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What It Takes to Cooperate: A Mixed-Methods Study of Farmer Organisations in *La Mosquitia*, Honduras

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Abstract

This research is embedded within the Circular Coconut (CiCo) project, an interdisciplinary initiative focused on advancing climate resilience and smallholder livelihoods through the adoption of circular economy practices. Within this broader effort, this research assesses a practical question: what is needed for farmers organisations dedicated to the production and marketing of agricultural products and their by-products in this region to happen and persist?

This study addresses that question by combining three complementary sources of evidence: participatory network mapping workshops that reveal how communities themselves perceive the actors shaping their agricultural activities; key informant interviews that document the lived experience of both past and present farmer groups; and individual surveys that gather further information on farmer group participation and attitudes towards cooperation and solidarity. Each source captures a different layer of information, and the value of combining them lies precisely in the possibility of triangulating findings that no single method could establish on its own.

The analytical backbone of this study is the theory of collective action developed by Elinor Ostrom (2010), which offers a rigorous framework for identifying the structural conditions under which cooperation succeeds. By applying this framework to the specific case of *La Mosquitia*, this study aims to contribute both to the practical work of the CiCo project and partner organisations operating in the region, and to the broader academic literature on collective action in contexts marked by geographic isolation and limited institutional infrastructure.

Keywords: collective action, farmer groups, agricultural cooperatives

List of Abbreviations

AI ……...…… Artificial Intelligence

CiCo ……...……...Circular Coconut

CPR …….…… Common Pool Resources

GIZ ……...……Deutsche Gesellschaft für Internationale Zusammenarbeit

JSDF …… Japan Social Development Fund

KIIs ……..…….. Key Informant Interviews

MIMAT ……..…...… Miskitu Indian Mairin Asla Takanka (also known as the Association of Miskitu Women)

MOPAWI ……..……Agencia para el Desarrollo de la Mosquitia (Mosquitia Development Agency)

NGO(s) ……Non-Governmental Organisation(s)

USD ……. United States Dollar

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Chapter 1. Introduction

1.1 Motivation

The Honduran *La Mosquitia* is a rural indigenous region presenting a distinctive context for studying agricultural cooperation due to its environmental value and agricultural potential, combined with geographic isolation, limited infrastructure, high rates of poverty and food insecurity (World Bank, 2023). Despite repeated interventions and local development actors on livelihoods, food security and natural resource governance, community-based structures for the production and commercialisation of agricultural products in the region remain limited in number and scope. Where such structures do exist, they tend to be concentrated around a small number of specific products, and their internal functioning, durability, and the conditions under which they succeed or fail remain poorly documented and understood in academic literature (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2024; The World Bank, 2024; Wildlife Conservation Society Honduras-Nicaragua, n.d.)

This gap is remarkable, given that the conditions for cooperative agricultural production and commercialization in *La Mosquitia* align closely with the criteria identified in the literature as conducive to positive collective agricultural action. For instance, several of the regional crops and derivatives, such as coconut oil, generate high-value products that require processing, production incurs high transaction costs due to poor infrastructure, and commercialisation demands volumes beyond the capacity of individual smallholders (Fischer & Qaim, 2012).

Moreover, research on agricultural cooperative structures indicates that, even when organisational structures are imperfect, they generally yield positive economic outcomes for members (Grashuis & Su, 2019). Other benefits from collective action and cooperation in agriculture cover the adoption of good farm management practices, new agricultural technologies, and sustainable farming methods, higher prices for farmers, increase in the technical efficiency of crop production and digitalisation (Marini, et.al., 2023).

Because collective action in agriculture has several potential benefits, and because La Mosquitia presents favourable conditions for the commercialisation and production of high-potential crops, this study investigates the conditions under which a feasible collective model could support agricultural production and commercialisation in the region.

1.2 Research Question

The present study seeks to answer the following question: what is needed for farmers organisations dedicated to the production and marketing of agricultural products and their by-products in this region to emerge and persist? To answer this question, the study explores the following sub-questions: why did earlier attempts at collective agricultural production or commercialisation fail? What characteristics do the currently operating farmers organisations in the region have? And what lessons from farmers organisation models in rural settings elsewhere can inform a more resilient approach in *La Mosquitia*?

To answer our research question, this research combines three primary data sources: network mapping workshops, key informant interviews, and individual surveys. In this study, the term “farmers organisation” is used as a broad umbrella that covers various forms of organised cooperation regardless of their legal standing (Ma et al., 2023). The focus is to explore the conditions that encourage agricultural collective action and the formation of farmers organisations in *La Mosquitia*, understanding collective action as defined by Elinor Ostrom: “interdependent situations where individuals must choose actions, such as building or maintaining a communal irrigation system, that affect one another” (Ostrom, 2010).

1.3 Work Structure

This study is organised into five chapters. Chapter 1 serves as an introduction, establishing the motivation and research question and outlining the structure of the work. Chapter 2 presents the theoretical framework underpinning the analysis, beginning with Elinor Ostrom's study of collective action and narrowing to its specific application in agricultural settings. This chapter sets out the conceptual tools that structure the rest of the study, in particular the seven variables Ostrom identifies as determinants of successful collective action, which later serve as the primary analytical lens applied to the qualitative data.

Chapter 3 reviews the existing literature on cooperation among farmers. First, exploring the benefits of such cooperation, and second, the factors that determine its appearance.

Chapter 4 details the empirical context in which this research takes place, and the methodologies and data underlying the empirical work, covering each of the three data sources in turn: network mapping workshops, key informant interviews analysed using Framework Analysis, and individual surveys. For each source, the chapter separately addresses the methodology and the data collected, and for the key informant interviews specifically, an additional section details the practical application of the Framework Analysis method to the key informant interviews dataset.

Chapter 5 presents the results from each of the three data sources, structured to mirror Chapter 4: first the network mapping results, then the findings from the Framework Analysis of the key informant interviews, and finally the results from the individual surveys. Finally, chapter 6 presents the conclusions of this study, summarising main findings, implications for future interventions, limitations and future areas of potential research.

Chapter 2. Theoretical Framework

2.1 The study of collective action

According to Faysse and Mustapha (2017), the study of collective action has grown over the past 30 years, and this growth has followed two main approaches: one from the perspective of institutional economics, led by authors such as Bernard, Agrawal, and Ostrom, characterised by simplified models of agent interactions typical of mainstream economics; and another from the perspective of sociology and anthropology, with authors such as Campbell, Dahal, and Van Der Koiij, who generally do not propose standard methods for analysing collective action because they argue that methods should be adapted to each case.

Even when both approaches have advantages and have contributed to the academic and policy sector, in this study we will study cooperation and collective action from the perspective of institutional economics. Specifically, we will heavily rely on the work of Elinor Ostrom, the latest leading exponent of this school of thought.

In the theory developed by Ostrom, collective action and cooperation are analysed not only by taking into account the material incentives facing individuals in social dilemmas, but also by analysing variables such as group size, communication, and participant heterogeneity, which have been shown to affect levels of cooperation and its benefits, especially in contexts of small, homogeneous groups that can interact face-to-face:

> *"We already understand some of the potential linkages. For example, one can confidently posit that in a small, homogeneous group interacting in a face-to-face meeting to discuss producing a public good, the costs of coming to an agreement will tend to be low and the probability that individuals keep their promises will be high. Previous gossip will have identified which members of the group could be trusted to keep agreements and efforts to exclude such untrust-worthy participants would be undertaken. The combined effect of the structural variables in this example on reputation, trust, and reciprocity is likely to overcome short-term material benefits that individual participants are tempted to pursue. In a different context— a large, heterogeneous group with no communication and no information about past trustworthiness who jointly use a common-pool resource—individuals will tend to pursue short-term material benefits and potentially destroy the resource."* (Ostrom 2010).

In particular, Elinor Ostrom (2010) identified seven variables that influence collective action:

1) Number of participants: Ostrom notes a traditional view that as group size increases, the probability of providing a collective good decreases due to the declining noticeability of individual contributions and higher transaction costs. However, she also highlights evidence of a curvilinear relationship: groups that are too small may lack the necessary resources to manage a resource effectively, while those that are too large face excessive conflict. Thus, moderately sized groups are often found to be most effective for the governance of natural resources.
2) Subtractive vs. Shared benefits: The impact of group size depends on whether the good is a public good or a common-pool resource (CPR). Public goods are nonsubtractive, and in this case, increasing the number of participants can be positive because it brings more resources to provide a benefit jointly enjoyed by all. Meanwhile, common-pool resources benefits are subtractive (one person's use reduces what is available to others), meaning an increase in participants is negatively related to social benefits due to overharvesting and crowding.
3) Heterogeneity: It refers to differences in assets, information, and payoffs. Diverse interests or resources are generally viewed as deterrents to cooperation because they increase transaction costs and generate conflict over the distribution of costs and benefits. Specifically, a wide wealth distance, in terms of socioeconomic assets, between players acts as a significant barrier to finding self-governed solutions.
4) Face-to-Face communication: Ostrom identifies this as a "major theoretical puzzle" because, while traditional game theory predicts it should make no difference, empirical research consistently shows it has a strong positive effect on cooperation. Communication allows for moral suasion, increases group solidarity, and enhances the likelihood that individuals will keep their promises, primarily by increasing the trust acquired through direct interaction.
5) Information about past actions: In repeated interactions, the ability to obtain information about the earlier actions of others is essential for building reputation, trust, and reciprocity. Members use this information to monitor who has cooperated and who has defected. While reputations are easily built and maintained in small farming neighbourhoods, this link becomes much harder to overcome in large groups.
6) Linkage structures: How individuals are linked in a network affects their willingness to contribute. Individuals in linked networks (where contributions are directed toward specific others in a chain) are more likely to cooperate than those contributing to a generalized pool. In a pool setting, individuals can free ride for longer without reducing their own benefits, whereas in a chain, a failure to contribute is more likely to cause the system to stop providing benefits
7) Voluntary entry and exit: The possibility of choosing whether to play or "opt out" increases the frequency of cooperative outcomes. When individuals have the freedom to enter or exit, they can identify and choose partners based on their past history, effectively using a veto to avoid interacting with untrustworthy players. This capacity to withdraw from a game has been shown to raise cooperation to high levels over time.

Chapter 3. Literature review

3.1 Benefits of cooperation among farmers

Vladislav Valentinov (2007) provides an economic rationale for why farmers groups (or cooperatives) are essential in an agricultural sector dominated by family farming. The author argues that farmer groups are not merely an alternative business model but a necessary supplement to the family farm, designed to overcome the inherent organisational limitations of small-scale production.

Because the family farm’s efficiency depends on minimizing the need for hired labour, its size is naturally limited by what a single family can effectively control. This results in a persistent tendency for agricultural production units to remain small. Valentinov argues that the transaction-cost-economizing effect of family farms comes at a high price, creating two major organisational disadvantages: the inability to realize economies of scale and market power asymmetry.

Therefore, farmer organisations like cooperatives serve as a hybrid organisational arrangement that allows farmers to survive this "double failure" of both market and hierarchy. Cooperatives allow small family farms to "pool" their resources to act as a large hierarchy, gaining market power and economies of scale, while avoiding the prohibitively high monitoring costs that would occur if those farms were merged into a single giant firm. This structure allows the family to remain the primary unit for production (where they are most efficient) while utilizing the farmer group for marketing and procurement (where large size is most efficient).

Grashius and Su (2019) performed a comprehensive review analysing 56 quantitative studies published since 2000 to illustrate the current state of research on agricultural cooperatives, one of the most common forms farmer organisations take. The authors find that while cooperative membership generally correlates with positive outcomes like higher prices and yields, these benefits are often distributed unevenly.

The review highlights that increased heterogeneity in member attitudes and objectives relates negatively to cooperative attributes and leads to organisational inefficiency. Specifically, a high ratio of large to small landholders within a group can lead to predatory behaviours by larger members, negatively impacting the overall benefits. Empirical findings suggest a clear trade-off between internal coordination and scale efficiency. While larger groups may achieve better economies of scale, social capital is found to be significantly higher in smaller cooperatives, which align more closely with the proposition of Ostrom. On this topic, the review also found that the authors also note that organisational growth often erodes this trust, requiring changes in governance to accommodate diverse member preferences.

In 2008, Wanyama, Develtere and Pollet, in their paper “Cooperatives and Poverty Reduction in Africa”, provided empirical evidence from eleven African countries to demonstrate how cooperatives mediate access to the capital necessary for poverty reduction. The authors emphasize that modern African cooperatives are uniquely successful because they integrate people of diverse backgrounds (e.g. the poor and the relatively well-off) into the same economic ventures, thereby reducing social exclusion. This is an interesting finding, because in other studies, that same diversity has been found to be a factor of conflict or predatory behaviour from the better-off farmers.

The study defines the co-operative as an open and voluntary association where members are free to join or leave at their discretion. This voluntary nature is cited as a reason why the management must remain democratic and transparent to ensure member retention, which aligns with what Ostrom states. Additionally, cooperatives provide "bridging capital" that allows smallholders to access higher-value markets (such as fair-trade coffee in Ethiopia) that would be unreachable individually.

In 2012, Fischer & Qaim (2012) investigated the determinants of group membership and its impact on household income in Kenya. An interesting finding is that mobile phone ownership is a primary determinant of group membership, which means that efficient communication tools are essential for group formation and notification of market days, particularly in remote areas where households are geographically scattered.

In 2023, Hintz and Pretzsch published a paper where they used a knowledge co-creation approach to develop business models for smallholder forest farmers’ organizations (FFOs) in Ethiopia and Tanzania. In both the Ethiopian and Tanzanian case studies, farmers expressed a strong preference for maintaining manageable group sizes (approximately 21 to 25 members). This preference is rooted in the desire to cooperate only with those they know and trust, which facilitates monitoring and prevents opportunistic behaviour. Also, the research emphasizes that successful horizontal coordination is seen as a prerequisite for more complex vertical coordination with wood processors and urban buyers.

In the coconut value chains, Hashim and Shamsudin (2025) investigated the socio-economic contributions of coconut farming to rural communities in Malaysia, specifically examining how it serves as a vehicle for poverty alleviation and sustainable livelihoods for smallholder farmers. The study identifies coconut farming as a source of income stability and employment. These are viewed as shared benefits that contribute to broader rural development. While the crop itself is subtractive (one farmer's harvest reduces the total available), the socio-economic stability it provides acts as a "cooperators' dividend" that supports the entire community's resilience against poverty.

A critical finding is that the full potential of coconut farming is currently hindered by market access and limited technological adoption. This suggests a weakness in existing linkage structures, both horizontal (connections between farmers) and vertical (connections to markets and technology providers). The authors argue that for coconut farming to be an effective tool for poverty reduction, it must be better integrated into broader rural development strategies, implying a need for stronger institutional and market linkages.

3.2 Determinants of collective action among farmers

When it comes to papers focused on studying the determinants of membership and participation in farmer groups, literature offers us a wide range of findings that emphasize how factors like participant heterogeneity, information/reputation, and linkage structures determine whether smallholder farmers in various global contexts join and commit to agricultural organizations.

In a paper from 2011, Fischer and Qaim moved beyond the binary choice of joining a group to investigate what determines the intensity of a member's involvement, specifically their attendance at meetings and the volume of produce they sell collectively. The researchers identify that low participation rates and "free riding" pose significant threats to the viability of these organizations.

The study finds a complex relationship between group size and collective action. Larger groups significantly reduce the frequency of participation in meetings because social ties are less tight and individual identification with the group is weaker. While larger groups may initially attract members to sell collectively due to potential economies of scale, they also provide more opportunities for free riding; as a result, the average quantity sold collectively per member is actually lower in larger groups than in smaller ones.

The services provided (technical training and organized market days) are treated as public goods within the group, as no member can be excluded from the resulting benefits. However, the "cooperators' dividend" in this case was found to be relatively small, with collective sales prices only slightly higher than farm-gate prices. This small margin, combined with the cost of transporting fruit to collection centres, creates an incentive for members to "free-ride" by selling individually while still benefiting from group-led technical innovations.

The findings highlight a "middle class effect" regarding asset heterogeneity. Both very small and very large landholders are less likely to participate intensely; the former find the fixed costs of participation too high relative to their small harvest, while the latter have more lucrative private marketing alternatives. Furthermore, highly diversified farmers (those growing many different crops) are less likely to sell collectively because the time-intensive nature of group marketing for a single crop does not align with their broader farm strategy.

The groups rely on regular monthly meetings to handle routine business and build social capital. The study demonstrates that these face-to-face interactions are essential for collective action in "rulemaking" situations, though the frequency of attendance is highly dependent on the member's perceived benefits and distance to the meeting place.

The groups were heavily reliant on NGO support (Africa Harvest and TechnoServe) for their initial formation, legal registration, and links to specialized labs for planting material. The paper suggests that these external linkages are vital for capacity building but notes that institutional constraints, such as delayed payments (up to several days), act as a negative linkage that significantly discourages intensive participation among liquidity-constrained farmers.

Participation in all group activities, including meetings and market days, is strictly voluntary. The authors conclude that because members are not formally required to market collectively, the group's survival depends on creating enough shared value to prevent members from choosing the "exit" option of selling to itinerant traders at the farm gate

Later on, the same authors (Fischer and Qaim (2014)) investigated the determinants of group membership in Kenya. The study identifies a positive but curvilinear relationship between land size and membership. While larger

farms have more capacity to expand production, very large farmers (over 11 acres) are less likely to join, suggesting they may have sufficient resources to manage transactions independently.

The researchers note a trade-off where smaller groups improve internal cohesion, while larger groups may be preferable for achieving the economies of scale necessary for marketing. Participation is facilitated through technical training sessions and group meetings. The use of mobile phones is a vital modern tool that enhances this communication by ensuring members are reachable for collective activities.

When it comes to network linkages, the groups rely heavily on external support from NGOs (Africa Harvest and TechnoServe) to facilitate linkages with tissue culture labs, nurseries, and urban wholesalers. These organizations act as the bridge between isolated smallholders and high-value value chains.

Regarding voluntary entry and exit, collective action is explicitly defined as a voluntary investment of time and money. Even within a group, participation in specific activities, such as collective marketing, remains voluntary, and members often exercise their "exit" option by selling to itinerant traders when group payment systems are delayed or premiums are low.

In the same year, Mensah et. al. studied determinants of commitment to cashew cooperatives in Benin. They use a two-stage model to analyse both the decision to join a cooperative and the depth of business commitment (proportion of produce delivered) among cashew farmers. They found that psycho-sociological factors are critical for the initial decision to join. A farmer's decision is heavily influenced by social learning: satisfaction with past personal experiences in cooperatives and the reported satisfaction of their close social network (reputation) are strong predictors of membership.

Also, membership commitment is driven by "affective" factors (wanting to belong), while actual business commitment is "calculative," driven by shared economic benefits like higher prices and reduced transaction costs. An important finding related to network linkages is that the lack of formal contracts between members and their organizations leads to high rates of "side-selling" to intermediaries. The study suggests that formalizing these linkages is necessary to reduce free-riding and opportunistic behaviour.

In a paper titled "Coffee Farmer Cooperatives in Rural Ethiopia" written by Mojo et al. (2017), social networks are found to be a cornerstone of collective action in this region. The probability of joining increases significantly for farmers who have extensive social linkages, such as knowing agricultural experts or having up-to-date information on coffee prices at the national auction market.

There is a "wealth bias" in membership; better-off farmers (older, more educated, larger landholders) are significantly more likely to join. Interestingly, "transitional heterogeneity" analysis shows that non-members would gain more (152% income increase) than current members if they were able to join, indicating that the poorest face the highest barriers to entry. Additionally, physical accessibility to cooperative offices and proximity to larger towns significantly influence the decision to join, as these locations facilitate easier monitoring and access to expert advice.

Also working with coffee farmers, Trejo-Pech et al. (2023) applied a Transaction Cost Economics framework to understand why some farmers choose to join a group, while others remain independent. The study confirms a "middle-class effect". While farmland size initially increases the likelihood of membership, it eventually has a negative effect (inverse u-shape). Very small farmers are excluded because they lack the resources to meet quality standards or pay fees, while very large farmers avoid cooperatives because they have the resources to find more attractive private markets on their own.

Miroro et al. (2023) examined chicken and goat farmers in semi-arid regions of Kenya to understand why membership remains low despite potential benefits. Access to information and training is a primary driver of membership. The likelihood of joining a cooperative is 11.2% higher for farmers who have attended training or accessed agricultural information compared to those who have not. High levels of awareness increase the likelihood that a farmer will take the risk of joining a collective.

Smallholder farmers are highly heterogeneous based on their commercial orientation. Those who invest more resources (e.g., owning a chicken house or vaccinating livestock) are more likely to join cooperatives to safeguard their specialized investments. Subsistence-oriented farmers with fewer assets are often excluded because they cannot afford initial or regular fees. Interestingly, proximity to infrastructure (like agrovets) was studied but found not to be a significant determinant in this specific semi-arid context, suggesting that social linkages (training) may be more vital than physical proximity to market outlets.

Finally, Grashuis (2025) did a meta-analysis on the likelihood of cooperative membership. This study synthesizes findings from 168 empirical papers to identify universal determinants of collective action by farm producers. The meta-analysis highlights systemic exclusion/inclusion patterns based on heterogeneity in assets and demographics. Small, female, young, and uneducated producers are statistically less likely to obtain cooperative membership. Gender heterogeneity is particularly noted, with male producers having a higher likelihood of membership due to cultural norms or laws that impede women's access to the information and credit necessary for collective action.

Experience (a proxy for human and social capital) and education (a proxy for cognitive ability) are consistently positive determinants. More experienced producers are more likely to understand the "economic mechanics" of cooperatives and are better at building the trust and reputation required for self-governance.

Access to credit is identified as the single most influential determinant for cooperation. The authors proposed that this is because credit access acts as a bridge that allows farmers to clear financial entry barriers, such as membership fees and capital investments. The study also notes that producers join to mitigate market power imbalances and asymmetric price transmissions, aiming for "scale economies" that individual smallholders cannot reach alone.

Chapter 4. Data and Methods

4.1 Case study

La Mosquitia, located on the Caribbean coast of Honduras, in the northeast of the country, is home to more than 80,000 people and is the region with the second-largest indigenous community in the country, encompassing four of the nine indigenous and Afro-descendant peoples present in Honduras: the Tawahkas, Pechs, Garífunas, and Miskitos. The regional economy relies on fishing, agriculture, and seasonal work tied to the surrounding land and sea, with plantain, cassava, and rice as the main agricultural products (World Bank, 2023).

Despite the abundance of natural resources, *La Mosquitia* faces severe and disproportionate deprivation relative to the rest of Honduras. Multidimensional poverty in the region stands at 71.8%, above the national average of 67.2%, reflecting overlapping deprivations in education, health, and other essential living conditions, and food insecurity affects 43% of the population, a rate 17.9% higher than in the rest of the country. These conditions of poverty and food insecurity coexist with persistent constraints on infrastructure, connectivity, health care, and education. (World Bank, 2023).

From 2016 to 2020, the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), together with Honduran government institutions, carried out *Manejo Sostenible de los Recursos Naturales bajo Aspectos Climáticos en los Territorios Indígenas de La Mosquitia (PANA-PANA)*, a project focused on sustainable natural resource management combined with climate change adaptation in *La Mosquitia*. Through this project, the communities received training in climate adaptation and resource management, information on climate-resilient farming practices for improving coffee production through agroforestry and value chain support, strengthened their maize systems for food security using soil conservation and drought-adaptation techniques, and developed alternative income sources, such as honey, wild berries, and resin (e.g., from liquidambar trees). (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2024).

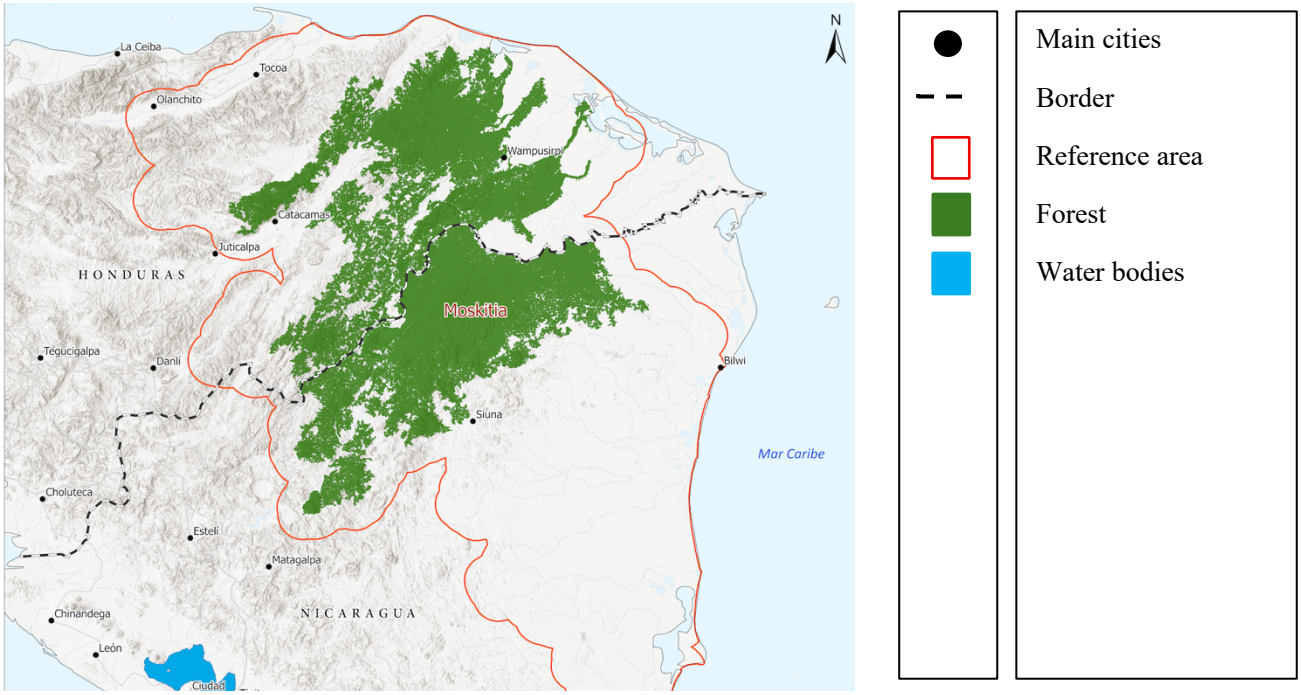
Later, a project funded by the Japan Social Development Fund (JSDF), via the World Bank, and implemented by the NGO *Ayuda en Acción* from 2019 to 2024, used a community-driven development approach to support

productive activities such as artisanal fishing, agroforestry, poultry farming, home gardens, and small-scale marketing. Technical assistance and capacity building were provided alongside the grants. However, this project focused on livestock, rice, horticultural crops, sweet potato, cassava, yams, taro, marzipan and banana, and did not target coconut activities (The World Bank, 2024). Similarly, other organisations like the Wildlife Conservation Society Honduras-Nicaragua and Paskaia, a Swedish non-profit, have ongoing projects in the region that are focused on the (Wildlife Conservation Society Honduras-Nicaragua, n.d.) focus on sustainable management of natural resources.

The interventions reviewed above indicate that *La Mosquitia* has not lacked external attention or resources. However, a systematic study of the determinants of collective action in the region to inform such interventions is absent. Researching this topic is necessary to ensure the efficient use of the funds allocated to these efforts and to better serve the interests of the Miskito communities.

Figure 1.

La Mosquitia Region



Source: Wildlife Conservation Society, 2022.

4.2 Methodologies and Data

Each source addresses different dimensions of the analysis, enabling a comprehensive understanding of the structural, social, and behavioural factors shaping collective action. Net-Map workshops focus on mapping stakeholder networks and capturing network linkages. Meanwhile, interviews document past and current experiences of the communities with farmers groups, giving us information on the performance of the different configurations of number of participants, subtractability of benefits, participant heterogeneity, entry and exit rules and communication models.

Finally, the surveys will give us data to evaluate the current conditions of the communities regarding their experience with collective action, attitudes towards cooperation, and other factors that could impact the success of a new farmers group attempt.

A. Network Mapping

A.1 Methodology

To obtain a general overview of the structures that operate around and shape agricultural activities in *La Mosquitia*, we applied the Net-Map method, developed by Eva Schiffer and Jennifer Hauck in their 2010 paper, "Net-Map: Collecting social network data and facilitating network learning through participatory influence network mapping."

Net-Map is a low-tech, low-cost, interview-based mapping tool designed for researchers, facilitators, and implementers to visualise implicit knowledge, understand the interplay of complex formal and informal networks, power relations, and actors' goals, and uncover sources of conflict as well as potential for cooperation. The tool produces both qualitative and quantitative data for understanding networks and measures actors' attributes, such as the nature of relationships between actors and their perceived influence (Schiffer & Hauck, 2010). The underlying idea of this framework is that network structure determines both individual success and the way an organisation or society acts and develops (Borgatti & Foster, 2003).

A.2 Data

During the month of November in 2025, we conducted five participatory workshops across three communities to map stakeholder networks influencing agricultural activities, capturing both relational dynamics and actors perceived influence using a 1–5 ordinal scale. Each workshop generated a network map, resulting in a total of five maps. The central question guiding the mapping was: Which actors influence, support, or hinder the production, processing, and commercialization of agricultural products within the community?

All workshops followed a consistent structure following the Schiffer & Hauck model (2010). They began with a clear explanation of the exercise goals. Participants then wrote all actors perceived to have influence over their agricultural work in a piece of paper ("actor card"). For each actor, they describe the relationships actors had among them, and the nature of those relationships, classifying them as a flow of money or products (green), problems or conflicts (red), or help or advice (blue). Then the participants linked the actors accordingly.

Finally, participants allocated a specific number of beans to each stakeholder, with 1 bean representing the least influential actors and 5 beans representing the most influential. Beans were chosen as indicators of influence given their availability in the region and their size, which allows them to allocate several ones in the same actor card. Multiple actors could receive the same number of beans if participants judged their influence to be equal. These decisions were made through consensus among participants, although some individuals assumed a more leading role than others, which may have affected the results. The full guide provided to the facilitators to conduct the workshop can be found in Annex 1.

Workshops were conducted one per community in each visited region. The three selected communities were drawn from a targeted pool of 12 communities previously involved in interventions, where the research team was able to secure the necessary permissions through established connections with local organizations. Participants were randomly selected from prior individual survey respondents (the third data source of this research, for more information see section C of this chapter), themselves a targeted sample of active farmers.

For each workshop, we obtained photographic records of the final network maps and full transcriptions of the workshop discussions that enabled us to understand the nature of each relationship within the networks and support the validity of the final maps. It should be noted that the sample was not statistically representative of the broader population. Communities were purposely selected from a bigger pool that had previously participated in development interventions, and workshop participants were drawn from a targeted survey of active farmers. While this approach ensures relevance and feasibility, it introduces selection bias and limits the generalizability of the findings. Therefore, the results should be interpreted as context-specific insights into stakeholder networks and perceptions, rather than as definitive representations of all farmers or communities in the region.

B. Framework Analysis

B.1 Methodology

The Framework Analysis is a systematic and flexible approach for the management and analysis of qualitative data. It belongs to a broad family of analysis methods often termed thematic analysis or qualitative content analysis, which seek to identify commonalities and differences in data before drawing descriptive or explanatory conclusions clustered around themes. The method was developed in the late 1980s by researchers Jane Ritchie and Liz Spencer at the National Centre for Social Research in the United Kingdom for large-scale social policy research and has since become increasingly popular in medical and multi-disciplinary health research. Its primary purpose is to provide a structured way to summarize and reduce data while ensuring that the context of individual participants' accounts is maintained throughout the analysis (Gale et al., 2013).

The combination of structure and case-level traceability makes Framework Analysis particularly well suited to the present study for two reasons. First, the matrix structure of this method allows systematic comparison across interviews and communities while preserving the specific wording and context of each individual respondent. Second, this study set out with the defined applied purpose of understanding how collective agricultural action can happen and persist in *La Mosquitia,* and what this implies for future organisational design. The Framework Method was developed for large-scale social policy research, which reflects the orientation of this research to produce findings that can inform practical decision-making by policymakers and practitioners.

The defining feature of the Framework Method is its matrix-based structure. This matrix serves as a summary of the data without losing the individual observation detail (Gale et al., 2013). The matrix is built by following a process that is both standard and flexible for the researcher, and it consists of the following stages: familiarisation, identifying a working analytical framework, applying the analytical framework, charting and interpreting the results.

The familiarisation stage involves a first reading of the qualitative material, listing key ideas and recurrent themes across the data. Ritchie & Spencer (1994) add that "where a study aims to explore aspects of the research process as well as substantive issues, for example in the study of sexual attitudes and behaviour, notes are also made on the general atmosphere of the interview and the ease or difficulty of exploring particular subjects."

The next stage is constructing an initial thematic framework. This process involved taking the familiarised data and identifying key issues, concepts and themes by which further data could be referenced. By the end of this stage the initial data had been grouped into manageable sections, and we have a first index to apply to the data. After this, we move on to the stage of applying the thematic framework, or indexing, which refers to the process whereby the thematic framework is applied to data, and it involves numerous judgments as to the meaning of data (Kiernan & Hill, 2018).

Later, there is the charting stage, where data is extracted from their original context and rearranged according to the thematic codes. The objective is to summarise the data into a matrix where rows and columns are the codes and cases (Gale et al., 2013). The point is that the whole data set for each case can easily be reviewed and traced back to the original source. It is important to note that this analytical matrix is not a simple copy and paste of the texts, but a summary of the data, and the level of detail recorded can vary between projects and researchers (Ritchie & Spencer, 1994).

This property of the charting stage is particularly valuable for the two-stage analytical strategy used in this study. Because the initial thematic framework applied to the interviews was constructed from the applied literature on agricultural collective action and latter from Ostrom's theoretical framework (see Chapter 3), the resulting matrix needed to retain sufficient interpretive detail to be reanalysed later against Ostrom's more abstract, theory-derived categories.

In the final stage, the researcher interrogates the matrix to move beyond mere description toward explanation and theory building (Gale et al., 2013). In the case of this study, the objectives are to provide explanations, illuminate people's attitudes, experiences and behaviour, and develop strategies to inform the work of NGOs and development organisations.

The final stage of interpretation is where the flexibility offered by Framework Analysis becomes most relevant to this research. Unlike more rigid coding approaches, the Framework Analysis method does not prescribe a single analytical destination for the completed matrix, and the same charted data can be interrogated for purely descriptive patterns, for explanatory mechanisms, or, as in this study, reorganised entirely around an external theoretical framework. This flexibility allowed the analysis to proceed from an initial, literature-grounded thematic index toward a second, theory-driven synthesis structured around Ostrom's collective action framework (2010).

B.2 Data

The key informant interviews (KIIs) were designed to gather information on different topics, and to be used in different research projects embedded within the Circular Coconut (CiCo) project. For this specific research, a module was included in the interviews with questions to collect information about past and current experiences with farmer groups.

Each interview was adjusted depending on the type of informant interviewed, but core modules were kept constant across all interviews. The corresponding questionnaires can be found in Annex 2. The organisation and participation modules are the most relevant for this research.

From the total of 39 interviews performed, 28 interviews are relevant for my research. If the informant had no experience with or knowledge of farmer groups or collective action, the organization and participation modules were skipped. The 28 relevant interviews include informants that were community leaders, pastors, community members, NGO members, cooperative groups members and ex members, local traders and sellers, and civil society organisation members.

The interviews were originally performed in Spanish or Miskito, depending on the request of the interviewee. For the Spanish-language recordings, a two-step, human-verified AI pipeline was used: an AI speech-to-text tool produced a first transcription, which was then checked against the original audio and corrected by native Spanish-speaking research assistants; the corrected Spanish transcript was then translated into English using an AI translation tool, and this translation was again reviewed and corrected by a human reviewer fluent in both languages before being finalised. Miskito-language recordings followed a different process: because no reliable AI transcription or translation tool for Miskito was available, these recordings were transcribed and translated directly into English by bilingual Miskito-English speakers, with no AI involvement at this stage. In both cases, the AI-assisted stages produced a first draft only; no transcript or translation was treated as final until a human reviewer had checked it against the source material. Finally, the reviewed English-language transcriptions were uploaded to NVivo to be coded.

B.3 Application of Framework Analysis

The analytical strategy adopted in this study followed a two-stage, sequential coding approach, moving from an empirically grounded thematic framework to a theoretically derived one in the charting stage. The initial thematic framework was constructed following the principles of Framework Analysis, by drawing on *a priori* issues informed by the research aims, emergent issues raised by respondents, and recurring patterns identified during familiarisation (Ritchie & Spencer, 1994). The codes and sub-codes that structured this framework were not devised independently of the literature but were informed by the empirical determinants of cooperation identified in applied studies of agricultural collective action.

This choice was appropriate at this stage of analysis since farmer groups are themselves a specific empirical instance of collective action embedded in agricultural value chains, a framework grounded in studies of analogous settings ensured the coding scheme was sensitive to the practical, context-specific dimensions of cooperation that are salient to producers and practitioners. It is worth noting that some topics entered the thematic framework purely through the emergent-issues channel, without any prior anticipation from the research aims or the applied literature. The issue of security is the clearest example.

Having established a comprehensive thematic index of 233 references across 30 codes and 28 interviews, the analysis proceeded to a second, theoretically motivated charting stage structured around the seven variables that Ostrom (2010) identifies as determinants of collective action. Concretely, this involved re-reading every cell of the first-stage matrix and re-tagging its content against the seven Ostrom variables, using the guiding questions listed in Table 3 as the inclusion criterion for each variable. The re-tagging drew on several original codes at once to populate a single Ostrom variable, and a single original code sometimes contributed relevant evidence to more than one Ostrom variable. It is this many-to-many relationship between the two coding schemes that ruled out a simple one-to-one relabelling of the existing 30 codes and required a full second reading and re-coding of the material instead.

This second stage was undertaken for three additional reasons. First, Ostrom's framework offers a higher level of theoretical generality and portability than the applied literature alone, enabling the findings from this specific regional and sectoral context to be situated within, and contribute to, a broader body of collective action theory that spans commons governance and repeated social dilemmas beyond the agricultural domain. Second, the seven Ostrom variables are analytically orthogonal to the original thematic codes, cutting across categories such as trust, dissolution, and future suggestions rather than mapping onto any single one, which is precisely why only a full re-coding exercise, rather than a simple relabelling of existing codes, could populate them adequately. Third, re-coding the data against a parsimonious, seven-variable framework enabled a more systematic comparison across the 28 interviews than would have been feasible using the original 30-code matrix, whose granularity was suited to thematic description but not to comparative analysis of structural determinants of collective action.

Stage 1: Familiarisation

From the complete dataset comprising 28 interviews, a subset of eight was selected for the familiarisation phase using a random number generator. Using a random number generator, to avoid researcher-driven selection bias in choosing which interviews to read first. The Framework Analysis methodology approach does not prescribe a specific percentage or minimum coverage of the interviews selected for familiarization relative to the full dataset, so the number eight was selected because it represents one quarter of the full data set. This subset was subsequently read in detail, during which notes were taken to identify recurring themes relating to cooperation and coordination.

Stage 2: Constructing an initial thematic framework

Following the review of the selected interviews, the analysis proceeded to the stage of developing a thematic framework, informed by the findings identified during the familiarisation phase:

> *"When identifying and constructing this framework or index, the researcher will be drawing upon a priori issues (those informed by the original research aims and introduced into the interviews via the topic guide), emergent issues raised by the respondents themselves, and analytical themes arising from the recurrence or patterning of particular views or experiences." (Ritchie & Spencer, 1994)*

The themes I identified from the familiarisation stage are shown in Table 1.

Table 1. *Topics identified in the familiarisation stage*

Topic	**Sub-topic**
Currently existing farmer or community groups	
	Crop(s) produced and/or commercialised through the group.
	Type of clients of the group
	Role of the NGOs or development agencies

	Characteristics of the group members
	Trust and cooperation in the group
	Process to become a member
	Costs of membership
	Benefits of membership
	Work done inside the group
	Decision making processes
	Obstacles faced by the group
	Future perspectives
Past farmer or community groups	
	Crop(s) produced and/or commercialised through the group.
	Type of clients of the group
	Role of the NGOs or development agencies
	Characteristics of the group members
	Trust and cooperation in the group
	Process to become a member
	Costs of membership
	Benefits of membership
	Work done inside the group
	Decision making processes
	Obstacles faced by the group
	Reasons for the dissolution of the group
Governance in the community	
	Formal and informal leaderships
	Trust in authorities
	Trust among the community
External interventions	
	NGOs and development agencies interventions
	Government interventions

Suggestions for future agricultural groups or cooperatives	
Perceived obstacles for the formations or the work of the agricultural groups in the community	
Motives for not joining or abandoning a group	
Parts of the value chain that is more efficient to do in groups	

Stage 3: Applying the thematic framework

During the indexing process, it became apparent that the structure of the initial codes was not optimal; consequently, the codes were restructured as displayed in Table 2. These codes and sub-codes were subsequently applied to manually code the interviews using NVivo.

Table 2. *Thematic framework for the coding of key informant interviews*

Codes	**Sub-codes**
Experience with agricultural collective action	
	Benefits of membership
	Characteristics of the collective members
	Collective structure
	Conflict resolution
	Costs of membership
	Crops produced or commercialised through the collective
	Decision making processes
	Enforcement mechanisms
	Fairness in the collective
	Future perspectives
	Legal frameworks for the collectives
	Motives for abandoning a collective
	Obstacles faced by the collective
	Process to become a member or participate
	Reasons for the dissolution of former collectives
	Role of government

	Role of the NGOs or development agencies
	Transparency
	Trust and cooperation among the collective
	Type of clients of the collective
	Work done inside the collective
Governance in the community	
	Formal and informal leaderships
	Trust and cooperation among community members
	Trust in government
	Trust in NGOs or development agencies
	Work structures in the community
Transport	
Perceived obstacles for the formations or the work of the agricultural collectives in the community	
Security issues impacting agricultural activities	
Suggestions for future agricultural collectives	

After a final review of the coding in an Excel matrix, the result was 233 references, coded across 30 codes and subcodes, and 28 interviews. The richest cloud of data is concentrated within the sub-codes of the category "Experience with agricultural collective action". This is encouraging, as it suggests that the interviews yielded substantial information pertinent to the research questions guiding this study: why have previous attempts failed, and what characteristics do the currently operating production or trade collectives in the region exhibit?

The code with the second-highest number of references is "Governance in the community", followed by "Suggestions for future agricultural collectives". The first one provides information to understand the characteristics of how communities are currently organised, both politically and economically, while the latter captures the lessons learned by local actors regarding how to organise and sustain collective agricultural activity.

Stage 4: Charting

To initiate the charting process, a text report with all the interview extracts coded under each code was generated in NVivo, downloaded and rearranged to construct an initial matrix. Within this matrix, each column corresponds to a code or sub-code, and each row corresponds to an interview, resulting in a matrix of dimensions 29x31 (28 interviews, 30 codes, plus the title cells). Each content cell was populated with all references from a given interview coded under the corresponding code.

To continue the charting process, the coded data was subsequently charted according to the information it provided in relation to the seven variables identified by Elinor Ostrom (2010) as determinants of collective action. This second charting exercise crosscuts the original thematic categories rather than mapping directly onto them and was guided by questions derived directly from Ostrom's framework.

The original coding scheme was built around the research questions guiding this study and the empirical findings in the existing literature about the determinants of collective action, related with benefits, costs, trust, obstacles, and so on. While analytically useful, these categories do not map one-to-one onto Ostrom's variables, and it was therefore necessary to cut across them. For example, the data informing the variable of information about past actions was drawn simultaneously from the trust and cooperation columns, the reasons for dissolution columns, the reasons for abandonment columns, and the suggestions for future agricultural collective's columns. The result of this second charting exercise was a new matrix, structured around the seven variables from Ostrom (2010), which forms the basis for the analysis presented in the following sections

This second charting exercise is not a standard stage of Framework Analysis as originally specified by Ritchie and Spencer (1994), but an extension made possible by the method's flexibility regarding the analytical destination of the completed matrix and is treated here as a distinct second application of the charting logic. The variables, underlying questions, and final number of references included under each variable are shown in Table 3.

Table 3. *Structure of the charting exercise: Ostrom variables and guiding questions*

Ostrom Variable	Underlying Question
Number of participants	1. How many people are involved?
Subtractive vs. Shared benefits	2. Are the goods at stake subtractable or shared?
Heterogeneity	3. How similar or different are the participants in interests, assets, and payoffs?
Face-to-Face communication	4. Do people communicate face-to-face, and does that communication produce binding commitments?
Information about past actions	5. What do participants know about what others have done before, both formally and informally?
Linkage structures	6. How are people connected to each other: through chains, pools, or bilateral links?
Voluntary entry and exit	7. Can people freely choose to participate or leave?

Given the extent to which artificial intelligence tools were used throughout the qualitative analysis of this study, it is important to make explicit where and how they were applied, and what role the researcher played in supervising their output.

Beyond the transcription and translation support described in section B.2, an AI language model (Claude, Sonnet 5) was used as a research assistant during the second charting stage described above, that is, during the re-coding of the first-stage thematic matrix against Ostrom's seven variables. This assistance took the form of an interactive, researcher-directed process. For each interview, the researcher provided the AI model with the relevant excerpts from the first-stage matrix and asked it to identify, summarise, and ground its synthesis in the specific evidence relevant to each of the seven Ostrom variables, following the guiding questions in Table 3. The researcher then reviewed each output against the source transcripts, and where the AI-generated synthesis was judged to be insufficiently grounded in the interview text, too general, or inconsistent with Ostrom's precise definition of a

variable, for example, in earlier iterations where community-level themes not directly evidenced in a given interview had been folded into that interview's coding, the researcher rejected the output and requested a revision constrained explicitly to the wording and content of the relevant transcript excerpts. This iterative correction process was repeated until the researcher judged the coding to accurately and conservatively reflect the source material.

This same collaborative process was used to identify and code the additional variables discussed in section 5.2.2, which fell outside the original seven-variable framework but recurred with sufficient frequency in the dataset to warrant separate analysis.

It is important to be transparent about the implications of this process for the study's methodological rigour. On one hand, using an AI model in this way allowed for a systematic, exhaustive re-reading of a large qualitative dataset (233 references across 30 codes and 28 interviews) against a theoretical framework, a task that would otherwise have required considerably more researcher time. On the other hand, this process does not constitute independent inter-coder verification in the traditional sense, because the AI initial output and the researcher's subsequent review were not independent of one another, since the researcher directed the coding criteria the model applied and repeatedly revised its instructions based on observed errors. This limitation, and its implications for the reliability of the coding, is discussed further in Chapter 6.

C. Individual Surveys

C.1 Methodology

Individual surveys were analysed using Python to identify tendencies and descriptive statistics that shed light on the heterogeneity of the regional population, their experience with collective action, and their attitudes towards cooperation. No causality hypotheses were tested due to the data limitations explained in the following sub-section.

C.2 Data

This research draws on cross-sectional data in the department Gracias a Dios, Honduras, obtained by surveys performed during November 2025. An ethical clearance was handed in and approved (Annex 3). All participants completed the same questionnaire in the language Spanish or, if requested, in Miskito, in the same order and without any experimental conditions or treatments (but follow-up questions were dependent on responses to previous questions).

The survey includes characteristics on demography and economy, agricultural and coconut production, living standards, rule compliance, security and illegal activities, social trust, risk awareness, agricultural information system as well as biases, and life satisfaction modules. The relevant question modules for this research are the group and community modules, which contain questions regarding experiences in collectives and attitudes towards collaboration. The questions were based on what the literature has found to be relevant in determining the formation and active membership of farmer groups (Matthews, et.al., 2024; Ostrom, 2010).

The fieldwork was supported by the NGO *Ayuda en Acción*, which provided trained enumerators to conduct the surveys and facilitated communication with the communities. To avoid safety issues, *Ayuda en Ación* purposely selected the communities beforehand based on predefined criteria, including their geographic location (coastal or inland and within reasonable proximity to Puerto Lempira) as well as the NGO's existing connections in the region. The NGO contacted community leaders, as well as other local gatekeepers such as pastors, teachers, and individuals responsible for coordinating several communities within the area, to facilitate access.

Within each community, guidelines regarding participant selection were provided, aiming for a balanced sample in terms of gender and age, with a focus on agricultural producers and, where possible, individuals involved in coconut production. However, the final selection of survey participants was not made by the research team, but by the local gatekeepers based on the guidelines provided. While the sampling procedure was not randomized, we sought to maximize diversity and minimize selection bias to the greatest extent feasible.

The interviews were assisted by enumerators familiar with work in the region and who spoke Spanish and/or Miskito, and delivered using the computer interview tool “KoboToolbox”. Given the fragile context in the region, characterised by security risks, mobility constraints, climate-related disruptions during hurricane season that limit movement for both enumerators and participants, the research team established a goal for the sample size of 200, but only 184 were achieved.

Several limitations should be acknowledged regarding the data collection process. Communities were selected based on predefined criteria, and access within communities was facilitated through local gatekeepers such as community leaders, pastors, teachers, and area coordinators. Although deliberate efforts were made to achieve a balanced sample in terms of gender, age, and livelihood, the reliance on gatekeeper-facilitated access means the sampling procedure was not randomised. Given the security situation, the remoteness of the study area, and the governance structures characteristic of indigenous communities, this approach was necessary and appropriate. Nonetheless, it may have introduced a degree of selection bias, as gatekeepers could have consciously or unconsciously favoured certain individuals, such as those more readily available, more willing to participate, or more aligned with the gatekeepers' own perspectives, over others. Relatedly, respondents may have been less willing to discuss sensitive topics candidly, particularly regarding local governance or the failures of previous collective action efforts, given that their participation had been facilitated by community authority figures, raising the possibility of social desirability bias.

Additional limitations relate to the nature of the data and its analysis. As several interview questions asked respondents to reflect on why previous attempts at collective action had failed, the data may be subject to recall bias, given that retrospective accounts are susceptible to reconstruction based on present circumstances or shared community narratives. Finally, all interviews were coded manually by a single researcher without a second coder to independently verify the coding framework; while this ensured consistency in the application of codes, the absence of an inter-coder reliability check means the coding process may reflect a degree of individual interpretation, which could affect the replicability of the findings. Future research could help mitigate these limitations through triangulation with additional data sources or independent samples, the inclusion of a second coder to strengthen inter-coder reliability, and longitudinal or follow-up studies to validate retrospective accounts against real-time observations of collective action processes.

The data was first collected in two separate files, one of them with the design of the survey, containing a survey sheet listing every question in the order it was asked, the variable name, the question type (select_one, select_multiple, text, etc.), the question text in English and Spanish, and the skip logic governing which questions appeared based on prior answers. This same document also contained a choices sheet functioning as a codebook. For every select_one/select_multiple question, it listed the numeric code (1, 2, 3...) and what that code actually meant in each language.

The second file was a single sheet, with the answer’s information. In total, the file had 184 rows, one per respondent, and 106 columns, one per answer recorded. Every response was stored as a raw numeric code, for example, district = 2, gender = 1, membership_status = 3, etc. For the multiple-choice, KoboToolbox's export format stores the answer twice, in two different shapes: a single "raw" column with all selected codes jammed into one space-separated string (e.g., group_type = "2 5" meaning the respondent selected both option 2 and option 5). A separate set of binary indicator columns, one per possible option, each holding a 1 or 0. The open-ended question was just free text, in Spanish, with inconsistent length and spelling.

These two raw files were machine-readable but not human-readable, and not directly ready for analysis. Therefore, an AI tool was used to generate a Python data frame that collapsed and harmonised all the data, which was later reviewed by the researcher. This processing pipeline was implemented in Python code generated by an AI language model (Claude, Sonnet 5) under the researcher’s direction. Every step of the resulting code and its output was reviewed by the researcher before being accepted into the final dataset.

The AI process was as follows: it decoded every categorical variable using the questionnaire's choices sheet, adding new human-readable label columns (e.g., district_lbl, gender_lbl) alongside the original numeric ones; then, it used the pre-built binary indicator columns for multiple-choice questions instead of parsing the raw code strings, which avoided common parsing errors and explains why those frequencies do not sum to 100%, since

respondents could select more than one option; later, it collapsed the continuous age variable into five-year bands solely for cross-tabulation purposes, while keeping the original continuous variable for summary statistics like the mean and median; afterwards, it thematically coded the 50 open-ended responses using keyword-based pattern matching to sort them into one or more of seven non-exclusive themes, which was the one step requiring interpretive judgment; finally, it built the additional variables needed for cross-tabulations (such as trust by membership status) by joining the decoded labels, and kept the original numeric codes side-by-side with the new labels, so any label could be checked against its source. All AI-generated code and its output were reviewed against the raw KoboToolbox export by the researcher before being accepted and no coding decision entered the final dataset without this manual verification. The pickle file containing the resulting data frame can be shared as requested, and the raw data and Python code used to build and later analyse the data is available in Annex 4.

Chapter 5. Results

5.1 Network Mapping Results

In all the 5 network maps, the participants (most of them farmers themselves) placed the farmers in the centre, picturing them as the node connecting all the other actors. Apart from the farmers, the most consistently present stakeholders were the family unit, buyers, thieves, and weather.

It is worth noticing that some unanimated actors ("weather"), abstract concepts ("transport") and non-human living beings ("plague") that are not considered stakeholders were mentioned alongside human stakeholders, such as "family" or "NGOs". In the original methodology developed by Schiffer and Hauck (2010), the participants of the workshop were from government institutions, members of NGOs, and other people with similar profiles, and in none of the papers where the methodology was used the participants listed this kind of actors. However, it is important to maintain the maps as the participants draw them, because the profile and world vision of the indigenous communities of which the participants are a part of world may be different from other populations, and for them, weather is seen as a stakeholder. Given that the Net-Map tool is inherently perception-based, the results reported reflect participants' subjective assessments and are presented without external verification or adjustment.

The frequency of appearance of each actor, and their average influence score, can be observed in Table 4. Pictures of each one of the maps can be found in Annex 5.

Table 4. *Frequency and Average Influence of Actors*

Actor	Frequency	Score Range	Average influence score
Family	5	3 to 5	4.4
Thieves	5	3 to 5	4.4
Farmers (central node)	5	3 to 5*	3.6*
Weather/Natural Disasters	5	1 to 5	3
Local buyers	4	2 to 3	2.6
External buyers	4	2 to 3	2.25
Buyers	1	1	1
Local authorities/Auxiliaries	4	2 to 4	3.3

Hardware store	3	1 to 5	3
NGOs	3	2 to 3	2.3
Transport	3	1 to 3	2
Plague	2	4 to 5	4.5
Community	2	2 to 3	2.5
Seed	1	5	5
Drugs	1	5	5
Products	1	4	4
Police	1	2	2

Note. *Only in 3 out of 5 workshops the farmer received an influence score.

Influence scores were derived from the number of beans allocated to each actor during the workshops, representing perceived influence on a scale from 1 to 5. These scores were first recorded at the individual workshop level and then compared across workshops. This allowed for the identification of patterns in perceived influence across communities. Given the qualitative and participatory nature of the method, the analysis focused on recurring trends rather than statistical aggregation. The range of the level of influence each actor had across the different maps, as well as its average scores, can be found in Table 4.

In all cases, the participants decided to design the entire network around the farmers, assigning this stakeholder as the centre of the web. In 2 of the 5 workshops, the facilitator failed to explain to the participants that they could also assign an influence score to the central actor, the farmers. In the remaining three workshops, the facilitator did explain this, and therefore the participants allocated beans to depict the influence of the farmers in the agricultural activity. As explained in earlier, the workshop participants were randomly selected from prior survey respondents, themselves a targeted sample of active farmers, which influences their point of view and could explain why they visualise farmers at the centre. In the three workshops where participants ranked the influence of farmers, their score falls between three and five beans, meaning that farmers are seen as a medium-high influence actor, with an average score of 3.6.

Family and thieves were the most influential actors, averaging 4.4 beans each. In all cases, the participants chose the colour blue to link the farmers and their families. According with what the participants explained while drawing the links representing the relationships between stakeholder, the family unit provides essential labour and advice to carry out their agricultural activities

Meanwhile, thieves were described as a constant negative presence. The participants always chose the colour red to depict the link between the thieves and the farmers. The participants stated that the thieves steal not only agricultural products but also work tools and even livestock. They also explained that this dynamic erodes farmers income and motivation due to its persistence. A noteworthy aspect is that, in one of the workshops, theft was linked to the drug dependency of the individuals who commit it. This led participants to add "drugs" as an independent actor in the map.

Weather and natural disasters showed more variable influence, ranging from as little as 1 bean, up to the maximum of 5 beans. During the discussion of the workshops in which climate and natural disasters were assigned a lower level of influence, participants argued that this factor and its impacts were limited by the temporality of natural phenomena, whereas other phenomena are constantly present. Meanwhile, the power and capacity of natural disasters to disrupt both supply and demand was an argument for giving more influence or creating more links between climate change and other actors, to the point where two workshop groups decided to model it as an actor that affected the entire network, with arrows pointing towards each stakeholder.

In the case of the buyers, in 4 out of 5 workshops, the participants differentiated between local and external buyers, while in one of them the participants grouped both in one same category simply labelled as “buyers”. In general, the participants granted the same or more influence score to the local buyers than to the external, because they are the most active ones. The influence of the local and external buyers was surprisingly lower than the other actors mentioned in all the maps. The reasons cited by the participants for not granting buyers greater influence were the low prices paid for their products, as well as the inconsistency with which those buyers are present.

Governmental authorities appear in 4 of the 5 network maps, and only in the form of local jurisdictions. In none of the groups were state or national authorities mentioned. Specifically, mayors, community leaders and auxiliaries were drowned in the maps. Participants scored the influence of these authorities between two and four beans, and an average score of 3.3, placing them as a medium-influence actor.

According to what was described by the attendees, local authorities provide farmers with some security (although not enough to mitigate the thieves issue), information, and general help. Community leaders and auxiliaries were described as the authorities with the greatest presence in the communities and their agricultural activities, while mayors were characterised as absent figures who set rules but do not provide help. Meanwhile, the farmers supply information about what happens in the community and what are their needs.

Hardware stores were present in three of the five workshops. Participants justified their inclusion by emphasizing the importance of the tools they could buy there to carry out their agricultural work. In one of the workshops where participants chose not to include hardware stores, they explained that they didn't buy any tools from those stores. This contrast between the groups that chose to include the stores and the group that explicitly stated they were not relevant, hints to the differences in technical development levels or technical access between the communities.

Surprisingly, non-profit organizations and development agencies appear to have a low to medium influence. They were mentioned in only three of the five workshops, with an influence ranging from two to three beans, and an average influence of 2.3 beans. This is particularly interesting because the three selected communities came from a specific group of 12 communities that had previously participated in interventions involving NGOs and/or development agencies. In other words, even though the community received intervention from these actors, participants indicated that these actors do not provide any meaningful support.

With a similar influence that surfaced in the maps was transport, depicted in three of the five maps, scoring between one and three “influence beans” and an average influence score of 2. The participants mentioned that transportation is important to them because it is the way they connect with markets outside their community, that is, with external buyers.

The phenomenon of plagues appeared in only two of the network maps, clearly with a negative influence on farmers and their agricultural activity. However, despite its low frequency of mention, in the two workshops where it was identified as a relevant stakeholder, it received a high influence score, being evaluated with 4 beans in one map and 5 in the other, resulting in an average influence score of 4.5.

Community, as a stakeholder, was drawn in two of the network maps. However, in one of those two maps, the participants were allocated in the same actor card of local buyers. The participants explained their decision arguing that the local buyers were basically the community. Therefore, there is only an actor card exclusively for the community in one of the maps. Its influence score was 2 in one of the maps, and 3 in the other one, resulting in an average score of 2.5. Despite its low frequency and influence score, it can be argue that local buyers represent in some way the influence of the community, because of the reasons exposed by the participants that grouped both actors together.

There were some actors that were only mapped in one of the workshops. These were “seed” (influence score of 5), “drugs” (influence score of 5), (agricultural) “products” (influence score of 4), and “police” (influence score of 2). Seed was given the maximum influence score of five beans, and the participants described it as a negative influence given the current seed shortage for their agricultural activity.

Drugs and police were mentioned as stakeholders in one of the workshops as part of a deeper discussion about thieves in the community. Participants explained that many thieves use robbery to obtain financial resources to buy drugs, and that police were present, but were not very useful in combating theft, leading to a low influence score of only two beans. The description of this dynamic is important as it illustrates how a social issue such as drug addiction directly influences the economic activity of communities in the region.

The robustness of our Net-Map findings lies in the consistency of patterns observed across workshops, rather than in statistical representativeness. Similar categories of actors and types of relationships emerged across communities, suggesting a degree of convergence in how agricultural systems are structured and perceived. At the same time, variation in influence scores highlights context-specific dynamics, which the methodology is designed to capture. The use of a standardised workshop procedure further strengthens comparability across cases.

To reduce the five maps obtained, this study uses the Consensus Structures approach suggested by Daniel Krackhardt (1987). In this approach, the relation between actor i and actor j takes the value of 1 if the participant, in this case each workshop group, states that the relation existed, and 0 otherwise. The threshold is then defined as the sum of 1s and 0s divided by the number of participants, in this case the number of workshop groups. A threshold must be determined depending on the specific context and needs of the research.

For this study, the threshold was set at 0.4. A threshold of 0.4 would be interpreted as meaning that a relation exists from i to j if at least two of the five workshop groups perceived that it exists. Using this criterion, the list of stakeholders related to the farmers, goes from the 17 that were mentioned in at least one of the maps, to 11. Table 5 depicts the matrix of relationships between stakeholders, where 1 means that the threshold is higher than 0.5 and therefore the relation exists, and 0 otherwise.

Table 5. *Matrix of relationships between actors of the network*

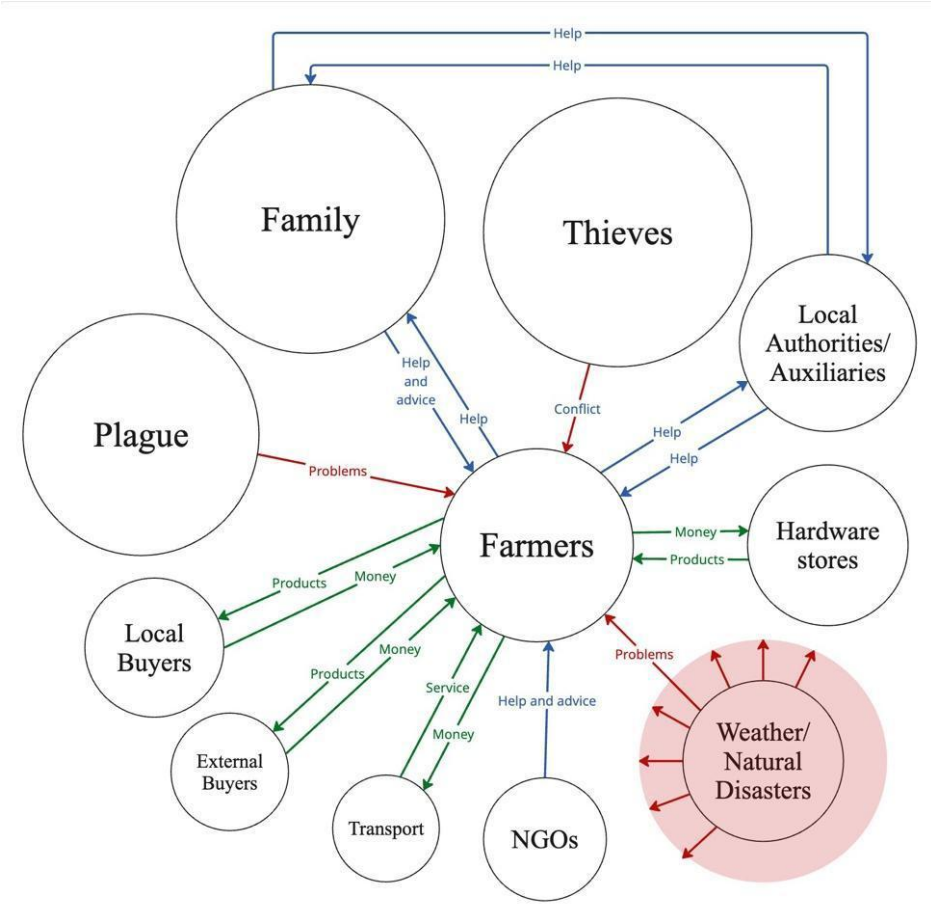
	Family	Thieves	Farmers (central node)	Weather / Natural disasters	Local buyers	External buyers	Local authorities / auxiliaries	Hardware stores	NGOs	Transport	Plague
Family	-	0	1	1	0	0	1	0	0	0	0
Thieves	0	-	1	1	0	0	0	0	0	0	0
Farmers (central node)	1	1	-	1	1	1	1	1	1	1	1
Weather/Natural Disasters	1	1	1	-	1	1	1	0	0	0	0
Local buyers	0	0	1	1	-	0	0	0	0	0	0
External buyers	0	0	1	1	0	-		0	0	0	0
Local authorities/ Auxiliaries	1	0	1	1	0	0	0	-	0	0	0
Hardware store	0	0	1	0	0	0	0	0	-		0
NGOs	0	0	1	0	0	0	0	0	0	-	0
Transport	0	0	1	0	0	0	0	0	0	0	0
Plague	0	0	1	0	0	0	0	0	0	0	0

Note. The one mention of "Buyers" as a sole stakeholder was counted as one mention of external buyers and one mention of local buyers.

Now, following the steps of Schiffer and Hauck (2010), a general, reduced network map is presented in Figure 2 that shows the relationships between stakeholders that complied with our threshold criterion. In this map, the size of the nodes represents the average influence score of each actor.

Figure 2.

Aggregated and reduced network map



Note. Size of nodes represents the relative influence of each actor. Blue arrows: flow of help or advice. Green arrows: flow of money or products. Red arrows: flow of problems or conflict.

The findings reveal that barriers to sustainable coconut production operate at multiple interconnected levels. Internally, the family unit sustains agricultural activity while persistent theft undermines it. Externally, unreliable market linkages are reflected in buyers' low influence scores, as participants highlighted both the irregular presence of buyers and the low prices offered for their products. This combination reduces the perceived importance of buyers in agricultural decision-making, positioning them as weak and inconsistent actors within the network. Weather adds a further layer of vulnerability for the whole network, although it is perceived as seasonal.

The findings from the Net-Map analysis suggest that a viable cooperative economic structure for the production and commercialisation of coconut and its subproducts must simultaneously address security conditions, informal social cohesion, and stable market connection. However, as additional data sources are still under analysis, these insights remain tentative. Key challenges such as theft, market instability, and limited processing capacity may be

addressed through coordinated and collective mechanisms, but this will require further validation. The specific roles of external actors also remain to be more clearly defined through ongoing data triangulation.

These findings aligned with the broader literature on collective action. Borgatti and Foster (2003) observation that network structure shapes both individual and organisational outcomes is borne out here in a specific way: the low influence attributed to buyers and NGOs, despite their formal presence in the network, suggests that *La Mosquitia* agricultural network is structurally thin at the links that the literature identifies as most consequential for collective action, namely the vertical linkages connecting producers to markets and technical support (Hashim & Shamsudin, 2025; Hintz & Pretzsch, 2023).

5.2 KIIs Framework analysis results

5.2.1 The seven Ostrom variables

Following the framework analysis methodology, the step next to charting is interpreting the data and presenting the results. Therefore, this section will discuss the findings of the key informant interviews in terms of the seven variables that determine collective action according to Ostrom (2010).

a) Number of Participants

Across the dataset, group sizes range enormously. The smallest functioning group in the dataset is the Watiasta savings circle of approximately 5 women, which was effective for 2 years. The group in Prumnitara started with 45 members and has now collapsed to 3 active users. Aproban organisation is described variously as 66 members across 14 communities and 316 members from 16 villages, a discrepancy that can be reflecting different moments in the organisation's growth or potential differences in the definition of membership. The Momanasta group in Mocoron has 63 members but held only one meeting in 2025. In Pranza, Suji, Sirsirtara, Krata, and Uji, no functioning collective of any size currently exists.

The two NGO interviewees who have the broadest evidence base converge on the same conclusion. The NGO GOAL, drawing on project experience with groups of 25–30 people across multiple value chains, states that "better results and greater impact when we work with small units, family units, within a family environment", and MOPAWI, with 40 years in *La Mosquitia,* says that "family, it is proved. In the communities, that's how they work. Each family produces their own goods; each family harvests their own coconuts". This convergence across two organisations with extensive experience in the region carries significant weight. This allows for a first empirical observation: the most effective collectives in the dataset are small, and regional practitioners recommend small units as the base for organisations.

However, there are some successful examples of large collectives in the region functioning well. The community of Mocoron stands apart from all other communities in having two distinct formal organisations simultaneously, and both are medium-to-large by local standards. Tinkitahua group spans multiple communities and have managed the size problem through a governance mechanism, a board that negotiates on behalf of all members, while Momanasta group has 63 members and solved the size problem through an appeal to gender homogeneity that reduces conflict per meeting regardless of size.

There is not a clear optimal numeric range of participants proposed in the interviews. Overall, the conclusion is that the base unit for organisation works better when it is kept at the family level, and the challenge is to coordinate these units at the community and then cross-community levels.

These findings resonate with the Grashuis & Su (2019) observation that social capital is significantly higher in smaller cooperatives, and Fischer & Qaim (2014) finding that larger groups in Kenya saw lower per-member collective sales due to weaker social ties and greater free-riding, both anticipate the governance strain observed here in the cases of fishing collective and 300+ member structure.

The convergence between the NGOs GOAL and MOPAWI on the family as the optimal base unit for a larger organisation also echoes Valentinov's (2007) argument that family farms are structurally limited in size but can achieve scale through a higher-level cooperative layer, rather than by enlarging the productive unit itself.

b) Subtractive vs. Non-substractive Benefits

The paper of Ostrom in 2010 draws a distinction between the effect of the group size, depending on the type of benefits. For non-subtractive public goods, increasing group size has a positive effect on provision because more members bring more resources to produce something everyone can share. For subtractive common-pool resources, increasing group size is negatively related to achieving social benefits because each additional member competes for the same rivalrous good, raises monitoring costs, and makes individual contributions harder to observe.

In our dataset, the productive activities among the groups that existed or currently exist involve subtractive goods, and there are no cases of pure public goods. This means that the theory predicts that collective action becomes harder as groups grow. However, the benefits produced in the collective differ in the degrees and ways of subtractability, therefore, is important to understand how the specific forms of subtractability found in the dataset interact with group size to produce governance problems of different types.

The first type of subtractability is the extraction subtractability, where what one member takes, sells, or borrows reduces what is available to others. For example, fish taken from the river by some members is unavailable to others, money disbursed from Aroban revolving loan fund to one borrower is unavailable to others, and so on.

Other examples of subtractable benefits offered by the farmer groups in the region are seed distributions, and shared equipment such as freezers, boats, graters, and solar panels. This is the standard CPR problem that is more commonly associated with Ostrom's work.

Farmer groups with non-subtractive benefits also appear often in our dataset. Training, pricing knowledge, market connections, group identity, and organisational capacity building are described as non-subtractive in several interviews. One member learning does not reduce what another can learn. The collective brand or market reputation that Aproban has built through television appearances and buyer relationships is also a non-subtractive asset, because one member's use of the Aproban name does not deplete it for others. The key observation is that these non-subtractive benefits are always enabling goods that make the production or commercialisation of agricultural products and subproducts possible.

Unmanaged subtractability is the consistent failure point. In Prumnitara, fish were caught and weighed but the proceeds from sale were captured by the leader. In Suji, contributions flowed into the loan pool for three years but loans never returned to members. In Krata, fishing equipment was captured by a small group and became unavailable to the community. The NGO GOAL names the underlying problem directly, by saying that when subtractive goods are held collectively without clear individual attribution, they "belong to everyone and to no one".

In Mocoron, the timber cooperative solves extraction subtractability through a regulated annual management plan that converts unlimited extraction rights into a bounded quota. The regulatory instrument is consistent with what Ostrom prescribes as a solution for this governance problem: it makes the subtractive limit legible, fixed, and enforced by an external body. However, this solution requires access to a legal form of organisation, which is costly relative to local income levels. In Prumnitara, fish faces the same problem, but there is no equivalent regulatory solution, no management plan, no quota, and no external authority involved in the fishery. The implication is that governing the extraction subtractability in this context is possible through formal legal structures, but those structures are financially inaccessible for most organisations.

Regarding the relationship between the subtractability of benefits and the size of the group, the data confirms that a larger group raises monitoring costs because the contribution of individual members to the collective becomes harder to observe as numbers grow. For example, in Watiasta-Raya's group of 5 women, the small size made extraction subtractability transparent by default because the weekly financial contribution of each member was

visible to all others in a face-to-face accounting meeting. In contrast, in the group with 45 members, the same transparency was impossible without a dedicated monitoring structure. Even though the 45-person group should in principle have generated more collective catch than the 5-person savings circle, the disjunction between individual contribution and collective outcome made governance collapse inevitable without monitoring infrastructure that the group did not have.

Across the data set, the issue of quality as a shared good appears. For example, when one producer mixes lard or sweet potato oil into coconut oil, they subtract quality from the collective reputation that made the price premium possible, which is a shared resource all producers relied on. Every honest producer bore part of the cost of one defector's adulteration, without being able to prevent it or charge the defector for the damage. This is the free-rider structure that defines CPR problems, where individual benefit is obtained at a collective cost.

The solution that the *Mosquibatana* group found to the quality issue was to weigh and verify density standards at the point of collection (coconut oil has a different density than sweet potato oil and lard). This is structurally equivalent to a monitoring mechanism for conventional CPR. According to what a local expert answered in an interview, the absence of this solution today is why "there's so much ambiguity and so much difference in quality" and why the market price premium has disappeared.

Once again, the bigger the group, the harder it is to control defection. Quality adulteration is more tempting and harder to detect as producer numbers grow. A group of 5 producing coconut oil together in the same location can observe each other's production process directly, but a regional cooperative with producers across many communities cannot. Because of its large size, the group *Mosquibatana* needed a technical verification protocol rather than simply rely on mutual observation.

In conclusion, across the productive activity observed in the dataset, the theoretical prediction of Ostrom about the relationship between group size and subtractability of benefits holds: larger groups both raise transaction costs and intensify competition over rivalrous resources. Also, because the group benefits depend not on the collective production, but on the collective commercialisation, the critical governance gap in the dataset is systematically located at this later stage.

Finally, the quality problem shows that subtractability can operate on shared reputation as well as on physical goods, and that it follows the same logic. The *Mosquibatana* solution of technical density verification demonstrates that this form of subtractability is governable through institutional mechanisms that require organisation at a scale that makes mutual observation impossible and formal monitoring necessary.

These findings extend Hashim and Shamsudin (2025) argument regarding coconut farming, that while the crop itself is subtractive, the broader socio-economic stability it can provide functions as a shared, non-subtractive dividend. The present findings also show that the cooperation dividend is realised only when the subtractive good is actively governed, and collapses into elite capture when it is not. The Mosquibatana quality case adds a dimension not addressed in the reviewed literature, namely that subtractability can be attach to the reputation of a good or service, and not only to its physical quantity, a nuance that may be particularly relevant for other collectively branded agricultural products beyond coconut oil.

c) Heterogeneity of Participants

In the framework of Elinor Ostrom, the heterogeneity of participants refers to differences in assets, information and payoffs, as well as diverse interests and resources. The logic is that such differences increase transaction costs and generate conflict over the distribution of costs and benefits, making cooperation harder.

In several interviews, there is the recommendation to work with family units as the base of the structure for any collective effort. This recommendation is grounded in asset homogeneity observations, because within a family, productive assets, labour capacity, and economic stakes are more closely aligned than in an externally assembled group drawn from a heterogeneous community. Interviewees converge on the family unit as the structure with the lowest asset heterogeneity, and therefore the easiest structure for reaching collective agreements.

In other cases, recruiting women with specific profiles is seen as a way to keep high homogeneity. The well-functioning Watiasta-Raya's group of 5 was explicitly recruited to match the economic profile of single mothers without partners, all facing similar household income constraints. The relative asset homogeneity removed the distributional conflict that wider wealth distance would have introduced.

Respondents consistently mentioned that in gender-mixed structures it almost always ends up being men who participate more, or who have more access to these resources, pointing to gender as a dimension of asset heterogeneity that distorts collective participation and payoff distribution.

Divergence in what members know about the collective resources, decisions, and outcomes also constitute a form of heterogeneity that the dataset shows to be as damaging as asset differences. One respondent noted: "they only meet with the president and treasurer. So people do not trust it and the project ends". The board members have information about the state of the collective's funds and decisions, while ordinary members have none. This asymmetry means members cannot assess whether their contributions are being used appropriately, cannot verify the board's claims, and have no basis for calculating whether continued participation is rational

The same asymmetry operates at the commercialisation point in the fishing group. Fish were weighed, transported to market, and sold, but members had no information about the sale price, the buyer, or the proceeds. The information advantage of the leader at the sales endpoint was the mechanism that made elite appropriation possible.

In another interview, the same dynamic is observed, this time regarding the information flows from external actors. In this case, when projects arrive in the community, resources are allocated by selected leaders, and broader community members have no information about what arrived or where it went.

In cases of functioning farmer groups that accept wide economic diversity among members, they have active governance mechanisms to manage the distributional tensions the heterogeneity creates. Mechanisms like formal bookkeeping, documented transactions, and regular collective accounting provide information about the state of collective resources that is equalised across members, reducing the asymmetry between those who govern and those who participate. Where they do not exist, economic heterogeneity tends to be exploited by those with privileged access to information about collective finances. The evidence therefore suggests that economic heterogeneity among members is not in itself fatal to collective action, but it raises the governance burden: the wider the asset distance between members, the more demanding the transparency mechanisms needed to prevent that distance from translating into informational advantage for some at the expense of others.

When it comes to heterogeneity in payoffs, the respondent who participated in a past swa oil group remembers it as functional precisely because all members received equal payoffs relative to contributions. That respondent now articulates this as a governance principle for any future group, which is an insistence on payoff symmetry across contributing members as the precondition for sustained collective action.

Gender appears one more time, this time as a systematic source of payoff heterogeneity that distorts collective arrangements. In mixed-gender governance structures, men tend to capture a disproportionate share of resources and decision-making influence, generating a predictable payoff asymmetry that erodes women's willingness to participate. This is why both MIMAT and Momanasta restrict membership to women as a governance solution to a payoff heterogeneity problem. Also, one of the NGOs noted a preference for working with both family groups and women-only groups, consistent with the preference for homogeneous units.

In this context, the NGO GOAL identifies externally assembled heterogeneous groups as a consistent failure pattern. They stated that "when groups are formed externally from heterogeneous rosters, perceived inequality in effort creates resentment and defection," and names elite capture driven by power heterogeneity as a predictable governance failure.

In conclusion, the family is consistently suggested as the lowest-heterogeneity structure and therefore is seen as a good base structure for farmer groups. The main reason for this is that within a family, expectations, contributions, and payoffs are more closely aligned. In other cases, women-only groups are also seen as a way to reduce

differences in payoffs among members. Finally, when economic heterogeneity among members exists, there is more demand for transparency mechanisms to prevent advantages for some.

The centrality of heterogeneity as a barrier to cooperation in this dataset is consistent with the majority of the literature reviewed in section 3.2, particularly the 'middle-class effect' documented by Fischer and Qaim (2014), Trejo-Pech et al. (2023), and Mojo et al. (2017) across three different countries and commodities, and with Grashuis and Su's (2019) finding that heterogeneity in member objectives erodes cooperative attributes.

d) Face-to-Face Communication

Given that the groups across the dataset are organised in small rural communities, and most of them are single-community groups, they have the possibility of face-to-face communication between members. The question is then how effective that communication is, and how it influences the formation and persistence of the farmer groups.

Two types of face-to-face communication occur among the farmers group experiences in the dataset. The first one is a genuine face-to-face communication, where participants express real needs, make binding commitments, and are held accountable. This communication appears in the well-functioning groups. For example, in the Watiasta-Raya's group, weekly accounting meetings are held to give updates and financial visibilities to members, and in a group created with the support of the NGO Aproban, assemblies produce legitimate governance decisions on board renewal and rule changes.

The second type of face-to-face communication is performative communication, where meetings occur but produce no accountability. This type of communication appears in failed farmer groups. For example, one group held meetings every three weeks in which promises were made, but those promises were constantly broken without consequences.

The NGO *Ayuda en Acción* reinforced the idea that participatory rulemaking requires sustained face-to-face deliberation over time, and short-term projects cannot invest sufficiently in building the social and organisational capital this requires. This comes in line with what the literature has found: while standard non-cooperative game theory predicts that communication should have no effect on outcomes, empirical and experimental evidence repeatedly demonstrates its strong positive impact on cooperation (Ostrom, 2010; Cárdenas & Ostrom, 2004).

Overall, the evidence across the dataset confirms that face-to-face communication positively influences collective action, but it can present different levels of quality that impact the size of this influence. Given the small and geographically concentrated nature of the communities in *La Mosquitia,* the physical preconditions for direct interaction are almost universally present, but not in all cases it generates binding commitments, financial transparency, and accountability over time, but sometimes merely appears without any real substance. Functioning groups in the dataset have converted face-to-face interaction into institutional mechanisms, like weekly accounting, legitimate assemblies, participatory rulemaking; while failed groups have experienced in-person communication without enforcement. This distinction aligns with Ostrom's broader argument that face-to-face communication works not only as information transfer, but also as a mechanism for moral suasion and credible commitment-making among participants who can observe each other's behaviour over repeated interactions.

This finding coincides with Fischer & Qaim (2014) observation in Kenya, that regular, face-to-face meetings are essential for collective rule-making and is consistent with Ostrom's own theoretical account of communication as a mechanism for moral suasion rather than mere information transfer (Ostrom, 2010; Cárdenas & Ostrom, 2004).

The distinction identified in this dataset between genuine and performative communication, however, is not explicitly drawn in the applied literature reviewed. The present findings suggest that frequency alone is an insufficient indicator, because several failed groups in the dataset met regularly without producing the accountability that Ostrom framework predicts communication should generate, indicating that what is said and enforced in a meeting may matter more than how often meetings occur.

e) Information about Past Actions

The gap between formal monitoring and informal reputational knowledge is wide, and the evidence shows that informal knowledge is both ubiquitous and actionable, while formal monitoring is rare and structurally inaccessible.

Formal mechanisms to inform about past actions are present in some cases, where the group keeps a record of the contributions of the members and those records are available to other members. These are also, not coincidentally, the four most institutionally robust cases in the dataset. In some examples, the small size meant formal recording was not even necessary, because the information was automatically shared thanks to the meeting structure.

Across virtually every community member interview, respondents demonstrated rich, specific, differentiated knowledge about how particular individuals have behaved in collective settings. This knowledge has been built through observation, conversation, and direct experience rather than formal recording.

The central analytical finding on information on past actions in this dataset is that there is a gap between knowing who has behaved badly and having an institutional mechanism through which that knowledge generates collective accountability. For example, when an interviewee from Prumnitara knows that the group leader kept the money, she can tell her friends and stop participating, but neither action corrects the governance failure, recovers the assets appropriated, or prevents the same person from doing the same thing in the next project. The informal information circulates through conversation and produces only individual-level responses (exit, avoidance) rather than collective-level responses (sanction, removal, restitution).

A last takeaway is how in communities where a lot of projects have failed and people know, Ostrom predicts people can be less willing to initiate cooperation again if that cooperation involves individuals or organisations that have failed them before. This is why it is important that international funding goes into responsible and well-designed projects, because the failure of those projects can erode the trust of communities in international organisations or even local NGOs involved in those projects, making success harder to achieve in each intervention cycle.

f) Linkage structures

Three types of linkage structure appear in the data. The first is directed chain structures, where each participant is accountable to the next in a defined sequence. For example, Tinkitahua's group chain runs from producers to the Cooperative Board, through Afinmos to ICF, and on to export buyers, with legal documents accompanying every step. Similarly, the NGO Aproban connects members through a documented delivery chain via boat services to named recipients in La Ceiba, with five Territorial Councils linking 14 communities. At the smallest scale and without a functioning farmer group, the communities described an informal bilateral chain system working in which one farmer gives products to a trusted other to sell, who returns the money.

The second structure is undifferentiated pools, where contributions flow into a common resource managed centrally with no direct accountability between individual members and their outcomes. For example, Caja Rural group in Suji connects members only through a government-managed savings pool into which contributions flow but from which loans are never returned. Another example is the savings group linked to the National Bank for Agricultural Development, that works through the bank as a central intermediary rather than through any peer-to-peer connection. The common market arrangement in Pranza also operates as a pool, where members pay weekly fees into a common fund and in return access shared resources such as cooking rights, plastic bags and overnight rooms, without any sequential accountability between individual members.

The third type of structure in the dataset is a broken chain, where a directed structure was designed but captured at one node. For example, in a fisher’s group, the chain ran from individual fishing to collective weighing, transport, and sale, but the leader intercepted proceeds at the commercialisation endpoint, breaking the chain at the only point where money was produced.

The NGOs operating in the region recommend a similar chain architecture. The NGO GOAL recommends family units connected to an independent community sub-intermediary, linked to a logistics entity, and from there to the market ("together but not intertwined") with each link accountable to the next. Similarly, the NGO MOPAWI recommends a structure of community groups connected through zonal councils to a cooperative, backed by Territorial Council approval, and from there to institutional markets. The structure would look as follows:

Family units → Community → Logistics entity → Market

In any case, the NGO *Ayuda en Acción* made a very important observation regarding how the group structures should be built. They recommended building organic peer-to-peer ties before imposing formal linkage structures, observing that the most durable linkages it has seen were those created through self-organisation rather than externally imposed project design. In the data set, this topic is pointed out as a recurring failure in the region because outside aid often reflects external priorities and imports organisational models from other regions -like western Honduras- that do not fit local cultural conditions, which leads to a lack of community ownership, which causes projects to fail once the external support ends. Repeatedly, NGO respondents said that when an association is proposed by an outside actor instead of built through extensive conversation with the communities, members often lack the sense of identity and personal benefit necessary to sustain cooperation.

In summary, local practitioners recommend a structure that links the family units in each community to an intermediary entity that can provide the support needed in topics like training, logistics, transport, quality control and marketing. Also, durable linkage structures tend to emerge from organic, self-organised ties rather than externally imposed designs.

g) Voluntary entry and exit

In all the farmer groups documented in the interviews, entry and exit were voluntary. According to Ostrom, when individuals have the freedom to enter or exit, they can identify and choose partners based on their past history, effectively using a veto to avoid interacting with untrustworthy players. This capacity to withdraw from a game has been shown to raise cooperation to high levels over time (Ostrom, 2010). Meanwhile, Fischer & Qaim (2012, 2014) document Kenyan farmers exercising exactly the kind of exit Ostrom's theory predicts, reverting to itinerant traders whenever the cooperative fails to deliver sufficient value.

Across the interviews, respondents said that their entry decisions were based on what the group was for and who will be part of that group. Exit as the control mechanisms that Ostrom describes (allowing individuals to avoid untrustworthy players and thereby raise the frequency of cooperative outcomes) exists, but its effects are limited. For example, in one group, nearly all 45 members progressively withdrew once it became clear the leader was retaining proceeds. This mass exit communicated clearly that the governance arrangement was unacceptable, and it did prevent further exploitation of those who left.

In short, exit in the dataset leads to individual withdrawal from collective action. The divergence that appears in La Mosquitia, where voluntary exit does not act as the mechanism proposed by Ostrom and confirmed by other empirical research, could be attributed to the low density of functioning farmer organisations in La Mosquitia relative to the Kenyan, Ethiopian, and Beninese contexts examined in the literature reviewed, where multiple cooperatives or intermediary options are typically available to a dissatisfied member.

5.2.2 Additional variables captured in the dataset

Beyond the seven variables identified by Elinor Ostrom in her paper from 2010, the literature on collective action in agriculture offers a wide range of interesting variables to look at when it comes to the determinant of the existence and persistence of such action. Such findings were key in the design of the interviews and the data collected was so rich that it exceeds the theoretical framework offered by Ostrom's seven variables. Therefore, this section analyses a set of additional variables that have been shown in the literature to determine the existence and persistence of collective action in rural settings, and which were strongly present in the present dataset.

a) Benefits of membership

Several benefits described here are institutional or developmental rather than economic. These benefits include training addresses gender-based violence, self-esteem, and financial literacy as a route to household and women wellbeing. In the literature, farmer groups are described as "mediating agencies" that provide essential non-economic services and provide social protection and safe work environments (Karatepe & Scherrer, 2019). For example, agricultural co-operatives in Egypt and elsewhere have provided training in home economics, health care, and rights awareness (Wanyama, et.al., 2008).

This is crucial, because economic upgrading (moving to higher-value activities) does not automatically improve lives; rather, social upgrading, like better rights, health, and security, is often a necessary foundation for sustainable economic growth (Karatepe & Scherrer, 2019).

Meanwhile, the NGOs GOAL and MOPAWI describe benefits in terms of legal standing, like access to export prices requires legal documentation that individual sellers lack. For example, the case of Tinkitahua's price premium per foot of mahogany is tied to legal documentation on sustainable sourcing and export capacity that individual sellers cannot access on their own.

However, the barriers for a legal constitution are significant. For instance, registration with the Honduran tax authority costs approximately $1,000 USD including lawyer fees and has to be done in offices located far away from the Miskito communities. In this regard, the literature highlights that legal standing and formalisation, and market bargaining power are critical institutional hurdles that individual smallholders often cannot overcome alone, but which collectives are uniquely positioned to solve.

Farmers organisations act as a vehicle to formalize previously informal transactions, which is essential for capturing higher value and boosting government recognition (Hintz & Pretzsch, 2023). For individual farmers, the lack of legal documentation is a barrier to entry for high-value chains, and collectives provide the necessary legal and organisational framework to obtain the needed statuses that individual enterprises cannot achieve (Trejo-Pech, et.al, 2023). Also, by organizing, the farmers increase their bargaining power against large retailers or input providers (Karatepe & Scherrer, 2019). In a few words, farmers organisations in *La Mosquitia* have the potential to reduce the transaction costs involved in gathering information on sustainable practices, complying with international trade requirements and bringing together various producers to gain bargaining power in the market.

Another interesting finding is that transport is repeatedly identified as the single largest cost item overcome by collective action. In *La Mosquitia*, transfers must largely be conducted through lagoon systems, rivers, and very poor roads. These logistical challenges imply that technical or administrative actions in the region can take up to 35 days longer than in other parts of Honduras (World Bank, 2024).

The NGO Aproban states that transport is the dominant cost in *La Mosquitia,* absorbing most of producers' profit and discouraging community members from bringing products to the common market they built. Community members say that transport costs are "prohibitive, wiping out margins even when products sell, with the added risk that a producer may travel to Puerto Lempira only to find no buyers.

This is a common struggle for smallholders observed in rural remote areas, where they often face the risk of transporting products individually only to find incomplete or missing markets, or a lack of buyers at their destination (Miroro, et.al, 2022). Farmers organisations are designed to achieve economies of scale to economize on external transaction costs, including the pooling of resources for transportation services (Fischer & Qaim, 2012), and the need to overcome transport barriers is a primary determinant of whether farmers join a collective.

Failing in identifying a reliable and accessible way of transport for their products can strand the market access of a group. For example, one respondent stated that her main aspiration for the collective is acquiring a truck, because without one, the members of the farmers organisation in her village cannot get their products to market. The collective infrastructure and rules were built and still exist, but the physical link connecting members to the group infrastructure is broken.

It is common for community members to coordinate the collective transport of their products, even if they do not belong to a farmer group. This indicates that the issue of transport is critical and can be one of the benefits around which farmer groups are formed. In similar rural development contexts, proposed business models for farmer groups specifically include outsourcing donkey carts, trucks, and drivers as key variable costs to connect members to urban marketplaces (Hintz & Pretzsch, 2023).

Overall, the benefits of farmers organisations documented in this research extend well beyond the direct economic returns. Alongside enabling access to higher-value markets through legal formalisation and easing the transport burden that constrains individual smallholders, farmers organisations in *La Mosquitia* serve as vehicles for social upgrading, providing training and support that address household wellbeing and gender-based vulnerabilities. This suggests that the value of collective action in this context cannot be assessed on economic grounds alone, and that any future intervention should account for these institutional and social benefits alongside its commercial objectives.

b) Role of NGOs and Development Agencies

The dataset confirms that the region has experienced multiple external interventions oriented to the formation of farmer groups and gives information about how the different approaches adopted by local and international NGOs and development agencies heavily impact the intensity and durability of the incentivised collective action.

Donor conditionality can distort organisational design from the most optimal one, to one more adjusted to the donor guidelines or preferences. The NGO MOPAWI critique that donors favor group-based aid because it looks for maximising the number of beneficiaries, maximising apparent reach per dollar, but those structures collapse quickly. This means that the farmers groups are built as a donor-driven artifact rather than an organically from within the communities. Similarly, the NGO GOAL corroborates that even when they know that slowly built family-based models consistently outperform quickly assembled groups, donors resist funding them because it does not produce the same beneficiary-count metrics they use.

The statements from both NGOs and a report from the World Bank (2024) are consistent with what the literature has found. General research on farmers organisations warns that direct administrative intervention aimed at rapidly increasing numbers can lead to "shell" or "zombie" cooperatives, which stands for entities that are officially registered to meet donor or government metrics but have no actual operations (Ma, et.al, 2023(1)). In the same way, a meta-analysis of 19 developing countries found that top-down, agency-led initiatives often fail once external funding ends because they were imposed to serve external socio-political goals rather than emerging from a bottom-up cooperation driven by shared needs (Ma, et.al., 2023(2)).

In this context, close collaboration of international development agencies with local stakeholders who have better knowledge of the communities is needed to achieve better results. For example, in the mentioned report from the World Bank about one intervention they did in the region in collaboration with the local NGO *Ayuda en Acción,* they documented that the original design required communities to produce "Business Plans", but the implementing agency found this to be a mismatch for the incipient state of business in Miskito communities, where activities focused more on subsistence and food security than on market-oriented commerce. Eventually, the project ended up using "Investment Plans" to fit the local context (World Bank, 2024).

The World Bank report concludes that future aid delivery must move away from "trial and error" and instead use a mindset that enables "informed risk tolerance" and flexibility in the instruments used in order to support local dynamics rather than imposing rigid donor guidelines. To ensure cultural relevance and overcome donor-driven distortions, the project recommended a model of community consultants, in this case, Miskito technicians who serve as intermediaries between donor requirements and local social structures (World Bank, 2024).

In sum, the evidence from both the interviews and the wider literature converges on the conclusion that donor metrics oriented toward beneficiary counts and rapid scale-up systematically favour organisational designs that are least likely to endure, while approaches grounded in local knowledge and adapted to community priorities, though slower and less visible in donor reporting, produce more durable collective action. This suggests that

intermediary structures capable of translating between donor requirements and local social conditions, such as the community consultant model documented by the World Bank, may be a necessary, rather than optional, feature of effective intervention design in *La Mosquitia*.

c) Security issues impacting agricultural activities

Theft, armed robbery, and land invasion are described as severe exogenous constraints on agricultural economic activity, independent of any collective's internal governance quality. In Mocoron, land invasion by non-Miskito groups has continued since 2011 despite complaints, involves drug trafficking, and has even escalated to produce violent threats against community leaders. Moreover, coconut theft is often driven by drug-related demand and is described as a severe constraint on production.

The dataset shows security threats operating at different scales with different implications for collective action design. Individual-level theft (like coconuts stolen at night) can in principle be addressed by shared monitoring. However, organised land invasion and drug trafficking cannot be addressed by any internal governance arrangement a farmer collective could design; it requires state or military capacity that the dataset shows as currently ineffective.

In sum, security conditions in *La Mosquitia* impose a constraint on collective action that lies outside of the scope of current agricultural collective action frameworks. While theft at the individual level may, in principle, be mitigated through internal governance mechanisms such as shared monitoring, organised threats like land invasion and drug trafficking exceed what any farmer collective could reasonably be expected to address on its own, underscoring the need for effective state capacity as a precondition for durable collective action in the region. This is an increasing concern in many regions in Central and South America and must be addressed in the literature.

d) Gender dynamics

Gender operates as a cross-cutting axis of exclusion, inclusion, and strategic design choice throughout the dataset. Machismo actively restricts women's economic participation as a direct behavioural phenomenon. The NGO Aproban states that female participation has declined due to machismo, as some husbands forbid their wives from selling. This is a specific mechanism of exclusion operating at the household level, prior to and independent of any collective's internal rules. One female respondent reports her husband questioned her participation in the group, an obstacle explicitly attributed to machismo.

Representation of women's leadership has reportedly improved over time. The respondent from MIMAT noted that women's participation in organisational leadership has grown significantly compared to the past, and that community boards were almost exclusively male, attributing these changes to the training and rights awareness knowledge administered by NGOs and development agencies.

Women-only groups are a deliberate strategic response, articulated with specific reasoning. The NGO MOPAWI stated that working with women is more efficient than with men. Momanasta's group respondent similarly states that the women-only format produces less conflict and more consensus. This is a finding about strategic self-selection into homogeneous structures specifically to avoid gendered conflict.

The NGO *Ayuda en Acción* presents the most sophisticated and seemingly contradictory position on gender strategy. They document that government credit programs consistently show men capturing more access than women, even where resources are nominally available, and that indigenous governance structures show the same asymmetry, because leadership often consolidates around individuals with strong personal authority, implicitly favoring men. Yet, *Ayuda en Acción* explicitly recommends working with couples and whole families rather than women alone, arguing that "when the whole family sees an initiative as beneficial... women gain the freedom to participate, breaking down the barrier of husbands withholding permission." This is presented as more effective than isolating women, because working with women alone can create tension inside of the household and lead to withdrawal.

These two opinions by *Ayuda en Acción* are not contradictory but describe different mechanisms operating at different levels. On one hand, excluding men from governance structures (as MIMAT, Momanasta, and MOPAWI's project do) removes competitive gendered conflict within the collective. On the other hand, including the whole family in project design removes the external veto power a husband holds over whether his wife may participate at all. The dataset thus reveals two distinct gender-related barriers: internal group dynamics and household-level authority, each of which require different structural responses.

Altogether, gender emerges as a structural determinant of participation in farmers organisations in *La Mosquitia* operating at two distinct levels. First, within the collective, where women-only structures reduce gendered conflict and improve decision-making. Second, within the household, where whole-family engagement is needed to overcome the veto power that men hold to limit women participation. Effective interventions must therefore address both levels simultaneously, as resolving heterogeneity within the group does nothing to remove the barriers to entry that operate before a woman ever reaches it.

e) External shocks

Beyond internal governance failures, many farmer group collapses in *La Mosquitia* stem from an inability to withstand exogenous market shocks. The NGO MOPAWI describes several such cases. The 2008 US recession ended a major batana/sweet potato export contract, though the buyer's continued contractual payments through 2015 unexpectedly benefited producers even after orders stopped; concentrated Chinese purchasing power exhausted the region's entire batana supply, a demand-side shock unrelated to any local governance failure; and the commercial attractiveness of coconut oil shifted over time for reasons entirely external to production quality or community capacity, only to regain relevance after 2022.

Together, these cases show that market viability of farmers organisations in *La Mosquitia* is vulnerable to global economic forces, meaning that the durability of local farmers organisations will depend not only on internal governance quality but on their capacity to absorb shocks originating far outside the region and adapt to new conditions. Table 6 summarises the main findings per variable analysed in this section.

Table 6. *Key findings, Framework analysis of key informant interviews*

Type of Variable	Variable	Main Findings
Ostrom variable (2010)	**Number of Participants**	Group size in the dataset ranges from 5 to over 300 members, with no clear optimal numeric range identified. Small groups achieved higher transparency and accountability, while larger groups faced greater governance strain. NGOs with extensive regional experience independently recommend the family as the base organisational unit, with coordination scaled up through governance mechanisms (e.g. boards) or homogeneity strategies (e.g. gender-restricted membership) rather than by simply enlarging the group.
	Subtractive vs. Non-subtractive Benefits	Larger groups raise monitoring costs and make individual contributions harder to observe, consistent with Ostrom's prediction. The critical governance gap is systematically located at the commercialisation stage. Non-subtractive benefits like training, market connections, or brand reputation are common and function as enabling goods for economic activity. Shared quality also behaves as a subtractive, reputational common-pool resource, governable through costly formal verification mechanisms.

	Heterogeneity of Participants	Differences in assets, information, and payoffs increase transaction costs and generate conflict. The family unit is consistently identified as the lowest-heterogeneity structure. Women-only groups are also used to reduce payoff heterogeneity, since mixed-gender structures tend to result in men capturing a disproportionate share of resources and influence. Information asymmetry between leadership and ordinary members was a recurring driver of governance failure. Where economic heterogeneity appears, functioning groups rely on transparency mechanisms like bookkeeping and regular accounting to prevent it from becoming exploitative.
	Face-to-Face Communication	Farmers organisations in the dataset have the physical preconditions for face-to-face communication, given the small, geographically concentrated nature of the communities. However, the quality of communication varies from genuine communication (e.g. weekly accounting meetings, legitimate assemblies) that produces binding commitments and accountability, to performative communication (regular meetings with broken promises) that does not. This distinction differentiates functioning from failed groups, consistent with Ostrom's argument that face-to-face communication works through moral suasion and credible commitment-making.
	Information about Past Actions	Formal monitoring is rare and is present mainly in the most institutionally robust cases. Informal reputational knowledge is ubiquitous and detailed across nearly all community interviews. The key limitation is that informal knowledge of past misconduct typically produces only individual-level responses like exit and avoidance, rather than collective accountability mechanisms like sanctions or restitutions. Repeated project failures also erode communities' willingness to re-engage in future collective action, underscoring the reputational cost of poorly designed interventions.
	Linkage Structures	Three linkage types appear in the data: directed chains (each participant accountable to the next, e.g. Tinkitahua's producer-to-export chain), undifferentiated pools (centrally managed resources with no individual accountability, e.g. Suji's Caja Rural), and broken chains (a designed chain captured at one node, e.g. proceeds intercepted at the commercialisation point in a fishing group). Local NGOs recommend a chain architecture linking family units to community intermediaries and onward to markets. Durable linkages tend to emerge from organic, self-organised ties rather than externally imposed designs.
	Voluntary Entry and Exit	Entry and exit were voluntary in all documented groups, and entry decisions were based on the group's purpose and membership. However, unlike Ostrom's repeated-game assumption, in the absence of collective alternatives, exit in this dataset tends to lead to permanent individual withdrawal from collective action altogether, rather than to renewed cooperation with better partners. Mass exit has functioned as a costly signal that a governance arrangement was unacceptable.

Additional variables	**Benefits of Membership**	Benefits extend beyond direct economic returns to include training on gender-based violence, self-esteem, financial literacy and legal/institutional standing that enables access to export markets and higher bargaining power. Overcoming transport costs is a core concern that farmers look to overcome through organisation, and broken transport links can strand market access even when group infrastructure otherwise functions.
	Role of NGOs and Development Agencies	Donor conditionality favouring beneficiary-count metrics and rapid scale-up produces organisational designs that collapse quickly, while slower, locally adapted, family-based models are more durable but harder to fund. Close collaboration with local stakeholders and flexible, locally adapted instruments improve outcomes. Intermediary structures that translate between donor requirements and local conditions may be a necessary feature of effective intervention design.
	Security Issues	Theft, armed robbery, and land invasion are severe exogenous constraints on agricultural activity. Individual-level theft may in principle be mitigated through internal governance (shared monitoring), but organised threats such as land invasion and drug trafficking exceed what any farmer collective could address internally, requiring effective state or military capacity currently lacking.
	Gender Dynamics	Gender operates as a structural determinant at the collective level, where women-only structures reduce gendered conflict and improve decision-making cohesion; and at the household level, where whole-family engagement is needed to overcome the veto power that husbands may hold over women's participation. Effective interventions must address both levels simultaneously, as resolving heterogeneity within the group does not remove barriers to entry operating before a woman ever reaches it.
	External Shocks	Farmer group collapse in *La Mosquitia* is not always attributable to internal governance failure. Exogenous market shocks show that market viability depends on the global economy. Durability therefore depends not only on governance quality but on a group's capacity to absorb external shocks.

5.3 Individual Surveys

Aggregated five-year age groups (18-29, 30-39, 40-49, 50-59, 60+) were created solely for cross-tabulation purposes. The analysis performed is exclusively descriptive, and includes:

- Frequency distributions for each categorical variable in the groups and community modules.
- Descriptive statistics for the Likert-type scales (trust, solidarity).
- Cross-tabulations between the variables of interest and demographic variables and among themselves.
- Thematic coding of the 50 open-ended responses to the challenges in farmer groups question, to identify recurring themes mentioned by respondents.

No inferential hypothesis tests or regression models were run, and no causal claims are made. Given the small size of some subgroups (for example, n=21 of respondents are current members or n=29 are former members), the corresponding percentages should be read as indicative rather than as precise population estimates. The data was processed in Phyton, and Matplotlib was used for generating the visualizations included in this document.

A first set of descriptive statistics characterizing the sample composition is presented in Table 7. Respondents were distributed in approximately equal proportions across the three geographic strata under study: the coast, the inland region, and Puerto Lempira. The latter is the capital of the department of Gracias a Dios in northeastern Honduras, located on the shores of the Caratasca Lagoon. As the largest urban center in the department and the administrative seat of the Miskito population, Puerto Lempira functions as the principal economic and logistical gateway connecting the remote *La Mosquitia* region to the rest of the country. With respect to age, the sample exhibits a mean of 46.2 years (median = 46; range = 19–88), suggesting a respondent pool skewed toward middle-aged and older adults.

Table 7. *Demographic composition of the sample (n=184)*

Characteristic	Category	n	%
District	Coast	62	33.7%
	Puerto Lempira	61	33.2%
	Inland	61	33.2%
Gender	Female	95	51.6%
	Male	89	48.4%
Age group	18-29	23	12.5%
	30-39	48	26.1%
	40-49	38	20.7%
	50-59	37	20.1%
	60+	38	20.7%
Education level	Primary school	76	41.3%
	Secondary school	58	31.5%
	Technical/vocational	22	12.0%
	University or higher	17	9.2%
	No formal education	11	6.0%

a) Level of participation in collective action and farmer groups

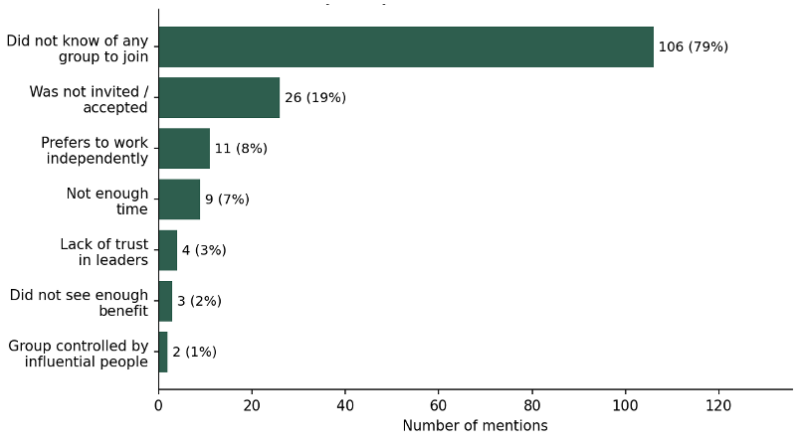
This section analyses the participation of respondents, or their families, in farmers organisations. Most of the sample has never participated in a farmer's organisation, accounting for 72.8%. An additional 15.8% participated in the past but no longer does, and only 11.4% currently participates. Taken together, only 1 in 4 respondents (27.2%, n=50) had any current or past group participation experience.

Current or past participation varies by district: it is more common in Coast (35.5% have ever participated) and less common in Puerto Lempira (21.3%). By gender, men are somewhat more likely to be current members (14.6% vs. 8.4% for women), while women show a somewhat higher share of former members (16.8% vs. 14.6%). By education level, no linear relationship is observed: people with only primary education show the highest rate of ever having participated (36.9%), while those with technical/vocational training show the lowest (13.6%). By age, people 60 and older show the highest share of former members (28.9%), consistent with groups that stopped operating some time ago, while people aged 18-29 show the highest current-membership rate (21.7%).

As described in Figure 3, among the 134 people who have never participated in a farmer's organisation, the dominant reason is simply that they did not know any organisation to join, accounting for 79%. Far behind, the second most common reason was not having been invited or accepted (19%) to one, and the third was a preference for working independently (8%). Reasons often associated with resource constraints or distrust, like inability to afford fees, fear of conflict, lack of trust in leaders, are marginal in this sample, with percentages up to 3%.

Figure 3.

Reasons for not joining a group

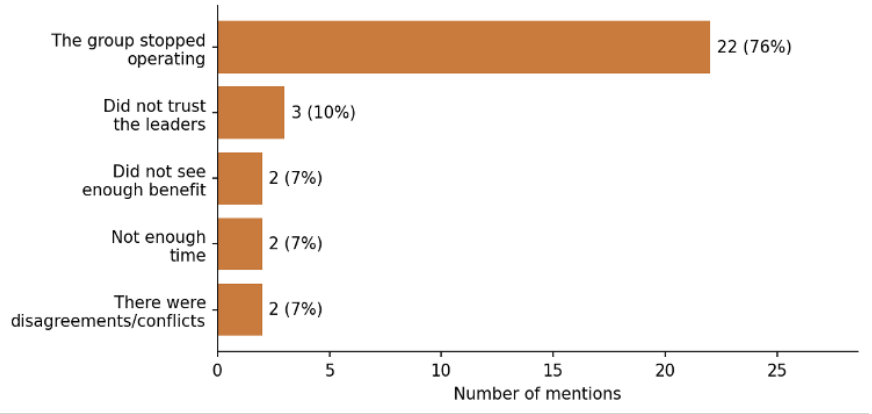


Note. n=134; multiple-choice question.

Among the 29 people who participated in the past but no longer do, the overwhelmingly most cited reason (76%) is that the group stopped operating. Internal conflicts, lack of trust in leaders, and lack of time appear as secondary reasons, each mentioned by fewer than 11% of this subgroup. This finding is consistent with what is observed in the open-ended responses (section 4.5) that point out to group discontinuation tied to the end of a project or its external funding rather than to conflicts inside the group.

Figure 4.

Reasons for leaving a group

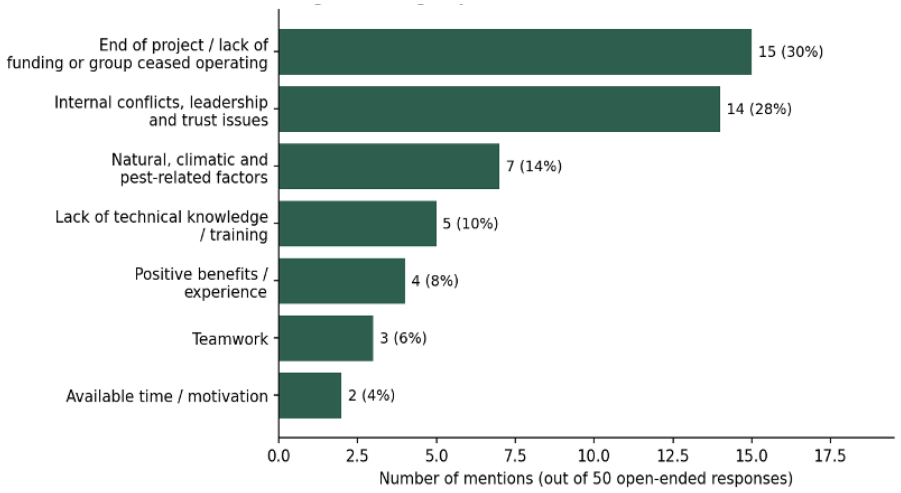


Note. n=29 former members; multiple-choice question.

The open-ended question "What are the biggest challenges in an agricultural group?" was answered by 50 individuals, who ever participated in a group, which confirms the internal consistency of the questionnaire. A keyword-based thematic coding was performed on these responses, identifying seven broad, non-exclusive themes, and can be seen in Figure 5.

Figure 5.

Challenges experienced in farmer organisations



Note. A single response can touch more than one theme, so percentages do not add up to 100%.

Among the answers corresponding to the category of “End of project/lack of funding or group ceased operating” statements like “the project ended” or "the group stopped functioning" can be found. This finding is consistent with what was found in the key informant interviews regarding the vulnerability of farmer groups created quickly and under donor conditions that do not correspond to what would have been the best in the local context, leading to the unsustainability of the group once the project ends or the donor retires its support.

In “Internal conflicts, leadership and trust issues” the respondents mentioned disagreements, conflicts with leaders, lack of trust and division between members. “Natural climatic and pest-related factors” include references to natural phenomena like pests, storms, and, notably, four mentions of the full moon as a factor affecting the group's work, possibly linked to traditional knowledge or practices regarding the lunar cycle and harvesting.

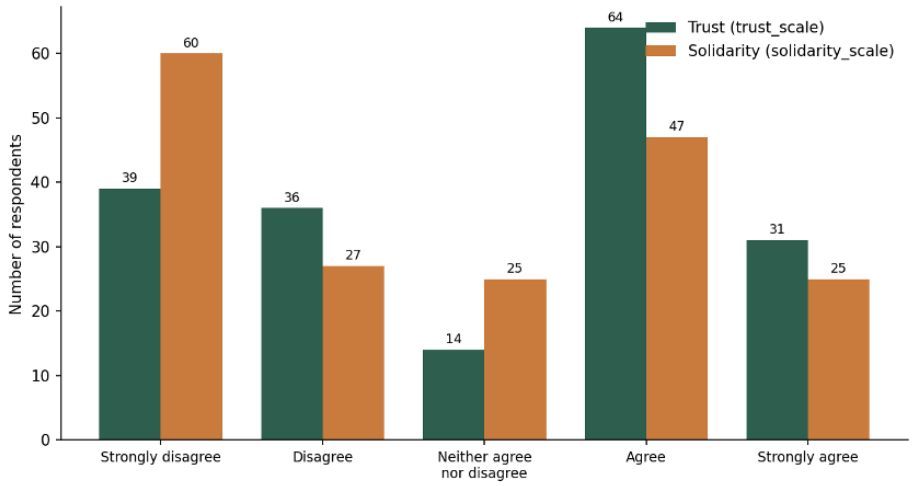
Meanwhile, responses that talked about lack of experience, difficulty learning and not knowing how to harvest as challenges faced in the groups, fall under the category “Lack of technical knowledge or training”. Finally, teamwork, available time and motivation contained mentions of difficulties of working with others, the time investment needed and lack of motivation to sustain the work inside the group.

Taken together, these results indicate that the main obstacles perceived by those who already have group experience are largely external to the group's internal dynamics like project and funding sustainability, and leadership and trust conflicts remain a nearly equally relevant theme. This relates to what was uncovered in the KIIs, where the key informant criticised the sustainability of farmer groups assembled quickly, imposing exogenous models and more aligned to what international donors and development agencies want instead of what works the best in the region.

The questions of the community module explored the trust and solidarity that respondents perceive among farmers in their community, and their preference for individual versus neighbour-coordinated farm management. Respondents were asked to indicate their level of agreement with two statements: that they can trust other farmers in their community to collaborate fairly and honour their commitments (trust), and that farmers in their community care about each other's interests (solidarity), on a 5-point scale from "strongly disagree" to "strongly agree". The results are shown in Figure 6.

Figure 6.

Perceptions of trust and solidarity in the community



Note. Distribution of responses on community trust and solidarity (n=184).

Trust obtained a mean score of 3.07 out of 5, with a median 4; 51.6% of respondents agree or strongly agree that they can trust other farmers, compared to 40.8% who disagree or strongly disagree. Perceived solidarity is consistently lower, with a mean of 2.73 out of 5 and a median 3; only 39.1% agree or strongly agree that others care about their interests, while 47.3% disagree or strongly disagree. In other words, respondents trust somewhat more that their neighbours will honour formal commitments than they believe those neighbours care about their wellbeing.

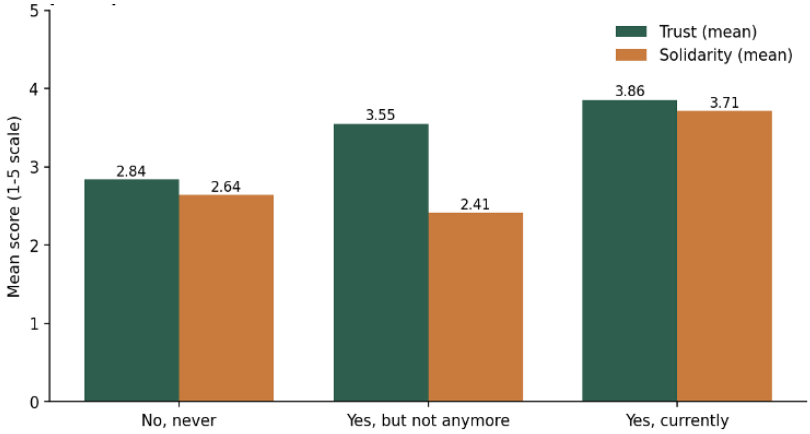
Geographically, the coast emerges as the district exhibiting the greatest associative dynamism, evidenced by the highest rate of ever-participation in collective organizations, alongside the highest average level of community trust. In contrast, Puerto Lempira registers the lowest values on both dimensions, suggesting a comparatively weaker propensity toward collective engagement and interpersonal trust within this district.

Both variables are moderately correlated, with a Spearman correlation coefficient equal to 0.67. People who report higher trust also tend to perceive higher solidarity in their community, which is consistent with both reflecting a shared general disposition toward community social capital, without implying a cause-and-effect relationship between them.

Cross-tabulating the trust and solidarity scales with group participation status reveals a pattern of people who currently participate in a group report the highest levels of both trust (3.86/5) and solidarity (3.71/5), well above those who never participated (2.84 and 2.64, respectively). The results can be visualised in Figure 7.

Figure 7.

Average trust and solidarity by organisation participation status



An interesting nuance appears among former farmers organisations members: their trust level (3.55) remains relatively close to that of current members, but their perceived solidarity (2.41) is the lowest of the three groups, even below those who never participated. This could reflect a group experience that left a reasonable assessment of other farmers' reliability, but a more critical perception of how much others genuinely care about their wellbeing, possibly associated with the experience of watching a group dissolve. This is a descriptive association observed in the data and does not allow us to establish whether group participation generates higher trust/solidarity or, conversely, whether people with higher prior trust are the ones who tend to join groups.

Respondents were also asked whether they prefer to manage their agricultural activities "their own way," without outside suggestions, or whether they are willing to coordinate practices with their neighbours toward a common goal, 78.3% of respondents leaned toward the first option (autonomous management) and 21.7% toward the second (coordination).

From those who currently participate in an organisation 100% stated a preference for managing things "their own way," an even higher proportion than among those who never participated (76.9%) or former members (69.0%). This might seem counterintuitive if one expected organisation participation to be associated with greater willingness to coordinate with others; however, given that the current-member subgroup is small, this figure should be interpreted as a specific observation in the data rather than as a robust conclusion about the relationship between group membership and willingness to coordinate.

Overall, participation in farmers organisations is a minority experience (27.2% ever, 11.4% currently), and the main barrier identified is not knowing of any organisation to join rather than economic or trust-related issues. Group dissolution is mostly tied to the end of projects or external funding (76% of reasons for leaving a group, and 30% of the themes spontaneously mentioned as challenges), which points to a pattern of dependence of the sample groups on external programs or funding, with implications for the long-term sustainability of these organizations. Nonetheless, internal conflicts and lack of trust in leadership constitute the second most-mentioned theme, indicating that internal group governance remains a relevant factor alongside external one.

Current group participation is associated with higher levels of community trust and solidarity, whereas former members exhibit relatively high trust but the lowest perceived solidarity among the three groups, a pattern potentially reflecting disillusionment following a group's dissolution, though this cannot be confirmed with the available data. The majority of the sample favours autonomous farm management over coordination with neighbours, including respondents who currently participate in a group, suggesting that group membership is not necessarily associated with a stronger general preference for collective coordination in day-to-day farm management. This finding is consistent with the nature of the activities performed by farmer groups in the region, where most groups generate benefits through commercialisation and marketing rather than collective production, and therefore do not require members to coordinate farm management itself, but rather to coordinate at later stages of the value chain, such as processing or commercialisation.

Chapter 6. Conclusions

A notable strength of this research is the degree to which its three independent data sources reinforce one another. For example, the survey's finding that group dissolution is primarily tied to the end of external funding rather than to internal conflict mirrors the statements given independently by NGO respondents in the key informant interviews regarding donor-driven organisational design. This convergence across methods, samples, and respondent types increases confidence that the patterns identified, even as the limitations of each, discussed in Chapter 4, should be kept in mind when interpreting the findings.

This study set out to answer what is needed for farmers organisations dedicated to the production and marketing of agricultural products and their by-products in *La Mosquitia* to happen and persist. Three sub-questions structured this inquiry: why did earlier attempts at collective agricultural production or commercialisation fail? What characteristics do the currently operating farmers organisations in the region have? And what lessons from farmers organisation models in rural settings elsewhere can inform a more resilient approach in *La Mosquitia*? Drawing on five network mapping workshops, 28 key informant interviews, and a survey of 184 respondents, the evidence converges on consistent topics.

The evidence points to a layered set of causes for the collapse of past farmers organisations operating at different levels. At the most structural level, the key informant interviews show that unmanaged subtractability of benefits is a consistent failure point. Contributions, catches, or fund disbursements were repeatedly captured or lost at the point of commercialisation, and the larger the group, the harder it became to observe individual contributions and hold anyone accountable for what happened. Extraction subtractability in this context was found governable through formal legal structures, but those structures often are financially inaccessible for the population of the region.

This dynamic was compounded by information asymmetry. In many cases of failed farmers organisations, ordinary members had no visibility into the collective finances or assets, a gap that leadership was able to exploit for elite appropriation, and that external projects reproduced by allocating resources through selected local leaders without informing the broader community of what had arrived or where it went.

Regarding face-to-face communication, in many cases genuine communication was replaced by its performative regular meetings that produced promises but no accountability. Additionally, the central finding on information on past actions is that there is a gap between knowing who has behaved badly and having an institutional mechanism through which that knowledge generates collective accountability.

The survey data extends this picture. Among the 29 respondents who had participated in a farmers organisation in the past but no longer do, 76% cited the group ceasing to operate as their reason for leaving. This aligns closely with what the key informant interviews describe as the vulnerability of farmers organisations assembled quickly under donor conditions poorly matched to the local context. The open-ended responses on the challenges of group participation reinforce this, because the most frequently mentioned theme was the end of a project or its funding,

echoing the interview finding that donor metrics favouring rapid, beneficiary-count-driven scale-up systematically produce organisational designs that collapse once external support withdraws.

At the same time, internal conflicts and lack of trust in leadership emerged as the second most common theme in the survey's open-ended responses. Governance failures within the group remain a relevant and recurring cause of dissolution alongside the loss of external support.

The network mapping workshops add a further exogenous layer. Thieves and weather were rated among the most influential actors shaping agricultural activity in every community where the network mapping workshop was held. This means that some of the conditions undermining collective action lie outside the farmers organisations internal governance mechanisms.

The findings of this study also confirm that gender operates as a structural determinant of collective action *in La Mosquitia*, distinct from but interacting with the variables discussed above. This determinant operates at two levels that require different structural responses. Within the collective itself, women-only structures were repeatedly identified, across both community respondents and NGO practitioners, as a deliberate governance solution to a payoff heterogeneity problem, because in mixed-gender organisations, men consistently captured a disproportionate share of resources and decision-making influence. Within the household, however, machismo restricts women's participation through husbands who forbid or discourage their wives from engaging in group activities.

Resolving heterogeneity within the group, as women-only structures do, therefore does nothing to remove this prior household-level veto. The two barriers must be addressed together, as evidenced by the finding that engaging whole families rather than women in isolation can extend women's freedom to participate by removing the husband's capacity to withhold permission in the first place. Any future intervention aimed at fostering durable collective action in *La Mosquitia* must treat gender not as a demographic characteristic to be balanced, but as a structural variable requiring deliberate design at both the collective and household level.

Finally, while entry and exit were voluntary across all documented organisations, exit in this context did not function as the model of Ostrom predicts in repeated-game models. In the absence of alternative collective options, exit tended to produce permanent individual withdrawal from collective action altogether rather than renewed cooperation with better filtered partners.

The organisations that do function in *La Mosquitia* today share a number of structural features. Across the interviews, there is no clear optimal numeric range of participants, but what does emerge with strong convergence, is that the family functions best as the base organisational unit, with the central design challenge being how to coordinate these units at the community and then cross-community level.

Functioning organisations also share active mechanisms for managing heterogeneity and information asymmetry, like formal bookkeeping, documented transactions, and regular collective accounting. Where quality itself functioned as a shared good, as with coconut oil, the solution identified in the dataset was a technical verification protocol, underscoring that the larger and more dispersed a group becomes, the more governance must shift from mutual observation toward formal monitoring.

The evidence from NGO practitioners, corroborated by the wider literature reviewed in Chapter 3, regarding the structure converges in the recommendation that the best structure for farmers organisations in *La Mosquitia* are family units linked to an independent community intermediary, connected in turn to a logistics entity and from there to the market, with support for training, quality control, and marketing.

Consistent with the findings of this research, durable linkages of this kind tend to emerge from organic ties rather than from externally imposed designs. Association models proposed by an outside actor without extensive prior dialogue with communities were repeatedly found to lack the sense of ownership needed to survive after the withdrawal of external support. Aid delivery that moves away from rigid, metrics-driven models toward locally adapted instruments produced markedly better-adapted interventions in the documented cases documented.

In a few words, farmers organisations in *La Mosquitia* have the potential to reduce the transaction costs involved in gathering information for agricultural activity, coordinate transport to overcome infrastructure barriers, complying with international trade requirements, and bringing together producers to gain bargaining power in the market, but only where the organisational model according to the conditions that this study has documented. The study finds a region rich in the informal social capital, family-level cooperation, and lived experience, but where farmers organisations have repeatedly been built around organisational structures poorly matched to local conditions and abandoned once external support ends. What derives from the evidence is that farmers organisations in the region need to be built with the families at the centre, coordinated through transparent and accountable intermediary structures, and supported by donors and NGOs willing to work at the pace and on the terms that durability in this specific context requires.

This study affirms the collective action framework proposed by Ostrom (2010) as broadly applicable beyond natural resource commons, while also revealing its limits. The strong explanatory power of variables outside those defined by Ostrom, such as donor incentives, security conditions, and gender, points to the value of integrating collective action theory with development economics in similarly fragile contexts.

This research should be read alongside several limitations already discussed. Firstly, the network mapping workshops and survey samples were not designed to be statistically representative, having drawn on communities and respondents with prior exposure to development interventions. Secondly, the key informant interviews were coded manually by a single researcher without an independent second coder. Thirdly, both the interviews and individual surveys rely substantially on retrospective accounts of past failures, which are susceptible to recall bias. These constraints mean the findings are best understood as context-specific insights.

This research should be read alongside several limitations already discussed. Firstly, the network mapping workshops and survey samples were not designed to be statistically representative, having drawn on communities and respondents with prior exposure to development interventions. Secondly, the key informant interviews were coded by a single researcher, working iteratively with an AI language model, without an independent human second coder; because the researcher directed and reviewed every AI-generated output, this process does not constitute independent inter-coder verification, and some degree of individual interpretation, whether the researcher's own or introduced through the coding criteria given to the AI model, may remain in the final coding. Thirdly, both the interviews and individual surveys rely substantially on retrospective accounts of past failures, which are susceptible to recall bias. These constraints mean the findings are best understood as context-specific insights. Future research would benefit from pilot interventions testing whether the family-unit-plus-intermediary structure recommended performs as well as respondents suggest, and from work that more directly addresses the household-level gender barriers identified here.

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Annex 1. Facilitator's guide for Net-Mapping Workshop

Workshop Objective

To collectively map how people and organizations interact around coconut production, processing, and sales — and to understand who holds influence, how decisions are made, and how women participate.

The resulting maps will provide evidence-based insight into social, economic, and gender dynamics within the local coconut economy.

Duration

Total: 1 hour 30 minutes

Participants: 10 (2 groups × 5 people each)

Materials

Item	Purpose
Large paper sheets (A3 or flipchart)	To draw the network map
Markers / colored pencils (3–5 colors)	To distinguish link types and write names
Small stones, seeds, or bottle caps	To build influence towers
Rope or string	To show connections between actors
Sticky notes or cards	To label actors and jot reflections
Tape	To hang or secure maps
Audio recorder / camera (optional)	For research documentation (with consent[1])

Group Setup

- Divide participants into two small groups of five (balanced by gender).

The facilitator and one assistant circulate to support both groups. It is important to guide the interviewee through the process by making sure that she or he goes step by step. If the participants are very few or no actors/links, the facilitator should point that out and ask whether that was an oversight or a purposeful statement. However, it is important that the participants do not feel pushed to add elements. Especially when dealing with delicate knowledge, the participants should be assured occasionally that the information will be handled confidentially.

Language Tips for Facilitators

Use simple, concrete language.

Instead of "actor" → say "person or group who helps or decides about coconuts."

Instead of "influence" → say "who has more power to decide."

Encourage participants to use local examples and storytelling.

Step-by-Step Instructions

Step 0 – Welcome & Introduction (10 min)

Purpose: Build comfort and explain the exercise.

Say:

"Good morning. We are here to talk about everyone who helps or decides about coconuts — from growing to selling. Together we'll make a picture that shows how people and groups are connected, who has more or less power, and how we can work better together."

Do:

- Explain that there are no right or wrong answers.
- Present the 'Coconut Rule': whoever holds the coconut (or recorder) has the turn to speak.
- Show examples of symbols:
    - Circles = people or groups
    - Lines = relationships
    - Stones = how much power someone has
- Divide into two groups; give each paper, markers, stones, and string.

Step 1 – Identify People and Groups (15 min)

Goal: List every actor involved in the coconut sector.

Ask:

- "Who is involved in the whole chain of the coconut? For example: the farmers plant them, the middle man that trades them, the markets that sell them to final consumers?
- "Who gives support, and what kind of support do they give (information, tools, money, etc)? For example: the NGOs give information, the government gives money, etc. "
- "Who decides the prices of the coconut and coconut sub products?"
- "Who decides the rules of the market?"

Do:

- Write each name or draw a symbol on a card.
- Encourage participants to include local leaders, NGOs, government offices, and buyers.
- Place the cards on the paper, leaving space between them.

Note: The participants can add more actors in the following steps if they need to, this is just a list to get started.

Step 2 – Draw Connections (20 min)

Goal: Show how these people or groups would be linked.

Ask:

- "Who works together?"
- "Who gives information or advice to whom?"
- "Who buys or sells to whom?"

Do:

- Use different colors or types of lines:
    - Green = product flow (selling/buying coconuts)
    - Blue = information/support
    - Red = problems/conflict (optional)
- Draw or place strings between cards accordingly.
- Clarify connections by asking both men and women for examples.

Step 3 – Rank Influence (15 min)

Goal: Visualize who has more decision-making power.

Say:

"Now let's see who has more or less influenced decisions about coconuts — who can change things the most."

Do:

- Give each group small stones or seeds.
- For each actor, ask participants to stack 1–5 stones to show influence:
    - 1 = very little influence
    - 5 = a lot of influence
- Record each tower's height numerically (for analysis).
- Discuss disagreements until consensus is reached.

Step 4 – Add Goals and Interests (10 min)

Goal: Capture what each actor wants or tries to achieve.

Ask:

- "What is this person or group trying to do — earn income, support others, protect resources?"

- Write one or two keywords near each actor (e.g., profit, training, environment, community support).

Step 5 – Group Reflection (10 min)

Goal: Discuss what the map shows.

Ask:

- “Who has the most power? Why?”
- “Who helps the most? Who causes challenges?”
- “Are women and men equally represented?”
- “Who should be better connected?”

The facilitator writes key points on sticky notes near the relevant parts of the map.

Step 6 – Sharing and Comparison (10 min)

Goal: Exchange insights between groups.

Do:

- Each group presents its map to the other.
- Ask:
    - “What is similar or different between the two?”
    - “What can we learn from each other’s structure?”
- Take a clear photo of each final map (no names of individuals).

Step 7 – Closing Reflection (20 min)

Goal: End with learning and appreciation.

Ask:

- “What changes in the network we assemble could help to make our coconut work fairer or stronger?”
- Request the participants to make the changes they identified in their maps.
- Close by thanking everyone for sharing their knowledge.

If permitted, take a group photo (without identifiers) beside their maps.

Quality & Ethics Checklist

- Obtain verbal consent before starting and before any recording.
- Emphasize confidentiality: no individual names appear in outputs.
- Ensure equal voice for women and quieter participants.
- Keep photos and recordings securely stored.

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Summary at a Glance

Element	Specification
Duration	90 minutes
Participants	10 (2 groups × 5)
Method	Full Net-Map (actors + links + influence + goals)
Output	2 network maps + influence rankings + reflections
Facilitator's role	Guide, not lecturer – ensure participation and comprehension
Research value	Produces publishable qualitative + visual data on power, cooperation, and gender in the coconut sector

Annex 2. KIIs Questionnaires

V1. 🌴 Structured Interview Guide – Agricultural Production and Marketing in La Moskitia (Honduras)
(Adapted for market vendors, association leaders, and women's groups)

A. Interviewer Introduction

Welcome and informed consent (read verbatim):
Welcome!
Before we begin, I'd like to ask if we can conduct the interview in Spanish, since that's the language we use to record and analyze the study's information.
However, if you prefer to do it in Miskito, I can explain and ask the questions in Miskito so that you feel more comfortable responding.

My name is [your name], and I'm part of a research team from the University of Bonn (Germany) and Georgetown University (United States).
First of all, we want to thank you for agreeing to participate in this study.
The study explores several aspects of your life and agricultural practices, especially related to coconuts (or your main product).

We'd like to clarify that the goal of this research is purely academic; it has no political or religious purpose.
We do not distribute resources, nor do we evaluate participants.
We guarantee that your information will be treated with strict confidentiality and will not be shared with third parties.
No personal data, such as your name, will appear in reports or presentations.

Information will be pseudonymized, meaning we'll use an identification number instead of your name, and it will be stored securely.
If you authorize it, we may take photos of you, your farm, or your agricultural activities.
These images would only be used for academic presentation or publication purposes.

Your participation is completely voluntary.
You may refuse to answer any question or stop the interview at any time.
There are no right or wrong answers.
We ask that you please not discuss the interview or your responses with others in your community while we are still conducting the study.

If at any point you have a question or feel unsure about something, you can ask us to pause. We'll gladly explain or clarify anything you'd like.

B. Note for Enumerators

If the participant does not produce or sell coconuts, adapt all questions to refer to their main product (e.g., cassava, rice, plantain, beans, honey, etc.).
Do not skip questions — use "coconut (or main product)" each time.

At the beginning of each interview, ask:
→ "Which products do you sell or grow most often?"
Record all products and mark which is the main one.
If multiple products are sold, prioritize the one that brings the highest income or requires the most effort.

C. Guide 1 – Market Vendors and Producers

1️⃣ Ecological and Productive Context

★ In which months is coconut (or your main product) most and least available?
★ How has the availability of coconut (or your main product) changed in the last five years?
What methods do you use for harvesting (climbing the tree, using a pole, collecting from the ground, etc.)?
Have storms, pests, or droughts affected production?
What do you do with the residues (shells, husks, water, or other by-products)?
Besides coconuts, what other products do you grow or sell?

2️⃣ Socioeconomic Importance

★ How important is coconut (or your main product) for your family's income?
Approximately how much can you earn from a day of market sales?
Who in your household handles harvesting, transport, and sales (men, women, youth)?
What other products help complement your income?
Has your income changed in recent years? Why?

3️⃣ Organization and Participation

Are you a member of any association or producers' group? Which one?
How does the group help with sales or storage?
Do you pay a fee or follow specific rules to participate?

4️⃣ Market and Value Chain

★ Who do you mainly sell your product to — local consumers, intermediaries, or external buyers?
★ What's the average price per unit or quantity? Has it changed recently?
★ What are your main costs (transportation, packaging, market stall)?
Do buyers require any specific quality or size?
What challenges do you face when selling?
What would improve your work (storage, transport, collection points, buyers)?

5️⃣ Security and Trust

★ Have you faced theft or security issues during transport or sales?
★ Do buyers pay on time and fairly?
If you have a problem with a buyer or supplier, who do you turn to?
Do you trust authorities or associations to support market vendors?

6️⃣ Future Vision

What changes would improve your business or the market's operation?
If you could receive training or support, what topic would you choose?
★ Would you like to add anything else about your experience selling coconuts (or other agricultural products)?

D. Guide 2 – Agricultural Association (e.g., APROBAN – Puerto Lempira)

(Approx. 45–60 minutes)

🟢1️⃣ Ecological and Productive Context

★ What are the main agricultural products grown and marketed by members of the association?
⏩ If not coconut, refer to the main product.
In which months is coconut (or the main product) most and least available?
Have climate, pests, or storms affected production or quality? How do you manage these issues?
Do member families use fertilizers or inputs? What kind and how do they obtain them?
Have you received training or support on good agricultural practices, pest control, or climate resilience? From whom?
What do you do with waste or by-products (e.g., shell, water, coconut fiber)?
Do you apply ancestral or traditional farming practices? Which ones?
How important is coconut compared to other crops in terms of income or volume?
Have you noticed changes in availability or price in recent years?

🟣2️⃣ Socioeconomic Importance

★ How market-oriented are the producers in the association?
Do they mainly grow for sale or for self-consumption?
What motivates them to sell more or less at the market?
Approximately what share of household income comes from agricultural sales?
What factors affect sales frequency or volume (transport, prices, buyers, seasonality)?
How does the association support families to increase income (market access, inputs, fair prices, training)?
What role do women and youth play in production and marketing?
Have you noticed changes in women's participation in production or leadership?

🟡3️⃣ Group Organization

★ How is the association organized (members, leadership, meetings)?
How are decisions made and communicated?
How are communities or producers selected to participate or sell through APROBAN?
What requirements or fees are needed to join?
What benefits do members receive (e.g., buyer access, infrastructure, training, representation)?
How are internal disagreements handled?
Are there sanctions or accountability mechanisms for noncompliance?
Have you received external support (NGOs, government, projects)? In what areas?
How diverse are members (farm size, gender, age, income)?
Have any producers been excluded due to lack of resources, location, or rules?

🟠4️⃣ Market and Value Chain

★ What products do you sell (coconut or others)? Where and to whom?
⏩ If not coconut, refer to the main product.
How are collective sales or collection organized?
Who decides the sale price — the producer, association, or buyer?
How easy or difficult is it to access reliable buyers who pay on time?
Are agreements with buyers verbal or written?
How often do you receive payment — immediately or later?
What main challenges do members face (transport, prices, competition, storage)?
What services or infrastructure does APROBAN provide (scale, storage, transport, packaging)?
Have you sold products outside Puerto Lempira (e.g., La Ceiba, Tegucigalpa)?
If not, what prevents it (costs, transport, permits, volume)?
If yes, what lessons did you learn?
If the association produced a value-added product (coconut oil, flour, soap, honey), how could it be marketed elsewhere?
What would be needed to export or scale up production (equipment, certification, partners, capital)?
Have you received or plan to seek credit or financing for commercialization?

🔵5️⃣ Security, Trust, and Institutional Support

★ Do members face security risks during transport or sales (theft, extortion, harassment)?
★ Do buyers pay on time and fairly?
What do you do if there's a problem with a buyer or transporter?
How transparent and fair is the association's management?
Do you trust external organizations (NGOs, government, projects) working with you?
What would help strengthen trust and cooperation between APROBAN, communities, and buyers?
When conflicts arise related to work or sales, who do you usually turn to (leader, institution, community)?

🟢6️⃣ Future Vision

★ What are the main goals of the association for next year?
What kind of support would be most useful (technical training, infrastructure, financing, transport)?
What opportunities do you see to improve agricultural marketing in La Moskitia?
How could collaboration be strengthened with APROBAN, women's groups, or local cooperatives?
What role should the association play in promoting coconut oil or other value-added products?
What message would you send to institutions or partners interested in supporting producers in the region?

✳️ Closing
Thank you very much for your time and for sharing your experience.
Your knowledge is very valuable for understanding how agricultural associations can strengthen production and marketing in La Moskitia.
May we take a photo of the market or facilities (without including personal names)?

E. Guide 3 – Women Producers, Farmers, and Vendors

(Approx. 45–60 minutes)

🟢1️⃣ Ecological and Productive Context

★ In which months is coconut (or your main product) most and least available?
⏩ If not coconut, refer to the main product and use "main product" in the following questions.
Do you process the product into oil, flour, soap, crafts, or other by-products?
⏩ If NO, skip to: "Besides coconut, what other products do you make or sell?"
If YES:
What type of product do you mainly make?
What tools or equipment do you have?
Where do you obtain raw materials — your own, purchased, or shared?
Is there enough supply to maintain production?
Have climate or pests affected production? How?
What do you do with leftover materials or waste (water, shell, fiber, cake)?
Besides coconuts, what other products do you make or sell?

🟣2️⃣ Socioeconomic Importance and Gender Perspective

★ How do these activities contribute to women's and their families' income?
What proportion of household income comes from this activity? (optional if time)

Motivation and benefits of the group:
Why did you decide to form an all-women group?
What benefits do you see in working among women (e.g., trust, cooperation, independence, learning)?
Have you noticed any personal or family changes since joining the group?
How do your husbands, families, or the community view or support your participation?

Challenges and barriers:
What difficulties or barriers do women face (time, access to land, tools, credit, cultural norms)?
Are there any tasks or decisions where you feel unheard or limited because you're women?
What kind of training or support would most help improve income or reduce these barriers?
Are earnings shared within the group or individual? How is this decided?

🟡3️⃣ Group Organization

★ How is the group organized — number of members, leadership roles, meeting frequency?
How are decisions made and communicated?
Have you received external support or training? From whom and on what topics?
Do you coordinate with APROBAN or other associations? How?
How do you resolve internal disagreements or problems?

Gender reflection within the group:
What advantages or challenges do you see in being an all-women group?
Have you considered including men, or do you prefer to keep it women-only? Why?
Is the group formally registered or informal? (optional if time)

🟠4️⃣ Market and Value Chain

★ What products do you sell (coconuts or others)? Where and to whom?
What's the average price, and who decides it?
What difficulties do women face when selling directly (e.g., transport, prices, competition)?
Are there opportunities to sell to higher-value or external buyers (e.g., La Ceiba, Tegucigalpa)?
⏩ If NO, ask: What prevents it — cost, contacts, logistics, permits?
What tools, equipment, or infrastructure would improve your work (e.g., press, packaging, transport)?
How do you coordinate with others to transport or store products?

🔵5️⃣ Security and Trust

★ Do women face security issues when traveling or selling (e.g., theft, harassment, unsafe routes)?
★ Do buyers pay on time and fairly? If not, what happens?
If there's a problem with a buyer or transporter, who do you turn to?
Do you trust that external organizations (NGOs, projects, government) represent your interests well?
What could be done to strengthen alliances and respect toward women producers?

🟢6️⃣ Future Vision

★ What are the group's main goals for the next year?
What kind of support would be most useful (training, machinery, credit, marketing)?
How could collaboration with APROBAN or other local/external partners help?
What do you dream of or hope to achieve in the next five years as a women's group?
Would you like to add anything else about women's role in agriculture in your community?

✳️ Closing
Thank you so much for your time and for sharing your experience.
May we take a photo of your group or products (without including personal names)?
Your knowledge is very valuable for strengthening the work and leadership of women producers in La Moskitia

V2. 🌴 Structured Interview Guide – Agricultural Production and Marketing in La Moskitia (Honduras)

(For market vendors/producers, association leaders, and women's groups)

A. Enumerator Introduction

To be read verbatim:

Welcome!

Before we begin, I'd like to ask if we can conduct the study in Spanish, because that is the language used by our research team for recording and analysis. However, if you prefer Miskito, I can explain everything and ask the questions in Miskito so that you can answer comfortably.

My name is [your name], and I am part of a research team from the University of Bonn in Germany and Georgetown University in the United States.

First of all, we would like to thank you for agreeing to participate in this study.
The study explores different aspects of your life and farming practices, particularly around coconuts (or your main product).

Please note that the goal of this research is to collect information for academic purposes; it has no political or religious motivation.
We are not distributing resources or evaluating anyone's performance.

We guarantee that your information will be treated with strict confidentiality and will not be shared with any third parties.
No personally identifiable information, such as your name, will appear in any reports or presentations.
The data will be pseudonymized for analysis, meaning it will be saved with a unique identification number instead of your name and securely stored.

If you agree, we may take photographs of you, your property, and your farming activities during the study. These images may be used only for presentation or publication related to our research.

Your participation is completely voluntary.
You are free to refuse to answer any question or withdraw from the study at any time. There are no right or wrong answers.

We kindly ask that you do not discuss the interview questions or your responses with others in your community while the study is still ongoing.

If at any time you have any questions or feel unsure about anything, please ask us to pause, and we will gladly re-explain or clarify any part of the study.

B. Note for Enumerators

If the respondent does not produce or sell coconuts, adapt all questions to refer to their main product (e.g., cassava, rice, plantains, beans, honey, etc.).

Do not skip any questions — simply use the phrase "coconuts (or your main product)" throughout.

At the beginning of each interview, ask:
→ "What products do you sell or grow most often?"

Record all products mentioned and mark which one is the main product.
If they sell several, focus on the one that provides the highest income or effort.

C. Guide 1 – Market Vendors and Producers

1️⃣ Ecological and Production Context

★ In which months are coconuts (or your main product) most available or most scarce?

★ How has the availability of coconuts (or your main product) changed in the last five years?

What methods do you use for harvesting (climbing, poles, collecting from the ground, etc.)?

Have storms, pests, or drought affected production?

What do you do with the waste or by-products (husks, shells, water, etc.)?

Besides coconuts, what other crops do you grow or sell?

2️⃣ Socio-Economic Importance

★ How important are coconuts (or your main product) for your household income?

About how much can someone earn in a market day selling this product?

Who in your household usually harvests, transports, and sells (men, women, youth)?

What other products or activities help you complement your income?

Has your income changed in recent years? Why?

3️⃣ Organization and Participation

Are you a member of any association or producer group? Which one?

How does that group help you with selling or storing products?

Do you pay any fees or have to follow specific rules to participate?

4️⃣ Market and Value Chain

★ Who do you mainly sell to — local buyers, intermediaries, or external traders?

★ What price do you usually receive per unit or quantity? Has this changed recently?

★ What are your main costs (transport, packaging, market fees)?

Do buyers demand a certain quality or size?

What difficulties do you face in selling?

What would make your work easier — better storage, transport, collection points, or buyer access?

5️⃣ Security and Trust

★ Have you experienced theft or insecurity when transporting or selling products?

★ Do buyers usually pay on time and fairly?

If there is a problem with a buyer or supplier, who do you go to for help?

How much do you trust the association or local government to support market sellers?

6️⃣ Future Vision

What changes would most improve your business or the market in general?

If you could receive training or support, what topic would you choose?

★ Is there anything else you would like to share about your experience selling coconuts (or other agricultural products)?

D. Guide 2 – Association Leaders (e.g., APROBAN)

1️⃣ Ecological and Production Context

★ How has the production of coconuts (or other main products) among your members changed over time?

What environmental factors most affect yields (pests, storms, drought)?

Are there any replanting or improvement programs in place?

2️⃣ Socio-Economic Importance

★ Approximately how many households depend on coconuts for income?

What share of member income comes from this product compared to other crops?

What roles do women and youth play in production or processing? What role do men play?

3️⃣ Institutional Organization

★ How is the association structured (membership, fees, decision-making)?

How are rules communicated and enforced?

Who monitors compliance, and what happens if someone breaks a rule?

What mechanisms are used to resolve internal conflicts?

Have you received technical assistance, training, or credit? From whom?

How do you maintain long-term member participation?

4️⃣ Market and Value Chain

★ How does the association organize collective sales or product aggregation?

What grading systems or standards are used?

Do you sell to external or higher-value buyers?

Do buyers require certifications or quality standards?

How do you handle payments to members — immediate or delayed?

What financial strategies (reserve funds, microloans) help ensure timely payments?

What are the main marketing challenges (transport, storage, price fluctuations, competition)?

Besides coconuts, what other products does the association manage or support?

5️⃣ Security and Trust

★ Do members face risks of theft, extortion, or insecurity during transport?

How do you protect or insure goods?

How do members perceive the role of NGOs or government — helpful, neutral, or interfering?

Does corruption or unfair enforcement affect your operations?

What strategies help maintain trust between leaders and members?

6️⃣ Future Vision

★ What are the association's main priorities for the next year?

What kind of support would be most useful (training, infrastructure, finance)?

How could women and youth be more involved?

What message would you like to share with potential partners or buyers?

E. Guide 3 – Women's Agricultural Group

1️⃣ Ecological and Production Context

★ In which months are coconuts (or your main product) more or less available?

Do you process your product into other items (oil, flour, soap, crafts)?

Has weather or pests affected your production recently?

What do you do with residues or waste materials?

Besides coconuts, what other products do you make or sell?

2️⃣ Socio-Economic Importance

★ How do these agricultural activities contribute to women's and household income?

What barriers do women face (time, land access, tools, social norms)?

What kind of training or support would help improve women's earnings?

Are profits shared among group members or kept individually?

3️⃣ Group Organization

★ How is the group organized (membership, leadership roles, meetings)?

How are decisions made and communicated?

Do you coordinate with APROBAN or other associations?

Have you received any external support or training? From whom?

How do you resolve disagreements within the group?

4️⃣ Market and Value Chain

★ What products do you sell (coconuts or others)? Where and to whom?

What is the usual price, and who sets it?

What challenges do women face selling directly at markets?

Are there opportunities to access higher-value or external buyers?

What tools or infrastructure would improve your production or processing?

How do you coordinate for transportation and storage?

5️⃣ Security and Trust

★ Do women face safety issues while traveling or selling at markets?

★ Do buyers pay on time and fairly?

If there's a problem with a buyer or transporter, who helps resolve it?

Do you trust outside organizations to represent women's interests well?

What could strengthen partnerships and respect for women producers?

6️⃣ Future Vision

★ What are the group's main goals for the coming year?

What kind of support would strengthen the group most (training, machinery, credit, marketing)?

How could collaboration with APROBAN or other partners help?

Is there anything else you'd like to add about the role of women in agriculture in your community?

F. Core "★" Questions – Ask to All Groups

Dimension	Core Question
Ecological	How has the availability of coconuts (or main product) changed? / When are they more or less available?
Socio-Economic	How important are coconuts (or main product) for household income?
Institutional	How are group rules structured and how are conflicts resolved?
Market	Who are your buyers? / What is the price? / What are the main challenges?
Security & Trust	Do you face insecurity or payment issues? / Do you trust buyers and institutions?
Future Vision	What support or changes would most help improve your work?

Structured Interview Guide – Community Leaders (Aligned with 5 Thematic Areas)

(Semi-structured, ~20 min total)

1️⃣ Ecological & Productive Context

(~4 min)

★ ¿Cuáles son los principales productos o actividades agrícolas, pesqueras o comerciales en la comunidad?

¿Qué ha cambiado en los últimos años — hay productos nuevos o menos producción?

¿Qué factores del clima o del ambiente (lluvia, sequía, plagas) afectan más la producción?

⏩ Probe: "¿Qué hace la comunidad para adaptarse cuando hay pérdidas o escasez?"

2️⃣ Socioeconomic Importance

(~3 min)

★ ¿Qué tan importantes son estas actividades para los ingresos y el bienestar de las familias?

¿Quiénes se benefician más — hombres, mujeres o jóvenes?

¿Qué retos enfrentan las familias más vulnerables (tiempo, recursos, acceso a tierra)?

⏩ Probe: "¿Qué cambios ha visto en la vida de las familias desde que mejoró o disminuyó la producción?"

3️⃣ Organization & Community Groups

(~5 min)

★ ¿Qué grupos o asociaciones existen actualmente en la comunidad (productores, mujeres, jóvenes, cooperativas)?

¿Qué tan activa es la participación en ellos?

¿Cómo se eligen los líderes y se toman las decisiones?

¿Qué beneficios han traído estos grupos a la comunidad?

¿Por qué algunas personas no participan o se han retirado?

¿La comunidad colabora con asociaciones más grandes como APROBAN u otras instituciones?

¿Cómo se coordinan o qué tipo de relación tienen?

⏩ Probe: "¿Qué haría falta para que los grupos sean más inclusivos o fuertes?"

4️⃣ Market & Value Chain

(~4 min)

★ ¿Dónde y cómo venden sus productos los productores locales?

¿Qué dificultades enfrentan para transportar o conseguir buenos precios?

¿Existen oportunidades de procesar o agregar valor (aceite de coco, miel, jabón, etc.)?

¿Quién apoya a la comunidad en esas actividades (grupos, compradores, proyectos)?

⏩ Probe: "¿Qué necesitarían para vender más o llegar a nuevos mercados?"

5️⃣ Security, Trust & Governance

(~4 min)

★ ¿Qué tan segura considera que es la comunidad hoy?

¿Existen problemas de robo, conflicto o violencia?

¿Cómo se manejan estos problemas? ¿Quién interviene?

¿Confían los vecinos entre sí y en las instituciones (gobierno, ONG, asociaciones)?

¿Por qué sí o por qué no?

¿Qué podría fortalecer la confianza y la cooperación entre comunidad y autoridades?

⏩ Probe: "¿Qué valores o prácticas mantienen la paz en la comunidad?"

6️⃣ Vision for the Future

(~2 min)

★ ¿Cuáles son las principales metas o necesidades de la comunidad para los próximos años?

¿Qué apoyo sería más útil (infraestructura, crédito, capacitación, mercados)?

¿Qué oportunidades ve para mujeres y jóvenes en la agricultura o comercio?

⏩ Probe: "¿Cómo imagina su comunidad en cinco años si recibe el apoyo necesario?"

Semi-Structured Interview Guide: Coconut Oil Producers

(Aligned with the 5 thematic dimensions and informed by survey modules)

(Duration: 45–60 minutes)

1️⃣ Contexto Ecológico y Productivo

(Linked to Survey: Agricultural & Coconut Modules — production, yields, inputs, environment)

★ ¿Cuántas palmas de coco tienen actualmente y de qué tamaño o edad aproximada son?

¿Cómo describiría la salud general de sus palmas de coco?

¿Han notado cambios recientes en la cantidad o calidad de los cocos producidos?

¿En qué meses hay mayor y menor producción de cocos?

¿Qué factores ambientales (lluvias, sequías, plagas, tormentas) afectan más la cosecha?

¿Cómo enfrentan o manejan esos problemas? (por ejemplo, replantación, control de plagas, poda, recolección compartida)

¿De dónde obtienen los cocos para hacer aceite — de sus propios árboles, de familiares, o los compran?

Si los compran: ¿A cuánto pagan por saco o por coco?

¿Hay suficiente disponibilidad de coco todo el año o tienen épocas de escasez?

⏩ Referencia encuesta: preguntas sobre disponibilidad, plagas, producción promedio, origen del coco, número de árboles, uso de insumos.

2️⃣ Importancia Socioeconómica

(Linked to Survey: Market Orientation & Income Sources)

★ ¿Qué tan importante es la producción de aceite de coco para los ingresos de su familia o grupo?

¿Qué otras actividades les generan ingreso además del aceite?

¿Cómo deciden cuánto producir cada mes o temporada?

¿Cuánto tiempo dedican normalmente a las actividades relacionadas con el coco (cosecha, secado, rallado, cocción, filtrado)?

¿Quiénes participan en cada etapa — mujeres, hombres, jóvenes?

¿Han recibido algún apoyo, insumo o capacitación para mejorar la producción o el procesamiento? ¿De quién?

¿Cuáles son los principales beneficios de producir aceite (económicos, alimentarios, sociales)?

¿Y las principales dificultades (tiempo, costo, herramientas, acceso a cocos)?

⏩ Referencia encuesta: módulos sobre orientación al mercado, fuentes de ingreso, trabajo agrícola, apoyo recibido, fertilizantes, horas trabajadas.

3️⃣ Organización del Grupo y Procesamiento

(Linked to Survey: Groups Module — organization, roles, challenges)

★ ¿El aceite de coco lo producen individualmente o como parte de un grupo o cooperativa?

Si es en grupo: ¿Cuántas personas participan y cómo se organizan las tareas?

¿Cómo se toman las decisiones — por consenso, liderazgo, turnos?

Describa cómo producen el aceite paso a paso.

¿Cómo se seleccionan, parten, rallan o prensan los cocos?

¿Qué herramientas o equipos utilizan (rallador, prensa, sartén, máquina)?

¿Cuánto tiempo tarda el proceso completo desde que se recoge el coco hasta que se obtiene el aceite?

¿Hacen el proceso a mano o con máquinas? ¿Por qué?

En promedio, ¿cuántos cocos se necesitan para producir un litro de aceite?

¿Qué hacen con los residuos (agua, cáscara, torta, fibra)? ¿Los reutilizan o desechan?

¿Han intentado mejorar o cambiar la forma de producción? ¿Cómo y por qué?

⏭️ Referencia encuesta: módulo coco — cosecha, procesamiento, herramientas, personas involucradas, productos derivados, subproductos.

4️⃣ Mercado y Cadena de Valor

(Linked to Survey: Commercialization & Coconut — buyers, transport, pricing, sales)

★ ¿Dónde y cómo venden el aceite de coco?

¿A quién se lo venden (consumidores locales, intermediarios, tiendas, ferias, compradores externos)?

¿Quién suele fijar el precio de venta — ustedes o el comprador?

¿Cuánto venden en promedio por semana o mes (en litros o unidades)?

¿Cuánto ganan por litro?

¿Los compradores pagan de inmediato o después? ¿Siempre pagan lo acordado?

¿Cómo transportan el aceite al punto de venta?

¿Usan bote, moto, a pie, vehículo?

¿Cuánto les cuesta el transporte?

¿Tienen problemas con el transporte (distancia, costos, seguridad, clima)?

¿Usan envases especiales o presentaciones (botellas, bolsas, frascos)? ¿Dónde los consiguen?

¿Han vendido alguna vez fuera de la comunidad o en lugares como La Ceiba o Tegucigalpa?

Si sí, ¿cómo consiguieron esos compradores?

Si no, ¿qué lo impide (costos, permisos, transporte, contactos)?

¿Cuáles son las principales dificultades o costos al vender el aceite por cuenta propia (sin intermediarios)?

¿Han considerado unirse a un grupo o asociación para vender en conjunto?

⏭️ Referencia encuesta: precios de venta, litros vendidos, compradores, transporte, pagos, acuerdos verbales vs. escritos.

5️⃣ Seguridad, Confianza y Apoyo Institucional

(Linked to Survey: Groups & Community Modules — trust, conflict resolution, external actors)

★ ¿Han tenido problemas de seguridad al transportar o vender el aceite (robos, pérdida de producto, acoso)?

★ ¿Los compradores son confiables y pagan de manera justa?

Cuando surge un problema con un comprador o proveedor, ¿a quién acuden?

¿Confían en las ONG o proyectos que trabajan con productores?

¿Qué experiencias positivas o negativas han tenido con ellos?

¿Qué se podría hacer para fortalecer la confianza y el respeto hacia los productores locales?

¿Han recibido apoyo del gobierno o de APROBAN para comercializar o mejorar su producción?

⏩ Referencia encuesta: instituciones de apoyo, confianza, resolución de conflictos, actores externos.

6️⃣ Visión Futura

(Forward-looking reflection; consistent with other KIIs)

★ ¿Cuáles son sus metas para el próximo año respecto a la producción o venta de aceite de coco?

¿Quieren producir más, mejorar la calidad, cambiar el empaque, buscar nuevos mercados?

¿Qué necesitarían para lograrlo (maquinaria, capital, capacitación, transporte, socios)?

¿Han pensado en diversificar a otros productos (jabón, crema, harina, fibra)?

¿Cómo se imaginan el futuro del coco y sus derivados en la comunidad dentro de cinco años?

⏩ Referencia encuesta: objetivos futuros, aspiraciones de mercado, visión de expansión.

✳️

Cierre

Muchísimas gracias por compartir su experiencia.

Su testimonio nos ayudará a entender mejor cómo mejorar la producción, comercialización y sostenibilidad del aceite de coco en La Moskitia.

¿Nos autoriza a tomar una fotografía de su taller o del producto (sin incluir nombres personales)?

🧭

Notas para Enumeradores

Duración máxima: 60 minutos.

Si el productor no fabrica aceite, salte la sección 3 (procesamiento) y enfoque en venta de cocos.

Si el productor trabaja en grupo, explore organización y división de tareas; si individual, enfoque en desafíos personales.

Las preguntas con ★ son esenciales.

Registre cantidades estimadas (cocos por litro, precios, litros por semana) cuando se mencionen espontáneamente — pueden triangularse con los datos del cuestionario.

Capture ejemplos, historias, o innovaciones locales (e.g., uso de prensa casera, venta por WhatsApp).

Annex 3. Ethical clearance form

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Ethical Clearance Form

Research Ethics Committee, Center for Development Research (ZEF) and Institut für Lebensmittel- und Ressourcenökonomik (ILR), University of Bonn

The Research Ethics Committee consists of nine senior researchers of ZEF and ILR, two of whom will review your application.

If you are asked to **resubmit** your application following the review by the committee, you must resubmit a revised electronic form with "**track changes**".

Once Ethical Clearance is granted, you receive an approved soft copy of your form and a signed and stamped Ethical Clearance. The entire process can take up to **8 weeks**. After the clearance, you may still make changes to your research design. Fundamental changes with ethical implications should be communicated to the chair of the Ethics Committee.
In case of **complaints** or violations of the ethical rules, institutions or interview partners can contact the head of the Research Ethics Committee, Dr. Silke Tönsjost. The Committee will issue a non-binding vote to the responsible researcher. The ultimate responsibility rests with the researcher.

Before submitting:

- ✔ You visited a training on Research Ethics
- ✔ You have completed the entire Ethical Clearance Form
- ✔ Your supervisor/ principal investigator and tutor have read, commented, and signed your Ethical Clearance Form,
- ✔ Send your signed Ethical Clearance Form **electronically as a word file** to zef.ethics@uni-bonn.de.

This interactive resource is very helpful as a guidance
https://eneri.eu/decision-tree/

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Ethical Clearance Form

Section 1: Applicant Information

Name	Vanessa Berghoff
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Telephone number	+49 228 73 - 3546
Submission Date	30.09.2025
1st application or resubmission?	*1st application*

Section 2: Research Details

Title of proposed research	CiCo - Circular Coconut: Advancing Climate Resilience and Smallholder Livelihoods through Coconut By-Products
Duration of data collection (start and end) date)	30.10.2025 - 20.11.2025
Source of funding	TRA 6 „Sustainable Futures“
Department / affiliated institute	Institute for Food and Resource Economics (ILR)
Location(s) of research	Gracias a Dios, Honduras
If applicable: name of larger project	CiCo - Circular Coconut
If applicable: name of the project leader and/or other researchers	Prof. Dr. Dr. Daniel Hermann (University of Bonn) & Vanessa Berghoff (University of Bonn) & Kylee McVicker (Georgetown University)

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Supervisor/ director of department/ principal investigator

Supervisors are asked to verify the accuracy of the application.

Name of supervisor(s)/ director/ principal investigator	Prof. Dr. Dr. Daniel Hermann
Faculty/institute	Faculty of Agricultural, Nutritional and Engineering Sciences / Institute for Food and Resource Economics

29.09.2025

Prof. Dr. Dr. Daniel Hermann *Date*

Doctoral students: Tutor's Signature

Tutors are asked to verify the accuracy of the application.

Name of tutor(s)	Daniel Hermann
Faculty/institute	AEI-ILR

Applicant signature

I confirm that all information provided in this application is correct and in accordance with the ethical guidelines of the professional association relevant to my field. I also confirm that the information provided does not deviate from the application to the funding institution. I am aware that the ultimate responsibility for compliance with the guidelines lies with me.

29.09.2025

Vanessa Berghoff *Date*

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Section 3: Overview and Aim of the Research

3.1: What is the overall purpose of the proposed research and its concrete aims? Please provide details of the research context, theoretical approaches, as well as primary and secondary research questions and proposed methods.
(max. 300 words).

The proposed research aims to identify economically and socially sustainable livelihood strategies for one of Honduras' most marginalized regions, Gracias a Dios, with high poverty rates, low infrastructure and complex governance structures. The CiCo (CiCo - Circular Coconut) project seeks to generate practical evidence on how underused coconut resources can be commercialised while fostering local cooperation and women-empowerment. CiCo is a collaboration between Bonn University and the University of Georgetown, funded by the TRA Sustainable Futures (University of Bonn) as part of the Excellence Strategy of the federal and state governments.

In a mixed methods approach, we will conduct interviews using both quantitative and qualitative questions and organize participatory workshops with farmers. Additionally, we will gather complementary insights from traders, intermediaries, and village councils.

RQ1: What is the relationship between farmer's aspiration and the degree of coconut commercialisation, and how does this commercialisation connect to women's empowerment?
Women coconut farmers in Gracias a Dios mainly operate at subsistence level. Despite high global demand and favorable conditions commercialization has limited development. Conducting a survey based approach using questionnaires, we want to assess possible relationships between farmers aspirations and commercialization levels as well as eventual impacts on women empowerment. Using aspiration, commercialization, as well as women empowerment indexes, quantitative data will be provided. Finally, it will help to understand to what extent commercialization is aspired by the local community, especially women farmers, and what impact it has on their empowerment.

RQ2: What characteristics would a sustainable cooperative/collaborative model have in Gracias a Dios?
Despite efforts from international organisations, previous attempts to establish communitarian initiatives to commercialize coconut products in the region have failed. Drawing on network mapping (1) and common-pool resource theory (2), it examines why earlier initiatives collapsed and identifies successful current trade networks in the region. Methods combine interviews, workshops and field observations to answer what characteristics would a sustainable cooperative model have in Gracias a Dios .

RQ3: What is the potential for sustainable commercialization of coconuts and coconut by-products in La Moskitia, and what conditions enable or constrain women's participation as micro-entrepreneurs?
Using a five-dimensional framework (ecological, socio-economic, institutional, market/value chain, and security/trust), the study documents current practices, by-product use, and barriers

for small farmers, while exploring gendered opportunities for cooperative models and female-led enterprises through surveys, interviews, and participatory workshops.

3.2: What insights do you expect to obtain? (max 200 words)

RQ1: This study will explore the triangle between women's livelihood aspirations, empowerment, and the commercialisation of coconut products. The research will investigate to what extent farmer´s livelihood aspirations relate to coconut commercialisation, as well as the relationship between women empowerment levels and commercialisation. The findings will help to understand to which extent commercialisation, as a pathway to livelihood improvements, is aspired by the local community, especially women - and if it correlates with more empowerment.

RQ2: Economic cooperation and collaboration are crucial for building sustainable agricultural value chains when common goods are involved or economic conditions require it. Yet such cooperation is not the default and often faces significant challenges. Drawing on network mapping and common-pool resource theory, this study identifies why previous coconut commercialization efforts in La Moskitia failed and which current trade networks succeed, to define the key characteristics of a sustainable cooperative model for informed policy and rural development.

RQ3: This study will generate the first systematic evidence on coconut production and by-product use in La Moskitia and identify enabling and constraining factors for women to develop viable microenterprises. By combining livelihood, market, and institutional perspectives with gender analysis, it will highlight how cooperative structures, financing, and trust dynamics affect commercialization potential. Findings will inform strategies for inclusive, resilient, and gender-responsive coconut value chains in fragile, Indigenous settings.

3.3. If new primary data will be generated, briefly describe the kind of data.

The study will generate new qualitative and quantitative primary data, including:

- Quantitative survey data – structured household survey responses from farmers capturing production practices, by-product use, market participation, cooperation preferences, and willingness to engage in collective trade.
- Qualitative interview data – semi-structured interviews with farmers, traders, women entrepreneurs, women's associations, NGOs, intermediaries, potential market actors, and village councils to explore social, economic, gender, and organizational dynamics.
- Focus groups – group discussions with women and mixed groups to understand perceptions of gender roles, empowerment, and participation in coconut enterprises.
- Participatory workshops – collective exercises to identify barriers and enablers for cooperative and female-led enterprises, including body mapping and other participatory tools.
- Network mapping outputs – participatory supply-chain and relationship maps of local production and trade networks.
- Field observations and comparative case insights – on-site notes and documentation of relevant cooperative and microenterprise models elsewhere.

All activities will take place within one region but across three geographically distinct districts—Mocorón, Puerto Lempira, and Raya. In each district, there will be four days of data collection at four different communities, which are geographically dispersed. Farmers will be invited to take part in a combined quantitative and qualitative survey, while a single workshop

will be held in each district in one randomly selected community. In the workshop communities, data collection (all surveys plus workshop) will take approximately 4 hours in total, whereas in all other communities, participants will only complete the survey. In all communities, we will provide complementary lunch, thereby reducing participant fatigue and maintaining motivation. The compensation will be approximately equal to a daily wage. All participation will of course remain voluntary.

3.4. If existing secondary data are evaluated, briefly describe the kind of data and who generated it.

The study will use existing secondary data solely through literature reviews on the topics described in Section 3.1. This will include peer-reviewed academic publications, policy reports, and documented case studies generated by universities, research institutes, and reputable international organizations. Relevant areas of literature include coconut and non-timber forest product commercialization, cooperative and social economy models, and gender and women's enterprise development in fragile and Indigenous settings.

Section 4: Participants and Objects of Your Research

4.1: Describe object(s) of your research and participants: people, animals, plants, natural resources, etc..

The objects of this research are human participants, including smallholder farmers, women entrepreneurs, traders, intermediaries, members of women's associations and cooperatives, NGO staff, and village council members. The project will also examine each step of the coconut value chain, from production and harvesting to processing, by-product utilization, and marketing, with particular attention to opportunities for female-led microenterprises. While no animals or plant specimens will be collected, coconuts and their by-products serve as the natural resource focus of the study.

4.2: How will the participants or the objects of your research be selected? How will you approach participants? How are aspects of gender, age, race, class, religion, and a balanced representation involved in your sample? Might participants be obliged to participate? Which gatekeepers e.g. an NGO, political institution or leader help you to select participants and fosters your access to participants? Understand that in some settings it may be difficult for people to say no, or they may be pressured by others to participate in the research.

The research is implemented jointly with Ayuda en Acción, which has an operational office in La Moskitia and conducts regular interventions and surveys in the region. Their presence and experience will help liaise with village councils, women's associations, and other local actors. Given the region's remoteness and social sensitivities, trusted local gatekeepers are essential to facilitate contact, ensure cultural appropriateness, and safeguard participants.

We selected La Moskitia/ Gracias a Dios for the study region because it presents a unique combination of agricultural potential, cultural richness, and research gaps. The area is characterized by an abundance of coconuts, which are central to local livelihoods and have strong economic and cultural importance. Despite its potential, the region remains one of the most remote, poor and under-researched regions globally. While the area has received considerable development funding

(e.g. from the World Bank) over the years, progress in improving livelihoods and gender equity has been limited, suggesting that existing interventions may not fully align with local realities. Conducting this study i therefore offers an opportunity to generate context-specific insights into coconut production, gender dynamics, and community development in a region that has so far been overlooked in agricultural and gender research.

Farmers, traders, women entrepreneurs, cooperative members, and other stakeholders will be identified and invited in collaboration with local councils and associations. We will provide these councils with clear guidelines on participant profiles (e.g., gender balance, age diversity, Indigenous representation, involvement in coconut production, processing, or trade). Particular attention will be given to ensuring the inclusion of women farmers and women-led organizations, to capture gender-specific opportunities and constraints in coconut commercialization.

Farmers will be invited to participate in the survey and qualitative interviews, which will take place in communal village spaces hosted by the village councils (indigenous community leaders). As mentioned above, we will conduct three "workshops" in total—one in each district. These workshops will combine elements of both the focus group discussions and the participatory workshops described in the initial draft, bringing them together into a single, integrated format. Beyond the data collection days with the farmers, there will be designated "supply chain days", which will focus on other key actors, such as women-enterprises, traders, councils among others for ensuring that perspectives from across the value chain are included.

Participation is strictly voluntary. We aim to recruit around 180 participants for the survey and interviews, with equal gender balance and diverse age representation. The number was determined by practical constraints. Given the fragile local context, it is possible that the final achieved sample size will be lower than 180. Potential constraints include security risks, election-related mobility restrictions, and climate-related disruptions that limit movement in the area. In such cases, data collection will prioritize respondent safety and data quality over numerical targets. In each of the three workshops, there will be 15 participants - the intended number of farmers who previously participated in the survey and interviews. Other interviews with key actors will be additional.

Local enumerators will conduct surveys and interviews in accessible community spaces, where lunch and a modest reimbursement will be provided. The household survey will not be conducted at farmers' homesteads because the communities are very small, and conducting the surveys in central communal spaces is more practical, culturally appropriate, and logistically efficient. Surveys will be organized in coordination with local village councils, with participants scheduled in small groups of five at a time, across three rounds per community. This approach allows for an orderly flow of participants and minimizes waiting times. Privacy will be ensured by setting up separate areas within the communal space where interviews can be conducted without interruptions or bystanders. The research team will manage interference from non-participants. Given the short distances within these small communities, transportation will not be necessary

Where possible, a stratified sampling approach, incorporating randomized selection within strata, will be applied to ensure the survey reflects a representative cross-section of households.

To address potential selection bias, we will collect demographic and socio-economic data from all participants, enabling us to assess representativeness and control for any imbalances in subsequent analysis.

4.3: How will consent be obtained from participants (formal/written or informal/oral consent)? Why in this way? The right to withdraw consent must be indicated to the participant.
For household surveys and individual interviews, oral informed consent will be obtained at the start of each session. Participants will first receive a plain-language explanation of the study's purpose, procedures, and their rights, including the right to withdraw at any time without consequences. Consent will then be recorded within the survey instrument by the participant verbally responding "yes" to a set of standardized consent questions. Oral consent is preferred here because literacy levels in the region vary, and this method ensures accessibility and comprehension. For focus groups and workshops, written consent will be documented by signature. Where literacy is limited, participants may provide a fingerprint in lieu of a signature, witnessed by a local enumerator. These sessions will begin with a clear explanation of confidentiality and the voluntary nature of participation, and participants will be reminded of their right to decline to answer questions or withdraw at any point.
4.4: Will participants take part in the research without their knowledge at the time e.g. covert observation of people in non-public places?
No
4.5: Will participants in dependent relationships be included? E.g. children, vulnerable adults, people with disabilities, (persecuted) minority groups. How is the interaction with such participants planned and how will consent be gained?
No
4.6: How do cultural, religious, social or gender-based norms affect your data collection?
Our research partner organization and the local enumerators/field facilitators possess a deep understanding of local customs, traditions, and social expectations. Their familiarity with local cultural and gender dynamics will help ensure that data collection is conducted in a culturally sensitive and respectful manner. This includes awareness of Indigenous governance structures, communal decision-making, and the influence of religious and social norms on livelihood choices. Special care will be taken in discussions of gender roles and women's entrepreneurship, which may be sensitive topics. When appropriate, separate focus groups for women will be organized to create safe spaces for open dialogue. This approach helps ensure participants feel comfortable and willing to provide honest responses.
4.7: Which sensitive topics will be touched in your research? E.g. ethnicity, politics, gender-based violence, income and wealth, protected species, scarce resources? Do you involve interviews with elite individuals/groups? Be aware of the intercultural context. What is the culturally appropriate and sensitive approach?
The survey is designed to be culturally sensitive by maintaining anonymity, emphasizing voluntary participation, and reassuring participants that their responses will be kept confidential and used solely for academic purposes. While the surveys will be conducted in open community spaces, they will take place in shaded corners set slightly apart from others to prevent conversations from being overheard. Holding the surveys in visible, familiar spaces is culturally important in these small communities, as it fosters

trust, transparency, and a sense of collective participation, while still ensuring that individual privacy and confidentiality are respected.

RQ1: Information about income and asset wealth will be required. Personal desires will be touched as well as inter-family or community relationships. Further, formal or informal structures might be considered to provide a comprehensive picture of the local situation.

RQ2: Our research will investigate how the religious, family and cultural norms influence the decision making at a community-level, and the optimal structure that a collective enterprise should have to be successful.

RQ3: This study will touch on gender roles, women's empowerment, and participation in microenterprises, as well as perceptions of safety, cooperation, and trust in local markets and institutions. These themes can be sensitive in Indigenous and rural contexts, where traditional norms and governance structures strongly shape livelihoods. To ensure comfort, women-only focus groups will be organized where appropriate, and discussions of trust and cooperation will be facilitated in neutral, non-confrontational terms, with participants free to skip questions at any time.

4.8: What are the potential risks or harms for participants e.g. physical, psychological, or disclosure danger? What procedures do you establish for the care and protection of participants (e.g. proper equipment, appropriate meeting place) and the control of any information gained from them or about them?

Risks to participants are expected to be minimal. There is no physical risk, and no sensitive personal data (e.g., health or political affiliation) will be collected. Potential risks include mild psychological discomfort when discussing livelihood challenges, and a risk of sharing contradicting opinions within group settings - especially when exploring reasons why past community collaborations have failed, which may touch on sensitive local relationships or conflicts.

- Safe and neutral meeting places will be used for all interviews, focus groups, and workshops.
- Local enumerators, trained in confidentiality and respectful facilitation, will carefully moderate discussions to prevent tensions and ensure all voices are heard.
- Participation is voluntary, with the right to withdraw at any time without consequences.
- All data will be anonymized, encrypted, and securely stored, with identifiers removed during analysis and in publications.
- At the start of group sessions, participants will be reminded to respect privacy and maintain confidentiality of shared information.

These procedures minimize potential harm and safeguard both participants and their information throughout the study.

4.9: Which forms of reciprocity do you plan? Will payment or any other incentive, such as a gift or free services be offered to participants? Keeping in mind that you should not set unsustainable precedents.

To acknowledge participants' time and potential opportunity costs, lunch will be provided to all farmer participants, and a modest reimbursement will be offered as compensation for lost income or work time. The amount is deliberately small to avoid creating unsustainable expectations or exerting undue influence on participation. The exact reimbursement rates are still being finalized, but participants will receive compensation equivalent to the local daily wage, which is approximately 200 Lempira (around €6.50). This amount reflects a fair recognition of participants' time and contributions. We are currently discussing whether the reimbursement should be adjusted for shorter activities—such as when participants only take part in the survey—while ensuring that all compensation remains consistent, transparent, and aligned with local standards. This approach ensures appreciation for participants' contributions while maintaining the voluntary and non-coercive nature of the research.

Ecological Impact

4.10: Which harmful impact may your research cause? E.g. long-term changes to the ecosystem, animals, plants, soil, water, etc.? If so, how will you minimize the risk of impact?
Not applicable.
4.11: If you will conduct genetic analysis or genetic engineering with organisms, please specify. If so, how will you minimize risk?
Not applicable.
4.12: Describe the procedures that have been established for the control of any information gained from the samples or about them e.g. collection location for economically valuable species.
Not applicable.
4.13: Specify the kind of material that will be sampled. What kind of sampling permissions are necessary and how will they be obtained? Will the material be transported outside their country of origin? What kind of export/import permits are necessary? [1]Did you consider UNCBD (https://nagoyaprotocol.myspecies.info/node/16) rules in that context? Do you plan to sample material e.g. animals, herbarium specimens or other plant material, soil samples? Which long-term strategies have you foreseen for the collected specimen/samples e.g. hand over to research museums, etc.?
Not applicable.

Section 5: Health and Safety Precautions

5.1: Please describe the precautions that you will take to protect the health and safety of any local partner or assistant in your research team. E.g. local research partners who may be subjected to pressures from the political regime, or assistants requiring protective clothing.

[1] A special permission must be granted by the German competent authority to import soil or plant samples from your field research for analysis to Germany. Apply for permission before your field research. University Bonn Members: contact Mrs. Rupprecht from ZEF (Tel: 2155, d.rupprecht@uni-bonn.de) for details.

All local research partners and field assistants will receive comprehensive safety briefings, including travel planning, communication protocols, and emergency contacts. Fieldwork will take place only in secure, neutral community spaces and will be scheduled with village councils.

Potential risks include extreme weather events (e.g., hurricanes) and heightened political sensitivities around elections. To mitigate these, the team will follow a formal safety concept established with the Work Safety Unit of Bonn University.

Field activities will be postponed or relocated if severe weather or political instability is anticipated.

The project area presents no specific physical hazards requiring protective clothing, but basic measures—such as first-aid kits, safe drinking water, and sun/heat protection—will be in place.

Section 6: Data source, management, intellectual property and data privacy protection

6.1: Describe the measures you will adopt to ensure the confidentiality of participants, and how you will comply with data protection requirements. How will data be anonymized? Who will have access to the data?
All personal data will be treated in strict confidence and will not be shared with third parties. Data will be encrypted during transmission and will not be stored on any cloud platform accessible to third parties. Pseudonymized data will be stored securely for at least 10 years and potentially indefinitely, with the anticipated deposit of raw, fully anonymized datasets in a scientific repository to meet publication requirements of peer-reviewed journals. Any publications or presentations will contain no names or other personally identifiable household information.
6.2: Which topics of commercial confidentiality or national security will be touched upon?
None.
6.3: Will the research involve administrative or secure data that requires permission from the appropriate authorities before use? If yes, how will you get permission?
Not applicable.
6.4: Will your research involve interacting with respondents online? If so, please describe the kind of measures that will be taken to ensure participants' anonymity.
Not planned.
6.5: Will you take photos with participants or other persons during your research and use these pictures later in publications and presentations, in printed or digital form? If so, how do you plan to get the consent of the depicted person? Or how will you ensure that person in question stays anonymous?

Photographs may be taken during the research strictly for presentation purposes, provided that all individuals depicted in the images provide their informed consent. Prior to capturing any photographs, participants will be fully informed of the intended use. No photographs will be published or used in any printed or digital materials without the explicit consent of both the photographer and the individuals depicted. Furthermore, appropriate measures will be taken to protect participants' privacy, including blurring or anonymizing identifiable features if necessary to ensure confidentiality.
6.6: If your research will involve geo-referenced data/location-linked information, please explain the kinds of measures to be made to assure the security of sensitive data.
The data will be stored and handled in the same way as other personal data (see 6.1).

Sharing and Re-use of Data

6.7: Will your data be shared with a partner institute(s)? If so, please specify.
No.
6.8: What is the anticipated use of the data (forms of publication and dissemination of findings, etc.)?
The pseudonymized data may be published in academic journals or file storage platforms, preferentially under the open access license. Derived data and the research findings may in addition be published in non-academic articles, reports, presentations, newsletters etc.
6.9: Will the data or findings of this research be made available to the participants of your research? If no, why not? If yes, specify the form and timescale for your feedback. Which participants will receive the information about the results of your research, what commitments will be made to these participants, and how will these obligations be verified?
The pseudonymized data may be made publicly available under the open access license and the research findings may be published. In addition, the participants are provided with contact details to be able to contact the research team and ask for the current stage of the research project and its findings.

Sources consulted for this document:

- https://www.uni-bonn.de/en/research-and-teaching/support-for-researchers-and-teachers/research-funding/ethik-1?set_language=en
- https://eneri.eu/decision-tree/
- Application for conduct of an epidemiological study, Medical Ethic Commission of the Federal Republic of Germany
- The International Development Ethics Handbook of the University of East Anglia, UK
- Human Research Study Synopsis, George Washington University & Medical Center, Washington D.C.

Annex 4. Individual surveys raw data and Python code for processing and analysis

```
# ========================================================================
# Honduras CiCo 2025 - Groups & Community module analysis
# ========================================================================
import pandas as pd
import numpy as np
import re
from collections import Counter
import matplotlib
matplotlib.use('Agg')
import matplotlib.pyplot as plt

# ------------------------------------------------------------------------
# 1. LOAD DATA
# ------------------------------------------------------------------------
QUESTIONNAIRE = "Questionnaire_Final_version.xlsx"
DATA = "WP2_Honduras-CiCo-2025-cleaned.xlsx"

survey = pd.read_excel(QUESTIONNAIRE, sheet_name="survey")
choices = pd.read_excel(QUESTIONNAIRE, sheet_name="choices")
df = pd.read_excel(DATA, sheet_name="Groups and community focus")

# ------------------------------------------------------------------------
# 2. RECODE NUMERIC ANSWERS TO LABELS
#               (codes taken from the "choices" sheet of the questionnaire)
# ------------------------------------------------------------------------
district_map = {1: "Puerto Lempira", 2: "Roadside / inland",
                3: "Coast", 4: "Not listed"}
gender_map = {1: "Female", 2: "Male"}
education_map = {1: "No formal education", 2: "Primary school",
                3: "Secondary school", 4: "Technical/vocational",
                5: "University+"}
membership_status_map = {1: "Yes, currently", 2: "Yes, but not anymore",
                         3: "No, never"}
agreement_map = {1: "Strongly disagree", 2: "Disagree",
                3: "Neither agree nor disagree", 4: "Agree",
                5: "Strongly agree"}
yesno_map = {1: "Yes", 2: "No"}
grouptype_map = {1: "Cooperative", 2: "Producer group/association",
                3: "Savings or credit group", 4: "Processing group",
                5: "Marketing group"}
joined_map = {1: "Did not know of any group", 2: "Not enough time",
                3: "Cannot afford the fees", 4: "Did not see enough benefit",
                5: "Was not invited/accepted", 6: "Prefers to work independently",
                7: "Fear of conflicts/problems", 8: "Lack of trust in leaders",
                9: "Group controlled by influential people"}
left_map = {1: "The group stopped operating", 2: "Moved away",
                3: "Not enough time", 4: "Could not afford the fees",
                5: "There were disagreements/conflicts",
                6: "Did not trust the leaders",
                7: "Group controlled by influential people",
                8: "Did not see enough benefit"}

df["district_lbl"] = df["district"].map(district_map)
df["gender_lbl"] = df["gender"].map(gender_map)
df["education_lbl"] = df["education_actual"].map(education_map)
df["membership_status_lbl"] = df["membership_status"].map(membership_status_map)
df["trust_lbl"] = df["trust_scale"].map(agreement_map)
df["solidarity_lbl"] = df["solidarity_scale"].map(agreement_map)
df["own_way_lbl"] = df["own_way"].map(yesno_map)
```

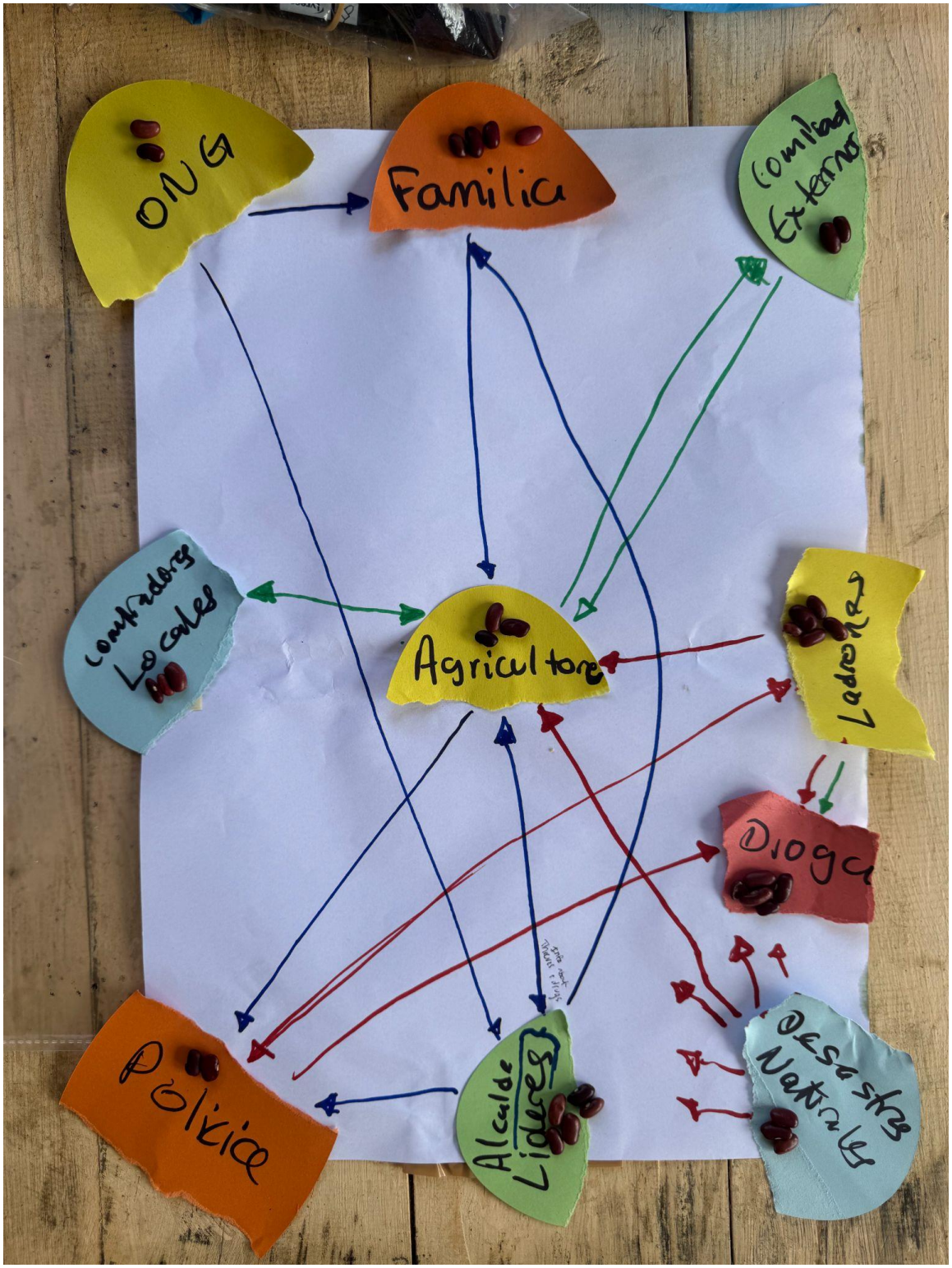
```
# Aggregate age into 5 age bands, used only for cross-tabulation
bins = [0, 29, 39, 49, 59, 120]
labels = ["18-29", "30-39", "40-49", "50-59", "60+"]
df["age_group"] = pd.cut(df["age"], bins=bins, labels=labels)

# ---------------------------------------------------------------------
# 3. SAMPLE OVERVIEW
# ---------------------------------------------------------------------
print("N =", len(df))
print(df["district_lbl"].value_counts())
print(df["gender_lbl"].value_counts())
print(df["age_group"].value_counts().sort_index())
print(df["education_lbl"].value_counts())
print(df["age"].describe())

# ---------------------------------------------------------------------
# 4. GROUP MODULE — descriptive frequencies & cross-tabulations
# ---------------------------------------------------------------------
print(df["membership_status_lbl"].value_counts())
print((df["membership_status_lbl"].value_counts() / len(df) * 100).round(1))

for var in ["district_lbl", "gender_lbl", "education_lbl", "age_group"]:
        print(f"\n=== membership_status by {var} ===")
        print(pd.crosstab(df[var], df["membership_status_lbl"],
            normalize="index").round(3) * 100)
        print(pd.crosstab(df[var], df["membership_status_lbl"]))  # absolute n

# Multiple-choice questions: the cleaned data file already contains one
# binary indicator column per answer option (e.g. group_type/1 ... /5),
# so frequencies are obtained by simply summing each indicator column.
n_ever = (df["membership_status"] != 3).sum()          # 50
n_never = (df["membership_status"] == 3).sum()         # 134
n_past = (df["membership_status"] == 2).sum()          # 29

gt_cols = [f"group_type/{k}" for k in grouptype_map]
group_type_counts = df[gt_cols + ["group_type/other"]].sum()
print(group_type_counts, group_type_counts / n_ever * 100)

mn_cols = [f"membership_none/{k}" for k in joined_map]
reasons_not_joining = df[mn_cols + ["membership_none/other"]].sum()
print(reasons_not_joining, reasons_not_joining / n_never * 100)

mp_cols = [f"membership_past/{k}" for k in left_map]
reasons_leaving = df[mp_cols + ["membership_past/other"]].sum()
print(reasons_leaving, reasons_leaving / n_past * 100)

# ---------------------------------------------------------------------
# 5. THEMATIC CODING OF THE OPEN-ENDED QUESTION group_challenges
#        (keyword-based classification into 7 non-exclusive themes)
# ---------------------------------------------------------------------
open_text = df[df["group_challenges"].notna()][
        ["ID", "membership_status_lbl", "group_challenges"]
].copy()


def categorize(text):
        t = text.lower()
        cats = []
        if re.search(r"proyecto|prollecto|econom|financ|fondo|dejo de funcionar|responsabilidad", t):
        cats.append("End of project / lack of funding or group ceased operating")
        if re.search(r"desacuerd|descuerod|conflict|confianza|lider|divis|renuenc|prefer|malos entend", t):
        cats.append("Internal conflicts, leadership and trust issues")
        if re.search(r"luna|clima|plaga|tormenta|natural|sequ|placas", t):
        cats.append("Natural, climatic and pest-related factors")
        if re.search(r"\btiempo\b|motivac", t):
```

```
                cats.append("Available time / motivation")
                if re.search(r"experiencia|conocimient|aprend|manteni|cosech|producci", t):
                cats.append("Lack of technical knowledge / training")
                if re.search(r"\bequipo\b|compa\u00f1er", t):
                cats.append("Teamwork")
                if re.search(r"buena experiencia|beneficio|veneficio|exito|surtir", t):
                cats.append("Positive benefits / experience")
                if not cats:
                cats.append("Other / not classified")
                return cats


open_text["themes"] = open_text["group_challenges"].apply(categorize)
theme_counts = Counter(t for row in open_text["themes"] for t in row)
for theme, n in sorted(theme_counts.items(), key=lambda x: -x[1]):
                print(f"{theme}: {n} ({n/len(open_text)*100:.1f}%)")

# ---------------------------------------------------------------------
# 6. COMMUNITY MODULE — trust & solidarity descriptive statistics
# ---------------------------------------------------------------------
print(df["trust_scale"].describe())
print(df["solidarity_scale"].describe())
print(df["trust_lbl"].value_counts())
print(df["solidarity_lbl"].value_counts())

print(df.groupby("membership_status_lbl")[["trust_scale", "solidarity_scale"]].mean().round(2))
print(df.groupby("district_lbl")[["trust_scale", "solidarity_scale"]].mean().round(2))
print(df.groupby("gender_lbl")[["trust_scale", "solidarity_scale"]].mean().round(2))

# Spearman correlation between the two Likert scales (descriptive
# measure of association only — no causal interpretation)
rho = df["trust_scale"].corr(df["solidarity_scale"], method="spearman")
print("Spearman rho (trust vs solidarity):", round(rho, 3))

print(df["own_way_lbl"].value_counts())
print(pd.crosstab(df["membership_status_lbl"], df["own_way_lbl"],
                 normalize="index").round(3) * 100)

# ---------------------------------------------------------------------
# 7. CHARTS
#               All charts use bbox_inches="tight" and wrapped, size-limited
#               titles so that long titles are never clipped by the canvas edge.
# ---------------------------------------------------------------------
COLOR_MAIN, COLOR_ACC = "#2E5E4E", "#C97B3D"


def save(fig, path):
                fig.tight_layout()
                fig.savefig(path, dpi=150, bbox_inches="tight")
                plt.close(fig)


fig, ax = plt.subplots(figsize=(7.5, 4.3))
order = ["No, never", "Yes, but not anymore", "Yes, currently"]
vc = df["membership_status_lbl"].replace(
                {"No, never": "No, never"}).value_counts().reindex(order)
ax.barh(order, vc.values,
                color=[COLOR_MAIN if o != "Yes, currently" else COLOR_ACC for o in order])
ax.set_title("Participation in agricultural groups or organizations (n=184)",
                fontsize=12, fontweight="bold", loc="left")
save(fig, "figs/fig1_membership_status.png")
# ... additional charts (group type, reasons for not joining/leaving,
# trust & solidarity distributions, trust by membership status,
# own_way pie chart, thematic-coding bar chart) follow the same pattern
# and are omitted here for brevity — see the analysis notebook for the
# complete, unabridged code.
```

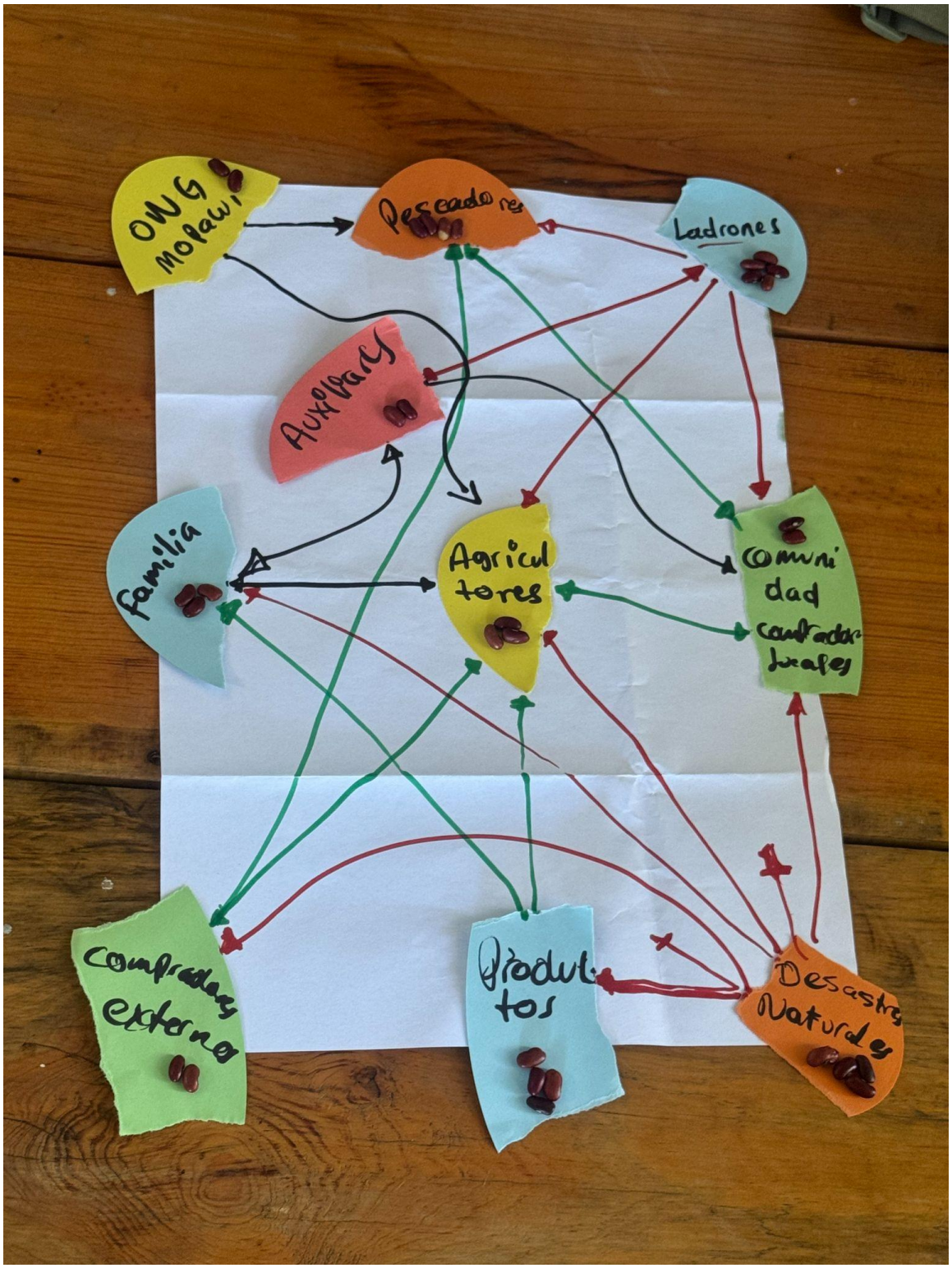
Note: for brevity, the chart-generation section shows the pattern used for one figure (participation in groups); the remaining seven figures in this report (group type, reasons for not joining/leaving, trust & solidarity distributions, trust by membership status, the own_way pie chart, and the thematic-coding bar chart) were produced following the exact same approach — wrapped, size-limited titles and bbox_inches="tight" on save — applied to the corresponding variables.

Annex 5. Network maps

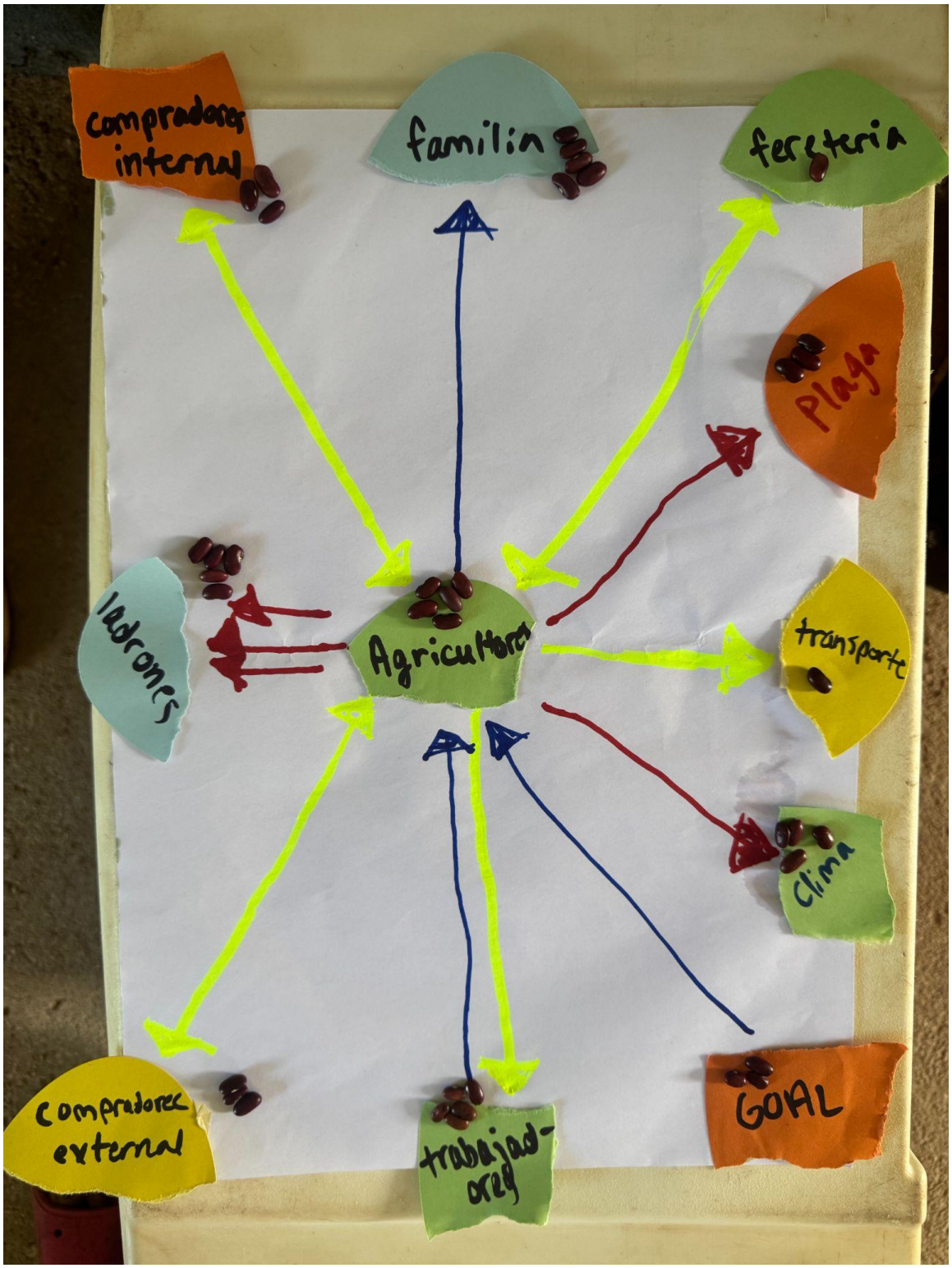
Raya community, 6 of November 2025



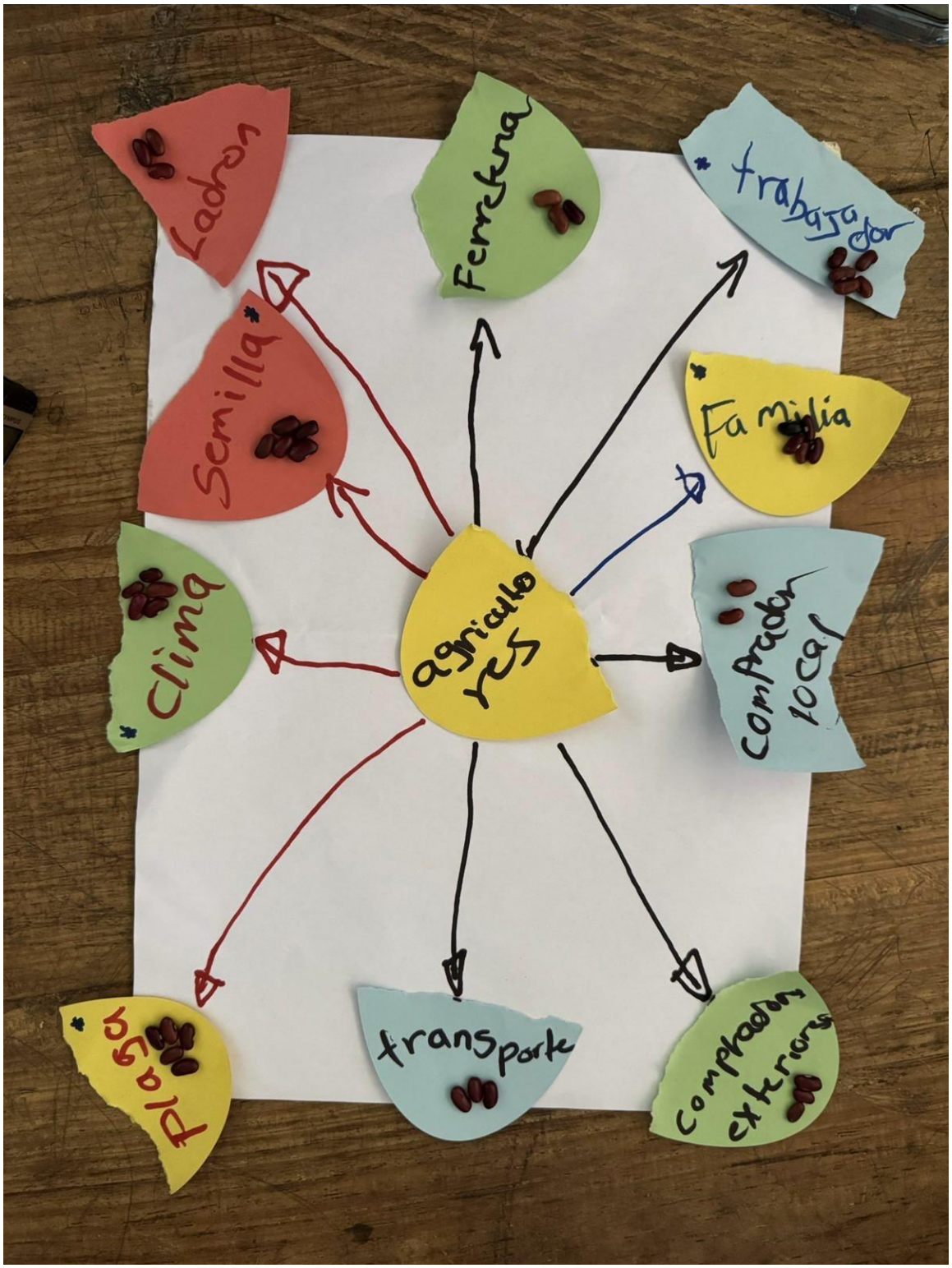
Prumnitara community, 7 of November 2025; Group 1.



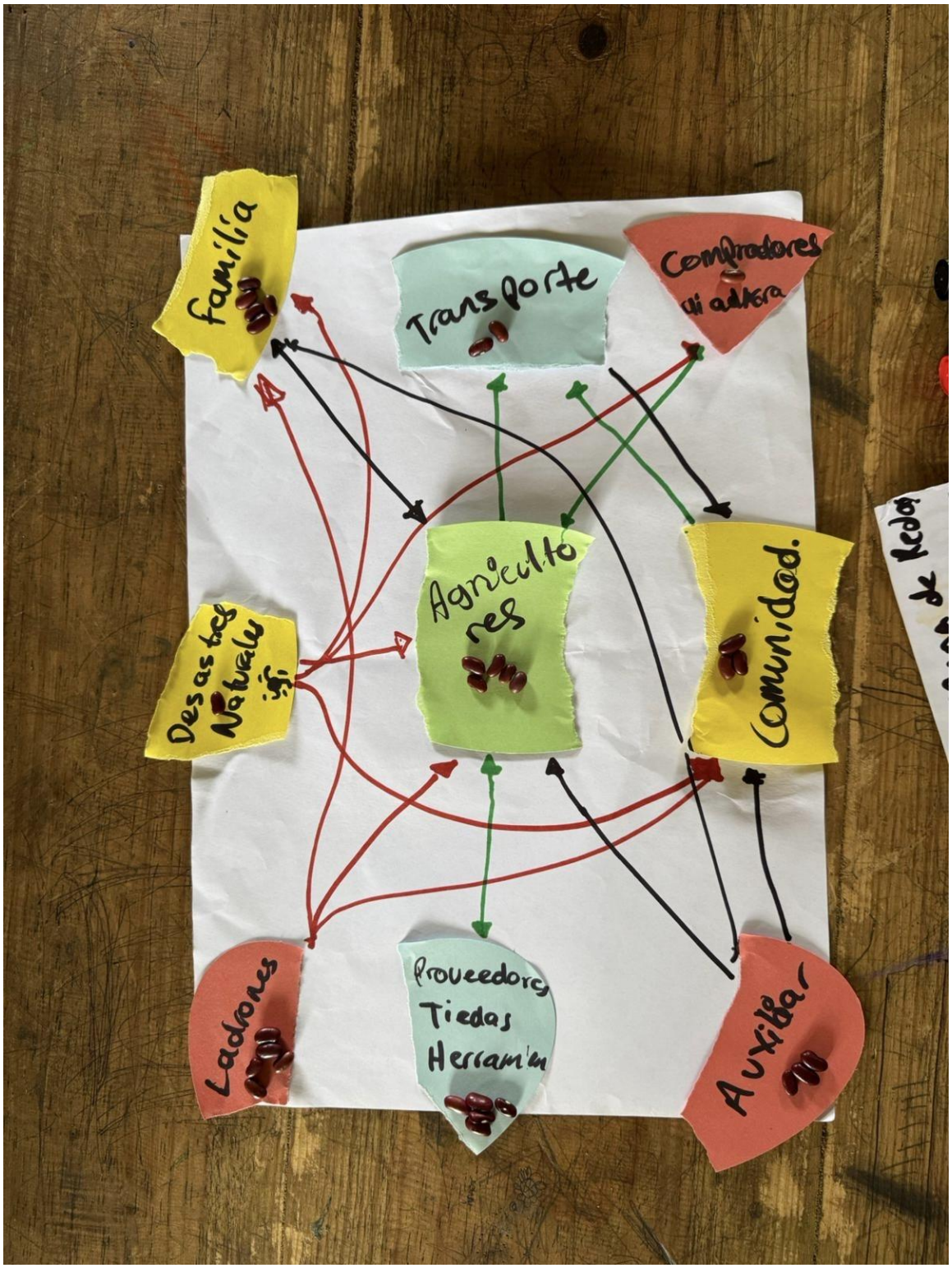
Prumnitara community, 7 of November 2025; Group 2.



Sirsirtara community, 13 of November 2025; Group 1.



Sirsirtara community, 25 of November 2025; Group 2.



What It Takes to Cooperate: A Mixed-Methods Study of Farmer Organisations in *La Mosquitia*, Honduras

Ma. Sabine Santana Sosa

This research is embedded within the Circular Coconut (CiCo) project, an interdisciplinary initiative focused on advancing climate resilience and smallholder livelihoods through the adoption of circular economy practices. Within this broader effort, this research assesses a practical question: what is needed for farmers organisations dedicated to the production and marketing of agricultural products and their by-products in this region to happen and persist?

This study addresses that question by combining three complementary sources of evidence: participatory network mapping workshops that reveal how communities themselves perceive the actors shaping their agricultural activities; key informant interviews that document the lived experience of both past and present farmer groups; and individual surveys that gather further information on farmer group participation and attitudes towards cooperation and solidarity. Each source captures a different layer of information, and the value of combining them lies precisely in the possibility of triangulating findings that no single method could establish on its own.

The analytical backbone of this study is the theory of collective action developed by Elinor Ostrom (2010), which offers a rigorous framework for identifying the structural conditions under which cooperation succeeds. By applying this framework to the specific case of *La Mosquitia*, this study aims to contribute both to the practical work of the CiCo project and partner organisations operating in the region, and to the broader academic literature on collective action in contexts marked by geographic isolation and limited institutional infrastructure.

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