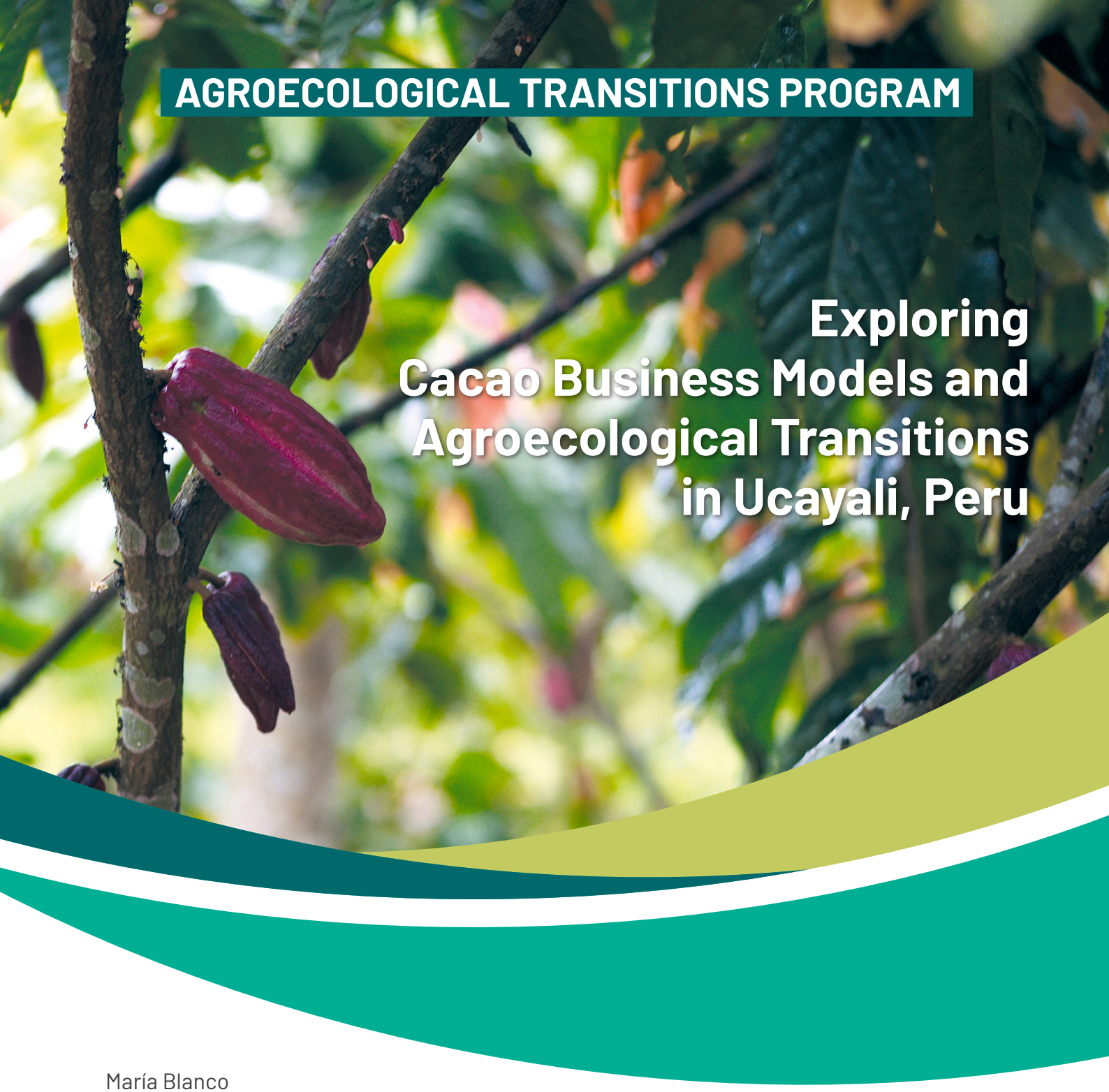

AGROECOLOGICAL TRANSITIONS PROGRAM

Exploring Cacao Business Models and Agroecological Transitions in Ucayali, Peru

María Blanco
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Report

TRANSITIONS

Alliance Bioversity & CIAT

IWMI International Water Management Institute

CGIAR

The **Private Sector Incentives and Investments (PSii)** project contributes to the **Agroecological TRANSITIONS** program and aims at the development of inclusive incentive structures for private and public sector stakeholders, as well as leveraging investments supporting agroecological transitions at multiple levels. A dynamic private and public sector ecosystem likely possesses some challenges but also provides new opportunities to accelerate agroecological transitions via creating incentives and mobilizing investments, transparent and holistic metrics, and capacity building to contribute to more economically efficient, socially equitable, and environmentally friendly food systems.

The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) and the International Water Management Institute (IWMI) are working in the framework of the Agroecological TRANSITIONS Program – Private Sector Incentives and Investments (PSii) project funded by the European Union and managed by the International Fund for Agricultural Development (IFAD).

The **Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)** delivers research-based solutions that harness agricultural biodiversity and sustainably transform food systems to improve people's lives. Alliance solutions address the global crises of malnutrition, climate change, biodiversity loss, and environmental degradation.

With novel partnerships, the Alliance generates evidence and mainstreams innovations to transform food systems and landscapes so that they sustain the planet, drive prosperity, and nourish people in a climate crisis.

The Alliance is part of **CGIAR**, a global research partnership for a food-secure future.

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Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)
Americas Hub
Km 17 Recta Cali-Palmira CP 763537
Apartado Aéreo 6713
Cali, Colombia
Website: https://alliancebioversityciat.org
Email: j.mockshell@cgiar.org

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About the authors

María Blanco is a research associate at the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), Colombia.

Leslie Estefany Mosquera is a research associate at the Alliance of Bioversity International and(CIAT), Colombia.

Diego Crisóstomo has a Masters in Bioeconomy from the University of Hohenheim, Germany.

César Díaz- Casana is a master's student at the Pontificia Universidad Católica del Perú, Peru.

Thea Ritter is a consultant at the Alliance of Bioversity International and CIAT.

Jonathan Mockshell is a principal scientist and senior agricultural economist at the Alliance of Bioversity International and (CIAT), Colombia. j.mockshell@cgiar.org

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NathanRussell / CIAT

Acronyms and abbreviations

B-ACT	Business- agroecology criteria tool
CCC	Comité Central con Desarrollo al Futuro de Curimaná
DEVIDA	National Commission for Development and Life without Drugs
FAO	Food and Agriculture Organization of the United Nations
FOB	Free on board
FyA	Flavor and aroma
HLPE	High-level panel of experts
ICCO	International Cacao Organization
MIDAGRI	Ministry of Agrarian Development and Irrigation
NGO	Non-governmental organization
PDA	Alternative Development Program
PES	Payments for environmental services
PSii	Private Sector Incentives and Investments Project
TAPE	Tool for agroecology performance evaluation
WCF	World Cacao Foundation

Contents

Executive summary

Peru is internationally recognized as a significant producer and supplier of fine and aroma cacao. It is the second-largest global producer of organic cacao and has 60% of the world's cacao biodiversity (MIDAGRI, 2022). In 2009, Peruvian cocoa production was stagnant; however, since 2010 cocoa production has grown at an average annual rate of 12.6% (MIDAGRI, 2022), with the three main national cacao varieties being Trinitario, Amazonian Forastero, and Criollo. Among the various regions in Peru, San Martín is the primary national producer, followed by Junín, Ucayali, Huánuco, and Cusco (Charry et al., 2020). The Netherlands is the primary destination for Peruvian cacao, followed by Indonesia, Mexico, and other countries. Cacao holds paramount economic importance in Ucayali, Peru. It is the second-largest export product and contributes significantly to the local economy. In 2017, cacao exports from Ucayali amounted to USD 2.7 million, accounting for 10% of total exports. The department is renowned for its cacao production, with a substantial area planted in cacao farms. The crop plays a crucial role in supporting the livelihoods of smallholder farmers. Additionally, cacao production provides employment opportunities and significantly contributes to the department's overall agricultural sector (Charry et al., 2020).

This study, integral to the Private Sector Incentives and Investments (PSii) project, conducts a meticulous exploration of cacao business models and agroecological transitions in Ucayali, Peru. Employing a combination of focus group discussions and the Business Model Canvas tool, the study provides a deep dive into the operational intricacies of cacao producers. The primary objective is to furnish cacao value-chain stakeholders with empirical insights, enabling a nuanced understanding of existing gaps and potential synergies.

The findings highlight critical facets of cacao producers' business models. Despite regional variations, underlying similarities persist, underscoring the resilience of certain operational aspects. However, a marked discrepancy emerges concerning crucial partnerships, particularly in sparsely populated regions. Producers in these areas face isolation and limited support, emphasizing the urgent need for targeted interventions. Challenges faced by cacao producers encompass a spectrum of issues, from cost control and plant diseases to insufficient institutional support. Addressing these challenges is imperative for effectively facilitating agroecological practices and environmental conservation. To this end, stakeholders must focus on delivering comprehensive support, including making resources more accessible, disseminating knowledge, and fostering sustainable cacao farming practices.

This report unpacks incentives that are essential for steering agroecological transitions. Monetary incentives, training workshops, and access to vital resources, such as organic fertilizers, are pivotal catalysts. Furthermore, innovative contracts linking international with local buyers and global initiatives are identified as crucial strategies to propel departmental agroecological transitions.

Keywords

Agroecology, Business model, Cacao, Incentives, Peru, Sustainable.

Elizabeth Ramirez Pérez / CIAT

1. Introduction

The TRANSITIONS program goal is to align policy, investment, and technical support to enable climate-informed agroecological transitions by farmers in low- and middle-income countries. The program promotes developing and adopting holistic metrics for food and agricultural systems' performance, inclusive digital tools, and transparent private-sector engagement to foster incentives and leverage investment. The Private Sector Incentives and Investments (PSii) project contributes to the broader TRANSITIONS program objectives. It aims to develop inclusive incentive structures for private sector and public-private stakeholders, and to provide insights on how to leverage investments that support agroecological transitions at multiple levels. This report is an output of Component 1 of the TRANSITIONS project. The primary objective of this field research is to identify the business model structure of cacao producers and the agroecological practices within these businesses. These insights provide evidence for all stakeholders in the cacao value chain, enabling them to pinpoint gaps in their agroecological practices and discover potential synergies that align with client requirements. Furthermore, this research delves into the realm of incentives, seeking to uncover existing mechanisms and identify additional incentives that can effectively drive the transition towards adopting agroecological practices in the region, while considering social and economic contexts.

The report is structured in eight sections: Section 1, comprising this introduction, provides a general background to the project and sets out the purpose and scope of the work. Section 2 offers a comprehensive overview of Peru's cacao industry within the global, national, and regional contexts. Section 3 presents the theorical framework, which is based on: *The Business Model Methodology, Incentives, and the Principles of Agroecology.* The fourth section outlines the methodologies employed during the workshops. Subsequently, section 5 emphasizes the case study's context and relevance. Section 6 delves into the outcomes of implementing these methods in the field, with subsections focusing on range of results from the implementation. Subsections focus on i) the Business model results, ii) self-performance evaluation, and iii) a mapping exercise. Section 7 proposes significant recommendations supporting the advancement of agrological transitions for the department study area, including strategies and reflections for all the stakeholders involved in the cacao value chain. Finally, the last section presents the final reflections of each methodology implemented in the fieldwork.

These insights offer a valuable and comprehensive overview of the business models adopted by smallholders in Peru, considering both their challenges and opportunities. These smallholders often face challenges in accessing inputs and adopting innovative agricultural practices. Consequently, this report aims to provide guidance to researchers, the private sector, and policymakers, facilitating the decision-making and development of more effective initiatives to support smallholders and foster the establishment of sustainable agri-food systems, creating a win-win strategy for all stakeholders involved in the cacao value chain.

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2. Cacao Sector Overview

This section delves into Peru's positioning within the global cacao industry, outlining its global, national, and worldwide standing. It explores key aspects, such as primary client demographics for product commercialization, export volumes at a global scale, and principal competitors. Furthermore, it provides an overview of Peru's domestic landscape in relation to cacao production regions, ending with a focus on the study area.

2.1 Global context

The cacao industry stands as a pivotal force in the global agricultural landscape, with fermented and dried seeds serving as the foundation of the lucrative chocolate industry (Silva et al., 2004). Remarkably, approximately 90% of the world's cacao production is carried out by small-scale farmers (Bermudez et al., 2022). In 2021, the international cacao market saw significant activity, with a total Free on Board (FOB) export value of USD 10.4 billion, corresponding to a production volume of 5.5 million tons (FAOSTAT, 2023). However, 2022 witnessed a downturn in global cacao production by 12.37%. This decline was attributed to several factors, including inflation, which led to increased agricultural input costs and reduced fertilizer use, as well as unfavorable climatic conditions and prevalent diseases, primarily in Africa. Despite these challenges, Africa remained the lead cacao-producing region, contributing 75% to global production, followed by the Americas (20%) and Asia-Oceania (5%) (ICCO, 2022).

The dynamics of cacao bean exports have had fluctuations over the past decade. Since 2014, there has been a steady annual increase of 1.6% in global cacao bean exports (ICCO, 2022). Table 1 provides a deep dive into the global cacao industry, spotlighting the lead exporters that shape the international market. Côte d'Ivoire, Ghana, Ecuador, and Cameroon stand out as the primary players, contributing significantly to the world's cacao supply. Notably, Peru has secured its position as the tenth largest cacao exporter, demonstrating its growing role in the industry by exporting 57,625 tons in 2021.

Table 1. Top ten cacao-exporting countries.

Country	Tons of cacao exported				
	2017	2018	2019	2020	2021
Côte d'Ivoire	1,510,082	1,525,594	1,621,749	1,486,051	1,681,058
Ghana	573,334	843,641	643,643	521,397	585,907
Nigeria	292,883	294,701	300,515	216,676	344,644
Ecuador	284,546	294,063	270,943	323,399	329,784
Cameroon	221,667	218,792	219,581	174,678	250,817
Netherlands	231,320	237,808	248,686	152,655	234,021
Belgium	237,207	189,197	199,459	223,497	214,625
Malaysia	145,294	155,572	110,892	95,556	104,461
Dominican Republic	53,975	73,890	67,853	64,685	70,704
Peru	58,238	61,970	59,857	53,685	57,625

Source: Own elaboration based on FAOSTAT (2023).

There is strong demand for cacao in Europe and Asia. Table 2 presents a comprehensive overview of the top-10 cacao-importing countries' import quantities in tons from 2017 to 2021. Notably, the Netherlands, Germany, the United States of America (USA), Malaysia, and Belgium emerge as dominant players in the global cacao market. In 2019, a significant shift occurred, with decreased cacao imports observed in most countries, except for Belgium, France, Indonesia, and Italy, which saw an increase in their import volumes. Remarkably, the Netherlands remains the leading cacao importer despite a 26.8% decrease in imports over the past three years (FAOSTAT,2023).

Table 2. Top 10 cacao-importing countries.

Country	Tons of cacao exported				
	2017	2018	2019	2020	2021
Netherlands	993,345	1,157,150	1,080,267	987,900	846,826
Germany	448,744	469,618	469,488	441,883	447,225
United States of America	470,258	415,272	375,536	377,074	471,675
Malaysia	311,519	345,489	351,493	384,682	478,787
Belgium	320,274	233,636	280,930	279,495	335,741
Indonesia	246,084	239,377	243,438	198,838	252,121
France	142,091	155,910	156,765	159,488	161,015
Canada	69,297	100,442	91,020	104,470	132,893
Türkiye	103,371	97,610	107,483	137,470	124,494
United Kingdom	105,452	113,525	101,353	116,462	79,759

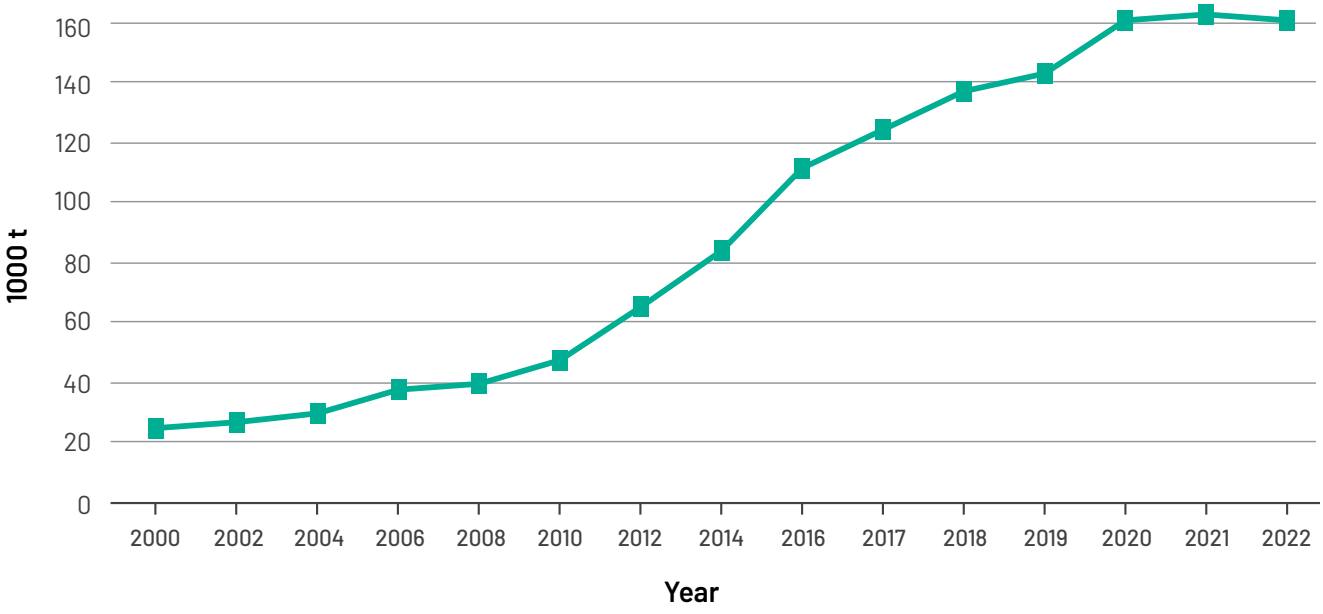
Source: Own elaboration based on FAOSTAT (2023).

Importers are becoming increasingly demanding regarding quality, responsibility, and traceability, an example of this is the minimum acceptable levels of cadmium in cacao and chocolate products set by the European Union as of 2019 (López et al., 2021). Simultaneously, the market for specialty cacao, constituting 10% of the market, has exhibited more growth compared to the conventional market. This sector encompasses distinct cacao types, such as Organic, Fair Trade, Rainforest Alliance (now merged with UTZ), FyA (Flavor and Aroma), and single origin cacaos. These are distinguished by their unique taste, aroma, quality, and socially and environmentally responsible production attributes (Charry et al., 2020). The top importer – the Netherlands – boasts a diverse chocolate market, with consumers open to innovative flavors and products. In the second top importer, Germany, the chocolate market is also thriving. Germans consume an average of 5.8 kilograms of chocolate per year in 2022 making Germans among the world's top chocolate consumers (Statista,2023). While price remains a significant factor, there is a growing preference for high cacao content and quality driven by sustainability concerns. Ethical consumption is also rising, focusing on fair trade and eco-friendly packaging.

2.2 National context in Peru

Peru is the eighth-largest cacao producer and tenth-largest cacao bean exporter in the world (FAOSTAT, 2023). Furthermore, Peru is internationally recognized as a significant producer and supplier of fine and aroma cacao. Notably, it stands as the second-largest global producer of organic cacao and houses an impressive 60% of the world's cacao biodiversity (MIDAGRI 2022). Figure 1 illustrates national cacao production trends from 2000 to 2022. Despite stagnant growth until 2009, Peru experienced a significant upswing from 2010 onwards, boasting a 12.6% average annual growth rate in cacao production between 2010 to 2020, and in 2021 reached a remarkable peak of 0.16 million tons (MIDAGRI, 2022). However, there was a slight dip in 2022 (TradeMap, 2023). This remarkable growth can be attributed to introduced new varieties and the cultivation of these three main national cacao varieties. Over half (53.3%) of all cacao grown is the Trinitario variety (found in Junín), while 37.3% is the Amazonian Forastero variety (cultivated in Cusco and Ayacucho) and 9.4% is the Criollo variety (found in the northern regions of San Martín, Amazonas, and Cajamarca) (MIDAGRI, 2022).

Figure 1. Cacao bean production in Peru (2000-2022).



Source: Own elaboration based on MIDAGRI (2022) and TradeMap (2023).

Among the various regions in Peru, San Martín leads as the primary producer, contributing 48,000 tons (35.6%) to the country's overall production. Junín follows closely with 25,000 tons (18.8%), followed by Ucayali at 17,000 tons (12.5%), Huánuco at 13,000 tons, and Cusco at 10,000 tons. Combined, these five regions account for approximately 84% of the country's total cacao production (MIDAGRI,2022).

In terms of international markets, the Netherlands stands out as the primary destination for Peruvian cacao, with a 28% share, followed by Indonesia (24.6%), Mexico (11.1%), Malaysia (9.7%), the USA (5.9%), Italy (5.2%), Spain (4.7%), Belgium (3.7%), Germany (2.2%), and Algeria (1.1%). Notably, Peru experienced significant export growth to Mexico (21%) and Indonesia (20%) in 2022 (Trade Map, 2023).

In summary, Peru's cacao industry has displayed remarkable growth and global significance, due to the recognition for its fine and aromatic cocoa, the growing supply of Peruvian cocoa and the fact that Peru produces 60% of the world's genetic material (MIDAGRI, 2023), positioning itself as a prominent player in international markets as a major producer, but also as a key supplier of organic cacao.

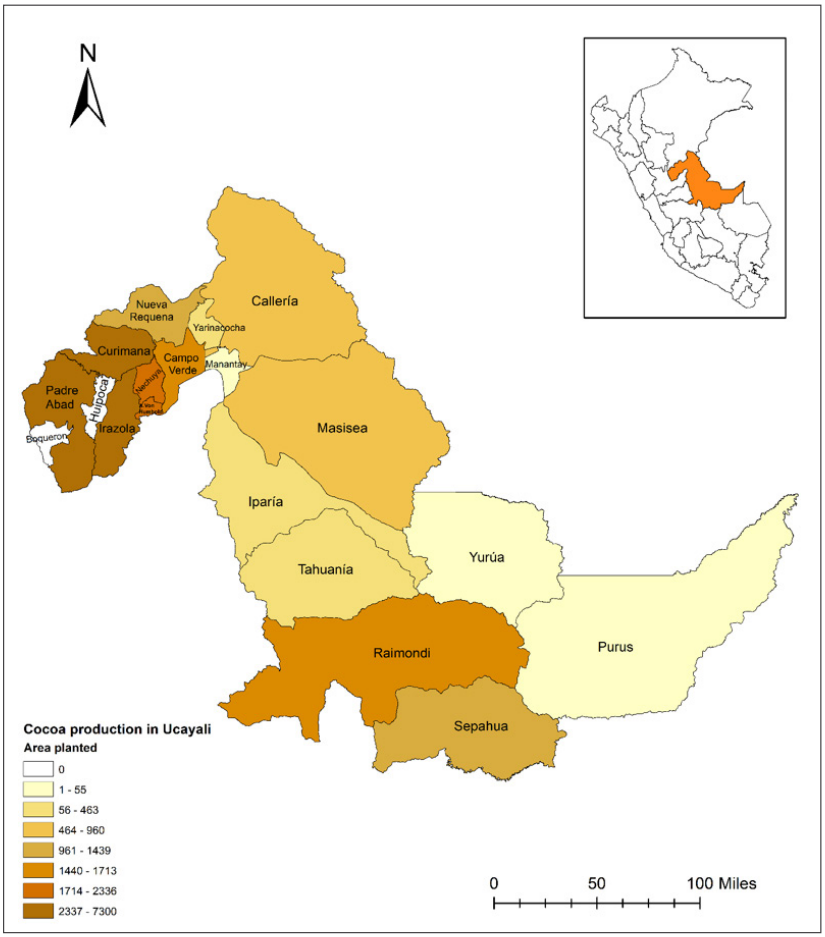
Elizabeth Ramírez Pérez / CIAT

2.3 Local context in the Ucayali department

The Ucayali department covers an area of 102,410.55 square km, representing 7.97% of the Peruvian territory, in which 1.4% of the country's population lives. Its capital is Pucallpa, which is located 154 meters above sea level. Ucayali is characterized as a forest region, with more than 70% of the region's area corresponding to forest land, while 12% is protected natural areas (Deperu, 2023). Currently, the department is the third largest producer of cocoa beans in the country, with more than 20,000 tons produced in 2022 (MIDAGRI,2022). In 2022, cocoa production in Ucayali increased by 23% compared to 2021 (MIDAGRI,2022).

Ucayali is divided into 4 provinces and 15 districts, Figure 2 is a choropleth map illustrating the distribution of cacao cultivation across districts in Ucayali in 2016. It shows the varying extent of area planted with cacao in each district and region. Cacao is grown in all four provinces, however, the area with the largest concentration of plants is the province of Padre Abad with a cacao cultivation area of 20,894 ha, representing 70.4% of the cacao area in Ucayali. This is followed by Coronel Portillo (5,101 ha) and Atalaya (3,667 ha). Lastly, the province of Purús has less than 25 hectares planted to cacao. In the province of Padre Abad, the district of Irazola stands out, with an area of 7,300 ha dedicated to cacao cultivation, followed closely by Padre Abad and Curimaná with 4,380 ha and 4,844 ha, respectively. In the province of Coronel Portillo, the three districts of Campo Verde, Nueva Requena, and Raymondi stand out, with 1,567 ha, 1,329 ha and 1,713 ha, respectively (Charry et al., 2020).

Figure 2. Area planted to cacao in Ucayali by district in 2016.



Source: : Own elaboration based on Charry et al., (2020)

Cacao is the second most exported agricultural product in the region after timber, which accounts for 81% of Ucayali's exports. Cacao exports were valued at USD 2.7 million in 2017 (10% of the total value of all exports from Ucayali). In 2017, the main cacao-exporting company in the region was the Cooperative "Colpa de Loros", located in Neshuya. This company recorded USD 2.5 million worth of exports, which was a 61% increase from the previous year. Following closely was the organization Comité Central con Desarrollo al Futuro de Curimaná (CCC), ranking as the second highest export company with US$0.8 million worth of exports in 2017 (Charry et al., 2020). The main export destination for cocoa beans in 2017 were the Netherlands (Charry et al., 2020).

3. Theorical framework

This section delves into the intersection and application of three pivotal concepts crucial for the reconfiguration of the agricultural sector. First, it analyzes the Business Model Canvas, an innovative tool that redefines entrepreneurial and strategic structures. Second, it explores the fundamental principles of agroecology, aiming to transform production systems through a sustainable and holistic approach. Lastly, it examines incentives as key drivers for transitioning towards agroecological practices, highlighting their role in incentivizing, and fostering the adoption of more sustainable models in agrifood systems.

3.1. The Business Model Canvas

The Canvas methodology, rooted in the Business Model Canvas developed by Alexander Osterwalder and Yves Pigneur offers a streamlined approach to visualizing and designing business models. Its graphical nature simplifies complex concepts, allowing a swift grasp of the various business components. By mapping out ideas on a canvas, businesses can discern how each element interconnects and contributes to the overall business framework. Through a detailed analysis of each component, organizations can point out areas ripe for improvement, innovation, and operational efficiency. Moreover, this methodology facilitates proactive problem-solving by aiding in the early recognition of potential challenges. In essence, the Canvas methodology proves invaluable in fostering a comprehensive understanding of business models, enabling businesses to adapt and thrive in dynamic market landscapes (Osterwalder & Pigneur, 2010)

This study uses the Canvas tool considering the Link Methodology toolkit to understand the business

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model of cacao producers and cacao buyers to identify potential gaps, economic sustainability, environmental sustainability, social inclusion, and agroecology indicators to provide recommendations for agroecological transition and improve the value chain. Link Methodology allows one to analyze a business from a general perspective, understand how it works, and discover new opportunities for innovation. This is based on applying a participatory toolkit that includes the value chain map, Business Model Canvas, new business model, and prototype cycle (Lundy et al., 2014).

Using business model analysis in agriculture is increasingly popular, as agricultural businesses face a range of challenges related to sustainability, profitability, and competitiveness. Case studies have been an essential tool for demonstrating the practical applications of business model analysis in agriculture by providing examples of how businesses have adapted to changing market conditions and adopted more sustainable and responsible business practices. Sivertsson and Tell (2015) use the business model canvas methodology in focus groups with farmers or farm business managers to identify and describe some of the barriers that Swedish small farms encounter when they consider innovating their business model. Within the results, some barriers were classified as "human-related barriers," such as traditions and cultures; "contextual barriers" related to the business sector; and "exogenous barriers," such as government regulations, position in the value chain, and climate.

Additionally, business model analysis is helpful in promoting social and environmental dimensions in agricultural business models. A case study of Colombian meat and milk supply chains employed participatory activities in the department of Caquetá, using Link methodology. The approach helped study the sector, analyze market opportunities, and develop strategies for improvement. As a result, necessary actions were prioritized for developing meat and milk value chains in the department. They proposed linkages with programs for payments for environmental services (PES), the creation of a technical assistance network, and inclusive commercial alliances (Enciso et al., 2018).

Similarly, a case study titled "Rural women on the road to prosperity" in Guatemala (peanuts); Honduras (honey); and Nicaragua (honey), was developed to build and provide social and financial support for business models led by women in rural areas. Link methodology was applied to these cases in a community-level approach with a total of 29 rural entrepreneurial endeavors, which included cashew, coffee, honey, peanut, and pig value chains. Some of the most noteworthy results show a lack of capacity to respond to innovative product demands from buyers. However, due to the application of the business model tool, the three businesses' value propositions improved. The new value propositions included a change in image and a new marketing strategy for that business. Accordingly, the health registration process was initiated for sweet or caramelized peanuts, salty peanuts, and chili peanuts. In Guatemala, the processing center was remodeled, and new equipment and necessary technology were acquired, restarting production (Hurtado et al., 2016). The methodology helped identify improvement opportunities for each business by i) analyzing production and operating costs to define prices; ii) creating savings and loan committees; iii) preparing investment plans; and iv) strengthening trading relationships with formal and informal customers.

3.2. Principles of agroecology

A sustainable transition occurs when there is a fundamental change in a system, both temporally (over time) and spatially (in a specific territorial location) (Marsden 2013 cited in Wezel et al., 2020). In that sense, agroecology represents a starting point for this transition to shift from businesses as "usual' to sustainable agroecological systems. Agroecology can be seen from different theoretical approaches: 1) a scientific research approach, 2) a set of practices that improve the sustainability of food and agricultural systems, and 3) a socio-political movement (CIDSE, 2018). Agroecology is thus seen as a dynamic and holistic approach to agriculture that combines science, a set of agricultural practices, and a social movement to support the transition of agri-food systems toward more sustainable practices and fairer outcomes (Ewert et al., 2023).

The Food and Agriculture Organization of the United Nations (FAO) first presented a comprehensive formal definition of agroecology, describing its ten elements. These ten elements are: diversity, co-creation of knowledge, synergies, efficiency, recycling, resilience, human and social values, food culture and traditions, responsible governance, and the circular and solidarity economy. In 2019, the High-Level Panel of Experts (HLPE) report synthesized different existing publications on principles and elements of agroecology into a list of 13 principles based primarily on the FAO guidelines (Wezel et al., 2020), shown in Table 3 below.

Table 3: Thirteen consolidated principles of agroecology based on FAO elements.

Principles of Agroecology	Definition
1. Recycling	Preferably use local renewable resources and as close as possible to nutrient and biomass resource cycles.
2. Input reduction	Reduce dependence on purchasing inputs and increase self-efficiency.
3. Soil Health	Ensure and improve soil health and functioning to enhance plant growth, especially by managing organic matter and improving soil biological activity.
4. Animal Health	Ensure the health and care of animals
5. Biodiversity	Enrich the biodiversity of agroecosystems at different scales by preserving species diversity, functional variety, and genetic resources over time.
6. Synergy	Promote complementarity between the different elements of agroecosystems
7. Economic diversification	Diversity of income that ensures financial stability and independence
8. Co-creation of knowledge	Encourage co-creation and knowledge exchange, especially among farmers.
9. Social values & diet	Build food systems based on the culture, identity, tradition, and social and gender equity of local communities that provide healthy, diversified, seasonal, and culturally appropriate diets.
10. Fairness	Promote equitable livelihoods for all participants in the food system, with particular attention to small-scale food producers, through fair trade, labor practices, and intellectual property rights.
11. Connectivity	Ensure proximity and trust between producers and consumers by promoting fair and short networks in local economies.
12. Land and natural resource governance	Improve support to peasant families, producers, and peasant food systems for managing natural and genetic resources.
13. Participation	Promote social organization and participation in decision-making processes through local mechanisms of the involvement in the food system.

Source: Taken from Wezel et al. (2020).

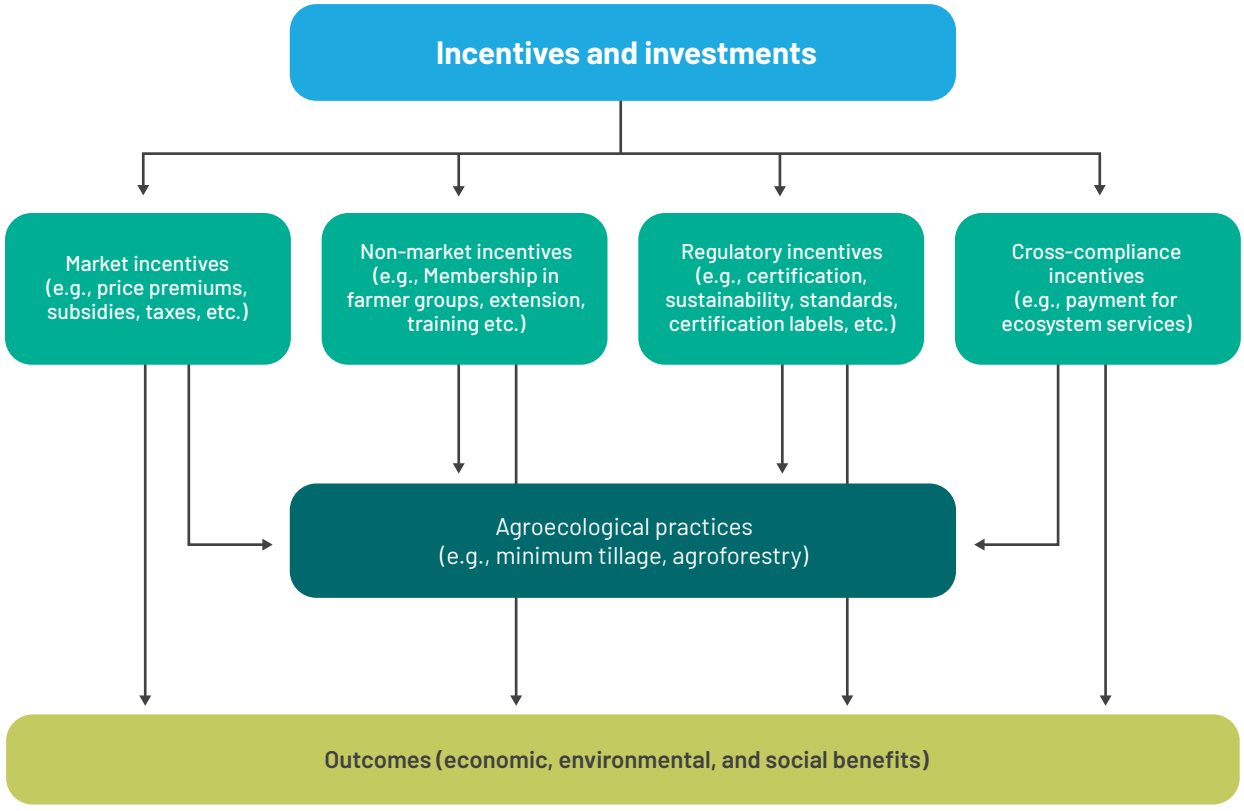
This study utilizes these 13 principles as a framework to evaluate the implementation of agroecological practices among producers in the four different localities. The research team developed a survey, namely the Performance Self-Assessment tool, for producers. The survey was rooted in agroecological practices and employed the Business- Agroecology Criteria Tool (B-ACT) to analyze the fieldwork results. This method for analysis data will be explained in section 4.

3.3 Guidelines on incentives

The path towards agroecological transition and adopting more sustainable practices requires concrete efforts and incentives from both private and public sectors. However, it is crucial to note that adoption effectiveness depends on several factors, including the program conditions; the incentives offered; and the environmental, economic, and cultural preferences of farmers (Caviglia-Harris, cited in Pinero et al., 2020). In this context, Pinero et al. (2020) defined incentives as instruments used by the public and private sectors to encourage producers to protect or enhance ecosystem services for themselves and others.

There are four types of incentives: market and non-market, regulatory, cross-compliance, and regulatory. As shown in Figure 3, **Market-based** incentives stimulate behavior change through factors such as input prices and output, subsidies, compensations, income transfers, and other incentives for agricultural producers. In contrast, **non-market** measures include technical support, technology transfer, and fiscal measures, such as carbon pricing and environmental sustainability taxes. **Cross-compliance incentives** link direct payments to farmers' compliance with environmental standards that encourage maintaining land in good agricultural and environmental condition. These incentives are often voluntary, such as public subsidies conditional on farmers following certain environmental practices. Finally, **Regulatory measures** are rules or specific actions imposed by the government to enhance environmental and economic outcomes. Certification and environmental laws, in general, are mandatory.[1]

Figure 3: Type of incentives.



Source: Taken from Mockshell et al. (2023)

1 These verbatim quotes were taken from Pinero et al., 2020.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4. Methods

For this study, three different methods were used, including the qualitative and quantitative approach to achieve the objectives mentioned above. Firstly, the research team applied the business model canvas, considering the link methodology and its guidelines questions. In the second part, a mapping exercise was utilized regarding incentives for agroecological transitions. In this order, this study addresses three main questions: *1) How do producers perceive the concept of incentives? 2) What existing incentives promote the adoption of sustainable practices among Curimaná producers? 3) What do producers consider the key incentives for a successful and sustainable transition to agroecology-based production systems*. This allows to identify suitable incentives for Curimaná producers, based on their economic, social, and environmental needs.

In the last part of the workshop, the team developed a survey based on B-ACT tool for the analysis of the self- performance evaluation that was applied to the producers for measuring how they are implementing the agrological principles in their daily routine.

4.1. Data collection

The principal location for collecting data among cacao producers was a pre-established meeting place in each village. The workshops for cacao producers were developed through four focus discussion groups with the expectation that ten cacao producers would participate in each one. Most of them were small producers. For a greater inclusion of producers, these groups were held in the center of Curimaná and the villages of Nueva Alianza, Dos de Mayo, and Nuevo Amazonas de Curimaná located in the Ucayali region of Peru. Each focus group discussion was divided into three sections: The first was the application of Canvas; the second sought to identify the current and potential incentives to move forward an agrological transition; and the last was a self-performance survey on the 13 principles of agroecology was conducted with producers. These focus groups are valuable for exploring complex issues, understanding diverse perspectives, and gathering in-depth qualitative data in a social context. Researchers use this method to uncover attitudes, beliefs, and motivations, providing valuable input for decision-making processes in various fields (Van Eeuwijk & Angehrn, 2017).

These participatory methods encourage participants to express their opinions, experiences, and ideas, generating rich and detailed insights. Finally, to obtain additional information about the cooperative, data was collected at the offices of the Banaqui Cooperative.

Focus group discussion for the Business Model Canvas exercise 📷 CIAT

Source: Bioversity & CIAT, Community Room at Dos de Mayo, Peru.

4.2 Performance self-assessment tool for agroecological practices

The Performance Self-Assessment tool for Agroecological Practices was developed as a self-evaluation instrument to gauge farmers' engagement in agroecological practices. Drawing inspiration from established frameworks such as The Business Agroecology Criteria Tool (B-ACT) and Tool for Agroecology Performance Evaluation (TAPE) developed by Biovision and FAO in 2019, the tool comprises a comprehensive questionnaire. This questionnaire consists of 43 specific agroecological practices aligned with 13 fundamental agroecological principles, questions were designed to be contextually relevant and comprehensible to the respondents.

Participants used a structured rating scale for self-assessment, ranging from 0 to 3. A rating of **0** means no interest or alignment with our vision; **1**: Not implemented yet, but we would like to do so; **2**: Implemented but needs improvement; **3**: Fully adopted, extensive experience with the practice.

In cases where a particular practice did not apply to the type of organization, participants marked their response as **N.A.** (not applicable). This nuanced rating system allowed for a detailed evaluation of participants' agroecological efforts.

Producers of Curimaná doing the performance self-assessment for agroecological practices. CIAT

The tool was designed to serve as a reflective approach for farmers to comprehensively assess their agroecological practices. By using this tool, participants were able to identify areas for improvement, reflect on their agroecological efforts, and track their progress in adopting sustainable agricultural practices. The performance self-assessment outcomes were analyzed after digitization, providing valuable insights into the participants' agroecological initiatives, and paving the way for informed decision-making in sustainable agriculture.

5. Case study of Agrarian Cooperative Banaqui Curimaná

Banaqui is a cooperative located in the Curimaná district. It began as an association of producers in 2008 and was registered in 2010 with the support of the SUMAQAO[2] and a Swiss cooperation within the framework of the Peru Alternative Development Program (PDA). The cooperative currently has 70 producer members and collects dry cacao and, to a lesser extent, cocoa beans from its partners. Moreover, it collects cacao from about 200 additional producers who are not official members since they are in the process of changing from conventional cacao to organic cacao production.

In addition to its marketing activities, the cooperative provides various services to its members, such as technical assistance, financial support, inputs, project management, and environmental monitoring. Their principal buyer is Alto Mercato, an Italian company that buys conventional and organic cacao.

Area of biofertilizers and drying area of cocoa beans in the Banaqui Cooperative. CIAT

The Banaqui Cooperative was selected based on several criteria. Firstly, it is a cooperative of organic producers who are deeply committed to environmental sustainability. Secondly, the cooperative's strong regional presence encompasses producers from every locality within the Curimaná district, making it a prime choice. Lastly, the accessibility and established connections with the cooperative's technicians, fostered through prior engagements in various CIAT projects, facilitated seamless communication and collaboration.

In this study, 44 cacao producers from the Banaqui de Curimaná Cooperative actively participated in the focus group discussions. The number of producers interviewed constitutes a significant portion (63%) of its total membership. The distribution of participants across various localities is shown in Table 4. It is noteworthy that our sample included a substantial 41% share of women. This high participation of women allows us to have a more accurate overview of the context and variation in responses by gender.

2 SUMAQAO, stems from the Quechua word SUMAQ meaning 'outstanding', organizes a network of around 4,000 farmers from all cacao-producing regions in Peru. See https://cacaorunners.com/grower/sumaqao/.

Table 4. Number of Banaqui de Curimaná cooperative participants per locality.

Locality	Women	Men	Total
Curimaná	3	3	6
Nueva Alianza	4	7	11
Dos de Mayo	9	10	19
Nuevo Amazonas	2	6	8
Total	**18**	**26**	**44**

Source: Own elaboration based on data collection.

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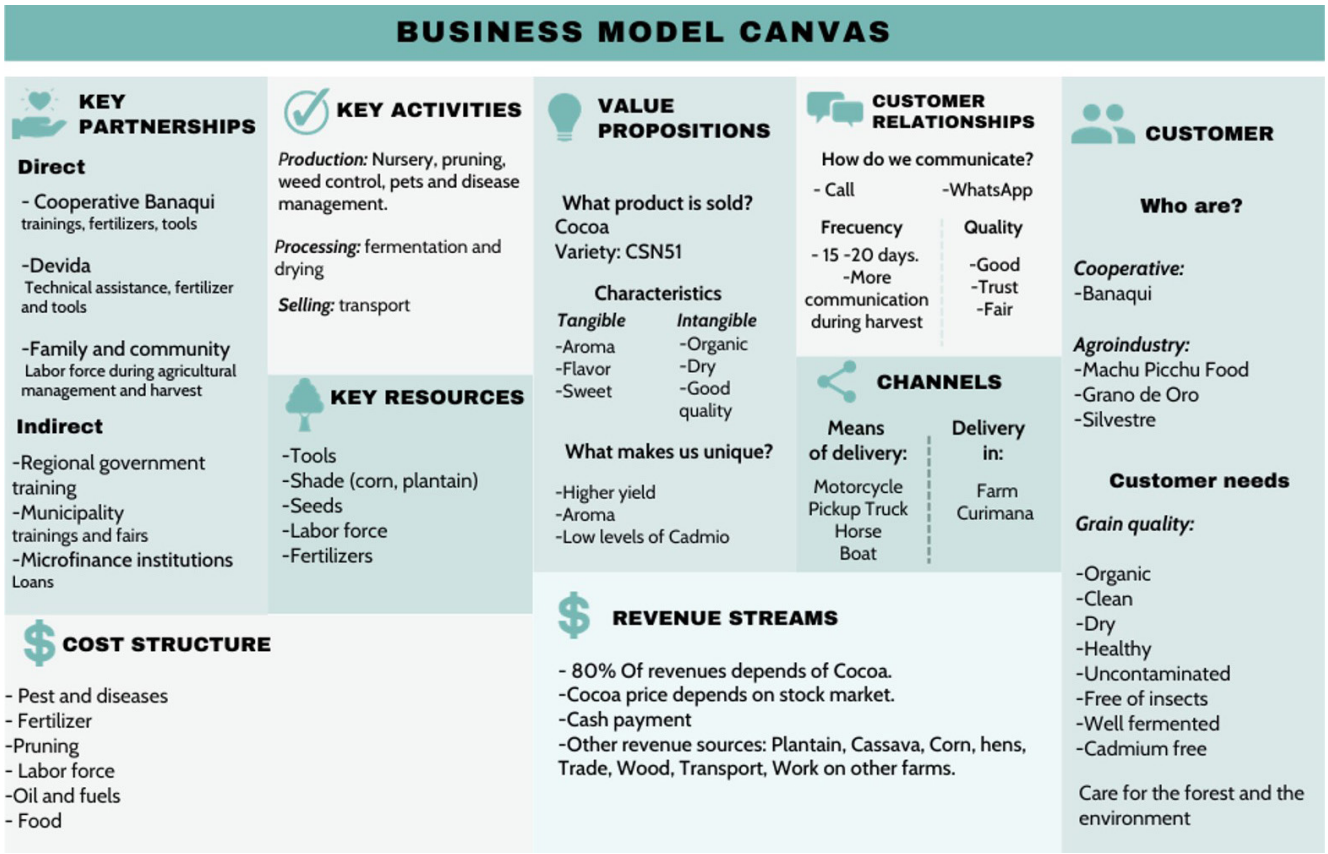
6. Results

This section presents a comprehensive analysis of key findings to help better understand the cacao business model landscape in Ucayali and develop strategies for improvement. It also presents the results regarding the agroecological practices of cacao farmers; the self-assessment of their performance, and the strategies for effectively applying the principles. Finally, results regarding the incentives that could encourage cacao farmers to make the transition to agroecology are also included. Each segment delves into distinct but interconnected aspects, highlighting the findings, challenges, opportunities, and practical applications that are essential for promoting sustainable agricultural practices and guiding future investments.

6.1. Business Model Analysis

Surprisingly, despite varying locations, the business models exhibited notable similarities. However, a significant discrepancy emerged concerning their relationships with key partners, especially in areas with fewer producers, like Nuevo Amazonas. In these regions, producers were perceived as more isolated and, while they identified similar partners in other locations, their interactions were less frequent, and the support they received was considerably lower compared with their counterparts in more densely populated areas. Figure 4 presents the overall results of the guiding questions that were formulated in each block of the business model of the cacao producers of the Banaqui Curimaná Cooperative through Canvas. These provide a complete overview of their operations, customer relationships, cost structure, and other key aspects that make up their business ecosystem. The results of all the nine blocks that conform to the Link methodology are explained in detail below.

Figure 4. Business Model Canvas for Curimaná.



Source: Own elaboration based on focus group discussions.

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- **Customers:** The main customer of the cacao producers is the Banaqui cooperative, which is responsible for exporting to international clients like Altromercato. However, some producers not only sell exclusively to the cooperative but also engage with other agribusinesses such as Machu Picchu Food, Grano de Oro, and Silvestre. These customers have needs such as cacao quality, which must be of high quality, implying a well-fermented, clean, dry, contaminant-free, organic (certified), low cadmium, and environmentally friendly beans.
- **Value proposition:** CCN51 cacao stands as the flagship product among cacao producers and holds the most extensive market presence. This cacao boasts distinct, tangible features, including a minty aroma, citrus undertones, and delicate shells. These characteristics are achieved through a proper fermentation process to enrich the flavor profile. In addition to these tangible traits, Curimaná's cacao embodies several intangible qualities, being organic, possessing low cadmium levels, and exhibiting excellent harvest and post-harvest management practices. Notably, what sets the product apart offered by Curimaná's producers is their commitment to preserving both cultural and natural identities within the final product.
- **Channels:** The cacao is delivered in a dried state and packed in sacks. The cooperative organizes the collection process in each locality. Producers are responsible for transporting their sacks either to the designated collection point within the farm or to an established location outside the farm. Some use motorcycles, horses, or pickup trucks for transportation. To ensure the cooperative's collection, a minimum quantity (300-500 tons collected by the total of the members per harvest

season) must be met. Consequently, producers from the same locality collaborate, combining their cacao to reach the required amount.

- **Customer relations:** Communication with customers is consistent, occurring every two weeks as standard practice. During the harvest season, the frequency of communication intensifies. Producers utilize phone calls and WhatsApp messages as their primary means of interaction. Additionally, there is an active WhatsApp group shared between the producers and the cooperative, ensuring continuous and efficient communication. Producers are satisfied with their relationship with the cooperative, describing it as reliable, swift, and, most importantly, built on trust.

- **Revenue streams:** The primary revenue stream comes from cacao sales, constituting approximately 80% of the total income. Producers diversify their income sources by selling other agricultural goods like bananas, cassava, and corn. Additionally, some farmers engage in temporary employment opportunities, such as working on other farms or providing transportation services using motorcycles, to supplement their earnings.

- **Key resources:** In the initial stages, tools such as machetes, pruners, bulldozers, chainsaws, and axes are crucial for soil preparation. During cultivation, the use of organic fertilizers and appropriate pruners becomes essential for effective plant management. At the harvest stage, the combination of scissors and skilled labor is indispensable for efficiently harvesting cacao. For the fermentation and drying process, bags, nets, and plastic sheeting are necessary to protect the cacao, along with pallets to elevate it off the ground during drying. Additionally, having a well-equipped nursery with seedling bags is vital for sustainable cultivation. Besides these material resources, expertise in overall plantation management is crucial to maintain plant health and ensure the quality of the produced cacao. This includes pest and disease management, and pod harvesting.

- **Key activities:** Pruning is essential for maintaining the health and productivity of cacao trees while preventing diseases. Weed control is crucial to prevent unwanted plants from competing for nutrients and resources, allowing cacao plants to thrive. Implementing effective pest and disease control measures is critical, involving regular monitoring and timely intervention to protect the crop from potential threats. Proper drying and fermentation are paramount for enhancing the flavor and aroma of cocoa beans.

- **Key partnerships:** The Banaqui cooperative stands as the primary partner, offering essential services like technical guidance, training, provision of tools and fertilizers, and aiding in organic certification and credit access. Government bodies like DEVIDA[3] and Agrobanco play pivotal roles in cacao production. DEVIDA, the National Commission for Development and Life without Drugs, supplies farmers with tools and organic fertilizers. Agrobanco, a Peruvian state-owned public bank, focuses on facilitating credit for small farmers in Peru. Additionally, international financial institutions like Rootcapital provide low-interest loans to select producers and offer financial advice to agricultural enterprises purchasing goods from small-scale farmers. Furthermore, farmers' families directly contribute through labor, serving as crucial allies in the cacao production process.

- **Cost structure:** The most significant costs are attributed to pruning, weeding, labor, and disease management. However, it is crucial to note that these costs are often overshadowed by family needs. In many cases, family expenses such as food, education, and healthcare take precedence over investments in production inputs. This situation leads to occasional reductions in resources allocated to improving cacao production, as the priority lies in ensuring the household's basic needs.

3 Comisión Nacional para el Desarrollo y Vida sin Drogas (DEVIDA) - is a State agency in charge of designing and conducting the "National the "National Strategy for the Fight against Drugs". Among its lines of action is the eradication of illicit crops and their substitution by licit crops, including substitution with licit crops, including cacao. In this regard, they provide technical assistance to small producers who are part of the alternative development model in the region.

6.2. Enhancement strategies: Identifying gaps, challenges, and opportunities

After identifying the structure of the cacao business, gaps and opportunities for improvement were identified. This allows producers and other actors in the cacao chain to propose innovative strategies and solutions to strengthen not both the producers' business model and the overall cacao value chain. Table 5 delineates key gaps identified within the cacao producers' business models, alongside corresponding opportunities for improvement and the specific blocks in the canvas to which these gaps are attributed. Understanding these gaps and the potential enhancements within the context of the canvas blocks is vital for devising targeted strategies.

Table 5. Gap Analysis and Improvement Opportunities in Cacao Producers' Business Models.

Gap	Opportunities for improvement	Block
Lack of processing facilities	Producers face significant challenges in the fermentation and drying processes. The use of sacks instead of wooden boxes leads to non-uniform fermentation, a major concern for producers. Additionally, drying the beans in the sun poses difficulties, as lack of access to dryers means beans are spread on plastic on the ground, making them vulnerable to animals and human interference. This challenge intensifies during winter when drying takes longer.	Key resources
Lack of knowledge about pest and disease management	Producers have openly admitted their lack of expertise in pest and disease management, recognizing it as a significant cost factor in crop management. Providing training in biological pest and disease control techniques, as well as other non-chemical practices, could greatly benefit their farming endeavors.	Key resources
Production costs are unknown	The cost structure is a crucial aspect as producers currently lack control and understanding of their costs. It is imperative to prioritize effective cost control and management strategies to sustain business profitability. Providing training on production cost and revenue management is essential, and it is equally vital to include women in this process.	Cost structure
Low-income diversification	On average, 80% of farmers' income depends on cacao. Agricultural diversification can reduce dependence on cacao alone, identify complementary crops that are well adapted to the local environment and in demand in the market, and consider reforestation with native timber species. Exploring tourism focused on the cacao plantation, such as guided tours, tastings, and workshops, can generate additional income and increase product-quality awareness.	Revenue streams
Limited communication with the cooperative outside of the harvest	Contact with the cooperative is consistently active during the harvest season, but it tends to wane during other periods of the crop cycle. Strengthening this communication is crucial as the cooperative offers essential services beyond being clients, including training and extension services vital for improving production.	Customer relation
Little collaboration with government and external organizations	Collaboration with government institutions and other organizations is limited in some instances. Exploring strategies to foster stronger relationships with these entities could unlock additional resources and support for the cacao producers. This can significantly enhance their cacao business sustainability and growth.	Key partners
Need for efficient and sustainable irrigation systems	Climate change has reduced the rainy season. Therefore, efficient and sustainable irrigation systems to optimize water use and ensure constant production in the face of scarce rainfall should be explored.	Key resources
Poor transportation infrastructure	Poor transportation infrastructure, such as roads and bridges, impacts logistics and customer relations. Producers located in Nueva Alianza and Dos de Mayo must cross the river and pay for this service to communicate with the rest of the Curimaná District. Exploring strategies to foster connectivity are necessary, for example, provide subsides for local communities in the river transport.	Channels

Source: Own elaboration based on focus group discussion with cacao producers.

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The Business Model Canvas analysis highlights critical gaps and opportunities within the cacao production framework. The findings underscore the urgent need to establish uniform processing facilities and protocols that ensure consistent cacao quality, and address challenges in fermentation and drying processes. Additionally, continuous technical assistance is essential, supporting producers at every stage of cacao cultivation and ensuring optimal agricultural practices. Encouraging collaboration among producers to share knowledge and resources expands learning and growth possibilities. Furthermore, researching and applying disease prevention techniques in cacao reduces losses and promotes long-term plantation health.

Diversifying income through additional agricultural products such as plantain, maize, and timber present itself as a robust strategy, reducing exclusive dependence on cacao and fostering financial resilience. Establishing price stabilization programs or long-term agreements with the cooperative can mitigate income variability, providing financial stability to farmers. Financial education and expense tracking are powerful tools for better financial management, translating into more informed and strategic decision-making.

Investing in local infrastructure, especially roads, bridges, and subsides for river transport stands out as a pivotal step to facilitate transportation and strengthen relationships with customers. This aligns with the identified gap concerning poor transportation infrastructure, especially for remote areas like Nueva Alianza and Dos de Mayo within the Curimaná District. Improved connectivity can significantly impact logistics and customer interactions. As the exploration of efficient and sustainable irrigation systems emerges as a crucial measure, given the impact of climate change on reduced rainfall, such systems become indispensable to ensure consistent production despite environmental challenges.

6.3. Agroecological practices analysis and performance evaluation

One of the main findings collected from implementing the self-performance evaluation was that, despite most farmers being unfamiliar with the formal concept of "agroecological principles," they instinctively applied numerous agroecological principles in their agricultural practices. For instance, one of the most intriguing findings was that most farmers were already implementing agroecological principle number 1 - recycling. They reused crop residues to manufacture their own fertilizers, utilized fallen leaves from trees as vegetative cover, and engaged in seed exchange with producers in the same village. However, it was observed that they did not store and reuse rainwater, although there was significant interest among farmers in implementing this technique for domestic use.

Additionally, many farmers set aside portions of their land for forest preservation by planting tree species such as Bolaina, Capirona, and Cedro. Some also allocated parts of their land to produce other crops like cassava, plantains, and maize. These activities exemplify how farmers are applying agroecological principle number 5 (conserving and enhancing agroecosystem biodiversity). Nevertheless, it was noted that most producers did not cultivate native or local cacao varieties; instead, the most-produced variety in the area was CCN 51, an introduced variety. Furthermore, the study gathered the opinions of farmers regarding practices they were interested in implementing with the assistance of public, private, or NGO organizations. Examples include installing irrigation systems to reduce input usage, deploying solar panels for alternative energy use, and seeking technical assistance to enhance soil management, animal health, and biological pest and disease control, among other practices conducive to implementing a more significant number of agroecological practices.

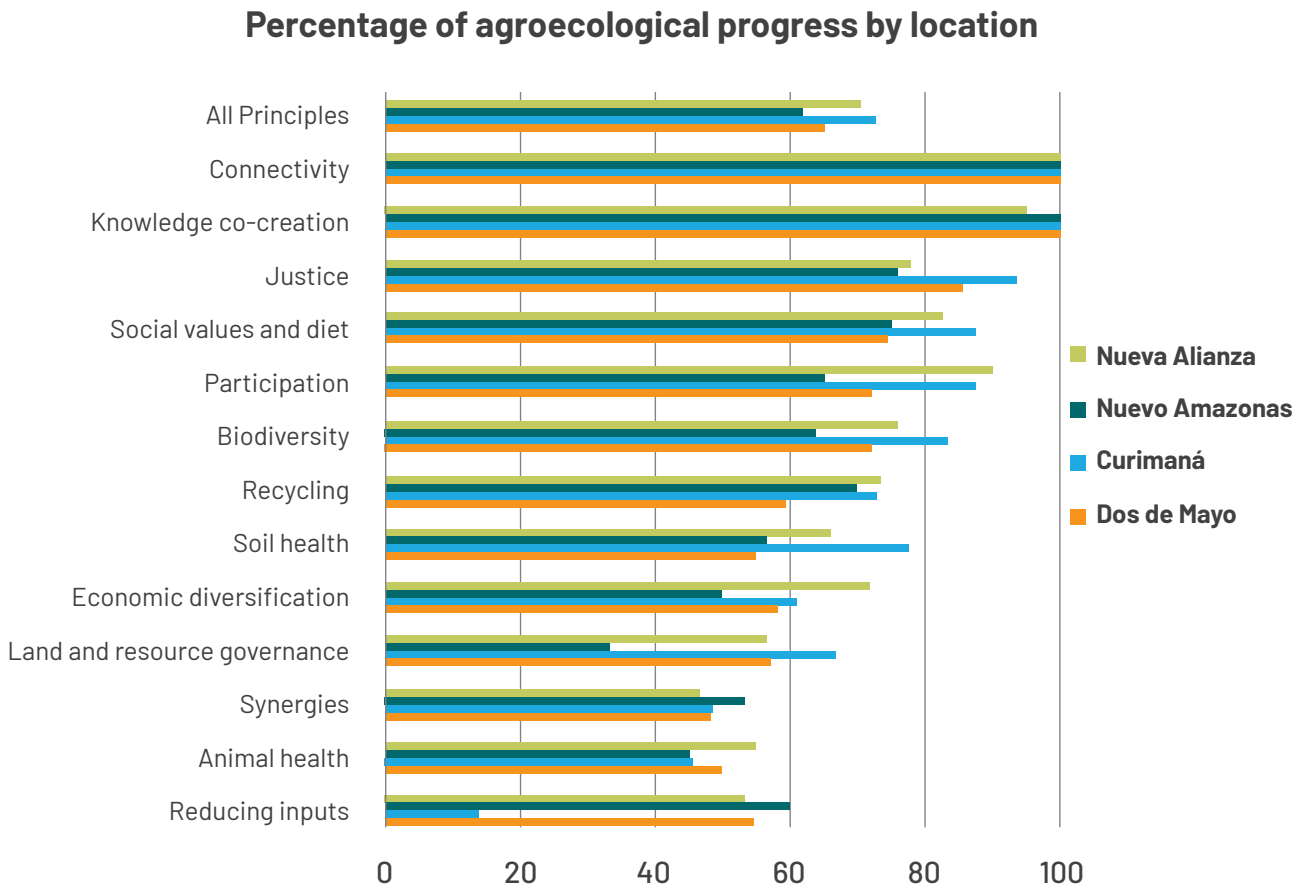
Figure 5 shows progress in the implementation of the agroecological principal, considering the participation of 38 cacao producers of the Banaqui Curimaná agricultural cooperative. The self-assessment results of each locality's compliance with the 13 agroecological principles indicated very similar results and there is no significant difference in their performance. On average, farmers showed a 67.64% progress in complying with the agroecological principles. Notably, they achieved better compliance in Guaranteeing social equity (79.40%) but lower compliance in Improving resource efficiency (61.96%) and Strengthening resilience (60.78%) areas. The agroecological principles with the highest compliance were Connectivity (100%), Co-creation of knowledge (98.75%), and Justice (83.17%), while those with the lowest compliance was input reductionnputs (45.50%), Animal health (48.96%), and Synergies (49.24%).

These results are also intriguing when comparing the outcomes from the four locations. For instance, all locations share Connectivity and Co-creation of knowledge as the highest-conforming principles. However, the results for the lowest conforming agroecological principles vary significantly. In Dos

de Mayo, the principles of Input Reduction (54.76%), Animal Health (50%), and Synergies (48.33%) least conformed. In Curimaná, Synergy (48.61%), Animal Health (45.83%), and Input Reduction (13.89%) least-compliance. Nuevo Amazonas had Economic Diversification (50%), Animal Health (45%), and Land and Natural Resources Governance (33.33%) as the least-conforming principles. Lastly, Nueva Alianza struggled with Animal Health (55%), Input Reduction (53.33%), and Synergy (46.67%) in that order (refer to Figures 02, 03, 04, and 05)(See annex).

Based on these insights and data gathered from Table 6, there is clear evidence of robust participation and communication links among the producers in all the localities. Consequently, the principal focus lies in ensuring social equity, demonstrating the strongest emphasis. Conversely, aspects linked to productivity enhancement and resource efficiency rank the lowest. This signifies that producers form a cohesive and well-connected group and are also resilient amid challenges arising from stagnant innovation and limited knowledge in their practices. These hurdles further intensify their struggle to enhance efficiency and increase incomes, particularly as their livelihoods primarily rely on cacao-related earnings without diversification into other activities.

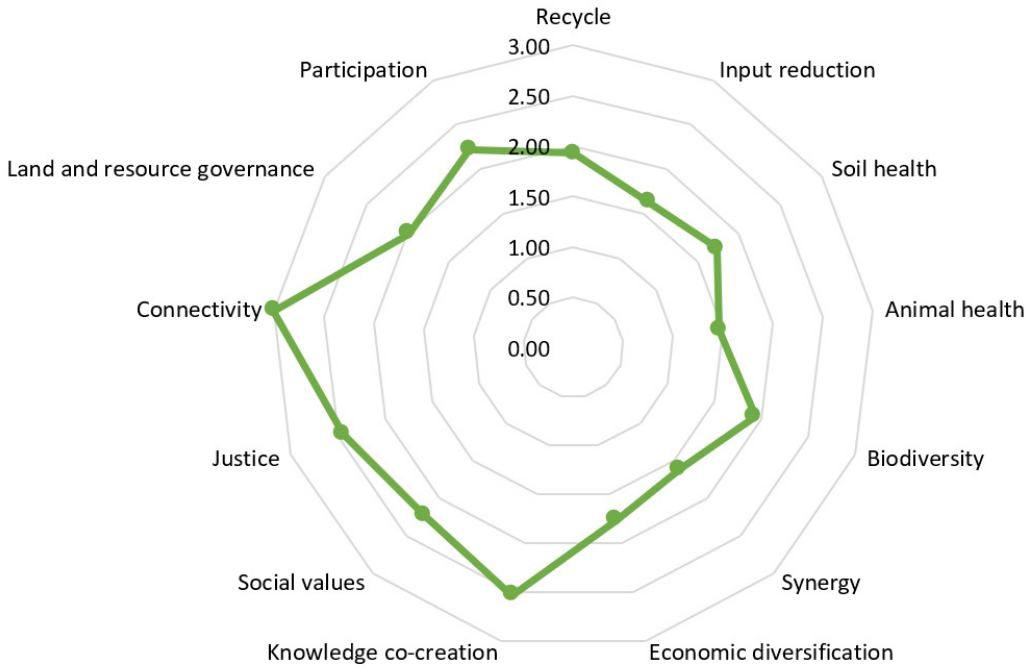
Figure 5. Percentage of agroecological progress by location



Source: Own elaboration based on the results of the Performance Self-Assessment tool for Agroecological Practices implemented with cacao farmers.

In the same order, Figure 6 depicts the mean scores derived from the self-performance evaluations conducted by all participating producers. These scores range from 0 to 3, with 3 denoting the highest level of performance achieved. Each producer's score is a composite measure calculated based on their responses to individual questions, as detailed in the methods section earlier. The score is an average representation of the producer's self-assessment, considering their ratings for each aggregated practice aligned with the 13 principles under examination.

Figure 6. Agroecological Performance Self-Assessment Cacao producers



Source: Own elaboration based on the Performance Self-Assessment tool for Agroecological Practices implemented with 38 cacao farmers.

In terms of the producers' performance in each principle, as shown in Figure 4, they demonstrated better implementation of Connectivity, Co-creation of knowledge, and Justice principles with scores of 3.0, 2.54, and 2.44, respectively. This indicates good connectivity among them. In addition, although they participate in activities related to the co-creation of knowledge and justice, they believe that there is room for improvement. Conversely, the lowest-performing principles were Input Reduction, Animal Health, and Synergies, with scores of 1.62, 1.46, and 1.60, respectively. These scores imply that producers do not engage in enough principle-related actions but are interested in implementing them in the future.

This analysis shows that the principle of Connectivity is based on cooperative membership, enabling farmers to access benefits such as training, fertilizers (biol, guano from the island, compost), transportation for their products, and market access. Moreover, being part of the cooperative allows them to adhere to the principle of co-creation of knowledge, as they receive information on good cultivation practices from various institutions, including local and regional governments. Furthermore, the transmission of their agricultural practices to their relatives, particularly children and neighbors, contributes significantly to any principle's fulfillment.

On the other hand, the low score in the principle of synergy is partly because their biological pest control is limited to the collection and burial of damaged fruits, and a lack of livestock grazing on cacao farms. Some have chickens that enter their farm from nearby homesteads. But without intending to raising chickens, some producers are starting to use biol provided by the cooperative, and using compost as fertilizer is limited since most of them only raise chickens and in many cases buy animal feed. Additionally, for the principle of Animal health, most only raise one animal species for wholesale (chickens– only one producer mentions rabbits,). Thus, this limits animal care to only disease control. Normally they also consider that the cacao farm is not a place where they graze or raise livestock.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6.4. Implementing Agroecological Principles: Effective Strategies for Practical Application

Based on the above, and the results, the areas to be prioritized should be improving resource efficiency and strengthening resilience. This includes the lowest-scoring compliance for principles of recycling, input reduction, soil health, animal health, biodiversity, synergy, and economic diversification, but with greater emphasis on the principles of synergy, animal health and reduction of inputs.

To improve adherence to the principle of Animal Health, in the context of cacao farmers who do not take proactive measures to prevent pain, injury, and disease in their animals, it is important to foster awareness and provide training in more ethical and sustainable livestock husbandry. Even though they do not have animals grazing in their cacao plantations, providing access to fresh water and a suitable living environment are good starting points. Producers could be encouraged to implement practices such as vaccination, parasite control, and providing a balanced diet for their animals, even if they are few. In addition, promoting crop rotation and diversifying their cacao plots could offer more suitable grazing areas. Through agricultural extension programs and collaboration with local organizations, information and resources can be provided to help producers improve their animals' health. This will better align their practices with agroecological principles and promote a more holistic and sustainable approach to cacao production.

On the other hand, to improve adherence to the principle of Input Reduction, it is essential to promote sustainable resource management practices. Agricultural organizations and government institutions can offer technical assistance and resources to help producers implement these practices effectively. This can be achieved by training and sensitizing farmers on the importance of rainwater harvesting, the use of organic fertilizers, and the adoption of natural pest control methods. In addition, encouraging the creation of local knowledge-sharing networks among farmers themselves can be beneficial in promoting agroecological techniques adoption. By reducing dependence on chemical inputs and promoting the efficient use of natural resources, progress is made towards more sustainable cacao production, and in line with agroecological principles, which in turn can lead to greater resilience and profitability in the long term.

Finally, to improve adherence to the principle of Synergy, it is essential to promote more integrated agroecological practices mainly for their biological pest management using damaged-fruit collection and burial. Strategies that harness beneficial interactions between different components of the agroecosystem can be promoted. For example, raising hens on cacao farms could be boosted with a dual purpose, not only for egg or meat production but also for natural pest control, as chickens can help eliminate harmful insects. In addition, the introduction of animal species that contribute to the fertilization and biodiversity of the farm, such as worm breeding or the incorporation of organic fertilizers, could be promoted. By encouraging these practices, beneficial synergies can be created that reduce dependence on chemicals, improve soil health and cacao production, and contribute to a more balanced and sustainable system in line with agroecological principles.

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6.5. Incentives for agroecology transition

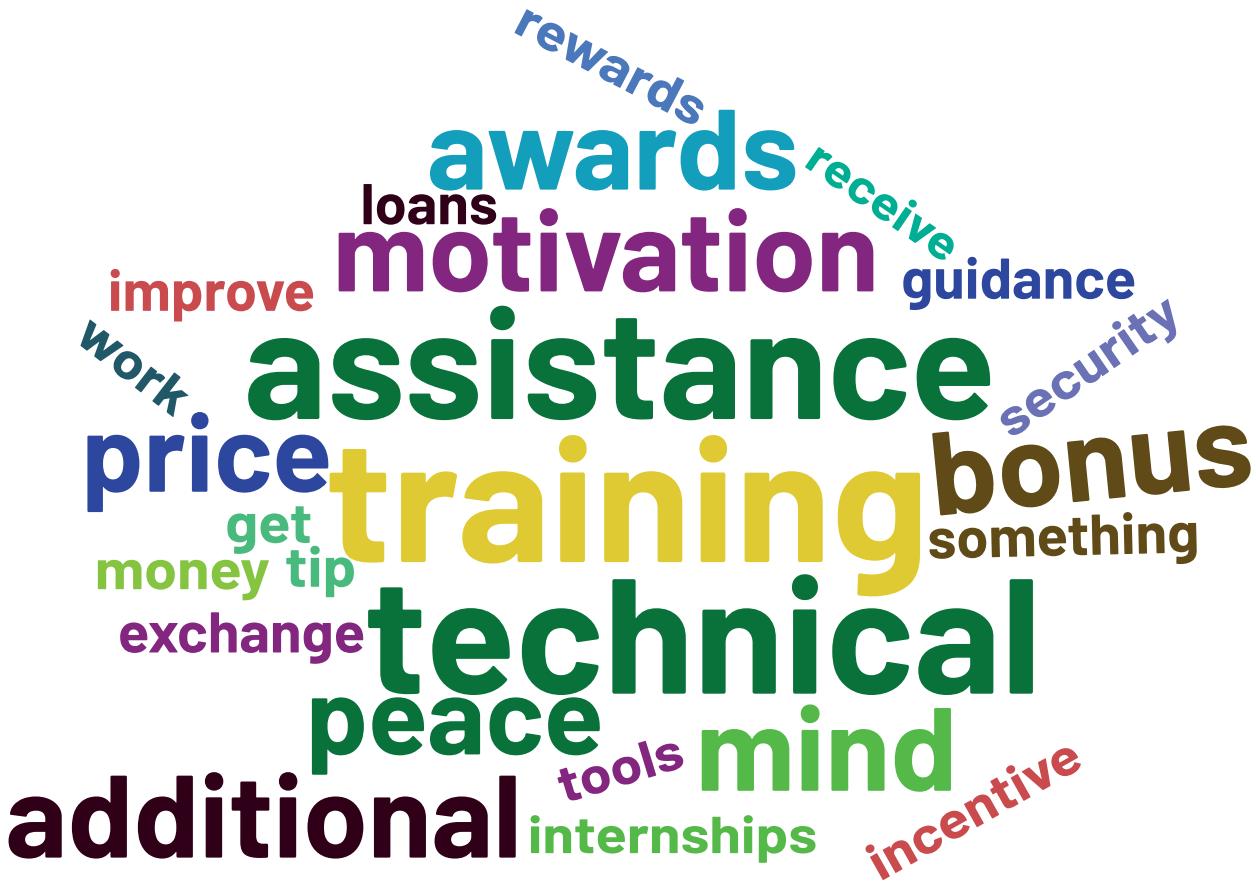
Generally, the results indicate that farmers are partially familiar with the concept of incentives, primarily in the context of financial matters. In the four localities, producers value the workshops and technical assistance that they receive. They empathize with the absence of the State in the zone, for this reason, public subsidies are not well-known by the farmers. The State does not appear to be seen as an authority figure in Ucayali. On the contrary, the cooperative seems to have an important role in the quality of farmer life. They have a high influence on each farmer's productivity and profitability, as they have been supporting producers. They need input or cash in advance, or in some cases, workshops, or technical assistance by the engineers from the Banaqui cooperative.

During the workshop, two sets of guidelines and lists of open questions were formulated, which are shown below. The first question seeks to put the issue of incentives on the table and to map how much producers know about this issue, and what are their first associations. After their response, the Alliance team gave them a short instruction related to the theoretical aspect of incentives to start the second part of the section.

Farmers' understanding of what an incentive is

Based on the 26 responses received, it is evident that the producers are highly familiar with the concept of incentives. According to Figure 7, their primary associations with incentives include technical support and financial rewards: "money", "price", "rewards", and "bonus". Additionally, they recognize non-market incentives, particularly the value of knowledge, as essential for their involvement in cacao cultivation. Knowledge is highly regarded, as it is not readily accessible in their day-to-day activities. Notably, training sessions were mentioned at least once in all four villages as well.

Figure 7. Producer perspectives about "What is an incentive?".



Source: Own elaboration based on a discussion focus group with cacao producers

What incentives are necessary to move forward with an agroecological transition?

Based on the feedback provided by 34 respondents across the four localities, it is evident that they deem financial incentives as essential for advancing agrological transitions. They emphasize the necessity of investing in their cacao crops to increase productivity. An illustrative strategy involves adopting organic fertilizers and diversifying their land with multiple crops to bolster their income, considering the physical condition of the flora and fauna of the Ucayali. The training was also an important issue highlighted as they express the need for farmers to be more environmentally conscious in their agricultural practices and crop management.

In a surprising revelation, likely influenced by the changing climate, respondents underscore the growing need for water to irrigate their crops, particularly as summers have become hotter in recent years. In many cases, the cacao trees have succumbed to these harsh conditions, resulting in reduced production during this season. Less frequently mentioned were concerns about access to these remote villages and the compensation for environmental services. Respondents noted their efforts in reforestation but expressed a lack of monetary compensation for these vital contributions.

Figure 8. Producer perspectives about "What incentives are necessary to move forward an agrological transition?".

Source: Own elaboration based on a discussion focus group with cacao producers

7. Discussion

This section delves into the fundamental aspects of steering the cacao business model towards sustainability. It has therefore been divided into two segments. The first part examines the essential requirements for making a transition to a more sustainable business model. It explores the challenges and actions needed to facilitate the shift towards agroecological practices.

The second part explores the landscape of opportunities and investment incentives inherent in the agroecological transition of the cacao value chain. Within this segment, we explore actionable strategies and potential investments aimed at addressing the challenges identified earlier in the report. Through a nuanced discussion of possible actions, we aim to illuminate avenues for leveraging opportunities and incentives to foster an effective transition to sustainable practices within the cacao industry.

7.1. What do we need to transition to a more sustainable business?

The use of agroecological principles has been recognized as a viable approach to establishing sustainable food systems. Moving towards sustainable food systems necessitates substantial investments and incentives aimed at encouraging the embrace of sustainable agricultural and agroecological methods (Mockshell et al., 2023). In the context of our study, it is evident that market incentives, non-market incentives, and regulatory incentives are already promoting and encouraging the adoption of agroecological practices among producers. For instance, given the absence of state presence in the intervention area, the cooperative assumes a pivotal role in the lives of producers. Cooperative technicians are crucial in disseminating more sustainable practices among farmers, enabling them to secure a premium price for their products, remarkably certified organic cacao.

In transitioning towards a more sustainable cacao value chain, all stakeholders, from states to intergovernmental organizations, civil society, the private sector, and academic institutions, should learn from agroecological and innovative approaches. Promoting the transformation of the cacao value chain towards sustainability involves considering and valuing the diversity of food systems, using relevant performance metrics that encompass environmental, social, and economic impacts, and recognizing the importance of improving the ecological footprint of food systems (HLPE, 2019).

Furthermore, there is an emphasis on fostering the integration of transdisciplinary science and local knowledge in participatory innovation processes that transform the cacao value chain (Pretty, 1995; Ramírez-Gómez & Rodríguez-Espinosa, 2022). It is crucial to support diversified and resilient production systems, such as agroforestry and mixed livestock and cropping, that preserve and enhance biodiversity and the natural resource base (Altieri, 2002). Advocacy for healthy and diverse diets is encouraged to support transitions towards more sustainable, diversified, and resilient cacao value chains (Willett et al., 2019). Additionally, there is a proposal to support innovation platforms in the cacao value chain that incentivize sustainable practices and the production of public goods through investment and reward from both the private sector and public bodies (Gereffi et al., 2005). This comprehensive approach aims to enhance resource-use efficiency, strengthen resilience, and ensure social equity and responsibility in the cacao value chain.

Elizabeth Ramírez Pérez / CIAT

7.2. Opportunities and investment incentives in the cacao value chain

Overcoming present obstacles and fostering a supportive environment for agroecological transitions, which aim for more sustainable, healthy, and resilient agri-food systems, necessitates vital components such as access to resources, markets, knowledge creation, and robust policy and institutional support (Sinclair et al., 2019; Place et al., 2022). Some of the incentives that were highlighted are potentially linked with environmental, productivity, and profitability outcomes that aim to build more resilient agri-food systems. One of the main insights of this is that international action can support the transition, focusing on innovative contracts linking international and local buyers that can facilitate and allow bundling incentives such as market premium prices, technical support (e.g., advisory services), and access to inputs (e.g., organic fertilizers, biological control agents, etc. (Mukherji et al., 2023).

The business model of cacao producers in Curimaná revolves around the production and sale of high-quality, sustainable cacao. It is built on close relationships with customers, collaboration with institutions, and investments in training and critical resources. However, it faces challenges related to cost control, plant diseases, and lack of institutional support in certain areas. Cacao producers require support in terms of resources and knowledge to implement agroecological practices and environmental conservation. Monetary incentives, training workshops, and adherence to environmental laws are crucial elements to encourage agroecological transition in the department.

The most surprising need recognized by cacao producers is optimizing water usage and conserving riverbanks and watersheds. To achieve this, they require assistance in introducing forest species adapted to the area for reforestation processes. Additionally, they seek financial support to sustain themselves while engaging in conservation and reforestation efforts, as this entails costs related to plant acquisition, transportation, and land preparation, among others. Raising awareness and conducting lectures to educate the community about the importance of these practices are also key requirements.

Table 7 shows the potential incentives identified by the producer that could facilitate moving forward more sustainable practices. Based on the outcomes derived from the business-model methodology implementation, and the thorough mapping of incentives added in Table 7, a comprehensive analysis identified six contextual challenges impeding the effective shift towards agro-ecological practices in the Curimaná district. By engaging a diverse sample of producers affiliated with the Banaqui cooperative across various localities within the district, it became evident that **non-market-related incentives** emerged as the most potent catalysts for enhancing productivity and augmenting incomes among these producers. This revelation underscores the persistence of traditional

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agricultural methodologies among these individuals, highlighting a noticeable **absence of technological innovation** in their daily practices. Simultaneously, given the department's location within the Amazonian region of Peru, an acute awareness of environmental conservation prevails, with particular emphasis on combatting deforestation. Consequently, the concept of **remuneration for environmental services** stands out as a promising strategy to propel the transition towards agro-ecological methods, aligning with the collective goal of preserving the environment while enhancing agricultural practices.

Table 7. Potential incentives for agroecological transition in cacao producers

Context problem	Type of incentive	Incentive	Expected outcome
Lack of water to irrigate the crops	Non-market incentives	Irrigation system, technology transfer	**Productivity**
	Non-market incentives	Rainwater collection system	**Environmental** • Recycling • Inputs reduction
Constraints in fertilizer acquisition	Market incentives	Cash transference, Subsidies	**Profitability**
	Non-market incentive	Training for producers to make their fertilizer	**Environmental** • Waste reuse • Reduction of inputs • Improved soil health
Lack of knowledge about pest and disease management	Non-market incentive	Workshops Technical assistance	**Productivity**
Limited adoption of innovative agricultural practices	Non-market incentives	Technical assistance Technology transfer	**Productivity**
Lack of income diversification in the cacao producers	Market incentive	Cash transferences, investment	**Profitability**
	Market incentive	Create a market demand for products derived from native timber	**Profitability** • Increase in revenues **Environmental** • Reforestation
	Cross-compliance incentives	Financial support for planting native timber species	
Deforestation	Cross-compliance incentives	Payment for environmental services	**Environmental** • More conservation areas • Reforestation
	Non-market incentive	Inputs and native plants for reforestation	
	Non-market incentive	Workshops and training sessions focused on reforestation	
	Regulatory measures	Law enforcement	**Environmental** • Reduced deforestation

Source: Own elaboration based on the responses of the focus group discussion with cacao producers.

8. Conclusions

Peru ranks among the top cacao producers globally, renowned for high-quality cacao – especially fine and aroma varieties – while leading in organic production. Hosting 60% of global cacao biodiversity, it preserves genetic diversity. Ucayali's cacao cultivation drives local economic growth, offering jobs and stability to communities. More effort is needed to advance agroecological transitions.

Strengths identified in the cacao producers' business models reveal a solid foundation for sustainable development. Stability in relationships, both with the cooperative and international clients, establishes a reliable platform for continuous growth. Additionally, awareness of sustainable practices and organic certification underscores the commitment to quality and environmental responsibility. They have a differentiated product due to the quality, taste, and aroma provided by fermentation that not only meets customer expectations but also sets a high standard in the market. These strengths lay the groundwork for ongoing development and the ability to tackle future challenges.

The long-term success of these cacao business models relies on continuous collaboration, the adoption of sustainable agricultural practices, smart diversification, and equal attention to both product quality and economic viability. Cacao farmers in the Banaqui cooperative face common challenges, such as the necessity to enhance bean fermenting and drying facilities, effectively control diseases and pests, and diversify income streams to decrease sole reliance on cacao. Essential investments in education and training, encompassing sustainable farming methods as well as business and financial skills, are vital. These investments empower cacao producers, enhancing their productivity and overall quality of life.

Most importantly, it is advisable to tailor incentives to the specific context and issues faced by cacao producers. These findings highlight the potential incentives considering the unique social, economic, and environmental conditions of each producer. The alignment of these incentives with the business canvas model results is evident, as it highlights the anticipated benefits from their implementation. However, it is important to recognize that while these incentives aim to foster a change in social behavior, the adoption of sustainable practices is greatly influenced by factors such as farmers' environmental preferences, market dynamics, and cultural and socioeconomic characteristics (Piñeiro et al., 2021). Therefore, we recommend it is recommended to carefully selecting those incentives that are most likely to yield the desired outcomes. Additionally, as suggested by Piñeiro et al. (2021), certain prerequisites must be considered for successful implementation. These include a thorough understanding of the policy's impact and the selection of appropriate institutions and mechanisms for implementation. In this stage, policymakers, donors, and researchers play a significant role in moving forward to more sustainable agri-food systems.

Findings from the mapping exercise underscore the significance of both public- and private-sector investments in critical areas, such as irrigation, financial support through cash transfers, and comprehensive training sessions. These particular areas stand out as pivotal points for garnering investment interest from all stakeholders within the cacao value chain. Such investments hold the potential for significantly impacting the quality of life for those involved, contributing to environmental sustainability, increased profitability, and heightened productivity.

Conversely, a prevailing challenge emerges in the form of a knowledge deficit regarding crop management, input efficiency and pest and disease management, which substantially hamper the efficient implementation of agrological practices. This knowledge gap places stakeholders at a distinct disadvantage in an ever-evolving market landscape, characterized by new and demanding market expectations. These remote regions face heightened obstacles in terms of accessing crucial inputs, markets, customers, and organizational resources, thus amplifying their vulnerability within the cacao industry. Undoubtedly, cacao has allowed them to transform the lives of farmers in Ucayali and change their history, as many of them used to grow coca (*Erythroxylum coca*) before cacao. Therefore, this transition to more resilient agroecological systems should not be the responsibility of small farmers alone. From their side, social outcomes rely on encouraging more formal organization and participation initiatives among producers, which would also help forge close ties that transfer knowledge among producers. Technology and access to information technologies could bring more productivity and profitability outcomes to the producers since the current practices of the Curimaná farmers are still very traditional. This support could come from the private sector.

Finally, from a gender perspective, it was evident that there was considerable participation of women in some areas of the workshop, but that overall, they do not seem to be actively involved, as they were listening rather than contributing with active voices. However, it is important to note that women have a fundamental role in the cultivation of cacao and make decisions about spending the income generated from the harvest. Surprisingly, all respondents stated that women do participate and make decisions. However, these women are also in charge of their home care and have long working hours. Women who own their own farms – having received them by inheritance – have greater decision-making power both in the farm and in household.

Producers are generally aware of the need to care for the environment and there is evidence of some sustainable practice implementation because they recognize the importance of conservation and its impact on the systems. However, there are still factors to improve, such as synergy, greater awareness of environmental and animal care, and greater crop diversification. Given that the four localities have little State presence, it is difficult to develop effective mechanisms for implementing both public and private initiatives that can generate results and be sustained over time. Therefore, efforts are needed from all the institutions in the different localities, which can be achieved through the Banaqui cooperative that serves as a bridge between small producers and institutional entities and even international cooperation and the private sector.

Elizabeth Ramírez Pérez / CIAT

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Annex

Annex 1: Thirteen agroecological principles, from (HLPE, 2019; Jones et al., 2022)

Agroecological principle (short name in bold)
Improve resource efficiency
Principle 1: Recycling, ideally local renewable resources, and closing nutrient and biomass cycles.
Principle 2: Reduction of inputs by prioritizing self-sufficiency and limiting or eliminating environmentally harmful chemicals and inputs.
Strengthen resilience
Principle 3: Improve **soil health** by managing organic matter and improving biological activity.
Principle 4: Ensuring **animal health** and welfare
Principle 5: Preserve and enhance the overall **biodiversity** of agroecosystems through time and space at the field, farm, and landscape scales.
Principle 6: Enhance **synergies** among the components of agroecosystems (animals, crops, trees, soil, and water).
Principle 7: Economic diversification aims to enhance financial autonomy and create more options for value creation, while also enabling the ability to meet customer demands.
Secure social equity/responsibility
Principle 8: Co-creation of knowledge and horizontal exchange, including local and scientific innovation, especially through farmer-to-farmer exchange.
Principle 9: Respect **social values and diets** by establishing food systems based on local communities' culture, identity, tradition, and social and gender equity that provide nutritious, diverse, seasonal, and culturally acceptable diets.
Principle 10: Promote **fairness** by ensuring that all actors in the food system have respectable and sustainable livelihoods based on fair trade, safe and dignified working conditions, and fair intellectual property rights.
Principle 11: Enhance the level of **connectivity** between producers and consumers by advocating for the development of local marketplaces and equitable distribution networks.
Principle 12: Land and natural resource governance. Enhance the institutional frameworks to acknowledge and support smallholders and indigenous peoples as effective managers of sustainable natural and genetic resources.
Principle 13: Promote and enable the **participation** of food producers and consumers, especially women, youth, and minority groups, in the process of making decisions.

TRANSITIONS

The Program on Agroecological Transitions for Building Resilient, Inclusive, Agricultural and Food Systems (TRANSITIONS) aims to enable climate-informed agroecological transitions by farmers in low- and middle-income countries through the development and adoption of holistic metrics for food and agricultural systems performance, inclusive digital tools and transparent private sector engagement.

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