**Journal of Sustainable Development Science**
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Food is the most basic need for a country's population within developing countries. Indonesia, food is often identified with rice because this type of food is the main staple food. The Indonesian government has been importing rice from several countries such as Vietnam, China, Thailand and others for decades. This condition can make a negative impact on national food security and also affect the community to obtain food (rice) for their daily life. Food sovereignty is the people's basic right to food so that the government must be able to realize the availability of food independently or known as food independence. In the concept of food security, the government must be able to fulfil its obligations to the people related to food, such as availability, affordability, food security, and .... In addition to being a human right, food also has a strategic role for a country because it can affect the social, economic, and political conditions of the country.

Experience has shown us that disruptions to food security such as the skyrocketing price of rice during the 1997/1998 economic crisis, which developed into a multidimensional crisis, have triggered social vulnerabilities that endanger economic stability and national stability. The strategic value of rice is also due to the fact that rice is the most important staple food. The rice industry has a major influence in the economic sector (in terms of labour absorption, growth and dynamics of the rural economy, as a wage good), the environment (maintaining water use and air cleanliness) and socio-politics, as a glue for the nation, realizing order and security (Jain and Bardan, 2023). Rice is also the main source of nutritional fulfilment which includes calories, protein, fat and vitamins.

So far, Indonesia has been able to achieve food security through various agricultural development programs. However, food security is still also determined by the import of rice from several countries (Atuoye *et al.*, 2017). Therefore, the government will change the national development strategy, especially in agriculture, namely to realize food sovereignty. Food sovereignty is the right of every country to control its national food system, including food production, distribution, and consumption, as well as the right to determine food policies according to the conditions and needs of its people. This means that the country is no longer fully dependent on food imports and can produce its own food independently. Various problems and challenges continue to haunt the productivity, production and quality of rice in Indonesia as a result of climate change that affects the condition of forest areas as irrigation water buffers, pests and diseases, conversion of rice fields and so on (Gina *et al*, 2023). Water limitations caused by damaged conditions in upstream areas or forest areas can result in vulnerability to water security, including irrigation water. This study aims to reveal various problems and challenges faced by farmers in realizing food sovereignty, and to formulate strategies towards food sovereignty.

## 2. METHODS

This study was conducted in Bali Province as one of the provinces in Indonesia. The selection of this location was carried out by purposive sampling with the consideration that: (i) Bali is a small island that has agricultural natural resources and has the potential to realize food sovereignty; and (ii)

**Journal of Sustainable Development Science**
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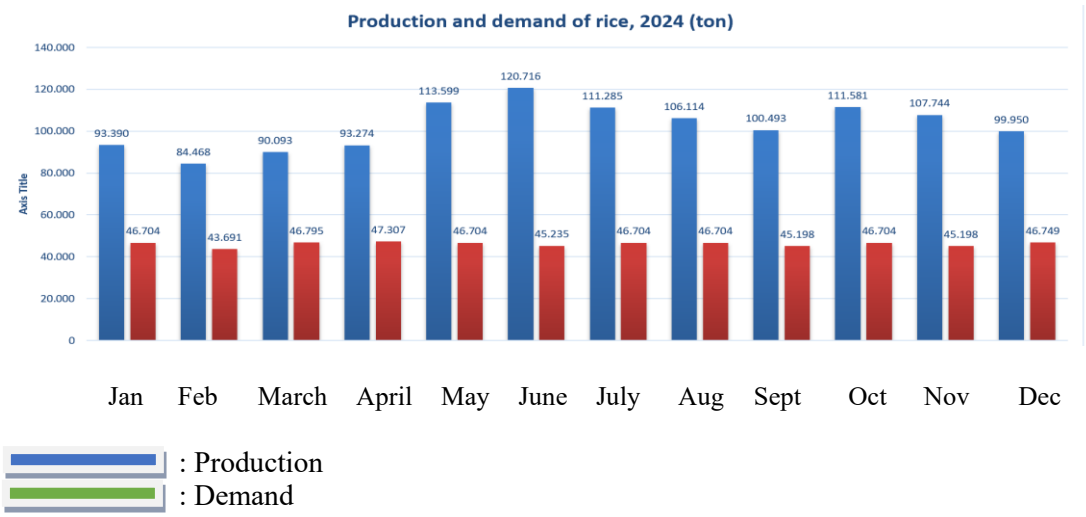
Bali as an international tourism area which is a challenge for the agricultural sector to realize food sovereignty. The data and information collected are secondary data obtained from various research documents and statistical data. In addition, this study also approaches experts to gain information and studies on food sovereignty. Data were analysed using descriptive methods.

## 3. RESULT AND DISCUSSION

The population of Bali is increasing along with the increase in domestic and foreign tourists, which is estimated to reach 8 million people. The increase in population affects the demand for food (rice), so that rice supplies are imported from other provinces. On the other hand, the conversion of agricultural land in Bali is relatively high. In 2017, the area of rice fields in Bali was 78,628 ha, and currently (2024) the area is getting smaller, namely ha. 71,890 ha. This means that there has been a land conversion of 6,738 ha.

The condition of rice in Bali until 2024 is still a surplus because the supply comes from the harvest of local farmers in Bali and from other islands, such as Java (especially East Java Province), and Lombok. The conditions of rice production and consumption needs in Bali can be seen in Figure 2.




Sources : Bali Statistic Agency, 2024

Fig. 2 Production and demand of rice, 2024

One interesting fact is the lack of interest of the younger generation to work in rice farming. They prefer to work in the tourism sector because the income from the agricultural sector (rice farming) is lower than from work in the tourism sector.

### *3.1 Problems and Challenges of Food Sovereignty Captions*

Figures Indonesia, which has a tropical climate and two seasons, greatly influences agricultural conditions, such as rice plants. In addition, the geographical conditions of the Indonesian region also affect the productivity of rice cultivated by farmers. Based on various experiences and study results, there are several problems and challenges faced by farmers and the Indonesian government in realizing food sovereignty, such as rice as stapple food.

**Journal of Sustainable Development Science**
Vol. 7, No. 1, June 2025, pp. 19-28
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The problems and challenges that are always faced in managing rice farming regarding the realization of food sovereignty in several decades must be the main concern of farmers and the government and other stakeholders. Some problems and challenges encountered relating to achievement of rice sovereignty relate to: (i) degradation of natural resources; (ii) Limited access to agricultural inputs and tools/machines; (iii) Limited access to knowledge and skills related to agribusiness.

*3.1.1 Degradation of natural resources*

The natural resources that are a problem and challenge in the rice production process are land and water. The area of rice fields planted with rice is decreasing due to land conversion, especially in areas located near centres of economic growth. The increasingly narrow area of rice fields affects the total amount of national production because the productivity of rice managed by farmers is relatively stable, namely with an average of 6.5 tons/ha. If this land conversion condition cannot be controlled, then the achievement of food sovereignty will be hampered, unless farmers have been introduced to modern rice farming technology, such as seeds that have high productivity, and are resistant to climate change and pests or diseases.

Water availability also has a significant effect on the productivity of rice produced by farmers. Climate change that occurs globally also has an impact on water availability in Indonesia (Sedana, 2024). Limited water at the source level (river) during the dry season often causes conflicts between farmers, and conflicts between farmers and other users, such as drinking water companies, the tourism industry and others. Competition for water use between users is the next problem and has an impact on rice productivity. Population and economic growth in Indonesia, both in cities and villages, has contributed significantly to land use and water use. In addition, the quality of soil in rice fields and water has also been damaged or degraded. Agricultural lands are increasingly declining in fertility due to the very large and massive use of chemical fertilizers and pesticides. The decline in water quality is caused by environmental damage to water sources and irrigation channels. Water pollution has reached the threshold of tolerance.

*3.1.2. Limited access to agricultural inputs and tools/machines*

Increasing productivity and quality of agricultural products (rice) is greatly influenced by the production process carried out by farmers. In Indonesia, most farmers who work on rice farms have the status of sharecroppers. In addition, the rice fields worked by farmers are relatively narrow with an average of 0.3 ha. The narrow area of land worked by farmers is also accompanied by their limited access to agricultural inputs because the prices are relatively expensive and there are often delays in the distribution of fertilizers to the farmer level. Currently, farmers do not use modern agricultural equipment, except for tractors to cultivate the land in their rice fields. As a consequence of this condition, farmers face difficulties in increasing the productivity and quality of their rice.

*3.1.3 Limited access to knowledge and skills related to agribusiness*

Problems and challenges that can affect the achievement of food sovereignty are the knowledge and skills of farmers and farmer groups in carrying out agribusiness-

**Journal of Sustainable Development Science**
Vol. 7, No. 1, June 2025, pp. 19-28
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oriented economic activities. Observations in various regions in Bali and Indonesia show that farmers who work in rice farming have knowledge and skills about agribusiness in the low category. Farmers still apply technology or farming practices according to their habits and experiences. The management of rice farming is not carried out in an integrated system from pre-production to marketing of its products. Most farmers in Indonesia, including in Bali, do not process their rice, but they prefer to sell it to local traders who buy it directly in the rice fields, namely when the rice is not yet ready to be harvested. Farmers do not yet understand the concept of the agribusiness system, especially post-harvest activities, such as processing and marketing. This condition results in the price of rice received by farmers being lower than the market price, so that their income remains relatively low. The relatively low income of farmers can affect the sustainability of rice farming and have consequences for hampering the achievement of food sovereignty goals.

*3.2 Strategies to Achieve Food Sovereignty*

Considering the problems and challenges as mentioned above, several strategies need to be carried out by farmers, government and other stakeholders to achieve food sovereignty. Some of them are: Ensuring the availability of irrigation water; Control of rice field conversion; Smart farming: Increasing productivity and quality of products; Improving the quality of human resources; inclusive agricultural business; and Developing agribusiness system.

*3.2.1 Ensuring the availability of irrigation water*

The availability of irrigation water and its quality are vital for the development of the agricultural sector, especially in rice fields. Plant growth from the beginning of planting to harvest is determined by the availability of irrigation water (Nkhoma, 2011). Climate change that occurs globally is one of the challenges and at the same time a threat if not anticipated through mitigation and adaptation (Campbell *et al.*, 2016; Connolly and Smit, 2016; Jambo et al. 2021). Various efforts that need to be made to ensure the availability of irrigation water are; (i) conservation of water sources, such as lakes, springs, rivers; (ii) conservation of forests as water catchment areas, and watersheds; (iii) preventing and controlling sedimentation in lakes, rivers; (iv) implementing good agricultural practices in upstream or mountainous areas; (v) building dams; and (v) law enforcement in upstream areas as buffer zones. In addition, the available water can be used by farmers through their groups or water users' associations, which in Bali are known as subak (traditional irrigation systems). The government through the Water Resources Section must prepare a water balance throughout the year, water allocation among water users (irrigation and non-irrigation including drinking water needs, companies, tourism and other needs). Water balance and water allocation documents are very important to avoid conflicts between water users, so that irrigation water availability can be guaranteed according to needs.

*3.2.2 Controlling of rice field conversion*

The rate of conversion of rice fields to non-agricultural uses has been increasing from year to year. To control it, the Government has issued Presidential Regulation Number 59 of 2019 concerning the Control of Rice Field Conversion. This Presidential

**Journal of Sustainable Development Science**
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e-ISSN: 2715-9140 **|** p-ISSN: 2722-919X

Regulation is the legal umbrella for the implementation of controlling the conversion of rice fields. The issuance of Presidential Regulation 59 of 2019 aims to: (1) accelerate the determination of protected rice field maps in order to meet and maintain the availability of rice fields to support national food needs; (2) control the increasingly rapid conversion of rice fields; (3) empower farmers not to convert rice fields; and (4) provide data and information on rice fields as material for determining sustainable food agriculture land. This Presidential Regulation then mandates the formation of an Integrated Team tasked with synchronizing verification results and proposing Protected Rice Fields.

#### *3.2.3 Smart farming: Increasing productivity and quality of products*

With the increasing development of technology, management in the agricultural sector must also be able to apply modern technology to increase productivity and product quality and have strong competitiveness. The modern agricultural system begins with improving the quality and capacity of human resources (farmers, agricultural extension workers, etc.) to produce innovation, ideas, and creativity regarding increasing productivity and product quality. In addition, advanced human resources are highly expected to be able to use and apply digital-based agricultural technology, such as smart farming or smart agriculture. Some elements found in modern agriculture that use smart farming are: (i) use of superior agricultural inputs; (ii) use of mechanization; (iii) application of digital-based agricultural technology; (iv) innovation and creativity of human resources; and (v) commercialization of agriculture. The use of smart farming is expected to be able to provide a significant contribution to increasing productivity and better product quality that are competitive and have comparative advantages and high economic value. Therefore, food sovereignty will also be achieved while increasing farmers' income and maintaining environmental sustainability.

#### *3.2.4 Improving the quality of human resources*

Human resources are a very important factor in agricultural development, especially in achieving food sovereignty. At the lowest level, producer farmers who actively carry out farming activities must have their capacity increased (aspects of irrigation and farming techniques, management, finance and agribusiness). Improving their capacity is expected to encourage a transformation in farming orientation, namely from subsistence to commercial, profit-oriented. Agricultural extension workers must also always update their capacity in accordance with changes in science and technology and the dynamics of the agricultural product market and climate change that occurs. Choices of communication media are also important for them to use to convey messages about agricultural practices to farmers. Agricultural extension workers are also expected to have the ability to use advanced or modern digital-based technology to facilitate the delivery of messages and understanding of messages for farmers. At a higher level, such as officials at the Agricultural Office at the district, provincial and central (national) levels, they are also required to have good quality in formulating innovative and productive policies that lead to food sovereignty.

**Journal of Sustainable Development Science**
Vol. 7, No. 1, June 2025, pp. 19-28
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*3.2.5 Inclusive agricultural business*

One way to realize sustainable agricultural development is to build an inclusive agricultural business that integrates and synergizes market actors according to the agreed business model. In the rice sub-sector, this inclusive agricultural business involves several market actors, including farmers/farmer groups, rice milling units, financial institutions, processing units, government, wholesalers, retailers and consumers. All market actors must share roles and responsibilities to build a smooth flow of goods, services, and money based on the established business model. This means that among the actors, they do not merely carry out product and money transactions, but also provide technical guidance to farmers related to products needed by the market, such as types of rice, packaging sizes and other responsibilities. Through this inclusive agricultural business, market actors will gain proportional profits, which will guarantee that their cooperation based on their business model will be able to run sustainably.

*3.2.6 Developing agribusiness system*

Achieving food sovereignty is not solely influenced by the availability of irrigation water and rice fields, but is also greatly determined by the quality and capacity of human resources, especially farmers and farmer groups. Farmers and farmer groups are required to be able to master and implement an agribusiness system to achieve food sovereignty. The agribusiness system includes five subsystems, namely the subsystem of providing inputs and agricultural tools and machinery; production or on-farm; processing, marketing and support. The agricultural inputs needed are good and certified seeds/seedlings to ensure increased productivity and quality of rice plants. This means that farmers and farmer groups must have the capacity to select and use good seeds/seedlings and at the same time how to plant them. In addition, achieving food sovereignty also requires farmer skills to use or operate agricultural equipment or machinery, such as tractors, drones, transplanting machines, rice threshers and so on. These skills will make a significant contribution to plant growth to produce higher production and better quality.

In addition, knowledge and skills in the use of fertilizers are also important factors that must be considered by farmers to increase productivity and quality. Other factors that must also be a concern for farmers are knowledge about processing and marketing of agricultural products, rice produced. Good rice processing with the right methods or techniques will be able to provide added value to the processed product. Moreover, the processed product is accompanied by good branding to attract consumers to buy it. The marketing subsystem concerning product determination, such as processing, packaging is one of the marketing strategies that must be carried out. In addition, the strategy needed for good marketing is related to pricing, product distribution and promotion. In principle, this processing and marketing subsystem contains the concept of four uses, namely form use, time use, place use and property use.

Meanwhile, the supporting subsystem includes the provision of irrigation water, transportation, agricultural extension, agricultural credit, agricultural insurance, government policies. This subsystem also greatly influences the success in realizing food sovereignty. Agribusiness as a system requires that the achievement of food sovereignty must be carried out through the

**Journal of Sustainable Development Science**
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integration of all existing subsystems as a whole unit.

*3.2.7 Farmer protection and empowerment*

Farmer protection is all efforts to help farmers in facing the problems of difficulty in obtaining infrastructure and means of production, business certainty, price risks, crop failures, high-cost economic practices, and climate change. Farmer empowerment is all efforts to improve farmers' ability to carry out better farming businesses through education and training, extension and assistance, development of agricultural product marketing systems and facilities, consolidation and guarantee of agricultural land area, easy access to science, technology and information, and strengthening farmer institutions.

Farmer protection and empowerment aims to: (i) realize farmer sovereignty and independence in order to improve welfare, quality, and a better life; (ii) provide agricultural infrastructure and facilities needed in developing farming businesses; (iii) provide certainty of farming businesses; (iv) protect farmers from price fluctuations, high-cost economic practices, and crop failures; (v) improve the ability and capacity of farmers and farmer institutions in carrying out productive, advanced, modern and sustainable farming businesses; and (vi) developing agricultural financing institutions that serve the interests of agricultural businesses.

Farmer protection strategy is carried out through agricultural infrastructure and production facilities. business certainty; and guarantee of agricultural commodity prices . Besides, the protection might be conducted through elimination of high-cost economic practices, compensation for crop failure due to extraordinary events, early warning system and handling of climate change impacts, and agricultural Insurance. Meanwhile, some strategies for the farmer empowerment include the implementation of agricultural education, extension and training, development of agricultural product marketing systems and facilities, and consolidation and guarantee of agricultural land area. The other strategies needed are provision of financing and capital facilities, ease of access to science, technology, and information, and strengthening of farmer Institutions.

*3.2.8 Food diversification*

Food diversification is an effort to increase the diversity of types of food consumed by the community, in order to avoid dependence on one staple food, namely rice. Food diversification is part of the food security, nutrition and community welfare program in an effort towards food sovereignty. In addition, food diversification also aims to reduce dependence on food imports, and on the other hand can increase the utilization of local food potential. The absence of dependence on one type of food, food diversification is one of the efforts to overcome the risk of food shortages in certain periods, especially when food production decreases due to natural disasters and other factors. Food diversification that is carried out can encourage an increase in the utilization of local food resources and the use of better production technology and post-harvest techniques including local food processing that has added value and higher product competitiveness.

## 4. CONCLUSIONS

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Vol. 7, No. 1, June 2025, pp. 19-28
e-ISSN: 2715-9140 **|** p-ISSN: 2722-919X

Some of the problems and challenges faced by farmers in Bali related to food production in an effort to achieve food sovereignty are: (i) degradation of natural resources, such as land and water; (ii) limited access to agricultural inputs and agricultural tools/machines; (iii) limited access to knowledge and skills about the agribusiness system. The strategies needed to overcome these problems and challenges must be implemented to achieve the goal of food sovereignty. Some of these strategies are: ensuring the availability of irrigation water; controlling the conversion of rice fields; smart farming: increasing the productivity and quality of food products and their processing; improving the quality of human resources; inclusive agricultural business; developing an agribusiness system, and farmer protection and empowerment, as well as food diversification.

In the future, an integrated program and synergy between sectors are needed to build an agricultural ecosystem from upstream to downstream so that food sovereignty can be achieved more easily and quickly.

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**Journal of Sustainable Development Science**
Vol. 7, No. 1, June 2025, pp. 19-28
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