International Review of Practical Innovation, Technology and Green Energy (IRPITAGE) | ISSN (e): 2808-8611
Volumes 5 No. 1 (2025)

SUSTAINABLE AGRICULTURE UTILIZATION IN MAINTAINING BIODIVERSITY AND PLANT PRODUCTIVITY IN BATU BAJANJANG VILLAGE

Azmen Kahar[1], Hermansyah[2], Khairani Saladin[3], Vischa Mansyera Pratama[4], Anggun Kurniati[5], Jefriyan Putra Deska[6], Muhammad Althof Fauzan Zain[7], Nasywa Farhanah Izan[8]
[1, 2, 3, 4, 5,6,7,8] Universitas Negeri Padang, Indonesia
azmen.kahar@fpp.unp.ac.id[1], hermansyah@fpp.unp.ac.id[2],
khairanisaladin@fpp.unp.ac.id[3] , vischamansyera@fpp.unp.ac.id[4],
Anggunkurniati812@gmail.com[5] jefrianfilter@gmail.com[6],
althoffauzan216@gmail.com[7], nasywafarhanah167@gmail.com[8]

Received	: 20 April 2025	Published	: 30 June 2025
Revised	: 29 April 2025	DOI	: https://doi.org/10.54443/irpitage.v5i1.3398
Accepted	: 17 May 2025	Link Publish	: https://radjapublika.com/index.php/IRPITAGE/

Abstract

This study examines the implementation of sustainable agriculture in Nagari Batu Bajanjang, focusing on efforts to maintain biodiversity and increase crop productivity. Nagari Batu Bajanjang has great potential in agricultural development. This study analyzes the transformation from a conventional agricultural system that still relies on monoculture practices and the use of chemicals, to a sustainable agricultural system. The implementation of sustainable agriculture is carried out through several main strategies, including crop diversification, the application of an agroforestry system, the use of organic fertilizers, and the development of a modern irrigation system. The results of the study indicate that the implementation of sustainable agriculture has a positive impact in three main aspects: increasing biodiversity, improving long-term land productivity, and increasing farmer income. The success of this implementation requires active collaboration between local governments, research institutions, and local farmer communities.

Keywords: ***sustainable agriculture, biodiversity, crop productivity, agroforestry, Nagari Batu Bajanjang, crop diversification.***

INTRODUCTION

The agricultural sector is a potential sector that can play an important role in the economic development of a country, especially in developing countries where most of the territory is agricultural. The agricultural sector absorbs the largest workforce compared to other sectors. In 2020, the agricultural sector employed 38.23 million people out of a total workforce of 128.45 million people. The agricultural sector consists of several sub-sectors, such as food production, horticulture, plantation production, fisheries, livestock, and forestry (Central Bureau of Statistics, 2020). The agricultural sector is a key player in employment opportunities, supply, and Labor is the driving force behind development in both areas. This will increase purchasing power not only for raw materials and food but also for products from other sectors. Of course, economic development must be supported by the development of a strong agricultural sector, both from the demand and supply sides. On the demand side, strong agriculture should create latent demand for the products of the agricultural sector itself, or for products of other activities that are not produced in other sectors. On the supply side, the agricultural sector can generate a production surplus that benefits producers (Charles et al., 2018).

Nagari Batu Bajanjang, located in Jorong Limau Puruik, is an area rich in natural resource potential, especially in the agricultural, plantation, and livestock sectors. This area has a supportive topography, with fertile soil and a tropical climate that is ideal for various types of crops and livestock businesses. These geographical conditions make Nagari Batu Bajanjang one of the areas that contributes significantly to local economic development (Central Statistics Agency, 2022). Agriculture in Nagari Batu Bajanjang is dominated by commodities such as rice, corn, and vegetables. Farmers rely on traditional farming methods, which have been passed down from generation to generation. However, challenges such as access to modern technology and marketing of crops are still obstacles

that need to be overcome. According to the Central Statistics Agency (2022), the agricultural sector in rural areas of Indonesia contributes more than 13% to Gross Domestic Product (GDP), but still faces various structural obstacles. In the plantation sector, Nagari Batu Bajanjang has great potential in cultivating crops such as oil palm, cocoa, and coffee. These crops are not only the main source of income for the community, but also have promising export opportunities. For example, according to a report from the Ministry of Agriculture (2023), Indonesia's cocoa exports have increased by 10% in the last decade, indicating that global demand continues to grow.

In addition, livestock is an equally important sector in Nagari Batu Bajanjang. Many local people raise cattle, goats, and poultry as additional sources of income. However, low access to modern livestock training and management often limits the productivity and efficiency of livestock businesses in this area. This is in line with the findings of Sutanto (2021), which states that technical training has a positive influence on livestock productivity in rural areas. To optimize this potential, collaborative efforts are needed between the government, the community, and the private sector. Steps such as the provision of modern technology, training, and opening market access can be a solution to increase the productivity and welfare of the community in Nagari Batu Bajanjang (Ministry of Agriculture, 2023). Specifically in Jorong Limau Puruik, there are several community initiatives in developing the agricultural and plantation sectors sustainably. One of these initiatives is a program to utilize idle land into productive land by planting high-value horticultural crops such as chilies and tomatoes.

This program not only increases farmers' income but also reduces dependence on primary commodities such as rice and corn. For example, farmer groups in this area reported an increase in chili harvests of up to 30% in the last two years (Ministry of Agriculture, 2023). In the livestock sector, the Jorong Limau Puruik community has begun to adopt an integrated livestock system that combines livestock farming with the use of organic waste as fertilizer. This system is not only environmentally friendly but also increases production efficiency. For example, waste from cattle farms is used to produce biogas, which is used by the community as an alternative energy source. According to Sutanto (2021), the implementation of this system can reduce operational costs by up to 20% while increasing livestock productivity. However, although various initiatives have been carried out, the development of the agricultural, plantation, and livestock sectors in Nagari Batu Bajanjang still requires greater support from the government and private sector. Providing access to modern technology, ongoing assistance, and opening wider distribution channels are top priorities to maximize the potential of this area. Close collaboration between various parties is expected to be able to create an ecosystem that supports sustainable local economic growth (Central Bureau of Statistics, 2022).

RESEARCH METHODS

This study uses a qualitative approach with descriptive methods through field observation and interviews. The study was conducted in Nagari Batu Bajanjang, Jorong Limau Puruik, Lembang Jaya District, Solok Regency. The study was conducted in Nagari Batu Bajanjang, Jorong Limau Puruik, Lembang Jaya District, Solok Regency. This location was chosen because it has significant agricultural potential with an altitude of 1,458 to 1,600 meters above sea level. Observations were made during the KKN implementation period in the area. Observations were made to directly observe agricultural conditions in Nagari Batu Bajanjang, with a focus on observations on: (1) Geographical and topographic conditions of agricultural land, including land height, slope, and soil type, (2) Agricultural practices applied by farmers, including planting systems, fertilizer use, and pest control, (3) Types of plants cultivated and planting patterns used, (4) Irrigation systems and water management applied, (5) Biodiversity conditions on agricultural land.

RESULTS AND DISCUSSION

1. Initial Conditions of Agriculture in Batu Bajanjang Village

   Nagari Batu Bajanjang, located in Lembang Jaya District, Solok Regency, is a highland area with an altitude of 1,458 to 1,600 meters above sea level. This special geographical position makes the area very potential for the development of agricultural commodities in the highlands. The agricultural sector in this area is dominated by highland vegetable cultivation which generally uses conventional methods. Most farmers apply a monoculture planting system, focusing on horticultural commodities such as potatoes, cabbage, and shallots. Ongoing agricultural practices still rely on the use of chemicals, both inorganic fertilizers and synthetic pesticides, to optimize crop yields and overcome attacks by plant-disturbing organisms.

Picture1. Form of agricultural conditions in Batu Banjanjang Village

Plant cultivation in Nagari Batu Bajanjang still follows traditional planting patterns that are highly dependent on the season. The irrigation system used mostly relies on rainwater, so agricultural productivity is greatly influenced by weather conditions and climate change.

In land management, there are still a number of agricultural practices that do not pay attention to environmental sustainability aspects. This can be seen from the habit of opening land by burning, excessive soil cultivation, and the use of sloping land without an adequate terracing system. In addition, efforts to return natural nutrients to the soil are still lacking.

Various existing conditions indicate the need for transformation in the agricultural system in Nagari Batu Bajanjang towards more sustainable cultivation practices. This step is very important to achieve a balance between increasing agricultural productivity and preserving existing natural resources.

2. Implementation of Sustainable Agriculture in Batu Bajanjang Village

Nagari Batu Bajanjang is in need of a transformation in its agricultural system towards more sustainable practices by adopting environmentally friendly technologies and effective land conservation methods. One strategic step that can be taken is crop diversification to overcome the weaknesses of the monoculture system. Farmers are encouraged to combine horticultural crops with legumes such as peanuts, mung beans, and soybeans. This more diverse cropping pattern not only increases land productivity but also strengthens plant resilience to extreme climate change. The right combination of crops can increase natural nitrogen fixation, reduce dependence on inorganic fertilizers, and create a better ecosystem balance.

The topography of Nagari Batu Bajanjang, which is dominated by sloping land, makes the implementation of an agroforestry system an optimal solution. Integration of horticultural plants with shade trees such as avocado, coffee, or durian can prevent erosion while creating a microclimate that supports plant growth. Deep tree roots help stabilize soil structure and increase the soil's ability to absorb water. In addition, the importance of using organic fertilizers and plant-based pesticides is also a priority. Farmers are trained to process organic waste into high-quality compost using modern technology and utilize local plant extracts such as neem, citronella, and tobacco as natural pesticides to maintain ecosystem balance.

In water resource management, a modern drip irrigation system is highly recommended for efficient water use, ensuring proper distribution to the plant root zone, and reducing water loss due to evaporation.

Meanwhile, conservation-based land management is implemented through no-till techniques and terracing. This method is effective in preventing erosion, increasing soil organic matter content, and maintaining optimal moisture for plant growth. With these steps, Nagari Batu Bajanjang is expected to realize more sustainable, productive, and environmentally friendly agriculture.

3. Impact of Implementing Sustainable Agriculture

The implementation of sustainable agricultural systems in Nagari Batu Bajanjang has provided various positive impacts that are interrelated in the lives of the community and the environment. The transformation from conventional agricultural practices to more environmentally friendly systems has resulted in significant changes in biodiversity, productivity, and environmental management. One of the real impacts is the increase in biodiversity. Diverse agricultural systems create complex habitats for plant and animal species. The presence of natural pollinating insects, natural enemies of pests, and beneficial soil microorganisms has increased significantly. This creates a more stable ecological network and helps control pests naturally without relying on chemical pesticides.

In terms of productivity, sustainable agriculture shows promising results. By improving soil structure and fertility through the use of organic fertilizers and conservation techniques, crop yields increase consistently in the long term, although there may be a slight decrease at the beginning of the implementation. The agricultural products produced are also of better quality due to minimal chemical residues. In addition, this system contributes to climate change mitigation. Practices such as stopping land burning and reducing the use of synthetic chemicals significantly reduce carbon emissions. Agroforestry systems and soil conservation play a role in carbon sequestration, making agriculture part of the solution to address the climate crisis.

Picture 2. The Impact of Implementation of Agriculture in Batu Banjanjang Village

Implementation of sustainable agriculture also has an impact on increasing farmers' income. Crop diversification helps reduce the risk of crop failure and provides more diverse sources of income. Production costs can be reduced by reducing dependence on external inputs such as chemical fertilizers and pesticides. The resulting organic products can even be sold at a premium price in specialty markets. However, the success of this transformation requires close collaboration between local governments, research institutions, and farming communities. Policy support, technological innovation, and technical assistance are important factors in accelerating the adoption of this practice, so that Nagari Batu Bajanjang can become a model for the success of harmonizing agricultural productivity and environmental conservation.

CONCLUSION

Agriculture in Nagari Batu Bajanjang was initially dominated by a monoculture system with a reliance on chemicals and less environmentally friendly practices, such as land burning and limited water management. The transformation towards sustainable agriculture is carried out through crop diversification, agroforestry, the use of organic fertilizers, and modern irrigation, which increase biodiversity, land productivity, and farmer incomes, while reducing environmental impacts. With collaborative support from the government, research institutions, and farmers, Nagari Batu Bajanjang has the potential to become a model of sustainable agriculture that is in harmony with nature.

REFERENCES

Central Bureau of Statistics. (2022). Indonesian Agricultural Statistics 2022. Jakarta: BPS.

Brotodjojo, RRR (2012). Pest Control with Agroecosystem Management in the Framework of Sustainable Agriculture to Support Food Security. Food Journal, 18(55), 17–24.

Faried, AI, Hasanah, U., Sembiring, R., & Ulzannah, N. (2024). Empowering Rice Farmers Through Agricultural Technology Innovation: Strategy to Increase Production and Income in Sidodadi Ramunia Village. 03(11), 1253–1266.

Jayaputra, J., Nurrachman, N., & Santoso, BB (2021). Increasing Farmers' Income Through Diversification and Intensification of Horticultural Crops in Dry Land of Gumantar Village, North Lombok Regency. Gema Ngabdi Journal, 3(1), 29–39. https://doi.org/10.29303/jgn.v3i1.134

Ministry of Agriculture. (2023). Annual Report of the Ministry of Agriculture 2023. Jakarta: Ministry of Agriculture.

Ningrum, TA, Nellitawati, N., & Utama, RI (2024). Master Plan Design for Tourism Village Development with Natural Potential Management. ADMA: Journal of Community Service and Empowerment, 4(2), 327–334. https://doi.org/10.30812/adma.v4i2.3460

Risdianto, D. (2015). Review of Organic Farming and Sustainable Farming in Efforts to Re-Achieve National Food Self-Sufficiency. Journal of Studies of the Indonesian National Resilience Institute, 31–41.

Statistics, BP, & South, KS (2016). SANGIR DISTRICT ht but so l ok s el at an ka ht but so ks at ka b .

Sutanto, A. (2021). The Effect of Training on Livestock Productivity in Rural Areas. Indonesian Agribusiness Journal, 10(2), 45-56.