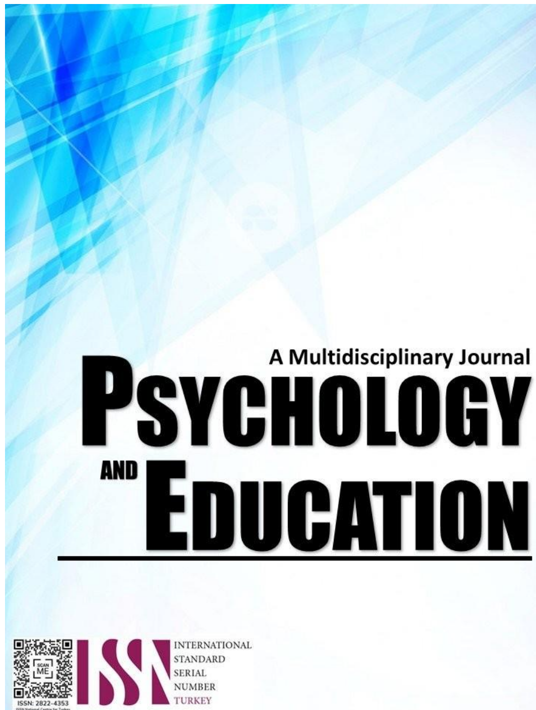
SUSTAINABLE AGRICULTURAL PRACTICES FOR COCONUTS (COCOS NUCIFERA L.) IN STA.CRUZ DAVAO DEL SUR



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Research Article

Sustainable Agricultural Practices for Coconuts (Cocos Nucifera L.) in Sta. Cruz Davao Del Sur

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Abstract

The research investigates the sustainable agricultural practices for coconuts in Sta. Cruz Davao del Sur. By examining this relationship, the research aims to determine the sustainable agricultural practices for coconuts in Sta. Cruz, focusing on the socio-demographic profile of the coconut farmers, the sustainable agricultural practices used in the area, and the impacts of these practices on the stakeholders of coconut production. The researcher will employ a mixed-methods approach, both qualitative and quantitative data collection and analysis methods. A combination of purposive and convenience sampling to select 30 key stakeholders, including landowners or farmers, farm workers, coconut traders, and processors, based on their expertise and relevance to the research topic. They will also conduct a focus group discussion with 15 groups, aiming to gather valuable insights.

Keywords: *sustainable agricultural practices, coconuts, exploratory factor analysis*

Introduction

Santa Cruz is a municipality in the Philippines, located in the province of Davao del Sur, on the island of Mindanao. It was founded on October 5, 1884, and occupies 6.7% of the province's total land area. With 18 barangays, including Astorga, Bato, Coronon, Darong, Inawayan, Matutungan, and Melilia, and the municipality is the oldest in the province. English, Tagalog, Mansakan, and Cebuano are the languages used, and the majority of the population is either Christian or Muslim.

Coconut (Cocos nucifera L.) plays a vital role in the environment and economic, social, and cultural lives of people in Sta. Cruz Davao del Sur. As of 2000, coconut is one of the major crops of the municipality; its total area is 7,297 hectares, or about 34.45% of the total agricultural land. In terms of production, all coconuts are reported to have 100 percent productivity, bearing four times in a year and producing 24,395 m.t. annually. By 1968, the first production facility is established, the Franklin Baker in Coronon, Sta. Cruz, then followed by the prominent coconut manufacturing companies Coco Davao Inc. and Agri Exim Global Philippines, were established and operating till this day.

Sustainable agricultural practices it encompasses various methods aimed at promoting environmental health, economic viability, and social equity (FAO, 2017), essential for the long-term viability of coconut farming. For the production and environmental well-being of the coconut business, sustainable agricultural practices are essential; these methods will lessen the negative effects on the environment, make farms more resilient to climate change, and give farmers financial security. Moreover, social sustainability will improve the well-being of coconut farmers and guarantee to sustain the industry, which can fuel economic development. Lastly, the process of fostering sustainable growth, enhancing living standards, and reducing poverty and inequality through productivity enhancement, increased employment opportunities, and innovation, which are the prime objectives in the recent year of Sta. Cruz, as identified, is one of the promising municipalities in Davao del Sur. The town's local government leaders and populace are envisioning a new aspiration for city growth, leveraging the presence of large industrial companies and small-medium businesses.

Research Questions

This study aims to identify the socio-demographic profile of coconut farmers in Sta. Cruz, Davao del Sur, identify sustainable agricultural practices, assess their environmental, economic, and social impacts, and provide recommendations for farmers, policymakers, and concern agencies in the government on implementing sustainable practices.

Literature Review

Coconut is one of the Philippines' most significant agricultural products, with substantial contributions to the national economy and local livelihoods. Coconut farming is a cornerstone of agriculture in tropical regions and faces challenges like soil degradation, water depletion, pest outbreaks, and climate change vulnerabilities, necessitating sustainable practices to balance productivity and environmental stewardship. According to the Philippine Statistics Authority (2022), the country has over 3.5 million hectares dedicated to coconut plantations. In Davao del Sur, particularly in Sta. Cruz, the demand for coconuts continues to grow; likewise, there is an increasing need for sustainable practices in the coconut industry, supporting the thousands of farmers and having a pivotal role in the local economy.

Sustainable agricultural practices encompass various methods aimed at promoting environmental health, economic viability, and social equity (FAO, 2017), particularly in coconut farming. These practices enhance soil conservation and fertility management, water conservation, pest and disease management, and climate resilience, providing socio-economic benefits for farmers. In recent years, sustainable coconut farming has gained significant attention due to the increasing challenges posed by climate change, pests and diseases, soil degradation, and market fluctuations. Hereby, several sustainable agricultural practices are being used in relation to environmental aspects. Agroforestry is well practiced; it is a land-use system that integrates trees, crops, and sometimes livestock, promoting ecological sustainability and enhancing farm resilience. Likewise, legumes like soybeans, cowpeas, and groundnuts are grown alongside coconut palms and can be integrated with multiple species, such as timber species and perennial crops. For high-value crops like bananas, coffee, cocoa, or turmeric, this additional approach is known as agroforestry with high-value crops (Sivakumar et al., 2017). Legumes can help to fix nitrogen in the soil, which decreases the need for artificial fertilizers. Also, serve as cover crops, increasing the amount of organic matter in the soil and preventing erosion (Poudel et al., 2021), and establish a more stable farming system by providing habitats for beneficial insects (Srinivasan et al., 2021). Coconuts can flourish with less competition for direct sunlight, but bananas benefit from the shade that coconut palms give, which helps to alleviate water stress (Rajan et al., 2020). The probability of complete crop failure due to environmental stress is decreased by these diverse systems' improved ability to adjust to climatic fluctuations (Thomas et al., 2019).

Next is soil health, considered the foundation of sustainable coconut farming. To preserve soil fertility and structure, organic farming methods such as the use of compost, farmyard manure, and green manure are essential. According to recent research, organic amendments greatly improve soil microbial activity and raise the availability of nutrients like phosphorus and nitrogen, all of which are essential for coconut growth (Azmi et al., 2020). According to Laviña et al. (2023), organic fertilization improves growth rates and yields more than conventional fertilizers, which benefits the environment and the livelihoods of farmers. Additionally, adding organic matter decreases soil erosion and enhances water retention. According to research by Salvador et al. (2020), preserving soil health and halting erosion need the adoption of sustainable measures, including crop rotation and cover crops. This strategy encourages nutrient cycling within the agricultural ecosystem and lessens the requirement for synthetic fertilizers (Mohan et al., 2018). In fertility management, several techniques are involved, like low tillage, mulching, and the use of biochar. Mulching enhances the soil's organic matter while also preserving moisture. According to Srinivasan et al. (2021), biochar, which is made from coconut husks and shells, can be utilized to increase soil fertility and sequester carbon. Terracing and contour planting are techniques that can help retain water and stop soil erosion in regions with sloping terrain and can affect intense rainfall on soil fertility. These techniques lessen nitrogen loss and stabilize the soil (Pradeep et al., 2019).

In sustainable agricultural practices, water conservation and management are a critical component. Thus, water scarcity is a growing concern in many coconut-growing regions that experience water stress or irregular rainfall patterns. Water conservation techniques like rainwater harvesting and drip irrigation can improve the resilience of coconut palms to droughts and varying climatic conditions. Rainwater harvesting reduces water consumption by up to 30%, while drip irrigation directly delivers water to the root zone, reducing water wastage and improving coconut yields by 15-20% compared to conventional flood irrigation (Ramesh et al., 2022).

Integrated Pest Management (IPM) is widely introduced to coconut farmers, which aims to control pests and diseases while minimizing the use of chemical pesticides, which can harm the environment and human health. Dela Cruz et al. (2021) found that IPM not only reduces pesticide use but also enhances biodiversity and improves crop resilience. IPM practices for coconut farming offer a more sustainable and eco-friendlier alternative, combining biological, cultural, and mechanical control methods. Biological control involves using natural predators like parasitic wasps or beneficial nematodes, reducing reliance on chemical pesticides and promoting ecological balance (Mohan et al., 2019). Cultural practices like pruning dead fronds, removing fallen nuts, and proper spacing between palms reduce pest habitats and lower fungal infections (Srinivasan et al., 2020). However, in mechanical control, the use of plant-based pesticides, such as neem oil or garlic-based sprays, offers an alternative to synthetic chemicals. These natural pesticides are less toxic to non-target organisms and provide effective pest control (Sivakumar et al., 2017). Organic pesticides are increasingly popular due to their lower environmental impact (Mohan et al., 2019).

Finally, the last sustainable agricultural practice related to the environment is climate-smart agriculture, whereas it promotes practices that improve productivity, enhance resilience to climate change, and contribute to reducing greenhouse gas emissions. Developing coconut varieties that can tolerate saline conditions or withstand higher temperatures is vital for maintaining coconut production in vulnerable regions (Ramesh et al., 2022). Also, efficient monitoring of climate conditions and adjusting farming practices accordingly helps coconut farmers adapt to shifting weather patterns. Additionally, incorporating more diversified agroecosystems into coconut farming systems improves resilience to extreme weather events like storms, floods, and droughts (Sivakumar et al., 2017).

On the other hand, sustainable agricultural practices also concern economic aspects. Cañete et al. (2024) noted that sustainable methods can increase yields, reduce input costs, and improve overall profitability. The coconut industry has potential for adopting circular economy practices, especially in resource utilization, waste management, and sustainable farming. Implementing waste-to-value systems in coconut farming offers opportunities to convert agricultural by-products into high-value goods. The by-products of coconut, like husks, shells, leaves, water, meat (copra), and sap, when it is generated and managed correctly, can be transformed into valuable resources and contribute to a circular economy. Each of these components has been explored for its various applications in the coconut industry as well as in other sectors. Coconut husk (Coir) made from the fiber husk has been utilized in a variety of fields, such as textile manufacturing, building, and gardening. Because of its superior water retention qualities, studies have shown that coir can serve as a sustainable substitute for peat moss in agriculture (Thangaraj et al., 2020). According to Rahman et al. (2019), these materials are useful for soil improvement, air purification, and water filtering. Coconut shells, previously thrown away as waste, are now being utilized more and more to make biochar and activated carbon. The production of activated carbon from coconut shells has become an integral part of the carbon economy, where waste materials are repurposed for high-value applications (Balakrishnan et al., 2016).

Biomass energy generation using coconut waste products such as shells and husks has gained traction. Several studies have highlighted the potential of coconut biomass for bioenergy production, including its conversion into biofuels for heating and electricity generation (Khan et al., 2018). Integrating coconut waste into the energy sector reduces reliance on non-renewable resources, contributing to a more sustainable farming operation. Coconut Water and Sap, although coconut water is mostly used as a beverage, its potential for fermented goods like vinegar and alcohol in the food and beverage industry has also been investigated (Murray et al., 2022). Coconut leaves and stems, often seen as waste, have been used in the handicraft and construction sectors. In rural areas, the leaves are frequently used as roofing materials (Pillai & Subramanian, 2020). Coconut leaves have also been investigated as a biomass source for energy production, offering rural people a sustainable energy supply (Sundaram et al., 2021). Waste processing facilities that focus on converting coconut by-products into marketable goods help reduce overall waste and increase the profitability of farms.

Lastly, social sustainability in agriculture refers to the ability of farming systems to support the well-being of farmers, rural communities, and future generations. It involves ensuring that farming practices are equitable, promote social inclusion, and contribute to long-term community well-being. Farmers should be able to earn a livelihood that supports their families and communities without being vulnerable to the instability of global commodity markets (Ramesh et al., 2018). In many coconut farming communities, women and marginalized groups face systemic barriers to land ownership, access to financial resources, and decision-making power that hinder women's participation in coconut farming communities. Addressing these challenges requires gender-sensitive policies, land rights, equal education opportunities, and community support systems. So, achieving social sustainability requires addressing these inequalities and promoting equal opportunities for all (Ghosh & Dutta, 2019). Because gender and social inclusion are fundamental to the concept of social sustainability. In most of the coconut farming regions, traditional knowledge and practices are an essential part of the community identity. As modern agricultural practices and commercialization take over, maintaining these cultural traditions is vital to ensuring that farming communities remain resilient and connected to their heritage (Fernando et al., 2017).

Economic well-being is one of the primary components of farmer well-being in coconut farming. However, coconut farmers often face economic hardships due to unpredictable income streams, fluctuating market prices, and limited access to financial support. Coconut farming is characterized by significant price volatility, especially for copra (dried coconut meat), which is the main product of the industry. According to Ramesh et al. (2018), coconut prices can fluctuate substantially due to global supply and demand factors. For smallholder farmers, these price swings can result in unstable income, making it difficult to plan for long-term sustainability. Also, they have limited access to larger, more profitable markets, often selling their produce through intermediaries who take a significant share of the profits. Moreover, coconut farmers, especially those in rural areas, often face barriers to accessing financial resources such as credit and subsidies. This limits their ability to invest in better farming equipment, irrigation systems, and modern technologies that could enhance productivity and income (Kumar & Patel, 2019).

Furthermore, access to technical knowledge and training is critical for farmers to adopt sustainable practices that can mitigate climate risks and improve yields. Even now, these challenges need to be addressed, though some mitigation may cope with them, like cooperatives and collective bargaining, which can enhance market access and strengthen farmers' bargaining power. According to Nelson & Winter (2020), by forming cooperatives, farmers can pool resources, access bulk inputs at reduced prices, and negotiate better deals with buyers. Additionally, the introduction of value-added products such as coconut oil, coconut water, and coir can provide farmers with alternative, more stable income sources (Bashir & Ahmed, 2022). Lastly, the receiving of holistic support from governmental and non-governmental organizations (NGOs) can help bridge these gaps. These interventions are essential to promoting economic sustainability in coconut farming.

The physical and mental well-being of coconut farmers is a vital component of social sustainability. Farmer's health is at serious risk since farming is a physically taxing activity that involves strenuous physical labor, such as climbing coconut trees for harvesting, which poses significant risks to farmer health. As noted by Barker et al. (2019), the physically taxing nature of the job might result in injuries, especially musculoskeletal disorders such as joint and back discomfort. Farmers are also at risk from exposure to chemicals and pesticides, as well as from working in extreme heat. Improvement strategies are crucial. Occupational safety training programs that emphasize safe harvesting methods and the provision of protective equipment, like safety ropes and climbing harnesses, can lower the chance of accidents. Long-term physical strain can also be lessened by adopting better ergonomic practices. Additionally, creating mobile health clinics and providing health insurance subsidies can help farming communities have better access to healthcare (Kishore et al., 2021). For mental well-being, financial uncertainty, unstable markets, and the unpredictable weather all contribute to mental health problems in agricultural communities by making farmers more stressed, anxious, and depressed (Singh & Rani, 2020). The strain is made worse by social isolation, especially in isolated locations. Peer support groups, community-based initiatives, and the provision of mental health resources inside agricultural cooperatives can all help to lessen these problems by improving access to mental health resources and counseling (Pal et al., 2022). Governments and NGOs can also play crucial roles. Despite the benefits of sustainable practices, barriers such as limited access to resources, lack of technical knowledge, and financial constraints hinder adoption (Ocampo et al., 2023). Policymakers must create supportive environments to facilitate the transition to sustainable practices.

Collectively, these studies provide a comprehensive overview of sustainable agricultural practices presenting their importance in economic, environmental and social aspect. This literature lays a solid foundation for further exploration into the specific requirements of coconuts with regard to agricultural practices.

Methodology

Research Design

The study employs a mixed exploratory design, combining qualitative and quantitative methodologies. It begins with a qualitative phase to understand participants' perspectives on blended learning. The study then uses quantitative data to analyze sustainable agricultural practices in Sta. Cruz, using a structured questionnaire to assess residents' attitudes and impacts on coconut production.

Respondents

The researcher will employ a combination of purposive and convenience sampling to select 30 key stakeholders, including landowners or farmers, farm workers, coconut traders, and processors, based on their expertise and relevance to the research topic. They will also conduct a focus group discussion with 15 groups, aiming to gather valuable insights.

Instrument

The researcher will be collected the primary data through a combination of methods, including in-depth interviews with 30 key stakeholders and focus group discussions with 15 groups. Moreover, the researcher also will be analyzed the secondary data, including related literature and government reports. Lastly, the researcher also will be collected online data, including news, articles and online reports as well as online databases and academic journals.

Conclusions

This study's insights can guide the development of targeted interventions that enhance the farmers, policymakers and concern agencies in the government on implementing sustainable practices, focusing on efficiency and satisfaction, particularly the agricultural sector, thereby enhancing organizational effectiveness and promoting farmers and farm- workers welfare.

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