SAJAAS

Southeast Asian Journal of Agriculture and Allied Sciences

Volume 5 Issue 2

Bittersweet Connections: Navigating Challenges and Collaborations Among Cacao Farmers in Quezon, Philippines

Maestro, Glemechille D.[1]
Tolentino, Geri Mae A.[2]
Liwanag, Giehway R.[3]

Corresponding Author: *geritolentino@slsu.edu.ph*

[1-2]*College of Agriculture, Southern Luzon State University, Barangay Ayuti, Lucban, Quezon, Philippines*
[3]*Office of the Vice President for Research, Extension, Production, Development, & Innovation, Southern Luzon State University, Barangay Kulapi, Lucban, Quezon, Philippines*

pp. 73-88

SAJAAS | Southeast Asian Journal of Agriculture and Allied Sciences
www.sajaas.basc.edu.ph
sajaasjournal@basc.edu.ph

Bittersweet Connections: Navigating Challenges and Collaborations Among Cacao Farmers in Quezon, Philippines

Article History:
Received: *Jul. 31, 2025*
Accepted: *Oct. 21, 2025*
Published: *Nov. 25, 2025*

https://doi.org/10.63943/sajaas.vol5iss2art123pp73-88

Maestro, Glemechille D.[1]
Tolentino, Geri Mae A.[2]
Liwanag, Giehway R.[3]

Corresponding Author: *geritolentino@slsu.edu.ph*

[1-2]*College of Agriculture, Southern Luzon State University, Barangay Ayuti, Lucban, Quezon, Philippines*
[3]*Office of the Vice President for Research, Extension, Production, Development, & Innovation, Southern Luzon State University, Barangay Kulapi, Lucban, Quezon, Philippines*

Abstract

This paper delves into the challenges faced by top-performing cacao farmers in Quezon, Philippines, and examines the contributions of various community actors in addressing these issues. Using deviant case sampling, respondents were selected based on their pod yield per tree, farming practices, post-harvest activities, community service, and years of experience in cacao farming. This qualitative study, guided by the Social Capital Theory, emphasizes the importance of social relationships within agricultural communities. Latent content analysis and thematic coding of interviews and focused group discussion (FGD) notes, conducted using Atlas.ti, identified six key challenges in Quezon's cacao industry: gaps in technical knowledge, challenges in resource intervention, market accessibility issues, climate-related risks, limited access to quality planting materials, and threats from cacao pests. The first three are commonly addressed by actors within cacao farming networks in the province, while the latter three receive comparatively less attention due to their complexity and context-dependent nature. This study affirms the need for fostering and nurturing multilayer collaborations encompassing formal and informal networks to support farmers and enhance industry resilience and sustainability.

Keywords: *agricultural communities, cacao farming, partnerships, qualitative research*

Introduction

The Mayans believed that cacao (*Theobroma cacao*), the source of chocolate, was discovered by the gods (Dillinger et al., 2000). Hence, its name means 'food for the gods'. Cacao only grows between 0° and 20° north and south of the equator—the so-called Cacao Belt—which usually experiences warm but rainy climates (Hermann & Diaz Pérez, 2010). Though not native to the Philippines, it grows well in the country and is considered a high-priority crop (High-Value Crops Development Act of 1995 [Republic Act No. 7900], 1995; Magallon et al., 2022). Globally, cacao production is dominated by countries such as Côte d'Ivoire, Ghana, and Ecuador, while the Philippines remains a small but emerging producer seeking to strengthen its position through improved farming practices and local collaborations (Gonzales, 2024; Kongor et al., 2024). In the Philippines, cacao production has gradually increased every year. In 2024, production reached 2.4 thousand metric tons, the highest data recorded since 2010 (Philippine

Statistics Authority [PSA], 2024). Despite the interest and demand for cacao, its cultivation is renowned as challenging due to its specific environmental requirements, susceptibility to pests and diseases, and the long maturation period before trees become productive (Magallon et al., 2022).

In 2020, the Department of Agriculture (DA) reported that Quezon is a “powerhouse” and an “emerging cacao hub” in the country (Simeon, 2020). However, an initial study reports that the province only has an annual average cacao yield of only 0.16 kg per tree of dried beans, equivalent to approximately four pods per tree (Maestro et al., 2020). This remains low, considering that one hectare has the potential to produce more than 1,000 kg of dried beans, equivalent to about 0.90 kg per tree annually (Suh & Molua, 2022).

Challenges in cacao farming and production have been studied globally (Cilas & Bastide, 2020; Suh & Molua, 2022) and in various regions of the Philippines (Magallon et al., 2022; Alvarado et al., 2023). However, the ways in which specific challenges are addressed through networks available to cacao farmers have rarely been explored. Research has established the importance of networks and communities to farmers, as these enable the exchange of ideas that lead to innovation (White et al., 2023), promote sustainability (Albizua et al., 2021), provide resilience (Bruce et al., 2021), and create more inclusive communities (Kerstetter et al., 2023). Without formal organizations, farmers become vulnerable to exploitation by middlemen (Castañeda-Ccori et al., 2020).

This paper examines the role of social capital—the benefits derived from social interactions and networks—in facilitating collective action, information exchange, and the achievement of shared goals among cacao farming communities in Quezon. The Social Capital Theory (SCT) posits that any aspect of a social relationship generates reproductive benefits, known as ‘social capital,’ which can take the form of tangible assets, such as money, and/or intangible gains, including skills and personal development (Schmid & Robison, 1995; Machalek et al., 2015). Through social capital, farmers can access knowledge that will enable them to adopt relevant agricultural technologies (Han et al., 2022). In addition, social connections are no alien to farming communities where local knowledge, community networks, and shared practices are necessary to navigate the complexities of farming, decision-making, and resource-sharing (Albizua et al., 2021; White et al., 2023; Yu & Gambrah, 2024).

Hence, this qualitative study aims to explore the challenges faced by cacao farmers and examine the role of collaborations and networks in addressing these issues. By determining these, Quezon’s cacao farmers can be empowered with actionable insights to improve productivity and cooperation. Likewise, policymakers can be guided in crafting locally responsive initiatives and policies that will strengthen the province’s cacao value chain by supporting farmer cooperatives, capacity-building programs, academic research, and market linkages toward a more resilient and competitive Philippine cacao sector.

Materials and Methods

Quezon Province, the study area, exhibits a varied climate, predominantly characterized as Type IV, having relatively even rainfall distribution throughout the year. October records the highest average rainfall, while March experiences the least rainfall (Department of Environment and Natural Resources [DENR], 2016; Gutierrez et al., 2020). The province’s western part experiences a Type II climate, characterized by a lack of a dry season and pronounced rainfall patterns from December to February, contrasted with minimal precipitation from March to May (*Basics of Philippine Climatology*, 2005). Based on 2012 to 2018 data, the province has had an annual average temperature of 22.7°C, which falls within the optimum range for growing cacao (Magtibay et al., 2020; Igawa et al., 2022). As in other parts of the Philippines, Quezon has been experiencing increasing temperatures, irregular precipitation, typhoons,

and flooding, all of which pose threats to the agricultural industry (Gutierrez et al., 2020; Pacific Disaster Center, 2021). Beyond its suitable agro climatic conditions, Quezon was selected as the study site because it is an emerging cacao hub supported by private organizations, national and local government programs, and farmer cooperatives, making it a strategic area for examining farmers' challenges and collaborative practices (Simeon, 2020). Moreover, initial interviews with the Office of the Provincial Agriculturist (OPA) indicate that intensive cacao promotion in the province began only in 2017, making Quezon a strategic setting to examine how early networks and collaborations develop in a growing industry.

Primary data collected by the provincial government, along with in-depth interviews, and focused group discussion (FGD) notes were utilized to explore farmers' experiences in cacao farming and production in Quezon, from 2020 to 2022. The aim was to glean valuable insights into farmers' perspectives—shedding light on the challenges they encounter as cacao growers and understanding the vital role of social capital, or the benefits derived from social interactions, relationships, and networks, in helping them overcome these challenges and achieve success. Respondents were selected through deviant case sampling, a purposive sampling design that helps identify unique or outlier cases for learning, in this case, to determine top-performing cacao farmers in the province who typically have well-connected markets and social networks (Palinkas et al., 2015).

Using data from the OPA released in December 2020, an initial survey visit was conducted among 35 cacao farmers in 16 municipalities with the highest cacao production in Quezon to verify production data and farming practices. Among the farmers, seven (7) exemplary cacao growers were chosen based on the number of pods per tree their farms produce, their farming practices, post-harvest activities, service to the community, and the years they have been engaged in cacao farming. The wives of three of the farmers were also included in the interviews due to their active participation in farming and production activities. Lasting one to three hours, each interview was conducted at least twice to fully capture each farmer's experiences. All interviewees, including representatives from the OPA, were included in the focus group discussion (FGD).

To express their willingness to participate in the study, all respondents signed informed consent forms. The researchers also underwent Research Ethics Training under the Philippine Health Ethics Research Board (PHREB) before commencing data collection activities, ensuring that the research is ethically sound in accordance with international and national standards. All interviews, done in the local language Tagalog, were audio-recorded, transcribed, and translated into English. The research team, composed of bilingual researchers fluent in both Tagalog and English, undertook the translation process to ensure linguistic and cultural accuracy. In addition, a member-checking process was carried out, wherein the translated transcripts were returned to the interviewees for verification (Harvey, 2014). Participants confirmed that the translations accurately represented their original statements. The FGD was likewise audio-recorded and summarized into notes. Coding themes were identified from the interviews and FGD notes by reviewing Tagalog transcripts and English translations (Dunn, 2016). The challenges faced by farmers were identified through the analysis of interview transcripts and FGD notes using Colaizzi's method. This approach of latent content analysis involves familiarizing oneself with transcriptions and field notes, extracting key statements, interpreting their meanings, grouping these meanings into themes, constructing detailed descriptions for each theme, identifying the overall structure and relationships between the themes, and validating these findings with respondents (Sanders, 2003; Morrow et al., 2015). Each researcher independently reviewed the transcripts and notes to extract significant statements, generate codes, and identify emerging themes.

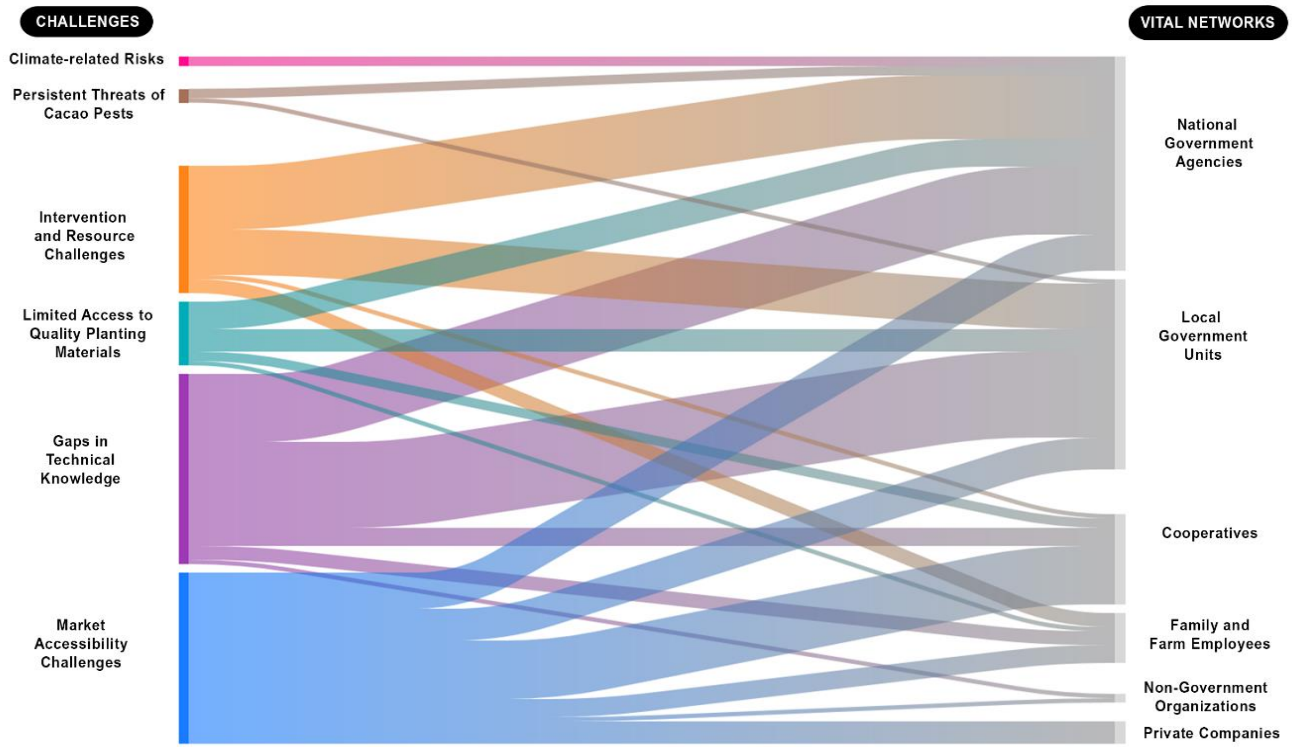
Subsequently, the team convened to discuss, negotiate, and reconcile findings, clustering themes into a coherent structure based on interpretations of the notes and transcripts, experiences during the data collection activities, the theoretical framework, literature, and the general context of farmers. Using the final themes, the interview transcripts and FGD notes were coded in the qualitative analysis software Atlas.ti to generate a Sankey Chart, illustrating the co-occurrence of vital networks and challenge themes.

Results and Discussion

This study aimed to identify the challenges faced by top-performing cacao farmers in Quezon and explore how collaborations among cacao farmers and various community actors contribute to overcoming these challenges. The analysis of interview transcripts and FGD notes in Atlas.ti generated a Sankey chart illustrating the relationship between the challenges (left) encountered by farmers and the various actors (right) that aid in addressing these (Figure 1).

Figure 1

Co-Occurrence Challenges Faced by Cacao Farmers and Vital Networks: Coded Themes in Interview Transcripts and FGD Notes



Cacao Farming Challenges

Through the analysis, six themes emerged representing challenges faced by cacao farmers: gaps in technical knowledge, intervention and resource challenges, market accessibility challenges, limited access to quality planting materials, persistent threats of cacao pests, and climate-related risks.

Gaps in Technical Knowledge

In 2017, the local government began extensively promoting cacao farming in Quezon. Participants who had started planting before this period acknowledged the initial lack of knowledge regarding cacao cultivation and production. Additionally, experts from Quezon who were able and willing to provide training and advice during the first three years after 2017 were scarce.

> Farmer 2: "There was no [cacao] group [in the province] at the time I started…I learned through experience. Seminars are essential because even though you learn through hands-on farming, having information from readings and learning from others is valuable, and the government provides that."

Education increases farmers' technical efficiency and administrative skills (Danso-Abbeam & Baiyegunhi, 2020). Due to persistent fluctuations in climate patterns and market dynamics, farmers require ongoing technical assistance. This goes beyond the mere provision of inputs and involves a consistent flow of knowledge and skills to sustain their farms' productivity and improve value-adding techniques for cacao products (Higuchi et al., 2023).

Intervention and Resource Challenges

Agricultural interventions and inputs, such as fertilizers, water, labor, machinery, and pesticides, are necessary to ensure optimal cacao growth and profitability (Sanchez et al., 2022). The increasing input prices burden farmers, especially those who have yet to reap profit from their first plantings (Nigatu et al., 2020). Sometimes, the government supplies planting materials, fertilizers, or machinery as part of its projects; however, this assistance is not always consistent. Hence, the farmers believe that self-reliance and personal investment are essential for the sustainability and success of cacao farms.

> Farmer 4: "When it came to interventions like fertilizers, relying solely on personal resources could be costly. Fortunately, the government assisted with fertilizers. However, it's essential not to rely solely on them and be prepared to invest if we want our plantation to succeed."

Although farmers recognize the need to invest using their own resources, they hope that the government continues to provide various forms of support beyond the initial stages of cacao cultivation, given the increasing prices of inputs.

Market Accessibility Challenges

The farmer-respondents encountered difficulties in accessing markets for their cacao products. Before the establishment of a cacao cooperative in the province, there was no clear guidance on standardized farming practices or product quality requirements. This limited farmers' access to broader markets and prevented them from securing fair prices for their products.

> Farmer 7*:* "When I started planting, the main problem was the absence of a cooperative that would buy and process the cacao beans… I planted cacao, which I had to harvest and sell independently since there was still no cooperative buying the beans."

Access to markets is a key factor influencing the sustainability of cacao farms (Effendy et al., 2019). The scarcity of reliable market linkages underscores the need for enhanced connections, enabling cacao farmers to effectively sell their products at a fair price and contribute to their farms' economic sustainability (Lenou Nkouedjo et al., 2020; Magallon et al., 2022; Gonzales, 2024). With cacao-focused cooperatives now established, the remaining challenge is empowering farmers to meet market demands for flavor and quality.

Limited Access to Quality Planting Materials

National Seed Industry Council-approved varieties, BR-25, UF-18, Criollo, and PBC 123 are the most commonly cultivated in Quezon, as reported by the respondents (Department of Agriculture–Bureau of Agricultural Research [DA-BAR], 2022). However, the farmers shared in both the initial survey and interviews that occasional inconsistencies in varietal identification occur, with reports of probable mislabeling or unidentified planting materials, even though these are distributed through government

programs. Such inconsistencies undermine not only the viability of cacao trees but also the reliability of sources of quality planting materials. These materials are characterized as genetically true, disease-free, grafted seedlings that are adaptable to local conditions and responsive to market requirements (Department of Agriculture–Bureau of Agricultural and Fisheries Standards [DA-BAFS], 2008; End et al., 2018; DA-BAR, 2022; N'zi et al., 2023). To ensure these characteristics are met, nurseries are usually certified by the DA's Bureau of Plant Industry.

Since 2017, sourcing quality seedlings has been a major challenge for Quezon's cacao farmers. Farmer 4 explained: "There were limited options when we searched for grafted seedlings, and the cost was too much". This account aligns with DA's national assessment, which highlights that the increasing number of cacao growers has outpaced the supply of certified, quality planting materials (DA-BAR, 2022). The assessment also highlights logistical issues, as most certified nurseries are concentrated in the Davao region, leading to high mortality during transport and handling. Meanwhile, the proliferation of non-accredited nurseries exacerbates the distribution of low-quality materials (DA-BAR, 2022). Access to quality planting materials is crucial for developing resilient crops, ensuring premium market opportunities, and sustaining cacao farms in the long term (Bekele & Phillips-Mora, 2019; Levai et al., 2015). Addressing this gap, however, requires long-term investments in provincial nursery infrastructure, research on varietal adaptability trials under Quezon conditions, and stronger certification standards, including DNA-based testing—to verify genetic authenticity.

Persistent Threats of Cacao Pests

The primary disease affecting cacao farms in Quezon is the black pod, or pod rot, caused by *Phytophthora* species. First reported in the Philippines in 1918, it continues to cause major economic losses among cacao farmers and remains widespread across Southeast Asia (Sudjud et al., 2013; Solpot, 2020; Paguntalan et al., 2022; Gonzales et al., 2023). This disease begins as a small black spot on the pods, which quickly spreads to other parts of the tree (Solpot, 2020). As Farmer 7 explained, "It rained a lot in the past months. [The pods] turned black and got black pod disease. When these small pods turn black, you can no longer save them. You can't harvest any fruit."

Prolonged rainfall and high humidity intensify fungal infection, linking agroclimatic variability with production loss (Sudjud et al., 2013; Solpot, 2020). Hence, crop diseases reduce both yield and bean quality, leading to lower income and higher input costs (Wessel & Quist-Wessel, 2015). Frequent pesticide use also adds labor and production expenses (Bourguet & Guillemaud, 2016). Addressing these challenges, therefore, requires integrated disease management and capacity-building programs to strengthen not only farmers' pest control knowledge but also reduce the impacts of climate-related disease risks on the cacao industry.

Climate-Related Risks

Quezon has two climate types. Most of the province is Type IV, with evenly distributed rainfall that peaks in October and reaches its lowest level in March, while the western part is Type II, characterized by heavy rains from December to February and drier conditions during the remaining months (DENR, 2016). Based on the DA (2014), Type IV is most ideal for cacao production. Despite this, Luzon, the island where most of Quezon is located, is highly susceptible to typhoons, with excessive rainfall and strong winds stunting cacao growth and aggravating the spread of diseases, hence, highlighting how light, water, and wind pose inherent risks to crop yield and survival (Lawal & Omonona, 2014; Reis et al., 2018; Lahive et al., 2019; Desquitado et al., 2020; DA-BAR, 2022).

In addition to contending with the fact that Quezon has diverse climate types, which hinder farmers from comparing their practices, they are also acutely aware of the repercussions of climate change on

their crops. The farmers acknowledge the need to consider individual and collective measures to adapt their farms in response to this evolving environmental challenge.

> Farmer 5: "One significant challenge for us is climate change adaptation. During hot weather, we struggle to keep our plants alive and need water. When a typhoon occurs, our plants are affected. Adapting to climate change is a considerable challenge, but since we have already planted and are seeing progress, we will continue."

Connecting Cacao Farmers to the Actors of Vital Networks

Vital Networks are essential, interconnected relationships and support systems critical to sustaining and enhancing productivity and success in cacao farming in Quezon Province. In this study, the actors identified by cacao farmers as vital networks include local government offices, national government agencies, cooperatives, non-governmental organizations, family and friends, and private companies (Figure 1). Guided by the SCT, these vital networks reflect a distinctive layering of both formal institutions and informal community ties, a feature that shapes how collaboration unfolds in Quezon's cacao sector.

Local Government Offices

The farmers deemed local government offices, represented by the Local Government Unit (LGU) and the Office of the Provincial Agriculturist (OPA), as vital to their success. Even though the OPA is technically part of the LGU, in some cases, the OPA and LGUs have different farming projects. Section 463 of the Local Government Code (Republic Act 7160) states that each province should have an agriculturist who develops and oversees agricultural programs, typically directed by the governor, to ensure farmers' access to knowledge and resources. Farmers consider local government offices important because they are the primary channels for accessing resources such as fertilizers, seedlings, and equipment. These offices are mandated by law to oversee programs to enhance agricultural activity. Hence, the LGU usually partners with other national offices to provide technical assistance via training programs to farmers. Farmers usually meet local government officials or the OPA through farmers' association meetings and farm visits, especially during these trainings and seminars. Viewed through the lens of SCT, frequent interaction and cooperation between farmers and government officials foster trust and social networks, which, in turn, facilitate easier access to future resources (Schmid & Robison, 1995).

> Farmer 1: "The collaboration between the LGU and the Provincial Government has brought projects here to our town, allowing us to undergo training and study at the Farm Business School. This has helped farmers not only to plant but also to become successful businessmen. That's how our life has progressed."

Among the challenges mentioned, the LGU usually focuses on addressing gaps in technical knowledge, intervention, and resource challenges (Figure 1). However, beyond providing access to resources and technical support, local government offices are vital because they represent the interests of farmers to higher government officials.

National Government Agencies (NGA)

The NGAs mentioned by the farmers are the Department of Agriculture (DA), DA's Quezon Agricultural Experiment Station (QARES), the Agricultural Training Institute (ATI), the Department of Science and Technology (DOST), and the Department of Trade and Industry (DTI). NGAs typically connect with farmers through the LGU by identifying the farmers who need assistance. Hence, they address similar challenges as the LGU, such as knowledge gaps, intervention and resource challenges,

and persistent threats of pests (Figure 1). With more resources and technical staff, however, NGAs can provide more advanced assistance to cacao farmers.

NGAs are also instrumental in assisting farmers with subsequent stages of cacao production, particularly in the commercialization and marketing of their products. Notable national offices include DOST and DTI. DOST provides grants for equipment in *tablea*[1] and chocolate production. The DTI, responsible for advancing industry and trade, has helped farmers promote cacao products through distribution and marketing efforts. As Farmer 7 noted: "DOST and DTI also helped us. DOST provided grants-in-aid for the improvement of tablea production… Our products are distributed to various *pasalubong*[2] centers. We have displays at the different OTOP (One Town, One Product)[3] HUBs."

Hence, NGA initiatives, which are not confined to the farming stage, support farmers in production, regulatory compliance, and market access, enabling farmers to become entrepreneurs and contributing to the overall growth of local businesses. These ongoing collaborations strengthen institutional social capital as farmers' engagement with local and national government agencies fosters trust, recognition, and. sustained access to national-level resources (Schmid & Robison, 1995). Among the challenges that NGAs prioritize, according to farmers, are gaps in technical knowledge, providing agricultural inputs, and enhancing market access for cacao products (Figure 1).

Cooperatives

Membership in a cooperative, a business entity and a voluntary association for farmers, has numerous advantages. Members jointly own and manage these organizations, which "focus on agricultural and food production" and, therefore, "market their own products" (Zahlava, 1989, p. 215). In Quezon, farmers benefit from belonging to the *Samahan sa Industriya ng Cacao ng Pangkabuhayan* (SICAP), which operates at both provincial and local levels. Cooperatives offer a sense of community and companionship to cacao farmers (Donovan et al., 2017). Aligned with the Social Capital Theory, joining cooperatives can serve as investments in relationships and trust, enabling cacao farmers to access economic and informational benefits (Schmid & Robison, 1995).

Farmer 5 shared, "Our cooperative is responsible for purchasing beans from farmers, unlike before when they had trouble finding buyers… to help cacao farmers, the cooperative will be the one to buy their beans." Within SICAP, for instance, participation generates social ties that translate into tangible advantages, such as access to markets, shared knowledge, and collective bargaining power. The cooperative's benefits are multifaceted when marketing cacao products (Lenou Nkouedjo et al., 2020). During the COVID-19 pandemic, SICAP addressed transport and accessibility challenges by personally visiting members' farms and designating local selling sites within towns, ensuring farmers market their products without hindrance. While cooperatives also help fill technical knowledge gaps, their primary contribution in Quezon lies in strengthening market linkages and sustaining farmers' economic participation.

[1]May also be spelled *tableya*, a compressed form of fermented, ground cacao beans, typically warmed and mixed with water to create a traditional Filipino chocolate beverage known as *sikwate.*

[2]A Filipino word that means a gift or memento presented to a friend or family member by someone who has come back from a journey.

[3]An initiative by the Philippine government tailored for small and medium-scale enterprises that aims to boost inclusive local economic growth by promoting 'flagship' products for each locality.

Family and Farm Employees

Given the challenges associated with cacao farming, the respondents repeatedly stressed the crucial role of family support in their farming activities. Though the nature of the network is more informal, farmers especially mention their spouses as partners in farm operations. The researchers also had the opportunity to interview the spouses of farmers who assist their husbands in planting and processing cacao.

> Farmer 1's wife: "In the seedling, I assist him. I also put soil in the bags sometimes, although it's already mixed; I'm the one who will seal it. Then he does the fermentation, and I'm the one who will put the seeds in once he's done… In terms of processing, I handle it all. Once it's fermented, I assist him with sun-drying and then the processing, starting from roasting, grinding, and molding, until it's finished. I take care of all that."

However, besides family members, farmers who employ workers recognize the contribution of their employees and view them as an integral part of their farms' success. Support from family and farm employees addresses challenges related to interventions, resources, and market accessibility (Figure 1). Through the lens of the Social Capital Theory, such family and workplace relationships reflect positive social capital, where care, loyalty, and shared responsibility motivate the exchange of labor and support beyond formal contracts in these cacao farms (Schmid & Robison, 1995). Furthermore, strong family support and fair treatment of farm workers underscore the interconnectedness of good social relationships and sustainable agricultural practices (Dessart et al., 2019). It also implies that recognizing the contributions of all individuals involved in the agricultural value chain reflects productivity, as well as equitable farming approaches that benefit their communities.

Private Companies

Partnerships with the business sector represent an investment not only financially but also socially, as they generate mutual benefits and shared value. Famers' partnerships with the private sector are promoted to improve productivity and drive growth in the agriculture sector worldwide (Rankin et al., 2016; Ramírez-Gómez & Rodríguez-Espinosa, 2022). In Quezon, cacao farmers who process their produce into *tablea*, chocolate, cacao nibs, wine, etc., benefit from private organizations that help expand their markets.

> Farmer 3: "Our cacao wine was first displayed in local hubs. During the pandemic, a mall allowed us to sell our products. We started in malls around CALABARZON, now we are regulars in malls in Sta. Rosa and Makati. Many bought it and enjoyed it. We have many repeat buyers."

Farmer-respondents reveal in their stories that collaborations with private establishments also invite them to festivals and exhibits to promote and sell their cacao products. These collaborations reflect a positive social capital in the cacao network, where both farmers and businesses invest in their relationship, recognizing that each actor's success contributes to the other's utility (Schmid & Robison, 1995). Hence, such partnerships enhance farmers' market presence and contribute to the resilience of local cacao enterprises (Ramírez-Gómez & Rodríguez-Espinosa, 2022).

Non-government Organizations (NGOs)

NGO's also "invest" in social capital by improving farmers' economic status through deliberate efforts such as capacity building and awareness programs (Schmid & Robison, 1995, p. 60; Borah et al., 2019; Chitiyo & Duram, 2019). For the farmers, one organization that has helped them in cacao fermentation and chocolate production is the non-profit international organization, Grameen Foundation. This foundation was able to reach out to cacao farmers through SICAP. Grameen Foundation's mission

centers on establishing connections between farmers and networks of scholars, academics, and industry experts within the cacao and chocolate sector (Kayongo, 2020). Through these connections, valuable knowledge and skills are exchanged, empowering farmers and fostering growth within the industry.

As mentioned by Farmer 5, “Grameen Foundation provides farmer-to-farmer assistance specifically for the cacao and coconut sub-sector. They aid us in business planning and how to grow and develop our cacao business.”

Value-adding is the primary purpose of the partnership between farmers and the Grameen Foundation. By engaging in chocolate-making trials, training sessions, and seminars that involved volunteer chocolatiers from international and private sectors, SICAP significantly enhanced the quality of chocolate it produces (Agnoletto & Lim, 2023; Andrews, 2023). Hence, NGOs mainly addressed market access challenges by converting social capital, built through relationships and knowledge exchange, into improved productivity and market reach (Schmid & Robison, 1995).

Conclusion

This research reveals that even though respondent-farmers in Quezon encounter multiple challenges in cacao farming and production, networks and collaborations with various community actors are essential to overcoming them. These vital formal and informal networks, mainly collaboration with local and national government entities, cooperatives, family and farm employees, NGOs, and private companies, serve as support systems for farmers mainly through the provision of technical training and advice, intervention and resources, and market access. Consistent with the Social Capital Theory, these linkages function as investments in relationships that generate mutual benefit and collective utility not only to the farmers but identified actors in the network. However, long-term issues such as limited access to quality planting materials, persistent threats of pests, and climate-related risks remain overlooked and insufficiently addressed due to their complexity and context-dependent nature. Fostering and nurturing multilayer collaborations—that is, both formal and informal collaborations that specifically address these insufficiently addressed issues could result in a more sustainable and resilient cacao industry in Quezon.

Recommendations

This study recommends strengthening collaboration among stakeholders in the cacao industry: the Department of Agriculture (DA) and its regional offices, the Department of Science and Technology (DOST), the Department of Trade and Industry (DTI), local government offices, farmer cooperatives, academic institutions, and private sector partners. Strengthening these partnerships also means investing in social capital and enhancing both formal and informal collaborations that underpin trust, knowledge exchange, and collective resilience within Quezon’s cacao network. Working collectively, these actors can address major challenges such as limited access to quality planting materials, pest and disease threats, and climate-related risks through coordinated platforms such as farmer innovation hubs, digital extension systems, multi-stakeholder councils, and local cacao development programs. These platforms open opportunities for knowledge sharing, collaborative research, and access to technical and financial support among farmers (Izuchukwu et al., 2023).

Public-private partnerships should also be explored and strengthened to enhance infrastructure, market linkages, and investment opportunities, thereby reinforcing the local cacao value chain (Mangeni, 2019; Aseete et al., 2022). Likewise, continued investments by public and private sectors in accredited nurseries, pest and disease management, research, and resilient cacao varieties are imperative for sustainable industry growth (García et al., 2024).

Finally, the findings of this study can serve as input for policy formulation among relevant NGAs and local authorities, particularly in refining programs on farmer-entrepreneur training, access to certified

planting materials, post-harvest facilities, market support, and management of agroclimatic risks. The academe and research funding agencies are likewise encouraged to align their research priorities and initiatives to generate evidence that supports these policy directions, ensuring that interventions remain grounded in local realities and industry needs. These evidence-based policies can help transform the bittersweet realities of cacao farming into stronger, more resilient connections that sustain the competitiveness of the cacao industry in Quezon Province and beyond.

Acknowledgements

The authors gratefully acknowledge the Department of Agriculture – Philippine Rural Development Project (DA-PRDP) for providing financial support for the research project titled “Cacao Benchmarking Study and Documentation of Success Stories in Quezon Province,” which facilitated the broader research activities from which this paper emerged. The views, analyses, and conclusions expressed in this paper, however, are solely those of the authors and do not necessarily reflect the position or policies of the Department of Agriculture. We also extend our sincere appreciation to the cacao farmers of Quezon for their generosity in sharing their experiences, and to our colleagues at Southern Luzon State University for their valuable support.

Conflict of Interest Statement

The authors declare no conflict of interest. Although the broader research activity was supported by the Department of Agriculture – Philippine Rural Development Project (DA-PRDP), the agency had no role in the analysis, interpretation, or presentation of the findings in this paper.

References

Agnoletto, J., & Ronald, L. (2023, July 27). *Notes from the field: Joyce to the world.* Grameen Foundation. https://grameenfoundation.org/partners/programs/notes-from-the-field/joyce-to-the-world

Albizua, A., Bennett, E. M., Larocque, G., Krause, R. W., & Pascual, U. (2021). Social networks influence farming practices and agrarian sustainability. *PLOS ONE*, *16*(1), e0244619. https://doi.org/10.1371/journal.pone.0244619

Alvarado, M. C., Sanchez, P. D., & Polongasa, S. G. (2023). Emerging rapid and non-destructive techniques for quality and safety evaluation of cacao: Recent advances, challenges, and future trends. *Food Production, Processing and Nutrition*, *5*(1), 7. https://doi.org/10.1186/s43014-023-00157-w

Andrews, E. (2023, August 25). *Notes from the field: Philippine adventures in cacao and chocolate.* Grameen Foundation. https://grameenfoundation.org/partners/programs/notes-from-the-field/philippine-adventures-in-cacao-and-chocolate

Aseete, P., Barkley, A., Katungi, E., Ugen, M. A., & Birachi, E. (2022). Public–private partnership generates economic benefits to smallholder bean growers in Uganda. *Food Security*, *15*(1), 201–218. https://doi.org/10.1007/s12571-022-01309-5

Bekele, F. & Philipps-Mora, W. (2019). Cacao (Theobroma cacao L.) breeding. In J. M. Al-Khayri, S. M. Jain, & D. V. Johnson (Eds.), *Advances in plant breeding strategies: Industrial and food crops* (Vol. 46, pp. 409-487). Springer International Publishing. https://doi.org/10.1007/978-3-030-23112-5_10

Borah, A. K., Gogoi, P. B., Halim, R. A., Phukan, S. N., & Rahman, B. (2019). Non-government organization and its impact on agriculture – A study in Jorhat District of Assam. *East African*

Scholars Journal of Agriculture and Life Sciences, *2*(10), 480–483. https://doi.org/10.36349/EASJALS.2019.v02i10.007

Bourguet, D. & Guillemaud, T. (2016). The hidden and external costs of pesticide use. In: Lichtfouse, E. (eds) Sustainable Agriculture Reviews. *Sustainable Agriculture Reviews*, (Vol 19, p. 35-120). Springer, Cham. https://doi.org/10.1007/978-3-319-26777-7_2

Bruce, A., Jackson, C., & Lamprinopoulou, C. (2021). Social networks and farming resilience. *Outlook on Agriculture*, *50*(2), 196–205. https://doi.org/10.1177/0030727020984812

Castañeda-Ccori, J., Bilhaut, A.-G., Mazé, A., & Fernández-Manjarrés, J. (2020). Unveiling cacao agroforestry sustainability through the socio-ecological systems diagnostic framework: The case of four Amazonian rural communities in Ecuador. *Sustainability*, *12*(15), 5934. https://doi.org/10.3390/su12155934

Chitiyo, P. & Duram, L.A. (2019). Role of NGOs in addressing agricultural challenges through certified organic agriculture in developing regions: A Zimbabwe case study. *Journal of Sustainable Development in Africa*, *21*(3), 138-157. https://opensiuc.lib.siu.edu/gers_pubs/39/

Cilas, C., & Bastide, P. (2020). Challenges to cocoa production in the face of climate change and the spread of pests and diseases. *Agronomy*, *10*(9), 1232. https://doi.org/10.3390/agronomy10091232

Danso-Abbeam, G., & Baiyegunhi, L. J. (2019). Technical efficiency and technology gap in Ghana's cocoa industry: Accounting for farm heterogeneity. *Applied Economics*, *52*(1), 100–112. https://doi.org/10.1080/00036846.2019.1644439

Department of Agriculture. (2014). *Cacao production guide*. Department of Agriculture – Regional Field Unit IV-B, in cooperation with AgriPinoy High Value Crops Development Program. https://hvcdp.da.gov.ph/wp-content/uploads/2022/05/Cacao-Production-Guide.pdf

Department of Agriculture-Bureau of Agricultural Standards. (2008). *PNS-BAFPS 58:2008 – Cacao or cocoa beans: Specification* [Philippine National Standard]. Bureau of Agricultural and Fisheries Product Standards, Department of Agriculture. http://spsissuances.da.gov.ph/attachments/article/828/PNS-BAFPS%2058-2008-Cacao%20Beans.pdf

Department of Agriculture-Bureau of Agricultural Research. (2022). *The Philippine Cacao Industry Roadmap (2021-2025)*. Department of Agriculture. https://www.da.gov.ph/wp-content/uploads/2023/05/Philippine-Cacao-Industry-Roadmap.pdf

Department of Environment and Natural Resources. (2016). *Physical and socio-economic profile*. Department of Environment and Natural Resources – CALABARZON Region. https://calabarzon.denr.gov.ph/index.php/about-us/regional-profile

Desquitado, A. M., Perez, M. R., Puchero, R. S., & Macalalad, E. P. (2020). A climatological study of typhoons over the Philippine area of responsibility from 1989–2018. *E3S Web of Conferences*, *200*, 02001. https://doi.org/10.1051/e3sconf/202020002001

Dessart, F. J., Barreiro-Hurlé, J., & van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: A policy-oriented review. *European Review of Agricultural Economics*, *46*(3), 417–471. https://doi.org/10.1093/erae/jbz019

Dillinger, T. L., Barriga, P., Escárcega, S., Jimenez, M., Lowe, D. S., & Grivetti, L. E. (2000). Food of the gods: Cure for humanity? A cultural history of the medicinal and ritual use of chocolate. *The Journal of Nutrition*, *130*(8). https://doi.org/10.1093/jn/130.8.2057s

Donovan, J., Blare, T., & Poole, N. (2017). Stuck in a rut: Emerging cocoa cooperatives in Peru and the factors that influence their performance. *International Journal of Agricultural Sustainability*, *15*(2), 169–184. https://doi.org/10.1080/14735903.2017.1286831

Dunn, K. (2016). Interviewing. In I. Hay (Ed.), *Qualitative Research Methods in Human Geography* (4th ed., pp. 149–188). Oxford University Press.

Effendy, Pratama, M. F., Rauf, R. A., Antara, M., Basir-Cyio, M., Mahfudz, & Muhardi. (2019). Factors influencing the efficiency of cocoa farms: A study to increase income in rural Indonesia. *PLOS ONE*, *14*(4). https://doi.org/10.1371/journal.pone.0214569

End, M., Laliberté, B., Lockwood, R., Sena Gomes, A. R., Sodré, G. A., Guiltinan, M., & Maximova, S. (2018). Cocoa plant propagation techniques to supply farmers with improved planting materials. In P. Umaharan (Ed.), Achieving sustainable cultivation of cocoa. Burleigh Dodds Publishing. https://doi.org/10.19103/AS.2017.0021.11

García, L. C., Maddela, N. R., Gavilanes, F. Z., & Aguilar Duarte, C. (2024). *Sustainable cacao cultivation in Latin America* (p. 334). Routledge. https://doi.org/10.4324/9781003381761

Gonzales, A. T., Alasaas, D. G., & Gonzales, M. T. (2023). Symptomatology and pathogenicity of phytophthora pod rot disease associated with cacao plants in selected municipalities in the province of Cagayan, Philippines. *Journal of Biodiversity and Environmental Sciences (JBES)*, *22*(5), 9–16. https://innspub.net/symptomatology-and-pathogenicity-of-phytophthora-pod-rot-disease-associated-with-cacao-plants-in-selected-municipalities-in-the-province-of-cagayan-philippines/

Gonzales, M. V. A. (2024). Cacao industry: Its status, opportunities and challenges. *International Journal of Science and Management Studies (IJSMS), 7*(6). https://www.ijsmsjournal.org/2024/volume-7%20issue-6/ijsms-v7i6p120.pdf

Gutierrez, F. Jr. J., Villasanta, P. A. H. C., & Montero, M. C. A. (2020). Climate risk vulnerability assessment and suitability analysis of various crops in San Andres, Quezon. *Siyasig: The Official Journal of Southern Luzon State University*, *10*, 37–52. https://siyasig.slsuresearch.info/journal-issues/volume-x-2020/crva

Han, M., Liu, R., Ma, H., Zhong, K., Wang, J., & Xu, Y. (2022). The impact of social capital on farmers' willingness to adopt new agricultural technologies: Empirical evidence from China. *Agriculture*, *12*(9), 1368. https://doi.org/10.3390/agriculture12091368

Harvey, L. (2014). Beyond member-checking: A dialogic approach to the research interview. *International Journal of Research & Method in Education*, *38*(1), 23–38. https://doi.org/10.1080/1743727X.2014.914487

Hermann, J. P., & Diaz Pérez, V. (2010). Growth and production of cacao. In W. H. Verheye (Ed.), *Soils, Plant Growth and Crop Production*. UNESCO and EOLSS Publishers. https://www.eolss.net/sample-chapters/c10/E1-05A-43-00.pdf

High-Value Crops Development Act of 1995 (Republic Act No. 7900), (1995). https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/2/2936

Higuchi, A., Coq-Huelva, D., Vasco, C., Alfalla-Luque, R., & Maehara, R. (2023). An evidence-based relationship between technical assistance and productivity in cocoa from Tocache, Peru. *Revista de Economia e Sociologia Rural*, *61*(1). https://doi.org/10.1590/1806-9479.2021.253614

Igawa, T. K., Toledo, P. M., & Anjos, L. J. (2022). Climate change could reduce and spatially reconfigure cocoa cultivation in the Brazilian Amazon by 2050. *PLOS ONE*, *17*(1). https://doi.org/10.1371/journal.pone.0262729

Izuchukwu, A., Erezi, E., & David Emeka, E. (2023). Assessing the impact of farmer-to-farmer communication networks on knowledge sharing and adoption of sustainable agricultural practices in Africa. *International Journal of Agriculture and Earth Science*, *9*(4), 58–76. https://doi.org/10.56201/ijaes.v9.no4.2023.pg58.76

Kayongo, S. (2020). *Dynamic capabilities in microfinance innovation: A Case study of the Grameen Foundation* [Doctoral dissertation, Georgia State University]. https://doi.org/10.57709/17701950

Kerstetter, K., Bonner, D., Cleland, K., De Jesús-Martin, M., Quintanilla, R., Best, A. L., Hazzard, D., & Carter, J. (2023). Social solidarity, social infrastructure, and community food access. *Agriculture and Human Values*, *40*(3), 1303–1315. https://doi.org/10.1007/s10460-023-10428-4

Kongor, J. E., Owusu, M., & Oduro-Yeboah, C. (2024). Cocoa production in the 2020s: Challenges and solutions. *CABI Agriculture and Bioscience, 5*, 102. https://doi.org/10.1186/s43170-024-00310-6

Lahive, F., Hadley, P., & Daymond, A. J. (2019). The physiological responses of cacao to the environment and the implications for climate change resilience: A review. *Agronomy for Sustainable Development, 39*(1), 5. https://doi.org/10.1007/s13593-018-0552-0

Lawal, J. O., & Omonana, T. B. O. (2014). The effects of rainfall and other weather parameters on cocoa production in Nigeria/Os efeitos dos parametros de chuva e outras condicoes meteorologicas na producao de cacau na Nigeria. *Comunicata Scientiae*, *5*(4), 518. https://link.gale.com/apps/doc/A403301971/AONE?u=nysl_oweb&sid=googleScholar&xid=6958aef0

Lenou Nkouedjo, L., Mathe, S., Fon, D. E., Geitzenauer, M., & Awah Manga, A. (2020). Cocoa marketing chain in developing countries: How do formal-informal linkages ensure its sustainability in Cameroon? *Geoforum*, *117*, 61–70. https://doi.org/10.1016/j.geoforum.2020.09.005

Levai, L. D., Meriki, H. D., Adiobo, A., Awa-Mengi, S., Akoachere, J.-F. T., & Titanji, V. P. (2015). Postharvest practices and farmers' perception of cocoa bean quality in Cameroon. *Agriculture & Food Security*, *4*(1). https://doi.org/10.1186/s40066-015-0047-z

Local Government Code of the Philippines, Republic Act No. 7160 (1991), sec. 463. https://lawphil.net/statutes/repacts/ra1991/ra_7160_1991.html

Machalek, R., Martin, M. W., & Wright, J. D. (2015). Sociobiology and Sociology: A new synthesis. *International Encyclopedia of the Social & Behavioral Sciences* (2nd ed., pp. 892–898). Elsevier.

Maestro, G. D., Leonar, S. A., & Abrigonda, G. A. (2020). Production practices of cacao (Theobroma cacao) farmers in the fourth district of Quezon, Philippines. *Siyasig: The Official Journal of Southern Luzon State University*, *10*, 23–26. https://siyasig.slsuresearch.info/journal-issues/volume-x-2020/cacao

Magallon, W. N., Patalinghug, M. E., & Tangalin, M. G. (2022). Status of Cacao (Theobroma cacao L.) production on its challenges and prospect in Zamboanga del Norte Province in the Philippines.

International Journal of Agricultural Technology, *18*(3), 1075–1092. https://philarchive.org/archive/PATSOC

Magtibay, K. J., Sinadao, C. J., Java, H. M., Saludo, Ma. T., Lat, L. J., Agawin, M., & Quinto, L. (2020). Analysis of climatic factors and recorded clinical cases of dengue in region IV-A CALABARZON. *LPU-St. Cabrini Journal of Allied Medicine*, *3*(3). https://lpulaguna.edu.ph/wp-content/uploads/2022/01/1.-Magtibay-Sindao-Java-Saludo-Lat-Agawin-Quinto-Climatic-Factors-and-Clinical-Cases-Dengue.pdf

Mangeni, B. (2019). The role of public-private partnerships (PPP) in ensuring technology access for farmers in sub-Saharan Africa. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(01), 14137–14155. https://doi.org/10.18697/ajfand.84.blfb1018

Morrow, R., King, N., & Rodriguez, A. (2015). Colaizzi's descriptive phenomenological method. *The Psychologist*, *28*(8), 643–644. https://eprints.hud.ac.uk/id/eprint/26984/1/Morrow_et_al.pdf

Nigatu, G., Badau, F., Seeley, R., & Hansen, J. (2020). Factors contributing to changes in agricultural commodity prices and trade for the United States and the World (ERR-272). *US Department of Agriculture, Economic Research Service (ERS).* https://ers.usda.gov/sites/default/files/_laserfiche/publications/95697/ERR-272.pdf

N'zi, J. C., Koné, I., M'bo, K. A. A., Koné, S., & Kouamé, C. (2023). Successful grafting elite cocoa clones *(Theobroma cacao* L.*)* as a function of the age of rootstock. *Heliyon, 9*(8), e18732. https://doi.org/10.1016/j.heliyon.2023.e18732

Pacific Disaster Center. (2021). *Philippines province risk profiles*. Pacific Disaster Center. https://www.pdc.org/wp-content/uploads/NDPBA-PHL-Province-Profile-New-Merged-compressed.pdf

Paguntalan, D. P., Aggangan, N. S., Buot, I. E., Sotto, R. C., & Pangga, I. B. (2022). Effect of AMF-cacao association on pod disease incidence in three-year-old cacao trees in an agroforest in Calauan, Laguna, Philippines. *Philippine Journal of Science*, *151*(1), 383–395. https://doi.org/10.56899/151.01.29

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2013). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *42*(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y

Philippine Institute for Development Studies. (2005). *Basics on Philippine climatology (Vol. 5, No. 2)*. https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidseid0502.pdf

Philippine Statistics Authority. (2024). *Major non-food and industrial crops quarterly bulletin, July-September 2024*. Philippine Statistics Authority (PSA). https://psa.gov.ph/sites/default/files/infographics/Infographics_Major%20Non%20Food%20and%20Industrial%20Crops%20Jul-Sep%202024.pdf

Ramírez-Gómez, C. J. & Rodríguez-Espinosa, H. (2022). Local public-private partnerships to promote innovation in agricultural value chains: the case of cocoa in Colombia. Revista de Economia e Sociologia Rural, 60(4), e249339. https://doi.org/10.1590/1806-9479.2021.249339

Rankin, M., Galvez Nogales, E., Santacoloma, P., Mhlanga, N., & Rizzo, C. (2016). *Public–private partnerships for agribusiness development*. Food and Agriculture Organization (FAO). https://www.fao.org/3/i5699e/i5699e.pdf

Reis, G. S. M., de Almeida, A. F., Mangabeira, P. A. O., Dos Santos, I. C., Pirovani, C. P., & Ahnert, D. (2018). Mechanical stress caused by wind on leaves of *Theobroma cacao:* Photosynthetic, molecular, antioxidative and ultrastructural responses. *PLOS ONE, 13*(6), e0198274. https://doi.org/10.1371/journal.pone.0198274

Sanchez, A. C., Kamau, H. N., Grazioli, F., & Jones, S. K. (2022). Financial profitability of diversified farming systems: A global meta-analysis. *SSRN Electronic Journal*, *201*, 107595. https://doi.org/10.2139/ssrn.4085360

Sanders, C. (2003). Application of Colaizzi's method: Interpretation of an auditable decision trail by a novice researcher. *Contemporary Nurse*, *14*(3), 292–302. https://doi.org/10.5172/conu.14.3.292

Schmid, A. A., & Robison, L. J. (1995). Applications of social capital theory. *Journal of Agricultural and Applied Economics, 27*(1), 59–66. https://doi.org/10.1017/S1074070800019593

Simeon, L. M. (2020, December 3). *Quezon eyed as new cacao hub*. Philstar.com. https://www.philstar.com/business/2020/12/04/2061283/quezon-eyed-new-cacao-hub

Solpot, T. C. (2020). Cacao (*Theobroma cacao*) diseases: Threats to the Philippine cacao industry. *Philippine Plant Disease Bulletin, 1*(1), 2–4.

Sudjud, S., Sasrahidayat, I. R., Mudijiono, G., & Muhibuddin, A. (2013). The intensity distribution of cacao pod rot disease (*Phytophthora palmivora Butl.)* in smallholder plantation in North Maluku Indonesia. *Journal of Biology, Agriculture and Healthcare*, *3*(7), 131–139. https://www.iiste.org/Journals/index.php/JBAH/article/view/6304/6407

Suh, N. N., & Molua, E. L. (2022). Cocoa production under climate variability and farm management challenges: Some farmers' perspective. *Journal of Agriculture and Food Research*, *8*, 100282. https://doi.org/10.1016/j.jafr.2022.100282

Wessel, M., & Quist-Wessel, P. M. F. (2015). Cocoa production in West Africa, a review and analysis of recent developments. *NJAS: Wageningen Journal of Life Sciences*, *74–75*(1), 1–7. https://doi.org/10.1016/j.njas.2015.09.001

White, A., Faulkner, J. W., Niles, M. T., Conner, D., & Mendez, V. E. (2023). The role of farmer networks in supporting adaptive capacity: Opening the door for innovation and transformation in the Northeastern United States. *Elementa: Science of the Anthropocene*, *11*(1). https://doi.org/10.1525/elementa.2022.00039

Yu, Q., & Gambrah, P. P. (2024). Information network among farmers: A case study in Ghana. *Sage Open*, *14*(1). https://doi.org/10.1177/21582440241228696

Záhlava, F. (1989). The nature and role of agricultural cooperative societies in Czechoslovakia. *International Review of Applied Economics*, *3*(2), 214–232. https://doi.org/10.1080/758530011