United International Journal for Research & Technology
Volume 06, Issue 08, 2025 | Open Access | ISSN: 2582-6832

Knowledge and Practices of Coconut Farmer-Beneficiaries in the Phillippines

Alvin M. Fortes[1] and Errol G. De Castro[2]
[1]Graduate School, Sorsogon State University; Philippine Coconut Authority
[2]Graduate School, Sorsogon State University

***Abstract*—** The coconut industry has proven to be a sturdy pillar of the national economy as Philippines is one of the top producers and exporters these agricultural export coconut commodities. Despite the government efforts led by the Philippine Coconut Authority, small scale coconut farmers continue to lag in production, technology, income generation, and readiness to climate resiliency. To this scenario, the study determined the extent of knowledge on coconut production the farmer-beneficiaries and explored the practices and challenges of these farmers along the programs implemented by the oversight agency. Using the mixed- explanatory-sequential research design, the results showed that coconut farmers possessed moderate yet practical knowledge of coconut production, with particular strengths in intercropping, on-farm management, and varietal selection. Farmers' strong preference for local coconut varieties further confirms their adaptive knowledge, shaped by years of hands-on experience. Their farming practices – including planting, intercropping, fertilization, harvesting, and general farm maintenance - remain deeply rooted in traditional methods. However, farmers face multiple challenges that significantly impact both their production yields and overall livelihoods. Thus, the study recommended some strategic interventions that shall engage youth in farming, implement gender-inclusive farming, capacitate farmers on scientific approach but integrate the traditional methods to plantation, intercropping, and fertilization practices.

***Keywords*—** coconut production, farmers, fertilization, intercropping.

I. INTRODUCTION

Coconut (Cocos nucifera) has been recognized globally for its many benefits to human health (Barlina et al., 2022). Being recognized as one of the most important plantation crops, coconut industry has grown exponentially around the world. Report shows that in 2022, global coconut production amounted to about 62.41 million metric tons (Shahbandeh, 2024). Coconut is known to be life-sustaining species in fragile coastal and island ecosystems. Around the globe, Indonesia, Philippines, India, and Sri Lanka are the major coconut-producing countries. These countries' yearly export amount to 1,792,539,200kg (WITS,2023).

Recently, the global trade recognized that the growing demand for plant-based food products in developed and developing countries is the primary growth driver of the global market of coconut products. The increasing consumer spending on functional food and beverage as well as the rising health consciousness of people in terms of proper nourishment greatly contributed in the increase in demand for coconut products specifically of virgin coconut oil. Undeniably, Jayasekhar and Chandran (2021) reported that stagnancy and instability observed in the global production of coconuts in the last decade is a worrisome fact. The global coconut industry is confronting numerous difficult problems such as low productivity, pest and disease outbreaks, price swings, unstable domestic marketing systems, a recession in the trade sector, and many others (Jayasekhar et al. 2024). Hence, policymakers and planners from the world's coconut-growing nations face formidable challenges from the liberalization of the coconut sector's marketing and trade regimes.

Coconut Industry in the Philippines

The coconut industry has proven to be a sturdy pillar of the national economy (Aguilar et al., 2022) . The export of goods made from coconuts, which has grown significantly rising global demands, provided income and livelihood opportunities for industry and stakeholders. As reported, coconut contributes 25% to the country's agricultural exports, with an average of Php 91.4 B yearly export earnings from 2014-2018. By exporting coconut products, it reached $1.24 billion in 2019. Given the magnitudes of these industries which contributed mostly to the nation's economy, the coconut industry's full potential is harnessed, sustained, and realized through a unified effort in setting an inclusive strategic plan for the industry's directions. "The Philippine Coconut Industry has to transform, as Madrigal (2022) posited, to achieve its vision of globally competitive and inclusive industry with ensured equitable gains to all industry stakeholders, the coconut

farmers in particulars". Coconut dominates the agricultural landscape of 69 provinces out of 82 provinces of the Philippines covering 3.65M hectares-a quarter of the country's total arable (Aguilar et al., 2022).

Policies and Legal Support on Coconut Industry

To promote the development of the coconut industry through investments in various sectors, including research, infrastructure, and marketing, the Coconut Industry Investment Fund (CIIF) law (Republic Act No. 6260) was established in 1971 intended to fully tap the potential of the coconut planters and accelerate the growth of the coconut industry and other related coconut products. The law also aims to improve, develop and expand the marketing system and ensure stable and better incomes for coconut farmers. In 2021, the Coconut Farmers and Coconut Industry Trust Fund Act (Republic Act No. 11524) was enacted to establish a trust fund for coconut farmers and the coconut industry. The fund provides financial support for programs that enhance the productivity and welfare of coconut farmers. Significantly, RA 11524 has mandated the Philippine Coconut Authority to craft the Coconut Farmers and Industry Development Plan (CFIDP). The Philippine Coconut Authority is the sole government agency that is tasked to develop the industry to its full potential in line with the new vision of a united, globally competitive and efficient coconut industry.

Public Administration in Agriculture

Public administration plays a pivotal role in shaping agricultural systems, serving as the bridge between policy formulation and on-ground implementation. Governments utilize administrative frameworks to design, regulate, and monitor agricultural policies aimed at enhancing productivity, ensuring food security, and promoting rural development.

By establishing regulatory standards for inputs like seeds and fertilizers, public administration ensures quality control and environmental sustainability, mitigating risks such as soil degradation and water pollution.

Additionally, agricultural extension services, managed by public institutions, disseminate knowledge on modern farming techniques, empowering farmers to adopt innovations that improve yields and resilience. This interplay underscores how administrative efficiency and governance structures are critical to translating agricultural policies into tangible outcomes.

Knowledge and Practices of Farmers

What people know and what people believe in, is somehow a reflection of their disposition towards many things. It is argued that the information in the form of knowledge governs their perceptions, opinions, and interests which give direction to what they do or practice (Nelson et al., 2016).

The source of knowledge coconut farmers is either from traditional knowledge and those derived from either training and seminars they have attended. As postulated by Nelson et. al, that traditional farming is handed down from one generation to the next generation and went through with some modification over the years. It is sometimes called local knowledge and their practices on coconut farming is embedded in their day to day farm operations.

The studies of Awaluddin et al. (2022) and Tama et al. (2021) focused on the smallholder farmer's intention towards conservation in agriculture. The studies revealed that knowledge, perceived risk, perceived behavior control, simultaneously had a significant effect on the intention of farmers to practice conservation. Based on these findings, the combination of extension services for upgrading the level of knowledge concerning the importance of conservation agriculture (CA) could significantly affect farmers' attitudes on intention towards the application of CA.

Research conducted over several decades has led to the standardization of improved agricultural techniques, aimed at achieving sustainable productivity and profitability in coconut farming (Thomas, et al. 2019). To name a few such as adoption of improved coconut nursery techniques enables to produce a quality planting materials. Making use of poly-bag nursery technique priming with fertilizers helps in producing quality seedlings. A well-managed farm following the recommended practices assures the farmer with a quality yield and pest and disease tolerant crops (Mercullo, 2024). These are several forms of technology used for making a variety of coconut-based products which could be adopted.

However, the adoption of these technology remains one of the biggest challenge to extension workers and agriculturists. Adoption of improved technologies and agricultural practices are prerequisites for increased farm productivity as claimed in the study of Mailumo and Onuwa (2022). However, it was inferred in other studies that farmers are willing to adopt technologies

that add value to their welfare and through timely resolution of problems that confront them. Thus, value propositions such as relevance, effectiveness, efficiency, sustainability, and impact must be the key considerations in policy interventions that promote positive technology adoption behaviors (Akudugu et al., 2023). However, despite all the technologies being introduced, some studies have found that the extent of adoption of technologies recommended for a productive and profitable coconut farming is comparatively low due to various constraints. This includes from socio-economic, technological, management or infrastructure (Jaganathan & Thamban, 2017).

In order to understand how farmers' knowledge promote sustainability and resilience, it is important to first look at the factors farmers' decisions (Šūmane, et al., 2018). To improve the extent of adoption technology, training on certain aspects may be organized to increase social participation. Adaption of improved technologies plays a major role in improving the productivity of any agriculture activities. This plays a significant impact in smallholder farmers' views of agricultural innovations (Aluko et al. 2021).

Intercropping is a farming practice which involve two or more crop species growing together and coexisting for a time (Brooker , 2015). This practices of growing intercrops can be categorized or divided such as mixed intercropping or simultaneously growing two or more crops with no, or a limited, distinct arrangement, relay intercropping or the planting a second crop before the first crop is mature, and strip intercropping or the growing two or more crops simultaneously in strips, allowing crop interactions and independent cultivation.

In the study of experience in coconut cultivation, social participation and extension contact were positively significant with the adoption, whereas, land holding, area under coconut cultivation and annual income were negatively correlated and age, education, family size, mass media exposure and risk orientation were non-significant relation with the adoption of coconut production technology.

While coconut products remain to be an export commodity, the country is experiencing a declining volume of production which has resulted in unmet demands in the global market. Due to the tepid performance of the industry, many of our coconut farmers are discouraged from investing in coconut enterprises (Castillo & Ani, 2019).

Farmers' Challenges within the Coconut Industry

The coconut farmers plays significant roles as the one of the actors among the stakeholders toward the achievements of the coconut industry's desired goals. Managing hundreds of millions of agricultural coconut trees requires some organizational support and oversight agencies. In the Philippines most coconut production is organized into medium-sized farms. According to the Philippine Coconut Authority there are around 2.5 million coconut farmers listed in the 2018 National Coconut Farmers Registry System.

Undeniably, farmer are confronted with different challenges within the sphere of coconut- agro-economic system. In the study of the coconut farmers in Lanao, Gurbuz and Manalus (2019) captured the severe problems encountered by the coconut producers in coconut such as the far distance of the land from farm to market road in marketing problem, intercropping in management problem, high cost of laborers in labor problem, and low and fluctuating price of coconut product for external issues encountered. This finding may be comparable of other coconut farmers in the different regions, of which that includes the Bicol region. According to von Diest et.al (2020), a rational approach has been conducted by the mainstream researchers in agriculture to generate, empirical, tangible knowledge for increased yields and sustainability. They inferred that this approach, although has led to the development of technological tools to support farmers in their management decision making, which, while helpful, are not able to factor in the complex, dynamic variables that motivate farmer decision making. More importantly, farmers often do not adopt these tools as expected . Also, negative impacts on-farm also influence imaginaries at wider scales. Rose and Chilvers (2018a) found evidence that the requirement to use emergent technologies are mismatched with the expectations of farmers about what farming is.

The Present Study

This study shaped policies and programs that could help coconut farmers develop a more diverse and integrated farming approach that would result in the increase of production and income. This study employed an integrated theoretical framework combining Rogers' Diffusion of Innovations (DOI) Theory (2003), Roling and Engel's Knowledge Systems perspective (1991), and the DFID Sustainable Livelihoods Framework (SLF) (1999). This synthesis offered a holistic lens to analyze sustainable coconut production among farmers

by examining three interconnected dimensions: the knowledge foundations , the practices adoption process, and the challenges rooted in livelihood assets and vulnerability.

This study is relevant to several entities in the agricultural landscape of the country. First, the coconut farmers may benefit from this study. Their knowledge and practices are to be considered in the policy formulation and project implementation of the oversight agency. Hence, their traditional knowledge may be considered and be amenable to the technology developed for coconut. Second, the agricultural extensionists may be provided with knowledge on how to deliver the services of the agency in the context of the coconut farmers. Third, oversight agency may be able to revisit their policies and improve project implementation strategies. Fourth, the coconut industry may be provided with support along policy and implementation; thus, increasing the production and improving the agricultural practices of the community.

The present study included the coconut farmers in one of the provinces in the Philippines who were registered in beneficiaries in the National Coconut Farmers Registry System. They were identified to be the beneficiaries of the three programs of the agency such as planting and replanting, intercropping, and fertilization. Thus, this study assessed the knowledge, practices and challenges farmer-beneficiaries. Specifically, it assessed the extent of knowledge of the farmer beneficiaries on coconut production in terms of planting/replanting, fertilization, intercropping; and described the practices and challenges of the farmer beneficiaries on coconut production.

II. METHODOLOGY

Research Design

The study used the mixed method explanatory-sequential research design. Through this design, an in-depth analysis reveals its significant role in understanding complex phenomena. This approach is useful when investigating attitudes, behaviors, and trends that demand a nuanced perspective. Using this design, the researchers often utilize both the qualitative and quantitative methods to gather diverse data, creating an extensive profile of the subjects under study (Hunter, et al. 2019). Thus, this study used quantitative analysis on the knowledge of coconut farmers on production. The practices of farmers coconut production was explored qualitatively.

The Participants

The participants of this study were derived from the list of coconut farmers who have already become beneficiaries in the three major programs of the government's agricultural agency. Based on the proportionate sampling, the participants involved 302 beneficiaries. The study included 108 respondents for the planting and replanting survey, 23 respondents for fertilization, and 171 for intercropping. However, the study interviewed 15 participants who were purposively chosen based on their age, status and size of land holdings, and number of services received or availed from the agency.

Research Instrument

The study employed a rigorously designed, researcher-made survey questionnaire to systematically assess participants' knowledge on coconut production. The instrument was structured into three comprehensive sections to ensure thorough data collection. The first section captured essential demographic variables including age, gender, educational attainment, farm size, and years of farming experience- factors known to influence agricultural knowledge and adoption of technologies. The second section contained a carefully constructed knowledge assessment focusing on critical domains: coconut production techniques, intercropping methods, fertilization practices. In addition, the study employed unstructured interviews to explore farmers' practices and challenges. Eight guide questions examined the actual farming practices, while six focused questions identified systemic challenges. Recognizing the importance of cultural and linguistic appropriateness, all interview questions were translated into the local dialect by native speakers and then back-translated to ensure conceptual equivalence.

Research Ethics

To adhere to ethical procedures, the researcher first secured permission to conduct the study. Upon approval, the participants in this study were identified, and their participation was made to be voluntary. Researcher explained their roles, the research compliance to data privacy act, and the consent secured from them. Participants were willing to take part in the study, and their personal information were treated with strict confidentiality. This procedure was employed adhering to the ethical standards and principles of research involving human participants (National Ethical Guidelines for Research Involving Human Participants, 2022).

Data Collection

The study employed a rigorous approach to data collection. In the initial preparatory phase, the researcher systematically identified program beneficiaries, conducted document analysis to verify and categorize participants.

The core data collection employed a validated survey instrument administered through face-to-face interviews. This approach ensured high response quality while accommodating farmers' literacy levels.

The size, and education and assessed knowledge across three critical domains: coconut production techniques, intercropping practices, and fertilization methods.

Each knowledge item was scored using a 5-point Likert scale to enable precise measurement of knowledge levels.

During field administration, researchers provided clarification when needed while maintaining question neutrality to prevent response bias questionnaire captured five key demographic variables (age, gender, farming experience, farm size).

In the final phase, the researcher conducted in-depth interviews with 15 purposively selected farmers representing diverse demographic profiles and program participation levels.

These unstructured interviews, conducted during routine field monitoring visits, were audio-recorded with consent and typically lasted 45-60 minutes.

The interview protocol explored the implementation challenges, the personal experiences programs, and the suggestions for improvement.

Data Analysis

To assess the extent of farmers' knowledge on coconut production, the study employed descriptive statistics to analyze quantitative survey data. For each knowledge domain planting/replanting, fertilization, and intercropping responses were scored.

The mean, median, and mode were computed to determine central tendencies, revealing the overall knowledge level of beneficiaries. Frequency and percentage distributions were used to categorize responses.

In describing the practices and challenges, qualitative data from interviews were analyzed through open coding, categorization, and thematic analysis to document practices and challenges. First, audio recordings were transcribed, and codes were inductively derived from farmers' responses. Similar codes were grouped into categories and themes were developed to explain patterns. The first step was the identification of the code in the first transcript, exploring all possible codes to be indicated in the data. The second step was done through looking at the similar responses in the first transcript to the other transcripts, adding more code to the newly identified practice or challenge. The third step focused on the grouping of code including the interview snippets to form categories.

Then, the last step was the forming of themes for each category. A summary table was prepared for each theme in order to derive the collective meaning and implications for each.

Thus, open coding, categorization, and theme identification to establish the themes for the practices and challenges were done manually and no software was used for qualitative analysis.

III. RESULT AND DISCUSSION

Knowledge of the Farmer Beneficiaries on Coconut Production

Table 1 shows the result of the assessment of coconut farmers' knowledge on planting and replanting techniques revealing an overall weighted mean score of 4.54, indicating an extremely high level of understanding among beneficiaries. Farmers demonstrated particularly strong knowledge in fundamental areas such as coconut growth biology, seed selection criteria, and basic farm layout practices.

The weighted mean computation for farmers' knowledge on intercropping practices yielded an overall score of 4.58, indicating an extremely high level of understanding among beneficiaries.

This strong performance demonstrates that coconut farmers possess substantial awareness of intercropping fundamentals and its benefits.

The assessment of coconut farmers' knowledge regarding fertilization practices yielded an overall weighted mean score of 4.25, indicating a moderate level of understanding among beneficiaries.

Table 1. Summary of the Extent of Knowledge of Farmer-Beneficiaries in Coconut Production

Programs	Weighted mean	Interpretation
Planting/ Replanting	4.57	Extremely Knowledgeable
Intercropping	4.58	Extremely Knowledgeable
Fertilization	4.25	Moderately Knowledgeable

The survey results revealed significant variation in coconut farmers' knowledge levels regarding coconut production. While farmer beneficiaries demonstrated moderate overall knowledge, they exhibited particularly strong understanding in three key areas: intercropping systems, on-farm management, and coconut variety characterization. This specialized knowledge reflects the effectiveness of traditional farming practices passed down through generations, particularly in maximizing land productivity through strategic intercropping and thoughtful farm layout planning.

The result suggests that core concepts about coconut cultivation are well-established within the farming community, likely due to traditional. However, the results also highlight important variations in knowledge levels across different aspects of coconut production that warrant attention. These findings are particularly significant as they relate directly to sustainable farming practices and yield optimization. While farmers may be familiar with traditional methods, there is room for improvement in adopting more scientific approaches that could enhance productivity and environmental sustainability.

The study's findings have important implications for farmer education and support programs. The moderately high overall knowledge level indicates that extension services have been generally effective, but the identified gaps point to specific areas where training could be intensified. Particularly, there appears to be a need for more focused education on the importance of using the certified planting materials, proper soil management techniques, and precision farming methods. These results align with the study's broader objectives by not only assessing current knowledge levels but also providing actionable insights for program improvement.

The farmers have successfully internalized the basic principles of intercropping as promoted by the government's extension programs, reflecting effective knowledge transfer regarding this important agroforestry practice. However, a concerning disconnect emerged between farmers' knowledge and actual practices. While respondents demonstrated sophisticated understanding of intercropping principles and seedling selection, their farms typically featured limited crop diversity and reliance on aging, low-yield native trees. Similarly, although farmers correctly identified optimal 8-10 meter spacing for coconut planting - a practice most followed - their fertilization practices revealed significant gaps. Most farmers reported using organic fertilizers but admitted uncertainty about specific fertilizer types and application methods. This paradox between theoretical knowledge and practical application suggests the presence of external constraints beyond mere awareness, possibly including limited access to quality inputs, financial barriers, or inadequate technical support. The findings highlight how knowledge alone proves insufficient without corresponding access to resources and practical guidance. These findings are particularly significant as they reveal potential gaps in farmers' awareness of program specifics and economic aspects of intercropping.

The moderate overall knowledge level indicates that while fertilization concepts are generally understood, there is substantial room for improvement in farmers' technical knowledge. This aligns with the study's broader goal of identifying gaps in farmers' understanding of government programs. The results suggest that agricultural agencies should consider enhancing its training programs to focus more on practical, hands-on knowledge about fertilizer types, application techniques, and proper documentation procedures. Such targeted interventions could bridge the identified knowledge gaps, ultimately leading to more effective implementation of fertilization programs and improved coconut productivity. The data particularly emphasizes the need for more comprehensive education about specific mineral fertilizers, which received the lowest scores but are crucial for optimal coconut nutrition and yield.

Hence, similar findings were revealed by the study of Sagocsoc, Alcantara, and Atega (2023) along farmers knowledge and practices on fertilization. Most farmers in Agusan do not apply fertilizer (107 or 68.15%). These findings suggest that while farmers excel in adaptive, field-tested techniques, they lack exposure to science-backed, high-yield methods endorsed by agencies.

Practices and Challenges of Farmers on Coconut Production

Several themes that capture the practices and challenges of these farmers. With the richness of data and similarities and dominance of codes and categories, these practices are hereby highlighted.

As coconut farming and the industry itself has become a way of life to the locals, these farmers develop agricultural practices along coconut production, crop management, harvest and post-harvest activities. Having grown with this industry, farmers been noted to have good agricultural practices (GAP) along coconut. It is being asserted that adoption of sustainable agricultural practices (SAPs) has been recommended by many experts and international institutions to address food security and climate change problems (Setsoafia & Renwick, 2022).

Contextualizing practices to coconut farmers, there are themes deduced from the data. The study was able to identify practices and challenges thematically presented in Table 2.

Thematic Analysis of the Practices and Challenges of Farmers Beneficiaries on Coconut Production

Programs	Practices	Challenges
Planting/ Replanting	Planting different coconut varieties	Knowledge Gaps Limit Productivity
	Cultivating the soil and crops	
	Marketing via 'Suki System'	Financial Literacy and Fragility
	Connecting with other cocoteros in the Cooperatives	
Intercropping	Boosting coconut farms with intercropping and livestock	Adopting and sustaining an Integrated Farming System
Fertilization	Optimizing fertilization through organic and synthetic	Innovation in Coconut farming

Practices of Farmer on Coconut Production

Planting different coconut varieties . The planting practices of the coconut farmers shows diversified varietal planting of which the merging of their traditional and local varieties with the new varieties. Although most of them revealed that they often plant the local coconut varieties rather than the hybrid crop, they recognize that each variety has its own biodiversity type and characteristics. The practice of planting 'pilipog' or traditional coconut is culturally rooted to these farmers; likewise, they also recognized the higher tolerance of these varieties to climate-related risks such as drought, and typhoon.

The indigenous knowledge of the farmers is also revealed in their selection of planting materials. In addition, farmers reported a strong tradition of planting coconut seedlings during the full moon, based on generations-old agricultural wisdom. They firmly believe this lunar phase significantly enhances coconut productivity, with many claiming seedlings planted at this time demonstrate faster growth rates and higher eventual fruit yield. This practice reflects the deep integration of celestial observations with agricultural knowledge. Traditionally, lunar cycles are carefully synchronized with planting schedules in most Asian countries. While scientifically unverified, these lunar-dependent planting traditions remain deeply embedded in local farming culture. Confirming to such belief, the Kumba- Quimbaya community in North America integrate astronomical phenomena into its daily life to improve harvests, carry out sowing or anticipate climatic or seasonal changes (Sánchez-Giraldo & Quintero-Salazar, (2023).

Implied in the planting practices of the coconut farmers is conventional cultivation with limited integration of technology-based farming techniques. None among the farmers explored on integrating breeding various modern breeding technologies for genetic improvement in coconut. Implied as well is their lack of practice to explore other genetic breeds that could yield more fruits. Instead, they consider planting what is available and what they have been growing. Their knowledge of the planting materials seem limited to the types- tall and dwarf. Their high preference to the native variety manifested their knowledge of the domesticated characteristics of this variety. As such, they believe that these crops would more have production, resilient to climate change, and less-demanding in cultivation and growth. Similarly, the coconut farmers practices in Dingalan, Aurora were too

traditional as revealed in the study of Datang, Lomanog, and Balaria (2019).

Cultivating the soil and crops. Several practices on cultivating the soil to prepare it for planting and nurturing crops until they are fully grown and yielding fruits. Interestingly, coconut farmers described how the topography of the land, the soil type, and the presence of water source affect the production of coconut trees. In terms of land preparation, all of them adhere to the a certain prescribed field lay-out. Most of them confirmed that they make sure of the 8-10 meters distance between seedling stating they plant seedlings in 'raya- raya' or 'linya-linya' line by line . This practice revealed that coconut farmers observed field spacing adhering to the single hedge lay-out with 8-10 meters distance in a row.

Boosting coconut farms with intercropping and livestock. Coconut farmers revealed to have practice intercropping as value- addition in their coconut production. intercropping adds to the income of the family whenever there is no coconut to be harvested. Most importantly, intercrop provide balance to the ecological surroundings that helps prevent soil erosion and eliminate pest and diseases. According to Rani, Subbulakshmi, Kavitha, Hassan, and Latha (2024), intercropping in coconut plantations is a traditional practice in small lands, but it is rare in large-scale systematic cultivation. Coconuts take up the most plantation space, but they yield the lowest net return per acre and give the fewest jobs. Therefore, different economically valuable crop species such as intercrops in coconut plantations must be popularized.

Reflecting from the responses of the farmers, it appears that intercropping among coconut farmers in the province is currently limited to a few staple crops—such as kamote, cassava, corn, vegetables, banana, and pineapple. While this demonstrates some diversification, it also highlights a significant gap in adopting a fully integrated coconut-based farming system . Most farmers have not explored more advanced combinations, such as integrating livestock, poultry, or high-value crops alongside coconut cultivation. This suggests a missed opportunity for maximizing farm productivity, income stability, and ecological resilience.

Optimizing fertilization through organic and synthetic. Farmers revealed that they use different methods and types of fertilizers to increase coconut production. In terms of pest control, most of them revealed that they do not use pesticides. To kill the 'bangag' or pest they make 'damukan' or fumigating with dried leaves. Almost all of the participants confirmed to these practice as they do not want to buy pesticides and they are not sure of what pesticides to use. it can be inferred that their practices on fertilization and pest control reflects their choices of using traditional method. They made use of fumigation and some usually cleaned the surroundings. In another view, their preference to the traditional method may be due to the expenses to be incurred in buying pesticides and even fertilizers, which may be financially limiting to them. Similar findings were identified by Datang, Lomanog, and Balaria (2019) in the coconut farmers in Mindano.

Marketing via 'Suki System'. Most of the participants revealed in the interview that they sell their coconut to their 'suki' or usual or regular trader. Some of them sell their coconut to the cooperative to which they are member. This practice revealed that farmers become tied with specific traders limiting them opportunities to seek better market opportunities such that higher prices for coconuts as lower prices are used to repay their loans. In addition, the suki system creates some constraint on bargaining power of the farmers to the traders. Although the suki system becomes the farmers support in times of financial difficulties.

Connecting with other cocoteros in the cooperatives. Interestingly, the coconut farmers recognized the value of joining farmers cooperatives as they admitted that they are members of the either associations or cooperatives. They mentioned that being a member of cooperatives has lot of gains. The participation of the coconut farmers to association or cooperatives manifest their strong willingness to connect with other cocoteros. By joining these groups, farmers recognize the collective benefits of shared resources, knowledge exchange, and stronger market bargaining

power. Cooperatives can contribute to improving their livelihoods and strengthening their organizations. Aside from the benefits given to them, their participation has a long term effect to their farming practices as they will be working collectively and would have access to subsidies, trainings, and government support.

Challenges of Farmers in Coconut Production

Knowledge Gap Limits Productivity. The knowledge gap identified as one of the challenges is somehow accounted to the profile of the farmers particularly their age and number of years as farmers. Considering that coconut farming is a livelihood past down to them, the

inter-generational knowledge on planting and cultivation too has been handed to them. Thus, the poor selection and non-compliance to the field spacing practices resulting to poor production are gaps that continuously confront the farmers. Creation of knowledge on farming is shaped by different sources. According to Tolinggi et al. , 2025), knowledge co-creation, is the interaction between scientific knowledge and public knowledge in which novelty emerges as a result of a shared evolutionary process. Old farmers, in sustaining their coconut cultivation, apply the concept of long-term orientation for example, performing rejuvenation processes to 40–50-year old trees that are less productive. Such observation is also supported by the study of Mestidio (2024). The age of the coconut farmers is a factor to look into when production capability is considered. The experience, maturity, experience, and wisdom are things that coconut farmers, government program implementers, and other partners and stakeholders recon with. Their inputs earned from their long years of farming, producing and selling coconuts and coconut products command respect and are most often a source of wisdom and advice.

Addressing this challenge calls for unified actions of the lead agencies, academe, non-government agencies, local government units, and the farmers associations. A more strategic and intensified farmers' education and training redesign in order to address these challenges. The lead agencies can provide technical expertise while the academe can help in the community organizing through extension services in order to produce a context-bases information communication materials for these farmers.

Adopting and sustaining an Integrated Farming System. The results indicate that establishing an effective intercropping system remains a challenge for the farmers, as they primarily focus on a limited number of crops and livestock. Many practice monocropping and do not cultivate value-added crops that could augment both their income and their family's daily sustenance. However, some farmers who practice intercropping demonstrate agricultural knowledge by adapting to their soil conditions. Farmers strategically plants 'saging' banana or 'pinya' pineapple instead of 'mais' corn, which they consider less suitable for their land.

The current intercropping practices largely depend on government-provided resources like livestock and vegetable seedlings, revealing a concerning level of dependency on external support. This reliance prevents farmers from developing their own sustainable

intercropping systems that could enhance farm biodiversity, improve ecological balance, and ultimately boost their livelihoods. The persistent challenge of adopting integrated farming systems reflects deeper systemic issues including lack of agricultural innovation, absence of farmer-led experimentation, and poor adoption of good agricultural practices. Thus, this challenge implies that farmers perpetuates cycled of dependency, missed opportunities for ecological farmers, limit income potentials, and stagnation in developing adaptive techniques in the farm that would make it more climate resilience.

This challenge underscores the current state of government agricultural programs, revealing an urgent need to address this issue. Government agencies should expand their efforts beyond simply providing free seedlings by focusing on mentoring farmers and shifting their mindset away from reliance on short-term assistance. Instead, they should emphasize technical support, including skills training and access to mechanization tools.

Innovation on Coconut Farming. One of the challenges encountered by farmers is the absence of mechanized tools incoconut farming hindering harvest efficiency and adaptive farm management. All of the farmers interviewed revealed that they use traditional method of planting, harvest, and farm maintenance and care. In terms of harvesting, either they themselves do it or they hire some labor to facilitate the harvest. They use the 'kawit' or the long bamboo pole to pull the bunch from the tree. The use of traditional method such as climbing the tree possess risks and danger to the coconut farmers who often times do not have health and accident insurance. It is also time consuming and physically demanding. Thus, harvesting process is an added expenses for the farmers especially when hiring labor. This observation is validated by the study of Bautista et al. (2017) that showed the level of Philippine's agricultural mechanization in selected crops or products such as rice and corn, vegetables, legumes and root crops, coconut, sugarcane, fruits and fiber crops.

The absence of mechanization can be due to the fact that many of the coconut farmers are classified as small scales. They felt that needs tool may not be needed although they recognized the need for one. Therefore, these mechanization tool may not be a priority for the

farmers. Similar challenge was observed in the coconut farmers in India. In the study of Rathinavel et al. (2024), the respondents with small farm holdings are not in great demand for intense labours/mechanization. Larger the farms have high demand on mechanization, especially for harvesting machinery. Challenges included the lack of awareness, higher investment, poor effectiveness etc., represents the poor/no adoption of mechanization developments among the coconut farmers.

Financial Literacy and Fragility. One of the most significant challenges for coconut farmers is maintaining proper records of their expenses, sales, income, and copra production. They admitted they did not. When questioned about their reasons for not maintaining records, farmers stated that all earnings are immediately used for family expenses and labor payments, making record-keeping seem unnecessary.

This challenge implies the lack of financial management through the absence of record keeping. With their record, this prevents the farmers from accurately track profitability of the coconut harvest and even their intercrop harvest. Thus, they do not have some physical file that would prove the economic viability of engaging in coconut farming. Significantly, the lack of record keeping also may affect their financial decisions and may have lost the opportunities for cost-saving measures particularly on the farm expenses. In addition, they become vulnerable to unfair trades and financial exploitations. Hutapea and Siallagan (2023) emphasized that inventory management is crucial in the coconut farming sector since it has a direct impact on sales and revenue.

Since coconut farming is the livelihood inherited by the children to their parents, the absence of record- keeping by the old farmers would have an impact to the financial management skills of the children. The possibility of lack of financial management skills may be reflected in the practices among the children. In addition, the absence of record keeping and tracking which means no financial data may hinder the farmer to develop entrepreneurial and business mindset and growth.

On the different note, this lack of practice may not be surprising to coconut farmers due to their mindset that their coconut farm is a source of the living of the family, augmenting the daily needs and education of the children. They did not develop the mindset of profitability and income; thus can affirmed why these farmers have also limited intercropping practices and innovations in their coconut farm. This scenario in the Philippines contradicts with the result of the study in Malaysia on small-scale coconut farmers of Omara, and Fataha, (2020) revealing coconut production is a profitable enterprise and therefore may help smallholders to augment their income and improve livelihoods.

Thus, this challenge calls for an effective and context-based approach to educate the farmers along financial literacy. Instead of complex bookkeeping, they could start with basic methods like marking sales and expenses in a notebook or using a mobile app with voice notes if they're not comfortable writing. As members of cooperatives and associations, they could be provided with training using real-life examples from their copra sales, showing how tracking money helps spot problems and opportunities. The key is making record-keeping feel useful rather than burdensome. Farmers must see recording not as extra work, but as a tool to gain more control over their livelihood.

IV. CONCLUSION

This study investigated the knowledge, practices, and challenges of the coconut farmers beneficiaries along coconut production. Coconut farmers possess moderate yet practical knowledge of coconut production, with particular strengths in intercropping, on-farm management, and varietal selection. Their proficiency in these areas demonstrates the effectiveness of traditional farming practices, such as optimizing land use through intercropping and strategic field spacing. Farmers' strong preference for local coconut varieties further confirms their adaptive knowledge, shaped by years of hands-on experience. Their farming practices - including planting, intercropping, fertilization, harvesting, and general farm maintenance - remain deeply rooted in traditional methods. However, farmers face multiple challenges that significantly impact both their production yields and overall livelihoods.

VI. RECOMMENDATION

This recommends different policies and programs to address the challenges of the coconut farmers. First, the PCA, as the lead agency in the implementation and regulation shall create policies and programs that would make the youth more engaged and involved in farming. To do such, academe may create activities and research on innovations that can make farming attractive to the younger generations. Second, policies and program for women may be created such as women's training groups focused on coconut by-products and value-adding

techniques. Third, a demonstration farms that may show case the combined traditional methods with new sustainable practices for coconut farming may be pursued. Farmers may be encouraged to apply scientific methods of planting, intercropping, and fertilization. Fourth, farmers cooperatives and association may be supported in order for the farmers to be trained and learn from one another the simple record-keeping tools to track expenses and yields and establish a farmer-to-farmer troubleshooting network to share solutions to common problems.

REFERENCES

[1] Aguilar, E. A., Lozada, E. P., & Aragon, C. T. (2022). Philippine Coconut Industry Roadmap. Quezon City, Philippine Coconut Authority.

[2] Akudugu, M. A., Nkegbe, P. K., Wongnaa, C. A., & Millar, K. K. (2023). Technology adoption behaviors of farmers during crises: What are the key factors to consider? Journal of Agriculture and Food Research.

[3] Aluko, K. J., Sennuga, S. O., & Ezinne, M. E. (2021). Exploring Smallholder Farmer's Perception on the Uptake of Agricultural Innovations in Kuje Area Council, Abuja. International Journal of Agricultural Economics, 315-319.

[4] Awaluddin, A, Rauf, B. Amir, F.(2021). Examining Farmers' Intention Towards Conservation Cocoa Farm in Bone Regency by Using Theory of Planned Behavior. Proceedings of the 1st World Conference on Social and Humanities Research (W-SHARE 2021). DOI https://doi.org/10.2991/assehr.k.220402.012

[5] Barlina, R., Dewandari, K. T., Mulyawanti, I., & Herawan, T. (2022). Chemistry and composition of coconut oil and its biological activities. Multiple Biological Activities of Unconventional Seed Oils, 383–395. https://doi.org/10.1016/B978-0-12-824135-6.00025-8

[6] Bautista, E., Jong-sun, K., Yun-jung, K., & Panganiban, M. (2017). Farmer's Perception on Farm mechanization and Land reformation in the Philippines. Journal of the Korean Society of International Agriculture, 29(3), 242-250.

[7] Brooker , R. w. (2015). Improving intercropping: a synthesis of research in agronomy, plant physiology and ecology. New Phytologist, 107-117.

[8] Castillo, M. B., & Ani, P. B. (2019, June). FFTC Agricultural Policy Platform . Retrieved from https://ap.fftc.org: https://ap.fftc.org.tw/e-journal

[9] Datang, H. G., Lomanog, J. E., & Balaria, F. E. (2019). Coconut Farming Industry in Dingalan, Aurora: Practices and Challenges. International Journal of Advanced Engineering, Management and Science (IJAEMS) , 5(1), 11-17.

[10] DFID (Department for International Development). (1999). Sustainable Livelihoods Guidance Sheets. London: DFID.

[11] Gurbuz, I. B., & Maranos , M. (2019). Impact of coconut production on the environment and the problems faced by coconut producers in Lanao del Norte Province, Philippines. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 19(3), 2285-3952.

[12] Hunter, D., McCallum, J., & Howes , D. (2019). Defining Exploratory-Descriptive Qualitative (EDQ) research and considering its application to healthcare. Journal of Nursing and Health Care, 4(1),.

[13] Hutapea, P., & Siallagan, M. (2023). Pre- dictive Analysis for Inventory Management of Coconut Warehouse (Case Study: Banio Lahe- wa. International Journal of Current Science Research and Review, 06(11)., 1-15.

[14] Jaganathan, D., & Thamban, C. (March 2017). Participatory approachs for enhancing technology utilization in coconut . Indian Coconut Journal, 18.

[15] Jayasekhar, S. & Chandran, K.. (2021). World Economic Importance in The Coconut Palm(Cocos nucifera L.) - Research and Development Perspectives (pp.801-820).DOI: 10.1007/978-3-030-76649-8_1.

[16] Jayasekhar, S., Thamban, C., Chandran, K., Thomas, L., & Thomas, R. J. (2024). Analysis of Farmer Producer Organisations in the Coconut Sector: Current Scenario, Limitations,

[17] Madrigal, B. R. (2022). Foreword. In E. A. Aguilar, E. P. Lozada, & C. T. Aragon, Philippine Coconut Industry Roadmap 2021-2040 (p. xxxvi). Quezon: Philippine Coconut Authority.

[18] Mailumo, S. S., & Onuwa, G. C. (2022). Adoption Index of Recommended Onion Production Practices and Correlation of Multivariate Factors among Smallholder Farmers. Turkish Journal of Agriculture - Food Science and Technology, 2926.

[19] Mercullo, W. A. (2024). Coconut Farm Management. PCA.

[20] Mestidio, C. B. (2024). tatus of Coconut Farmer-Marketers: A Review towards Sustainable Production Options. Canadian Journal of Business and Information Studies, 6(4), 147- 155.

[21] National Ethical Guidelines for Research Involving Human Participants (2022). Philippine Health Research Ethics Board. https://ethics.healthresearch.ph/index.php/phoca-

[22] Nelson, G., Abrigo, G., Ocampo-Dayao, J., & de Guzman , L. (2016). Organic Farming: A Thriving Fashion and Passion, Selected Stories of Organic Agriculture Champions in the Philippines. Quezon City. BA-BAR.

[23] Omara, Z., & Abdul Fataha, F. (2020). Unravelling the factors affecting agriculture profitability enterprise: Evidence from coconut smallholder production. Accounting 493-500.

[24] Rani, S., Subbulakshmi, S., Kavitha, K., Hassan, S., & Latha, R. (2024). A review on coconut based intercopping. International Journal of Research in Agronomy, SP 7(9), 243-247.

[25] Rathinavel, S., Surendrakumari , R., Kavitha , R., Sanjeevi, P., & Suthakar, B. (2024, September). Key challenges faced in coconut farming across Coimbatore and Tirupur districts, Tamil Nadu. International Journal of Agriculture Extension and Social Development, 7(9), 896-901.

[26] Rogers, E. M. (2003). Diffusion of Innovations (5th ed.). Free Press.

[27] Roling, N. G., & Engel, P. G. H. (1991). The development of the concept of Agricultural Knowledge and Information Systems (AKIS): Implications for extension. In Agricultural Extension: Worldwide Institutional Evolution and Forces for Change (pp. 125-137). Elsevier.

[28] Africa: Enriching Farmers' Livelihoods (pp. 9-34). Earthscan.

[29] Rose, D. C., & Chilvers, J. (2018). Agriculture 4.0: Broadening responsible innovation in an era of smart farming. Frontiers in Sustainable Food Systems, 2, 87. https://doi.org/10.3389/fsufs.2018.0008

[30] Sagocsoc, R., Alcantara, E.-D. D., & Atega, T. A. (2023). Coconut production and marketing practices in BATA ARC. International Journal of Agronomy and Agricultural Research, 23(1), 5-10.

[31] Sánchez-Giraldo, D., & Quintero-Salazar, E. A. ((2023). Astronomical phenomena in the cultural practices of the kumba-quimbaya indigenous community of colombia. Journal of Astronomical History and Heritage, 26(3), 621–636.

[32] Shahbandeh, M (2024). Coconut production worldwide from 2000 to 2023. Statistica. https://www.statista.com/statistics

[33] Setsoafia, E. M. (2022). Effects of sustainable agricultural practices on farm income and food security in northern Ghana. Agric Econ 10, 9 (2022), 1-15

[34] Šūmane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., des Ios Rios, I., Ashkenazy, A. (2018). Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. Journal of Rural Studies , 232- 241.

[35] Tama, R. A. Z., Ying, L., Yu, M., Hoque, M. M., Adnan, K. M. M., & Sarker, S. A. (2021).

[36] Assessing farmers' intention towards conservation agriculture by using the Extended Theory of Planned Behavior. Journal of Environmental Management, 280, 111654. https://doi.org/10.1016/j.jenvman.2020.111654

[37] Thomas, G. V., Krishnakumar, V., Dhanapal, R., & Shrinivasa Reddy, D. V. (2019). Agro-management Practices for Sustainable Coconut Production. Springer Nature Link, 227- 322.

[38] Tolinggi, W. K., Salman, D., & Rahmadanih, H. (2025). Farmer regeneration and Knowledge co-creation in the sustainability of coconut agribuisness in Gorontalo, Indonesia. Open Agriculture, 8(1), 1-18.

[39] Von Diest, S. G., Wright, J., Samways, M. J., & Kieft, H. (2020). A call to focus on farmer intuition for improved management decision-making. Outlook on Agriculture, 49(4), 278- 285. https://doi.org/10.1177/0030727020956665(Original work published 2020).

[40] World Integrated Trade Solution (2023). Coconuts, fresh or dried exports by country in 2023. https://wits.worldbank.org