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Sustainable Agricultural Practices and Their Effects on Environmental Quality and Economic Viability in Central Visayas, Philippines

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Abstract - **Sustainable environmental practices and food production depend heavily on agricultural techniques. This study aimed to determine the extent to which local farmers adopt sustainable agriculture and to design an agroecological model to support this approach. A non-experimental descriptive correlational research approach was used, involving 70 local farmers in Region VII, Central Visayas. Probability simple random sampling was employed to select participants who engaged in farming practices. The statistical tools used included frequency counts, percentages, weighted means, and the chi-square test of independence. The findings revealed that agricultural practices among the local farmers significantly contributed to achieving sustainable agricultural production in terms of environmental quality. However, these practices were moderately extensive concerning economic sustainability and social viability. Additionally, a significant relationship was found between the extent of adoption of agricultural practices and farmers' perceptions of these practices' contributions to agricultural sustainability, including economic sustainability, social viability, and environmental quality. The study concluded that these agricultural methods provided the local farmers with food security, enhanced social welfare, and, to some extent, improved environmental quality. Sustainability and resilience hinge on the collaboration between farmers within the community and the support of both public and private sectors through adequate financial and agricultural mechanisms.**
Keywords: **Sustainable Agriculture, Agroecological Model, Environmental Quality, Economic Sustainability, Social Viability**

I. INTRODUCTION

Government programs, academic research initiatives, and extension organizations globally focus on sustainability. However, despite several decades of effort, sustainable agriculture has not yielded sufficient outcomes. Conventional agriculture remains the prevailing paradigm, despite some progress. Agricultural systems continue to produce waste, including degraded environmental resources, lost biodiversity, and contaminated air, water, and soil (Karami & Keshavarz, 2010).

In the third quarter of 2023, the Philippines' agricultural output increased by 2.87 percent, with increases in crops, livestock, poultry, and fisheries. Crop production increased by 2.01 percent, contributing 45.19 percent to the total agricultural output. Among the major crops, corn production rose by 23.47 percent, while rice grain (palay) production decreased by 4.53 percent. Livestock production was 1.63 percent higher, contributing 18.67 percent to the total agricultural output, with increases in hog production (1.96 percent) and dairy production (6.48 percent). Poultry production grew by 8.41 percent, accounting for 19.44 percent of the total agricultural output. The fisheries sector contributed 16.70 percent to overall agricultural output, with a 0.56 percent increase. The production of all poultry commodities increased, while seaweed, skipjack, and milkfish yields also grew. The total value of agricultural output, valued at current prices, was Php 395.3 billion, 3.64 percent lower than the record set the previous year (Philippine Statistics Authority, 2023).

Approximately half of the labor force is engaged in agricultural activities. Agriculture plays a significant role in the economy, and stable national growth necessitates a modern and competitive agricultural sector. Thus, it is no surprise that agriculture is one of the most studied areas. Despite this, much remains to be done to ensure food security and sustainable competitiveness (Ponce, 2004).

The country's complex, multidimensional farming systems were developed to provide a steady flow of income and a high level of productivity. However, they have also resulted in undesirable environmental effects such as soil erosion, water pollution, groundwater depletion, loss of natural habitats, and loss of biological diversity. Farming systems impact the resource bases for agricultural output, and these are affected by external environmental factors. Policies, programs, and initiatives focused on sustainability are in place to maintain agricultural production bases and mitigate the negative environmental effects of farming systems (Briones & Balisacan, 2005).

Climate change is having a significant negative impact on the agriculture and water sectors in the Philippines. It has caused record-high agricultural losses, water scarcity, productivity declines, disruptions in energy supply, flooding, and infrastructural damage. Integrated strategies that consider social, economic, and environmental concerns, as well as the synergies between the water and agriculture sectors, are required to address these challenges. Expanding the scope of these programs is essential to promote resilience and sustainable development (Pulhin & Tapia, 2016). Despite statistical evidence of increased agricultural production, the country's rapidly growing population requires more than it can produce. Therefore, if the nation relies solely on local production, a severe food shortage will persist. For this reason, the Philippines must import goods from other Asian nations, including China, Vietnam, and Thailand.

The Philippines' agricultural sector faces significant challenges, including low productivity, climate change impacts, natural resource degradation, underinvestment in technology and innovation, and structural issues (Brown *et al.,* 2018). These challenges hinder agricultural development, leading to low farm incomes, food insecurity, and limited competitiveness (Sanchez, 2015). To address these issues, the country needs to increase investment in productivity-enhancing technologies, infrastructure, and support services, promote climate change adaptation and natural resource conservation, and implement policies for inclusive growth in the agricultural sector.

In Buenavista, Bohol, the main industry is agriculture, which includes farming and fishing. Farmers once raised a wide variety of livestock and crops. However, due to climate change and sustainability concerns, animal and crop diversity has declined. To address this, the project aims to create an agroecological model that provides consulting services for farming reform and serves as a guide for farmers as they plan, implement, and evaluate sustainable initiatives.

II. OBJECTIVES OF THE STUDY

The study determined the extent to which farmers in Region 7, Central Visayas, adopt sustainable agricultural practices. Specifically, it sought answers to the following:

1. The extent to which farmers adopt sustainable agricultural production;
2. The extent to which these agricultural practices contribute to achieving agricultural sustainability; and
3. The significant relationship between the participants' responses on the extent of adoption of agricultural practices and the extent of their contribution to achieving agricultural sustainability.

III. MATERIALS AND METHODS

A non-experimental, descriptive correlational research approach was used in the study. It was conducted on selected farms in Bohol, Region VII, Central Visayas, where the primary sources of income include fishing, weaving, and agriculture.

Probability simple random sampling was employed to select participants engaged in farming practices. Table I presents the first group of participants: local farmers. There are 70 respondents from this group, representing fourteen selected barangays, who provided data on the adoption of sustainable agricultural production and the extent to which agricultural practices contributed to achieving agricultural sustainability.

This investigation used two survey tools to gather primary data from the identified research participants. The first set consisted of two parts.

The first part contained questions on the extent of adoption of sustainable agricultural production in terms of crop choice, crop spatial distribution, crop temporal succession, tillage, fertilization, irrigation, weed, pest, and disease management. The second part consisted of questions on the extent of the contribution of agricultural practices to achieving agricultural sustainability in terms of economic sustainability, social viability, and environmental quality.

Data Analysis: The data were analyzed and interpreted using the weighted mean and the chi-square test of independence, with Minitab v17 software, at a 5% probability level.

IV. RESULTS AND DISCUSSION

TABLE I FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF CROP CHOICE

Sl. No.	Indicators	Mean	Description
1	The choice of crop type to be planted depends on the soil type of the farm.	3.51	Greatly Extensive
2	The choice of crop to be planted is based on its ability to withstand varying weather conditions and extreme climatic factors to ensure that productivity is maximized.	3.64	Greatly Extensive
3	The choice of crop is based on its demand and marketability.	2.91	Moderately Extensive
4	When choosing the crop to be planted, resistance to pests and diseases is considered to avoid high production costs and potential crop failure.	3.24	Moderately Extensive
5	The availability and cost of planting materials, especially seeds and seedlings, are crucial for achieving cost efficiency in agricultural production.	3.21	Moderately Extensive
	Aggregate Mean	3.30	Greatly Extensive

Farmers implemented sustainable farming methods by considering variables such as soil suitability, market demand, and climate. The highest weighted mean of 3.64 suggests that they selected crops for optimal output based on their resistance to harsh weather. They also considered market demand and marketability when choosing which crops to grow, as indicated by the lowest weighted mean of 2.91.

Climate and precipitation impact farmers' crop selection. In warmer climates, farmers select fruits and vegetables, while in colder climates, they choose wheat and potatoes. Rice, fruits, potatoes, squash, and maize are more commonly grown in drier climates. As a result of global warming, farmers are expected to shift their crops from maize, wheat, and potatoes to fruits, vegetables, and squash (Seo & Mendelsohn, 2008).

Chisom (2016) elucidated that farmers were generally efficient in allocating resources but could have been more rational in their crop choices. The primary factors influencing crop choice included accessibility to inputs, non-farm income, the use of seeds from the previous growing season, household size, gender, and various geographical factors. These decisions had varying effects on household poverty and productivity.

TABLE II FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF CROP SPATIAL DISTRIBUTION

Sl. No.	Indicators	Mean	Description
1	Applying multiple cropping in different locations increases the production levels of various crops.	3.37	Greatly Extensive
2	The availability of road networks and the proximity of farms to markets are factors considered in crop spatial distribution.	3.14	Moderately Extensive
3	The availability of natural farming resources in the farm area determines the crop's growth rate and ensures agricultural productivity.	3.39	Greatly Extensive
4	Soil quality across the land area used for agricultural production is another factor considered to increase productivity and maximize land resources.	3.44	Greatly Extensive
5	Topography is considered to identify the highest-yielding crop suitable for planting on the farm.	3.31	Greatly Extensive
	Aggregate Mean	3.33	Greatly Extensive

Sustainable agricultural practices were employed by farmers in Buenavista, Bohol, taking into account variables such as crop spatial distribution, soil quality, and transportation networks. They planted various crops at appropriate spacings to prevent overcrowding and maintain soil nutrients, engaging in a comprehensive approach to agricultural spatial distribution. To maximize land resources and boost productivity, soil quality was also considered crucial. Road networks were carefully evaluated, with farmers choosing to plant more crops near roadways to facilitate the transportation of their produce to markets. Moreover, spatial patterns of resource use should be consistent across different tropical farming systems. Therefore, enhancing principles for the efficient allocation of scarce resources is required to address the dynamics of interacting temporal and spatial scales. This approach can explore short- and long-term trade-offs of management strategies and evaluate the effects of policy on farms varying in resource endowment (Giller *et al.,* 2006).

TABLE III FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF CROP TEMPORAL SUCCESSION

Sl. No.	Indicators	Mean	Description
1	The application of crop rotation in succession planting is considered essential for achieving sustainability in production.	3.31	Greatly Extensive
2	Soil content and fertility in the field are considered essential for promoting effectiveness in succession planting.	3.49	Greatly Extensive
3	In succession planting, a crop's life span is considered to sustain production over a particular period of time.	3.43	Greatly Extensive
4	The type of soil conducive to succession planting is determined to maintain productivity and maximize the nutrient content of the soil.	3.43	Greatly Extensive
5	Seasonal crops are another reason succession planting is used to maintain productivity levels and meet market demands.	3.40	Greatly Extensive
	Aggregate Mean	3.41	Greatly Extensive

The farmers implemented sustainable farming methods by considering variables such as soil fertility, crop temporal succession, and crop content. They planned crops for each planting cycle and rotated crops year-round based on soil fertility and other criteria. They practiced crop succession to a significant extent. Crop rotation maintained the soil's nutritional content and ensured a sustainable yield. In contrast, soil content and fertility were considered to enhance the efficacy of succession planting.

Brankatschk and Finkbeiner (2015) stated that crop rotation can be very beneficial for agriculture's sustainability. Increasing phytosanitary conditions can reduce agrochemical requirements, decrease harvest failures to stabilize yields, and enhance soil texture and conditions for soil organisms to improve yields. Crop rotation causes changes in the physical, chemical, and biological characteristics of agricultural soil over time, leading to these effects. Crop rotation significantly impacts soil fertility, yields, and overall sustainability. Therefore, it is critical to include these effects in agricultural life cycle assessments (LCAs) to ensure an accurate assessment of environmental impacts.

TABLE IV FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF TILLAGE

Sl. No.	Indicators	Mean	Description
1	Tillage systems, along with the application of technologies, are used to maintain soil nutrients.	3.19	Moderately Extensive
2	Tillage is used to prepare the seedbed and increase crop productivity.	3.40	Greatly Extensive
3	The number of times tillage is performed is considered to avoid disrupting soil structure, accelerating surface runoff, and causing soil erosion.	3.10	Moderately Extensive
4	Tillage depth also helps preserve the natural structure of the land area.	3.19	Moderately Extensive
5	Various tillage equipment provides farmers with opportunities to improve environmental performance.	3.46	Greatly Extensive
	Aggregate Mean	3.27	Greatly Extensive

Farmers implemented sustainable farming techniques by considering elements such as tillage. They use various equipment to prepare the land for crop planting, improve environmental performance, and practice tillage extensively. Farmers use tillage to intentionally or unintentionally reduce soil biodiversity. The services provided by soil biota have a major impact on a variety of factors, including disease incidence, pests carried by soil and residue, crop growth and quality, water transfer and nutrient cycling, and ultimately, the sustainability of crop management systems (Estrade *et al.,* 2010).

TABLE V FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF FERTILIZATION

Sl. No.	Indicators	Mean	Description
1	The application of organic fertilizer to farmland increases soil nutrients and reduces acidity.	3.57	Greatly Extensive
2	The amount of fertilizer applied to the soil is calculated to avoid both plant undernutrition and overnutrition, which can run off the fields and pollute streams and groundwater.	3.54	Greatly Extensive
3	Proper scheduling and timing of fertilizer application are essential to avoid damaging the soil.	3.49	Greatly Extensive
4	The level of chemical fertilizer application is considered to enhance and support plant growth.	3.20	Moderately Extensive
5	Priority is given to using organic fertilizers, such as animal manure, to minimize costs and enhance the sustainability of agricultural production.	3.23	Moderately Extensive
	Aggregate Mean	3.41	Greatly Extensive

Farmers use sustainable farming methods by considering fertilization. They apply organic fertilizers to boost soil nutrients and reduce soil acidity, and they fertilize their land extensively. This approach promotes environmental preservation and cost-effectiveness.

Increased yields, greater drought tolerance, resistance to pests and diseases, and higher crop quality are all results of proper fertilization. Plant response is influenced by the type of fertilizer, its concentration, frequency of application, and growth stage. Fertilization can also help plants recover from environmental stressors such as hail damage and transplant shock (Haytova, 2013).

In addition, applying organic fertilizers and charcoal increases nutrient stocks in crops' rooting zones, reduces nutrient leaching, and improves crop production on acid and highly weathered tropical soils (Steiner *et al.,* 2007).

TABLE VI FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF IRRIGATION

Sl. No.	Indicators	Mean	Description
1	The application of an irrigation system is intended to ensure higher crop growth rates, support agricultural crop growth and landscape maintenance, and mitigate the effects of inadequate rainfall.	3.63	Greatly Extensive
2	The availability of water resources such as streams, rivers, and lakes is considered the primary source of water for irrigation to ensure higher yields.	3.77	Greatly Extensive
3	The irrigation system uses sprayers, tubes, and sprinklers to distribute water to the crops effectively.	3.30	Greatly Extensive
4	The amount of irrigation is considered to prevent the loss of nutrients in the soil, which can negatively impact other natural resources.	3.44	Greatly Extensive
5	The irrigation system uses machinery and technology (mechanical or electric-powered) for increased efficiency.	2.96	Moderately Extensive
	Aggregate Mean	3.42	Great Extent

With an aggregate mean of 3.42, farmers in Buenavista, Bohol, heavily utilize irrigation techniques, indicating a strong reliance on irrigation for crop growth, particularly during hot seasons. A weighted mean of 3.77 shows that the availability of natural water sources, such as lakes, rivers, and streams, serves as the primary source of irrigation water. Farmers should prioritize using readily available water resources to secure higher agricultural yields and better tolerate adverse weather conditions. A weighted mean of 2.96 suggests that, although some farmers use machinery or technology for efficient irrigation, many still rely on conventional methods, reflecting a moderate adoption rate of irrigation technology.

Because of extreme fluctuations in and inadequate rainfall, irrigation is essential in agriculture. It is crucial for productive agriculture, particularly in regions with erratic rainfall. Irrigation is a fundamental factor in agriculture, as inadequate irrigation reduces agricultural output (Gu, 2012).

The Philippines faces the challenge of managing irrigation water due to increasing competition between the industrial and municipal sectors. To address this, the nation must explore alternative water sources and use water more efficiently. Technological approaches are essential for future agricultural and economic progress, as they can increase crop yields while minimizing negative environmental effects (Qadir & Oster, 2004).

TABLE VII FARMERS' EXTENT OF ADOPTION OF SUSTAINABLE AGRICULTURAL PRODUCTION IN TERMS OF WEED, PEST, AND DISEASE MANAGEMENT

Sl. No.	Indicators	Mean	Description
1	The application of weed, pest, and disease management is considered essential for preventing crop production failures.	3.45	Greatly Extensive
2	Farming uses pesticides, herbicides, and fungicides to increase agricultural yields.	3.20	Moderately Extensive
3	Farming minimizes the use of pesticides and other harmful chemicals to protect humans, animals, and the environment from harm.	3.23	Moderately Extensive
4	Organic and natural methods of managing weeds, pests, and diseases are used to reduce production costs.	3.19	Moderately Extensive
5	Farmers receive training from the Department of Agriculture and other authorized agencies on properly managing weeds, pests, and diseases to develop organic methods for preventing crop pests and diseases.	3.14	Moderately Extensive
	Aggregate Mean	3.24	Moderately Extensive

Table VII shows the results of the study related to the farmers' extent of adoption of sustainable agricultural production concerning weed, pest, and disease management.

In Buenavista, Bohol, farmers use somewhat comprehensive techniques for managing weeds, insects, and diseases. This suggests that they have adopted environmentally friendly and crop-failure-reducing sustainable agricultural practices. Farmers are highly motivated to control pests and diseases because they understand their impact on crops. Additionally, they receive technical training on organic pest management from governmental and non-governmental organizations to promote innovative and sustainable farming methods.

Abate *et al.,* (2000) argue that pest management is an integrated process rather than a stand-alone endeavor in conventional agriculture. Increased population pressure and the need for food production result in decreased biodiversity, higher agricultural production, and the unintentional introduction of alien pests.

Pest and disease management in traditional agriculture emphasizes an integrated approach, focusing on preventive measures to maintain ecosystem health and plant resistance. The three main lines of defense against pests and diseases are crop rotation, soil quality management, and cultural practices (Shravan, 2017).

TABLE VIII EXTENT OF CONTRIBUTION OF AGRICULTURAL PRACTICES TO THE ATTAINMENT OF AGRICULTURAL SUSTAINABILITY IN TERMS OF ECONOMIC SUSTAINABILITY

Sl. No.	Indicators	Mean	Description
	The Adoption of Sustainable Agricultural Production:		
1	has provided farmers with increased income to support their daily household needs.	3.31	Greatly Extensive
2	increases the financial capacity of farmers and improves their standard of living.	3.14	Moderately Extensive
3	increases the supply of farm crops in the community and stimulates the local agribusiness industry.	3.30	Greatly Extensive
4	has led to improvements in technology and increased investments in both public and private agricultural programs.	2.89	Moderately Extensive
5	lowers the prices of agricultural goods due to the higher level of supply in the community.	3.06	Moderately Extensive
Aggregate Mean		3.14	Moderately Extensive

Table VIII shows the extent to which agricultural practices contribute to achieving agricultural sustainability in terms of economic sustainability.

The aggregate mean of 3.14 indicates that, to a moderately extensive degree, the current agricultural practices of the farmers in the study area contribute to agricultural sustainability in terms of economic sustainability. In most cases, farming as an economic activity has provided a sustainable source of food and income, improving living conditions, increasing the supply of agricultural products for domestic consumption in the municipality, and stabilizing the prices of fruits, vegetables, and grains.

The role of agriculture in economic development has become increasingly clear to economists and policymakers in recent years. Improvements in agriculture and land use are crucial for achieving food security, poverty alleviation, and overall sustainable development (Khanna & Solanki, 2014).

TABLE IX EXTENT OF CONTRIBUTION OF AGRICULTURAL PRACTICES TO THE ATTAINMENT OF AGRICULTURAL SUSTAINABILITY IN TERMS OF SOCIAL VIABILITY

Sl. No.	Indicators	Mean	Description
	Adoption of Sustainable Agricultural Production:		
1	increases community knowledge, leading to the development of additional strategies and practices in agriculture.	3.33	Greatly Extensive
2	leads to greater access to education at all levels.	3.03	Moderately Extensive
3	increases community collaboration to achieve higher farming yields.	3.14	Moderately Extensive
4	enhances the availability of funds from various social organizations, including cooperatives, providing farmers with access to support for agricultural production.	2.96	Moderately Extensive
5	increases the availability of jobs for people in the community.	3.03	Moderately Extensive
Aggregate Mean		3.10	Moderately Extensive

Table IX shows the extent to which agricultural practices contribute to achieving agricultural sustainability in terms of social viability.

The aggregate mean of 3.10 reveals that, to a moderately extensive degree, the current agricultural practices of the farmers contribute to agricultural sustainability in terms of social viability. In most cases, respondents perceived that their existing farming practices led to the development of knowledge about more efficient farming, increased access to funds from community groups, and opportunities for work and income.

However, the data also indicate that there are instances where respondents felt that current farming practices did not improve their social well-being.

Understanding social issues, the social nature of farming, and the social basis of adoption are essential for agricultural extension to effectively address issues related to natural resource management and promote sustainability in its triple bottom line conceptualization. Some fundamental principles of this understanding include recognizing the social diversity of farmers, viewing farming as a social activity, identifying social drivers in agriculture, and considering the socio-cultural basis of adoption (Vanclay, 2004).

Furthermore, Sharp and Smith (2003) explained that support for and tolerance of agriculture are stronger when nonfarmers report the presence of social capital with farmers. These findings impact farm operator adaptations and community capacity to preserve or develop local agriculture.

TABLE X EXTENT OF CONTRIBUTION OF AGRICULTURAL PRACTICES TO THE ATTAINMENT OF AGRICULTURAL SUSTAINABILITY IN TERMS OF ENVIRONMENTAL QUALITY

Sl. No.	Indicators	Mean	Description
	The adoption of sustainable agricultural production:		
1	leads to the promulgation of local ordinances on soil and water preservation in the community to prevent the degradation of natural resources.	3.47	Greatly Extensive
2	leads to the reduction of soil degradation, water shortages, and air pollution.	3.23	Moderately Extensive
3	minimizes the risk of floods and landslides caused by natural calamities.	3.30	Greatly Extensive
4	enables the community to become attractive for living, working, and visiting due to its ecological integrity and scenic value.	3.24	Moderately Extensive
5	leads to the avoidance of the deterioration of natural habitats and the loss of wildlife.	3.40	Greatly Extensive
	Aggregate Mean	3.33	Greatly Extensive

Table X shows the data relating to the extent to which agricultural practices contribute to achieving agricultural sustainability in terms of environmental quality.

Consequently, tight coordination between cropping and grassland systems should help reduce the negative environmental effects of cropping system intensification while enhancing grassland quality through recurring restorations (Lemaire *et al.,* 2014).

Moreover, agriculture is a resource-intensive enterprise. How food production systems utilize resources has a significant influence on environmental quality. Avoiding the expansion of cultivation into natural ecosystems, increasing nitrogen use efficiency, and improving soil quality are pivotal components of sustainable agriculture that meet human needs and protect natural resources (Cassman *et al.,* 2003).

TABLE XI SIGNIFICANT RELATIONSHIP BETWEEN THE EXTENT OF ADOPTION OF AGRICULTURAL PRACTICES AND THE EXTENT OF CONTRIBUTION OF THESE PRACTICES TO THE ATTAINMENT OF AGRICULTURAL SUSTAINABILITY (A = 0.05)

Variables	Computed Chi-Square	df	Critical Value	Significance	Result
A. Economic Sustainability					
Crop Choice	85.938	9	16.919	Significant	Ho Rejected
Crop Spatial Distribution	78.780	6	12.592	Significant	Ho Rejected
Crop Temporal Succession	109.224	6	12.592	Significant	Ho Rejected
Tillage	85.975	9	16.919	Significant	Ho Rejected
Fertilization	87.369	6	12.592	Significant	Ho Rejected
Irrigation	83.174	6	12.592	Significant	Ho Rejected
Weed, Pest & Disease Management	85.732	9	16.919	Significant	Ho Rejected
B. Social Viability					
Crop Choice	38.019	9	16.919	Significant	Ho Rejected
Crop Spatial Distribution	44.395	6	12.592	Significant	Ho Rejected
Crop Temporal Succession	38.784	6	12.592	Significant	Ho Rejected
Tillage	44.095	9	16.919	Significant	Ho Rejected
Fertilization	49.003	6	12.592	Significant	Ho Rejected
Irrigation	36.731	6	12.592	Significant	Ho Rejected
Weed, Pest & Disease Management	40.214	9	16.919	Significant	Ho Rejected
C. Environmental Quality					
Crop Choice	83.899	6	12.592	Significant	Ho Rejected
Crop Spatial Distribution	72.911	4	9.488	Significant	Ho Rejected
Crop Temporal Succession	85.232	4	9.488	Significant	Ho Rejected
Tillage	74.863	6	12.592	Significant	Ho Rejected
Fertilization	93.817	4	9.488	Significant	Ho Rejected
Irrigation	81.115	4	9.488	Significant	Ho Rejected
Weed, Pest & Disease Management	73.377	6	12.592	Significant	Ho Rejected

Table XI shows the significant relationship between the responses on the extent of adoption of agricultural practices and the extent to which these practices contribute to the attainment of agricultural sustainability. The data revealed a significant relationship between the extent of adoption of agricultural practices and the extent to which these practices contribute to attaining agricultural sustainability. This means that the extent of adoption of various factors performed and practiced by local farmers in agricultural production, such as crop choice, crop spatial distribution, crop temporal succession, tillage, fertilization, irrigation, and weed, pest, and disease management, has a statistically significant relationship with the attainment of economic sustainability, social viability, and environmental quality in Buenavista, Bohol. Residents, together with the farmers, place a high value on the social, economic, and environmental aspects of community growth and development (Micabalo, 2022).

In order to preserve ecosystem services essential to agricultural output, Bowman and Zilberman (2013) state that practices in diverse farming systems (DFS) have developed as a model embracing functional biodiversity at many temporal and geographical scales.

Agro-Ecological Model

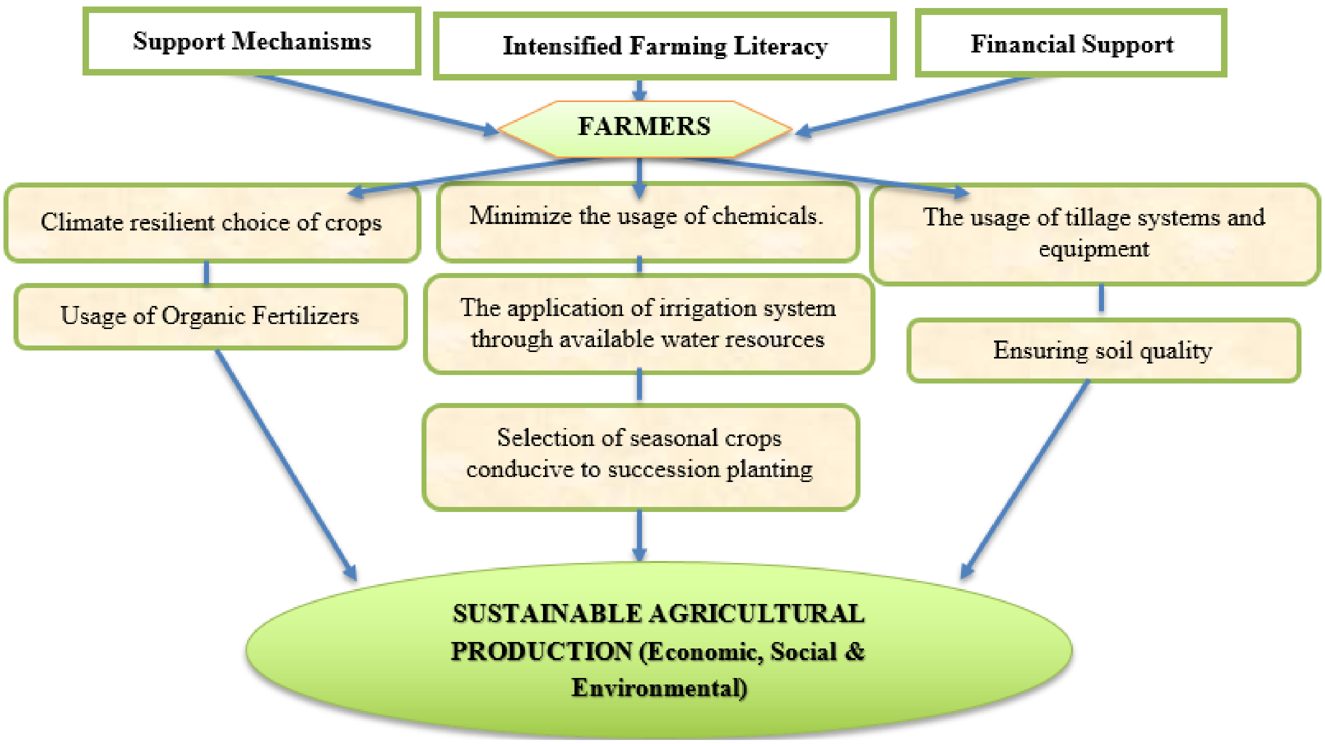

Fig. 1 Agroecological Model for Sustainable Agricultural Production

V. CONCLUSION

Farmers in Region 7, Central Visayas, have adopted various farming techniques that have enabled them to achieve food security and generate income to meet household needs. These farming practices are highly relevant to sustainability in agricultural production. However, there is a need for farmers to learn more about how innovative farming approaches can enhance their resilience to extreme weather conditions, such as severe typhoons and intense heat during El Niño in Bohol. Additionally, while these practices have provided local farmers with food security, social well-being, and, to some extent, environmental quality, inadequate observance can lead to catastrophic circumstances that may damage their farms and crops. The scope of sustainability and resilience depends on cooperation among farmers within the community and support from both the public and private sectors, including adequate financial and mechanization assistance.

VI. RECOMMENDATIONS

1. The Sanguniang Bayan (Municipal Council) and local barangay officials could create an ordinance to enhance farmers' competence and skills in innovative farming practices and collaborative community support systems that are economically sustainable, socially viable, and environmentally friendly.
2. The Municipal Agriculture Office should initiate the formation of a farmers' association with cooperative society characteristics to provide a direct source of funds and mechanisms available to farmers, in addition to those offered by the Local Government Unit (LGU).
3. Adopting the agro-ecological model to sustain agricultural production in Region 7, Central Visayas.

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