

DIGIBUILD

D2.3 Upgraded Green Sector Digital Need Analysis

**Digibuild: Building
Digitalization in the Green Sector
in Honduras and Costa Rica**



INDEX

I. Introduction.....	3
Objectives of the DigiBuild project.....	4
Key points.....	4
Analysis of Coffee and Cocoa Production.....	4
II. A glimpse into the sustainable agricultural sector in Costa Rica and Honduras.....	5
Costa Rica.....	5
Challenges.....	6
Honduras.....	7
Challenges.....	9
III. Current state of the cocoa and coffee sector in Honduras and Costa Rica.....	10
IV. Needs and Opportunities Assessment in the Green Sector: Digital Gap Analysis and Strengthening Strategies for Coffee and Cocoa Producers in Costa Rica and Honduras.....	13
4.1 Priority needs in the coffee and cocoa sector in Honduras and Costa Rica.....	14
1. Small-scale agriculture.....	14
2. Climate change	15
3. Labor and Technology.....	16
4. Internet Access and Digital Literacy.....	17
5. Limited infrastructure.....	17
6. Lack of investment	18
7. Youth participation in agriculture.....	18
8. EU guidelines.....	19
9. Inclusion of Women.....	20
Key Findings from Desk Research and Interviews.....	22
VI. Current needs of the cocoa and coffee sector in Honduras and Costa Rica.....	25
Limitations.....	27
VII. Digital Gaps.....	29
Digital Literacy.....	30
Skills and Knowledge needed by the Productive Community.....	33
VIII. Conclusions and Recommendations.....	36
IX. References.....	38



DigiBuild: Building Digitalization in the Green Sector

I. Introduction

The reduction of the digital gap in productive areas of the green sector is key for the sustainable development of Latin America. Digitalization of the green sector would help countries to improve competitiveness, employability and productivity.

DigiBuild aims to provide VETs and training providers in Costa Rica and Honduras with the capacities and skills to digitize their pedagogical approaches related to the green sector in agriculture. It will transfer the expertise of the participating EU countries -Greece, Luxembourg and Spain- to these two countries of the Latin America region, to contribute to the accomplishment of their priorities. DigiBuild has a twin goal: a) The capacity building of VETs and training providers to digital transition with a specific focus on the green sector and, b) to empower professionals in the green sector, especially women, to act as mentors in this transition.

DigiBuild will increase the capacities of VET staff, teachers and trainers toward digitalization, and it will reinforce the link between VETs and the labor market as well as the national and regional priorities. It will enhance the attractiveness of lifelong learning and it will create synergies between VETs, trainers, professionals in the green sector and public stakeholders. Last, but not least, it will raise awareness on the twin transition, and it will create a bridge to women's equal participation in the labor market.

To achieve this objective, it is essential to carry out a study that includes the various actors involved in the areas of implementation. The project has decided to focus specifically -but not exclusively- on the cocoa and coffee sectors of Honduras and Costa Rica. This approach ensures that the particularities and challenges of each sector are duly considered, facilitating a comprehensive understanding of the context in which the analysis will be developed.

In this sense, this document focuses on identifying and prioritizing the specific needs of each sector, in order to achieve successful results in future project activities and results. These priorities have been established and analyzed based on contributions from a group of representatives from each sector, ensuring a collaborative and informed perspective that supports informed decision making. Thus, this document is based on the previous results of the project: “[Green sector current analysis](#)” and “[Report on experts' groups result](#)”. Both results are available on the DigiBuild project website: <https://digi-build.eu/>.

Objectives of the DigiBuild project

Digibuild aims to provide VETs and training providers in Costa Rica and Honduras the capabilities and skills to digitize their pedagogical approaches, mostly related to the green sector, based on the European partners' expertise, global standards and market-leading technology.

To build an attractive tool, related to the needs of the labor market VET sector by enabling VET providers and trainers to offer digital skills and develop concrete links with the labor market and the field of the green economy.

To produce technologically trained professionals in the green sector and agriculture. This will enable them to use technology and access services, information, investment and trade.

The analysis is based on a comprehensive study of the agricultural sector of Costa Rica and Honduras, in which we identify the opportunity to focus a project on cocoa and coffee crops. The importance of implementing digital technologies in agriculture is highlighted to increase productivity and environmental efficiency, as well as to promote digital transformation in agriculture. This study is based on the research of the digital needs of the green sector presented by Think Corp, Novel Group, EUROTraining, IICA, Defoin, UCENFOTEC and FHIA.

Key points

- Technological Implementation in Agribusiness.
- Digital technologies have become essential in the design, production and marketing of goods, improving productivity and adding value in companies.
- In the agricultural sector, technologies such as the use of remote sensors via satellite, artificial intelligence and big data are positively impacting production models.
- Challenges for digitalization in agriculture include infrastructure, financing, digital skills, regulations and collaboration between various actors.

Analysis of Coffee and Cocoa Production

This document provides relevant information on cocoa production in Honduras and Costa Rica. It highlights that cocoa is an important productive activity for small mostly organic producers in Honduras. In Costa Rica, it is mentioned that cocoa production is concentrated in certain regions and organic production is promoted. Both countries face challenges in terms of access to financing, technical assistance and technology to improve cocoa productivity and quality.

The promotion of organic cocoa production in several regions of Honduras stands out, with the participation of organizations and cooperatives organic cocoa is almost 100% of its export to the

EU. Cocoa exports have experienced significant growth in Honduras, with a focus on product quality and sustainability.

In Costa Rica, cocoa production is concentrated in certain regions, with an emphasis on product quality and traceability. Organic production is promoted and the participation of producers in certification and quality programs is encouraged. This country exports cocoa to international markets, with a focus on sustainability and product quality.

Regarding the coffee sector, it stands out that it is of great importance for the economy of Honduras, with a high number of families dedicated to its production. In Costa Rica, coffee production is concentrated in certain regions and the adoption of sustainable practices is promoted. Both countries face challenges in terms of access to financing, technical assistance and technology to improve coffee productivity and quality.

Coffee is fundamental to the economy of both countries, with a high number of families dedicated to its production in various regions. It is important to strengthen the coffee value chain, with emphasis on product quality and the sustainability of agricultural practices. Honduras faces challenges such as low investment in technology, lack of access to financing and the need to renew coffee plantations to improve productivity.

Both countries, Honduras and Costa Rica, face similar challenges in the coffee and cocoa sectors, such as diseases, aging of plantations and slow adoption of technology. The need for socio-environmental certifications, access to financing and technical assistance to improve productivity and product quality is highlighted. Lately digitalization and traceability are key aspects to comply with international market regulations and demands, especially with the EU deforestation-free product regulation which is a major market for both crops and countries.

II. A glimpse into the sustainable agricultural sector in Costa Rica and Honduras

Costa Rica

Costa Rica's agricultural sector, often referred to as the "green sector," is a vital part of the country's economy and identity. It encompasses a diverse range of activities, from traditional crops like coffee and bananas to more modern ventures like organic farming and sustainable tourism. Here's a brief overview:

Diversity: Costa Rica boasts a wide variety of agricultural products, including fruits, vegetables, coffee, cacao, sugar cane, and livestock. This diversity contributes to food security and export earnings.

Sustainability: The country has a strong focus on sustainable agriculture practices, with a growing emphasis on organic farming, agroforestry, and conservation. This commitment is reflected in its national policies and initiatives.

Export-Oriented: A significant portion of Costa Rica's agricultural production is exported, generating substantial foreign exchange. Key export products include bananas, coffee, pineapple, and beef.

Small-Scale Farming: Most Costa Rican farms are small-scale, often family-owned and operated. This structure contributes to rural livelihoods and community development.

Tourism Integration: Agriculture is increasingly integrated with tourism, offering visitors opportunities to experience farm life, taste local products, and learn about sustainable practices.

It is indicated that the agricultural sector is of great economic and social relevance, which is reflected in variables such as the Gross Domestic Product (GDP), exports (source of foreign currency), contribution to employment, improvement of the socioeconomic conditions of the rural population, food production, among others. According to data from the Central Bank of Costa Rica, the participation of expanded agriculture in the GDP was 9.6% in 2021, of this percentage 4.5% corresponds to the primary sector and 5.1% to agroindustry. In relation to the agricultural value added, 69% corresponds to agricultural activities, 21% to livestock activity and the remaining 10% is made up of support activities (6%), forestry and timber extraction (3%) and fishing and aquaculture (1%) (Public Policy for the Costa Rican Agricultural Sector, 2023).

The main agro-industrial crops of Costa Rica are coffee, oil palm and sugar cane. And the fresh fruits business network: Banana, pineapple and melon. In the case of basic grains, Costa Rica produces mainly rice, beans and corn, and in the case of vegetables: potatoes and onions.

In Costa Rica the agricultural sector is second place as a job generator with a total of 238,227 employed people (11.7% of the total employed population). The group of people employed in the agricultural field is distributed as follows according to gender: 87.7% male population and 12.3% female population.

Challenges

Costa Rican producers face the following challenges to achieve sustainable production: the need to increase efficiency and productivity, the lack of access to economic resources that allow them to implement better sustainable practices (non-use of synthetic agrochemicals, efficient management of water and energy, reducing environmental impact, measures against climate change) and the adoption of new technologies and training in all these aspects mentioned above. An understanding not only of the crop but the business that allows to open new markets where

"being sustainable" is also profitable. The following factors are also generally considered as challenges in the agro-food industry.

Climate Change: Costa Rica's agricultural sector faces challenges from climate change, including more frequent droughts, floods, and extreme weather events.

Market Volatility: Global market fluctuations and competition can impact the prices of agricultural products, affecting farmers' incomes.

Labor Shortages: The aging population and migration to urban areas have led to labor shortages in some agricultural sectors.

Technological Gap: While Costa Rica has made progress in adopting technology, there's still a need to bridge the gap between traditional farming practices and modern innovations.

Overall, Costa Rica's agricultural sector is characterized by its diversity, sustainability focus, and its relevance to the national economy. While facing challenges, the country is actively working to promote innovation, resilience, and a more equitable and sustainable future for its farmers and rural communities.

Honduras

Honduras' agricultural sector is a cornerstone of the country's economy and social fabric. It provides livelihoods for millions of Hondurans, contributes significantly to national food security, and generates substantial export earnings. However, the sector faces a complex set of challenges, ranging from climate change to market volatility, that require innovative solutions and strategic investments to ensure its long-term sustainability and prosperity. Here's a closer look at the key features and challenges of Honduras' agricultural sector:

Diversity: Honduras boasts a wide array of agricultural products, including bananas, coffee, palm oil, melons, and livestock. This diversity contributes to food security and export earnings.

Small-Scale Farming: Most Honduran farms are small-scale, often family-owned and operated, all of them contribute greatly to rural livelihoods and community development.

Export-Oriented: A significant portion of Honduras' agricultural production is exported, generating substantial foreign exchange. Key export products include bananas, melon, coffee, and shrimp.

Potential for Growth: Although 2/3 of Honduras is forestly oriented it does possess fertile land, a favorable climate and a skilled workforce, offering significant potential for agricultural growth and diversification.

Focus on Basic Grains: The production of basic grains like corn, beans, and rice is crucial for domestic food security, though Honduras still relies heavily on imports for these commodities.

The population is 9.6 million Hondurans, with an annual growth rate of 1.54% and a rural population of 44%, with agriculture being one of the main sources of employment. The female population is 52%. 37% of households are headed by women. About 135 thousand women are dedicated to the agricultural sector. 30% of the population is under 14 years old. Above 35% of employment comes from agricultural, livestock, forestry and aquaculture activities (INE,2022).

The agri-food sector of Honduras, which encompasses productive and service activities, agriculture, livestock, hunting, forestry and fishing, has a strong impact on food security and in the country's economy. The contribution of the sector to economic activity was in 2019 at an average of 13% to real GDP, with a participation of over 35% in exports and sources of employment (IDB, 2019). According to the Central Bank of Honduras, the agri-food sector represented 12.6% of real GDP by 2022 (BCH, 2023). In the composition of the Economically Active Population (PEA) of the country, that of the agri-food sector constitutes 19.6%, the majority settled in rural areas.

Honduran agricultural production maintains low average yields that can increase. Agriculture, livestock, forestry and fishing registered a decrease of 1.1% due to various technical, climatic, financial factors, among others (as of November 2022). Honduras has a high development potential with favorable agroecological factors and advantageous location regarding the largest markets for agri-food products. The sector requires a policy public and institutional framework that guides sectoral development that must be sustainable and inclusive.

Banana production had a positive performance, due to the harvest recovered by the renovated area on the farms of transnational companies. In addition, production increased in sugar cane, pineapple and melon crops. Also, poultry farming grew in the production of breeding birds with better performance, both in terms of the number and weight of the birds, destined to the food industry. Fishing maintained the upward trend due to shrimp production cultivated.

Honduras has managed to position itself as an important exporter of coffee, bananas, melons, shrimp, oriental vegetables, among others. Regarding exports in agricultural and livestock matters forests, in 2021 they were USD 470,522.4 million, while, in 2022, the figure is USD 730,190.1 million. The increase is due to different products from the primary sector of the economy, such as: melons, watermelons, bananas, among others. Within the manufacturing industry, agro-industrial products, such as gold coffee and crude palm oil, represented 28.9 and 13.5%, respectively (BCH, 2022).

Although Honduras has positioned itself as an exporter of agricultural products, imports of processed foods have increased as well. Actions are required to reduce the dependence on imports for food supply, paying attention to issues of competitiveness and productivity associated

with agro-industrial growth. Likewise, it requires a review of trade agreements, such as the Free Trade Agreement between the Dominican Republic-Central America and the United States of America (Dominican Republic-Central American Free Trade Agreement, DR-CAFTA, for its acronym in English), which guides the behavior of production and agricultural products market and the new trade opening with the Republic of China.

Challenges

The information presented below describes the needs emphasized in reports of the project: “[Green sector current analysis](#)” and “[Report on experts’ groups result](#)”. Both results are available on the DigiBuild project website: <https://digi-build.eu/>. And an additional survey that underscores the needs identified by stakeholders in the green, cocoa, and coffee sectors of Honduras and Costa Rica.

This report provided a current overview of the challenges that the country presents to achieve sustainable production of cocoa and coffee. Among the challenges that stand out in both the coffee and cocoa sectors, climate change is one of the most significant. Today, producers are unaware or find it very expensive to invest in the practices necessary to adapt to climate changes. This directly affects productivity, and the cocoa and coffee community report low productivity per hectare. On the other hand, the high costs of the inputs necessary to apply on the farms and the costs of construction materials for infrastructure make it difficult for the producer to make sustainable investments. Finally, the labor shortage has had a huge impact, representing considerable losses in productive areas. It is considered that internal and external migration has been a determining factor so young people as adults do not have greater interest in participating in labor related activities. In the coffee sector, most farms in the country are aging, a situation that is alarming due to the lack of attention and the decline in productivity reported in recent years. In summary, the current challenges in the agro-industrial chain are detailed:

Climate Change: Honduras' agricultural sector faces significant challenges due to the climate change, including more frequent droughts, floods, and extreme weather events which impact yields and livelihoods.

Limited Infrastructure: Inadequate infrastructure, including roads, irrigation systems, and storage facilities, hinders efficient production, transportation, and marketing of agricultural products.

Lack of Investment: Insufficient investment in research, technology, and extension services limits productivity and hinders the adoption of sustainable practices.

Market Volatility: Global market fluctuations and competition can impact the prices of agricultural products, affecting farmers' incomes and making it difficult to plan for the future.

Land Tenure Issues: Land tenure insecurity and access to land remain significant challenges for many small-scale farmers, hindering their ability to invest and improve their livelihoods.

Honduras agricultural activities are a vital contributor to the country's economy and food security. While facing significant challenges, the sector holds immense potential for growth and development. Addressing issues related to climate change, infrastructure, investment, and land tenure will be crucial for unlocking this potential and creating a more sustainable and prosperous future for Honduran farmers and rural communities.

III. Current state of the cocoa and coffee sector in Honduras and Costa Rica

With the general information provided by the Latin American partners of the DigiBuild project, a comparison is made below with current data between Costa Rica and Honduras in the areas of cocoa and coffee, the specific sectors within the green sector that the DigiBuild project aims to address.

Regarding the coffee sector, Costa Rica produced 550.9 TM of coffee in 2021. The green sector is the second largest employer and has the largest poverty index in the country. A gender description in agriculture points out that there is a large gap where women are in every way underrepresented in agriculture. In the coffee sector in particular just two proposals directed exclusively to women have been listed in the summary. Coffee plantations are declining, and the generational overlap is small. Digital applications are present in the coffee sector and IA has been used to estimate plant populations and shade. The use of GPS and drone technology are other examples of digitalization in this sector in Costa Rica.

In the case of cacao production, men dominate the sector by 79%. One way to overcome this gap could result from strengthening leadership and training of women. In this area women are perceptually better represented in Honduras than in Costa Rica by 23%. The main causes involved in the intensification of gender inequalities in the agricultural sector are similar between both countries, among them are:

- Institutional management
- Administrative management
- Marketing and markets
- Access to land
- Access to financing
- Building Capacity
- Technical assistance
- Technology gap
- Climate variability

In Costa Rica the digital gap analysis done by the partners reveals three different stages or levels and it also states the possible general but also the socio-economic factors that encapsulate them. And these findings are perfectly applicable to Honduras. The first level is knowing whether the study unit - people, households, companies, territories or countries - has or does not have access to a certain technology or a set of technologies. The second level refers to its level of use; However, this measurement is more complex since a measurement of the capacity to use the technology must be defined. As a third level, the quality of the technology is considered; that is, to analyze the wide range of mobile phones, computers, tablets or other types of devices with very different capabilities (Universidad de Costa Rica, 2023).

Costa Rica exported 79,200 TM and 800 TM whereas Honduras exported 315,490 TM and 1,332 TM of coffee and cacao beans, respectively, in 2022. Both countries have large and well represented family groups of farmers devoted to their production. Both countries are very much alike in terms of farming, organization, social structure, markets and needs, and in both countries, women are underrepresented in virtually every aspect of the value chain. But what is more important: for both countries and both products the UE market ranges from very important to indispensable.

Likewise, similarities have been identified in the coffee sector between Honduras and Costa Rica referring to the main challenges of the sector:

- Significant disease impact.
- High impact of low prices.
- Subsistence that relays on monoculture areas.
- Aging of coffee plantations (more than fifty years old).
- Low percentage of generational integration of young people-older adults.
- Slow adoption of cutting-edge technology and tools of the fourth industrial revolution.
- Reduced renovation of a coffee park, a higher percentage of new varieties, more resistant to pests and diseases, which help with climate adaptation and resilience.
- Increasingly prolonged cyclical low-price crises.

In the case of Costa Rica, the country has a high penetration of ICTs compared to other countries in the international system. For the year 2019, Costa Rica was positioned as the third country on the continent with the highest internet access in homes (86%), also in mobile telephony, Costa Rica was the country with the highest penetration in the world (169 lines per 100 people), surpassing technological powers such as Singapore, Finland and South Korea. Despite the previous data, the country still faces the great challenge of reducing the digital gap between socioeconomic groups (Vargas, 2022).

As commented in the UPEG (2020), after the pandemic caused by Covid-19, it was demonstrated that good connectivity is a fundamental right for all people. For this reason, specific public and private actions are required to improve internet access for many people who, due to their socioeconomic level and/or geographic location, do not have this possibility.

Honduras has a recognizable base of high-quality genetic materials. This work of research and promotion of good materials has been promoted by the Fundación Hondureña de Investigación Agrícola (FHIA), being a reference for the entire region. The cocoa value chain in Honduras has a system of technical assistance services for the cultivation of cocoa in agroforestry systems, operating in coordination between the bidders and demanders, through the National Technical Assistance System SINATEC. The strengthening of organizations and cooperatives has been decisive for the increase in production of quality cocoa.

Cocoa in Honduras represents a very important productive activity for small producers. Cocoa production is concentrated in the northwest, Atlantic coast and Olancho, totaling approximately 4,468 ha. in traditional agroforestry systems, established by some 3,469 producers. In recent years there has been promotion of production of organic cocoa and currently there are seven producer organizations that are starting with this type of production in the departments of Gracias a Dios, Olancho, Colón, Atlántida, Cortés, Yoro, Santa Bárbara and Olancho, with approximately 1,600 hectares of cocoa.

During the period 2011-2015, the total value of cocoa exports registers increased with an average annual growth rate of 46%. In 2013, the exports practically doubled compared to 2012, reaching USD 554,706.12. However, in 2015, the value of cocoa bean exports reached USD 1,301,439.96. This export dynamic is due to the combined growth that exports to Central America and exports to Europe have suffered, which are the ones that register higher profitability.

The cocoa value chain in Honduras is made up of input suppliers, producers, collectors, marketers and buyers - some located in the area of influence of production and others outside of it - as evidenced in the supply chain value map that arise from different institutions, organizations, programs and support projects, both for the provision of services as well as for technical assistance and training.

Coffee has top importance to the Honduran economy; more than 102 thousand families are dedicated to their production in 15 of the 18 departments of the country, representing 30% of agricultural GDP and 5% of GDP total. This agricultural sector generates more jobs than any as well as key foreign exchange. Honduras is currently the fifth largest producer of grain in the world.

Efforts to improve the functioning of the coffee value chain are carried out from several public and private institutions with a common need: to have information that allows them to evaluate correctly the dynamics of this productive sector, to design and implement public policies for collective benefit. In 2016 IHCAFE registered a total of 102,047 producers of which 18% are women. The total of the cultivated area is around 291,650 ha with average yields of 1.8 Tn/ha. 60% of the farms are located between 900-1300 meters above sea level, 30% at more than 1300 meters above sea level and 10% less than 900 meters above sea level. The coffee is grown under an agroforestry system, with 95% of the area planted with shade from different forestry species.

IV. Needs and Opportunities Assessment in the Green Sector: Digital Gap Analysis and Strengthening Strategies for Coffee and Cocoa Producers in Costa Rica and Honduras

The information obtained through the research of the project partners and the realization of interviews with green sector professionals in Costa Rica and Honduras -information that can be found in the previous results of the DigiBuild project: “Green sector current analysis” and “Report on experts’ groups result”- was amplified with a new research that sought to deepen the topics highlighted in the previous activities. Then, all information was reviewed to present the findings relevant to the task: **identifying the digital gaps and subsequent needs of the green sector, particularly those of coffee and cacao producers in Costa Rica and Honduras.** As a result of all these activities, we can consider the following objectives:

1. Identification of Specific Needs:

- Facilitate discussion sessions to identify the specific needs and challenges faced by cocoa and coffee producers in both regions.

2. Strengthening Networks:

- Promote the establishment of collaborative networks between farmers, cooperatives, academic institutions and non-governmental organizations to share knowledge and experiences.

3. Fostering Innovation:

- Stimulate the exchange of ideas on innovative and sustainable agricultural practices that can improve the productivity and quality of cocoa and coffee.

4. Capacity Building:

- Design training workshops in critical areas such as business management, cultivation techniques, post-harvest handling and certifications, to strengthen the capacities of sector stakeholders.

5. Generation of Reports and Resources:

- Document the findings and recommendations arising from the workshops in a report to be used for future project management.

The participants in the interviews and workshops were classified as having the following leadership types:

- Green Sector Trainers
- Public Sector Stakeholders
- Green Sector Professionals
- Green Sector Labour Market Representatives

4.1 Priority needs in the coffee and cocoa sector in Honduras and Costa Rica

The agricultural sector in Honduras and Costa Rica is vital to the countries' economies and social structures, providing livelihoods to millions, ensuring food security, and generating substantial export revenue. However, it faces numerous challenges, such as climate change and market volatility, requiring innovative solutions and strategic investments for long-term sustainability and growth.

During the focus group meetings, several critical challenges for the cocoa and coffee sectors, as well as for the green sector in general, in Honduras and Costa Rica were identified. These include difficulties in accessing quality training, identified gender limitations, a lack of supporting associations, a lack of technology and resources for innovative practices, and the need to enhance sustainability and productivity in value chains. (Marketing and Package for example). Additionally, addressing the digital knowledge gap and adapting educational methods to the specific needs of cocoa and coffee producers were highlighted as essential.

During the process of identification and analysis of the needs and challenges of both sectors, the research team determined the importance of carrying out a second contact with the actors to implement a survey to determine specific areas of action for each of the needs. To do this, 41 actors from the green sector in Honduras and Costa Rica were contacted to make specific considerations¹ in the challenges presented below:

1. Small-scale agriculture

Most farms in Honduras and Costa Rica are small, family-operated enterprises that play a crucial role in supporting rural livelihoods and fostering community development. However, small-scale producers face significant challenges that hinder their growth and sustainability. A notable limiting factor is the lack of generational integration and organizational skills within these farming operations, which is exacerbated by the exodus to urban centers or abroad in search of better opportunities. This trend leads to a shortage of qualified labor, resulting in production inefficiencies and heightened labor costs.

¹ Note: such considerations are not in order of importance.

Additionally, the small scale of these farms often translates into limited access to advanced technologies and modern post-harvest processing techniques, which are essential for enhancing the quality and marketability of their products. Compliance with stringent European standards regarding deforestation and environmental sustainability poses further challenges for small producers who often lack the necessary resources and technical know-how to navigate complex supply chains.

In both the coffee and cocoa sectors, it is essential for small producers to organize themselves into cooperatives or associations. By joining forces, they can negotiate better prices for their products, access financing, training, and technology more easily. Additionally, organization allows them to develop leadership, management, and communication skills, which strengthens their position in the market and helps them face the challenges of the sector more effectively.

To address these issues, there is a pressing need for technological innovations that minimize labor dependency and optimize production processes. Collaborative efforts among producers, policymakers, and stakeholders are vital to create an enabling environment that supports the longevity and competitiveness of small-scale cocoa and coffee production in these regions.

In this work area, it is possible to identify some outstanding actions to consider in order to train producers to better take advantage of small-scale production. In order of importance these are: Pest and disease management, Good agricultural practices and post-harvest processing. There are some examples in Asia where small scale producers are being empowered as a group with a Digital tool such as <https://digitalgreen.org/>.

2. Climate change

The agricultural sector in Honduras and Costa Rica has been increasingly affected by climate change, such as frequent droughts, floods, and extreme weather events that severely impact crop yields and jeopardize the livelihoods of farmers. These climatic challenges demand the adoption of technological solutions, such as irrigation systems, to ensure sustainable production. However, the implementation of such technologies is frequently afflicted by a lack of access to sound guidance and the high costs associated with necessary materials. Additionally, many small-scale producers struggle with poor input management and ineffective administration, primarily due to insufficient education and training in agricultural best practices. This mismanagement often results in critical shortages of inputs when they are most needed, further exacerbating the negative impacts of climate change.

To address these challenges, focus group discussions have identified the establishment of community-based, climate-resilient farming cooperatives as a viable solution. These cooperatives can facilitate the shared use of irrigation systems and storage facilities, optimizing resource use and enhancing productivity through collaboration. Participants in these discussions believe that by fostering associations and collective action, such initiatives can be successfully implemented, leading to improved resilience against the adverse effects of climate change. Building such

cooperative frameworks not only promotes sustainable farming practices but also strengthens community ties and enhances the overall stability of the agricultural sector in the face of environmental uncertainty.

It is notable that for the focus group it is necessary to implement actions so producers can carry out actions to monitor and mitigate climate change. Training cacao and coffee producers in climate change mitigation and sustainable practices is crucial because these crops are highly vulnerable to changing environmental conditions, such as temperature fluctuations, droughts, and irregular rainfall. **By educating farmers on sustainable farming practices, such as agroforestry, soil management, and water conservation techniques, they can reduce the negative impacts of climate change on their production.** This knowledge not only helps improve the resilience of their crops, ensuring long-term productivity, but also contributes to global efforts to reduce greenhouse gas emissions. Empowering producers with climate-smart strategies supports both environmental sustainability and their economic well-being. These actions also suggest aiming to promote the culture of soil management, water harvesting (soil and water conservation) and carrying out climate-smart agriculture.

3. Labor and Technology

The focus group underscored the critical need for the implementation of advanced technologies to reduce dependency on labor in the cocoa and coffee sectors. However, the widespread adoption of such technologies is often dismissed by financing challenges. Many small producers lack access to credit and financial resources necessary to invest in modern equipment and tools, this inhibits their ability to enhance productivity and efficiency.

According to the recent survey conducted, the majority of participants agree that to improve the workforce in the cocoa and coffee sectors, **it is essential to provide leadership training for producers, enhance labor practices, and implement awareness-raising actions to promote sustainable agriculture.** Promoting sustainable agriculture is believed to improve the workforce in sectors like cocoa and coffee for several reasons. First, sustainable practices often lead to more efficient and resilient farming methods, which can reduce labor-intensive tasks and make the work environment healthier and safer for workers. By focusing on long-term environmental and economic viability, farmers are encouraged to adopt practices that not only improve crop yields but also ensure the well-being of the workers. Additionally, sustainability initiatives often come with training programs that build skills, enhance productivity, and offer better work conditions. This can attract and retain a skilled workforce, as workers are more likely to stay in jobs that provide fair wages, stability, and opportunities for growth. Lastly, promoting sustainability helps address broader social and environmental challenges, which can create a more positive and supportive community around agriculture, further enhancing labor satisfaction and retention.

4. Internet Access and Digital Literacy

To advance in both the cocoa and coffee sectors digital connectivity is required if new technology is to be adopted. Prioritizing online education initiatives is crucial to improving digital literacy among farmers and rural communities, enabling them to leverage technology effectively in their agricultural practices.

Participants in the discussions proposed that any investment in digital platforms must include a comprehensive plan to deliver internet access to rural areas. A digital platform reliant on internet connectivity will not serve its purpose if the necessary infrastructure is lacking. Furthermore, the issue of digital access extends beyond mere connectivity; it is imperative to provide education on how to effectively use the hardware and software associated with these platforms before their implementation. This dual approach—improving internet access while simultaneously enhancing digital literacy—will empower small-scale producers to utilize technology for better crop management, market access, and overall productivity. By fostering an environment where both connectivity and education are prioritized, stakeholders can create a more equitable and sustainable agricultural landscape that benefits the cocoa and coffee sectors in these regions.

According to the surveys conducted, participants suggest that training in the use of digital tools for self-directed learning is an option to overcome the digital barrier. They also propose leveraging available digital resources such as applications, artificial intelligence, e-commerce, and digital marketing.

5. Limited infrastructure

The inadequacy of infrastructure, encompassing roads, irrigation systems, and storage and fermentation facilities, significantly hinders the efficient production, transportation, and marketing of agricultural products in the cocoa and coffee sectors. Poorly maintained rural roads and highways create logistical challenges, obstructing access for both producers and buyers, which can lead to delays, increased costs, and spoilage of perishable goods.

There is an urgent need for targeted government action to address these infrastructure deficits. Investing in the repair and enhancement of rural routes and highways is required to improve accessibility for farmers, enabling them to transport their products to markets more cost effectively. Additionally, modernizing irrigation systems is mandatory to optimize agricultural practices, particularly in face of climate change.

Moreover, establishing adequate storage and fermenting facilities can help minimize post-harvest losses and ensure that producers can maintain product quality until they reach the market. By prioritizing infrastructure development, stakeholders can create a more conducive environment for agricultural growth, enhance the competitiveness of cocoa and coffee producers, and foster overall economic development in rural regions.

To overcome the infrastructure challenges in the cacao and coffee production sectors, it is essential to provide training in project management and foster a deep understanding of investment and financing. By equipping individuals with these skills, they can effectively plan, execute, and manage infrastructure projects. This includes identifying funding sources, developing detailed project plans, and ensuring the efficient allocation of resources. Moreover, knowledge of investment and financing principles allows for the development of sustainable business models that can attract investors and support long-term infrastructure development in these sectors.

6. Lack of investment

Insufficient investment in research, technology, and extension services significantly constrains productivity and reduces the adoption of sustainable agricultural practices within the cocoa and coffee sectors. The lack of funding for research limits innovation and the development of new techniques that could optimize crop yields and enhance resilience to climate challenges. Furthermore, without adequate investment in technology transfer, farmers may struggle to implement good agricultural practices that are essential for long-term sustainability and economic viability.

In addressing these investment challenges, focus group participants highlighted the potential of cooperative associations to facilitate funding opportunities. **By establishing cooperative structures, producers can create a collective investment fund supported by the banking system.** This approach allows small-scale farmers to access financial resources that may not be available to them individually, thus empowering them to invest in necessary technologies and practices collaboratively.

This cooperative model not only enhances the financial capacity of farmers but also fosters community solidarity and shared knowledge. By working together, producers can leverage their collective strength to negotiate better market access, share resources, and ultimately drive sustainable development in the cocoa and coffee sectors. Encouraging investments through cooperatives can catalyze a significant shift towards more resilient and productive agricultural practices, benefiting both the farmers and the broader economy.

To enhance investment in the cocoa and coffee sectors, it is crucial to provide training in developing investment proposals, financing strategies, financial management, and analysis of the feasibility of accessing financial products. By equipping producers with these skills, they can create more compelling business plans, secure necessary funding, and effectively manage their finances. This empowerment enables producers to make informed investment decisions, improve the sustainability of their operations, and ultimately increase their incomes.

7. Youth participation in agriculture

There is a burgeoning interest among young people in agricultural work, yet this potential is often undermined by a declining enthusiasm for traditional farming practices. To effectively

engage the youth, it is necessary to implement impactful educational initiatives within schools and communities. Incorporating topics such as reforestation, climate change, and forest conservation into academic curricula can foster a deeper understanding of sustainable agricultural practices and their importance to the environment.

To address the challenge of youth involvement and generational integration in the cocoa and coffee sectors, participants interviewed highlighted the importance of providing youth with training in entrepreneurship and technological innovation programs. Additionally, implementing new business models in cultivation and fostering generational integration, rather than a generational shift, is crucial. These approaches can empower young people to become active participants in the industry, bringing fresh perspectives and innovative ideas while preserving the knowledge and experience of older generations.

Many participants noted that a significant number of young individuals in rural villages have become disenchanted with agriculture, often turning to alternative activities when provided with internet access. This shift in interest highlights the need for innovative approaches to make agriculture more appealing and relevant to the younger generation.

To address this challenge, participants proposed the development of an agricultural entrepreneurship program tailored to the interests and aspirations of young people. Such a program could leverage new platforms and technologies to introduce modern farming practices, promote sustainable agriculture, and encourage entrepreneurial thinking. By emphasizing the potential for innovation and economic opportunity within the agricultural sector, these initiatives can help to revitalize youth interest in agriculture and empower the next generation of farmers.

Furthermore, fostering partnerships between educational institutions, local governments, and agricultural organizations can enhance outreach and provide mentorship opportunities. By creating a supportive ecosystem that values youth participation in agriculture, communities can cultivate a new wave of engaged, knowledgeable, and passionate young farmers who are equipped to address the challenges facing the cocoa and coffee sectors in Honduras and Costa Rica.

8. EU guidelines

Compliance with EU deforestation standards presents a significant challenge for both coffee and cocoa smallholders in Honduras and Costa Rica. However, for the cocoa sector, this challenge is particularly acute due to its heavy reliance on the European market. The demand for deforestation-free certified products is much more pronounced in the cocoa sector, forcing producers to rapidly adapt to new requirements and invest in sustainable practices. Here is where a digital tool could really have a significant impact.

Additionally, the complexities involved in obtaining certifications create barriers that can hinder market access for smallholder farmers. This situation is often compounded by their reliance on intermediaries, who may not prioritize transparency or sustainability in the supply chain.

As a potential solution, there is a growing discussion around diversifying market opportunities by identifying alternative markets, such as China and other Asian countries, which currently do not impose the same environmental standards. By exploring these alternative markets, producers may find avenues for growth and greater economic resilience. However, such a shift would require time and tailored strategies that account for different market dynamics, consumer preferences, and quality expectations.

To effectively navigate these challenges, it is essential to bolster digital support systems for small producers, including access to apps and training on sustainable practices and digital resources for securing ge positioning of farms, guaranteeing traceability of production and gaining certification approved by the EU. Furthermore, encouraging collaboration among farmers and establishing cooperatives could enhance collective bargaining power and reduce dependency on intermediaries. By fostering an environment that prioritizes sustainable practices while adapting to market demands, producers in Honduras and Costa Rica can improve their competitive positioning while contributing to responsible agricultural practices.

In conclusion, according to the results presented in the interviews, the actors express that it is necessary to promote the required certifications, quality regulations and fair trade. Furthermore, it is suggested that a mass exposure of the European Union guidelines is necessary, since there is a large number of people in both sectors who are not aware of the new regulations. To face this challenge, it is necessary to promote the guidelines as well as carry out an analysis of the environmental impact and identify other markets that are not from the EU.

9. Inclusion of Women

Creating inclusive spaces for female participation in agricultural production processes is essential for fostering gender equity and enhancing the overall sustainability and generational integration of the cocoa and coffee industries in Honduras and Costa Rica. Participants emphasized the importance of integrating moral and civic education to highlight the critical role women play in society and the economy. It is vital that education is recognized as a priority for women, not only for their personal and professional development but also for the well-being of their families and communities.

The underrepresentation of women in agriculture is not merely an academic issue; it reflects deeper societal norms and family dynamics that often restrict women's access to resources, training, and decision-making roles within agricultural enterprises. Addressing these barriers requires a multi-faceted approach that includes both educational initiatives and community engagement.

Promoting awareness about the value of women's contributions to agriculture is crucial. By fostering an environment that supports women's involvement and leadership, agricultural communities can leverage their skills and knowledge to improve production outcomes and drive innovation. Initiatives such as women-focused training programs, access to financing, and mentorship opportunities can empower women to take on active roles in the cocoa and coffee supply chains.

Furthermore, collaborating with local organizations and stakeholders to advocate for women's rights and equitable access to resources can lead to transformative changes. By prioritizing female participation and leadership in agricultural practices, these communities can enhance not only their economic resilience but also promote social equity, thereby enriching the fabric of rural life in Honduras and Costa Rica.

10. Low productivity

Productivity issues significantly impact national production resulting in lower overall yields and diminished economic returns for farmers. Many smallholder producers face challenges such as aging plantations, inadequate agricultural practices, and limited access to modern technologies, all of which contribute to suboptimal productivity levels. These factors not only reduce the quantity of crops produced but also affect the quality, which is crucial for maintaining competitiveness in international markets.

Moreover, low productivity can have far-reaching implications for national economies, particularly in rural areas where the agricultural sector is a primary source of livelihood. As farmers struggle to achieve efficient production, the economic viability of their operations diminishes, leading to increased poverty and migration to urban areas in search of better opportunities.

To address these productivity challenges, it is essential for stakeholders to implement comprehensive strategies that include training programs aimed at improving agricultural techniques, investments in research and development for crop improvement, and access to financing for modern farming equipment. By enhancing productivity, the cocoa and coffee sectors can not only improve the livelihoods of farmers but also boost national production levels, fostering economic stability and growth in both Honduras and Costa Rica.

Many smallholder farmers require tailored guidance that encompasses sustainable farming practices, pest management, and post-harvest processing techniques. However, the current level of technical support frequently falls short, leaving producers without the comprehensive resources they need to enhance their productivity and competitiveness in the global market. Moreover, the availability of technical assistance is often uneven, with rural areas facing greater challenges in accessing reliable support services. This lack of adequate assistance not only inhibits the potential for individual producers to improve their practices but also affects the overall growth and sustainability of the sector.

To address this gap, it is imperative for governments, non-governmental organizations, and private sector partners to collaborate in expanding their technical assistance programs. Strategies could include increasing funding for extension services, creating training workshops tailored to the specific challenges of cocoa and coffee production, and fostering partnerships with agricultural experts to ensure that knowledge transfer is both effective and accessible. By strengthening technical assistance frameworks, stakeholders can empower producers to adopt

innovative practices that enhance productivity, sustainability, and resilience in the face of evolving market demands.

Key Findings from Desk Research and Interviews

In addition to the focus groups in Honduras and Costa Rica, interviews with green sector professionals in both countries and two research in all countries of the consortium were also carried out beforehand. Some key aspects of the information gathered in these interviews and in the research are highlighted below to help contextualize what was found in the focus groups.

- **High Presence of Small Producers:** The cocoa and coffee sectors in Honduras and Costa Rica are characterized by a significant presence of small producers, many of whom face substantial challenges due to limited resources and technology. These smallholder farmers typically lack access to modern agricultural tools, advanced farming techniques, and financial support, which hinders their productivity and overall competitiveness in the market. As a result, their ability to adapt to changing market conditions and consumer demands is severely restricted. Additionally, limited access to training and education further exacerbates these challenges, leaving many producers unable to implement sustainable agricultural practices or optimize their yields.

To address these issues, it is essential to invest in targeted support programs that enhance access to resources, facilitate technology transfer, and provide training in best agricultural practices. Strengthening cooperative models can also empower small producers, enabling them to pool resources for purchasing technology and accessing markets more effectively. By focusing on the specific needs of small producers, the cocoa and coffee industries can foster a more resilient and sustainable agricultural landscape that benefits both the producers and the broader economy.

- **Disparities:** Exhibit significant disparities among producers, particularly concerning the access to resources, education, and technology. Many smallholders farmers struggle with limited financial capital, which restricts their ability to invest in necessary equipment and technology that could enhance productivity and sustainability. Furthermore, educational gaps often leave these producers without the knowledge required to employ innovative farming techniques or to navigate complex market conditions effectively.

This inequity not only affects individual producers but also has broader implications for the entire industry, as it hampers the potential for collective growth and sustainability. Producers with better access to resources and advanced education tend to adopt more efficient practices, leading to higher yields and improved quality, while those lacking these advantages are left at a disadvantage. To address these disparities, it is crucial for stakeholders, including government agencies, NGOs, and private sector actors, to collaborate in developing targeted interventions that promote equal access to education

and technology. Initiatives such as training programs, resource-sharing cooperatives, and investment in rural infrastructure can help bridge these gaps, fostering a more equitable and resilient cocoa and coffee production landscape that empowers all producers to succeed.

- **Digitization Efforts:** Digitization efforts of Honduras and Costa Rica are currently underway, yet there remains a critical need for greater adoption among producers to fully realize the potential benefits of these technologies. While some initiatives have introduced digital tools for tracking crop health, managing supply chains, and accessing market information, many smallholder farmers face barriers to implementation, such as limited access to the necessary technology, insufficient digital literacy, and a lack of tailored solutions that fit their specific needs.

The slow pace of digitization hampers productivity and hinders producers from competing effectively in an increasingly globalized market. Moreover, without widespread adoption, the potential advantages of enhanced data-driven decision-making, risk management, and resource optimization are not being fully leveraged.

To accelerate the adoption of digital tools, it is essential for stakeholders—including government agencies, NGOs, and the private sector—to collaborate on initiatives that promote training and education in digital skills tailored to the agricultural context. Additionally, providing affordable access to technology and ensuring that digital solutions are designed with the unique challenges of smallholders in mind will be crucial. By fostering an environment that encourages the integration of digital technologies, the sectors can enhance productivity, improve market access, and ultimately strengthen the economic resilience of cocoa and coffee producers in both countries.

- **Labor Shortage:** Both sectors are facing a significant labor shortage, which adversely affects both efficiency and productivity. As these industries are labor-intensive, the lack of available workers impacts key activities, such as planting, harvesting, and processing, ultimately leading to lower output levels. Contributing factors to this labor shortage include rural-to-urban migration, where many young individuals leave farming communities in search of better opportunities in urban areas, and an aging workforce that is less able to meet the demanding physical requirements of agricultural work.

This shortage not only reduces the immediate capacity for production but can also result in increased labor costs as farmers compete for a dwindling workforce, further straining their financial viability. Additionally, inefficiencies in operations can arise when producers are unable to acquire skilled labor, leading to suboptimal agricultural practices that diminish yield quality and sustainability.

To mitigate the impacts of labor shortages, it is crucial for stakeholders to explore innovative solutions, such as promoting mechanization where appropriate, improving labor conditions to attract and retain workers, and implementing training programs to enhance skill sets within the local workforce. Collaborating with educational institutions to provide agricultural education and encouraging youth engagement in these vital sectors could also help address labor shortages in the long term. By taking a comprehensive approach to this issue, the cocoa and coffee sectors can boost productivity and ensure a more sustainable future for producers in both countries.

- **Technology Gap:** Many smallholder farmers struggle to adopt innovative agricultural technologies that could enhance their productivity, improve crop quality, and promote sustainable practices. This financial constraint prevents them from investing in essential tools such as precision farming equipment, irrigation systems, and advanced processing technologies, which are vital for competing in an increasingly competitive global market.

Without access to modern technology, producers are often reliant on traditional methods that may not yield optimal results, limiting both efficiency and overall output. Furthermore, the technology gap exacerbates existing challenges related to sustainability, as farmers lack the resources to implement eco-friendly practices that are essential for long-term viability. Addressing this technology gap requires a multi-faceted approach involving collaboration between governments, non-governmental organizations, and the private sector. Initiatives such as microfinance programs, subsidies for technology adoption, and capacity-building workshops can provide farmers with the necessary resources and knowledge to integrate new technologies into their operations. By bridging the technology gap, the cocoa and coffee industries can improve productivity and sustainability, ultimately enhancing the livelihoods of producers and the economic health of the regions involved.

- **Agricultural Technology:** The adoption of agricultural technology is significantly limited due to funding issues and resistance to change among farmers. While modern agricultural technologies offer substantial benefits—such as increased productivity, improved crop quality, and enhanced sustainability—many producers face financial barriers that hinder their ability to invest in these essential tools. Smallholder farmers often operate with tight budgets and may prioritize immediate survival needs over long-term investments in technology, ultimately stifling innovation within the industry.

Additionally, cultural attitudes and a reluctance to shift from traditional farming practices can contribute to resistance among producers. Many farmers, steeped in generations of established methods, may be skeptical about the effectiveness of new technologies and unsure of their return on investment. This hesitation can lead to a stagnation in adopting

advancements that could significantly improve their operations and market competitiveness.

To encourage the broader adoption of agricultural technology, it is crucial for stakeholders—including government agencies, NGOs, and industry leaders—to implement targeted initiatives that address funding challenges and promote a culture of innovation. Strategies such as providing access to microloans for technology investments, organizing demonstration farms to showcase the effectiveness of new tools, and offering training sessions to build confidence in using advanced techniques can facilitate a smoother transition. By overcoming financial and cultural barriers, the cocoa and coffee sectors can harness the potential of agricultural technology to drive growth and sustainability in the region.

VI. Current needs of the cocoa and coffee sector in Honduras and Costa Rica

In both Honduras and Costa Rica, cocoa and coffee are fundamental crops that generate employment, contribute to GDP and are vital to local economies. The need to strengthen these sectors is highlighted to guarantee their sustainability and competitiveness at the national and international level. Improving access to financing, specialized technical assistance and the adoption of sustainable practices are priority needs for the continued development of the cocoa and coffee sector in Honduras and Costa Rica.

Challenges include lack of access to financing, limited technical assistance, and the need to adopt sustainable practices to address the impacts of climate change and international competition. The opportunities lie in the promotion of technological innovation, the improvement of the value chain and the opening to international markets that demand sustainable and high-quality products.

In terms of marketing, the challenges indicated are: the need to consolidate public-private partnerships, standardize to achieve minimum volumes together, add value to the products (not only commercialize the crop, but also processed products). Have access to markets that recognize the value of sustainable practices and pay prices. The cost of intermediation is also a critical issue to address, so having options for direct connection with the market is important. Price management, standardization to achieve volume as a whole and achieve the required minimums.

In Honduras there is a lack of consumer culture of cocoa products, which harms the demand for a variety of derived products such as chocolate, drinks and desserts, which are not consumed in the desired volume. In addition, many cocoa producers depend on a cooperative or association that buys their harvest, and prices are usually not the most favorable. These cooperatives depend on a single buyer, and the lack of competition and options in the country prevents producers from enjoying benefits from competitive prices. Of course, climate change has greatly affected the

productivity of the farms, and by failing to obtain a desired volume, a direct negotiation with the buyer cannot be carried out. On the other hand, in the coffee sector, 60% of coffee production is marketed through intermediaries, which greatly affects the establishment of competitive prices. It is necessary to identify direct markets, without intermediaries. Furthermore, it has been detected that many producers are unaware of the quality of their production, and without knowledge of negotiation, many sell quality coffee at low prices. Competition in the sector is increasing, and only a small number of consumers can identify quality in coffee.

In conclusion:

Competition (according to 38% of participants) and buyers at good prices (28%) indicate the need to strengthen value chains and improve access to profitable markets for sustainable products. These are common challenges in any market, and for sustainable products, competition with conventional products can be particularly strong.

- Intermediaries can inflate product prices without proportionately benefiting producers. This reduces farmers' profits and affects equity in the distribution of benefits.
- Finding buyers willing to pay fair prices is an ongoing challenge. The pressure to reduce costs can lead buyers to offer low prices, harming producers.
- Ensuring that producers receive fair payment for their products is essential for the economic sustainability of the agro-chain.
- The most pronounced challenge is the high investment cost and the low marketing price: The disparity between high investment costs and low marketing prices affects producers' profitability.
- Poor infrastructure, including storage, transportation, and distribution, is a significant obstacle to the efficient marketing of products.
- Lack of access to markets (19%) suggests the need to develop strategies to connect producers with national and international buyers.
- Logistical and policy limitations prevent many producers from directly accessing international markets, affecting their ability to obtain better prices.
- The political and economic stability of the country directly impacts producers' ability to market their products efficiently.
- ●Market price volatility creates uncertainty and complicates the planning and management of production and marketing.
- Strong local and international competition forces producers to constantly improve their practices and products.
- Producers must be willing to adapt their products to meet the changing demands of the global market.

Limitations

Some limitations include the high cost of production, lack of technical assistance in production and commercialization, limitations in access to agricultural financing, and the effects of climate change. These challenges have been exacerbated by adverse complementary and situational factors: the contraction caused by the COVID-19 pandemic, global inflation, and the Russia-Ukraine war conflict, which resulted in increased oil prices, subsequently raising fuel and fertilizer prices and causing inflationary pressures on energy and food. A positive effect has been the growth in the production of bio-inputs, especially organic fertilizers, in the country.

Access to financing and technical assistance for production, adding value, and marketing products are prioritized as major needs. There is an implicit need to invest in appropriate technology to adapt to climate and to add value. The lack of updated data—for instance, the last National Agricultural Census was in 1993—and the absence of a system providing agricultural, livestock, climatic, and agri-commercial data, etc., influence the low growth of the sector. On the other hand, there is potential to strengthen alliances and coordination between different institutions at the grassroots level to achieve greater impact and effectiveness in the use of funds. The scenario of the agri-food sector highlights the need for public and private investment to increase productivity and to mitigate the impact of climate change and the effects of rising costs of external services and inputs.

Below are the most critical limitations in the cocoa and coffee sector, although also applicable to the green sector in general:

1. Production limitations

- a. There is no formal credit and inadequate conditions for banking.
- b. Insufficient technical assistance services.
- c. Dependence on a single buyer.
- d. Training is based on supply and not on demand and little availability of technologies.
- e. Poor access conditions to the farms.
- f. Fertilizer prices increase up to 15% annual.
- g. Poor organization prevents increasing production and economies of scale.
- h. Traditional production and resistance to adoption of good practices.
- i. Low educational level.

2. Limitations in internal marketing

- a. Limited access to financing for infrastructure.
- b. Lack of drying and fermentation structures.
- c. Structures with poor warehouse conditions.
- d. Low purchasing volumes with organizations or producers and absence of long-term commercial relationships.
- e. There is a lack of uniformity in grain quality.

- f. Low transport capacity of the product during the peak of harvest.
- g. High cost of vehicle maintenance.
- h. Social insecurity.

3. Limitations on external marketing

- a. There is a lack of accurate forecasts regarding the quantities and prices to be marketed.
- b. Volatile prices and low promotion of Honduran coffee/cocoa.
- c. High financing interests.

4. Limitations on prosecution

- a. Lack of credit to purchase equipment.
- b. There is limited access to cutting-edge technology to achieve the lowest possible cost and a more environmentally friendly process.
- c. Infrastructure needs to be improved.
- d. Little access to training programs.

5. Limitations in roasting and fermentation process.

- a. Low capacity for innovation and development products and cup lines.
- b. Lack of financial products to acquire coffee or chocolate preparation equipment.
- c. There is no innovative industry packaging.

To increase productivity, it is necessary to generate new knowledge; in this regard, national and local research conditions and capacities oriented towards performance must be improved. The establishment of these plots must be coordinated by actors in the territory so that it becomes a strategy managed from within the farm.

It is necessary to create a local infrastructure development plan; there are initiatives by commercial houses aimed at promoting solutions for drying, such as small solar dryers and other support infrastructure. However, these efforts are geared towards product sales rather than the development of producers. Through this plan, access to specialized technical assistance could be ensured.

Sector planning must focus on facilitating resources for specific aspects, such as fertilization and preventive pest control. The study shows that those who invest in an orderly manner achieve better yields. In companies and community associations, infrastructure development should be oriented towards more extensive use to scale up production.

The agricultural sector has great potential to consistently be the main driver of the national economy through trade within the country and with international markets. Food production must meet the supply needs of the national market and ensure food and nutritional security. In this

regard, promoting the consumption of national products will be encouraged through actions that foster awareness and a sense of belonging among the population, accompanied by awareness campaigns.

The growth of international trade involves seeking strategies for niche competition, differentiation, and added value for both traditional and emerging products being promoted. Efforts will be made to shift from exporting raw materials to exporting to differentiated markets, taking advantage of inter and extra-regional international trade schemes, as well as existing trade agreements.

VII. Digital Gaps

In Honduras, the agricultural sector grapples with a significant digital divide, characterized by limited internet access and uneven digital literacy among rural farmers. Many rural areas lack adequate infrastructure for reliable internet connectivity, hindering access to crucial information, market data, and agricultural extension services. This digital gap exacerbates challenges such as climate change adaptation and efficient resource management, which are increasingly critical for sustainable agriculture. Farmers often face difficulties in accessing online educational resources and digital tools that could enhance productivity and resilience against environmental and market fluctuations. Moreover, the disparity in digital skills between urban and rural populations further marginalizes smallholder farmers, limiting their ability to adopt modern farming practices and participate effectively in global supply chains.

Costa Rica, despite its advancements in technology and education, also contends with a digital gap in its agricultural sector, particularly in remote and indigenous communities. While internet penetration rates are higher compared to neighboring countries, disparities persist in rural areas where infrastructure remains underdeveloped. Farmers in these regions encounter challenges accessing real-time market information, agricultural best practices, and online training opportunities that could improve crop yields and sustainability practices. Moreover, the cost of digital infrastructure and services presents a barrier, especially for small-scale farmers who operate on narrow profit margins. Bridging this digital gap is crucial not only for enhancing agricultural productivity but also for empowering farmers with the knowledge and tools necessary to adapt to climate change impacts and contribute to the country's agricultural resilience and food security goals.

In Honduras and Costa Rica, the digital divide is a multifaceted issue influenced by various factors, including:

Income	Access to information and communication technologies (ICTs) requires sufficient financial resources. The cost of the latest technologies can be prohibitive for low-income individuals and households.
--------	--

Geography-Rural Area	Urban areas, with their higher population densities, attract more investment in telecommunications infrastructure and connectivity programs. This often leaves rural areas with limited access.
Age	Younger generations, who have grown up during the technological revolution, are more adept with ICTs compared to older adults, who may face exclusion due to a lack of training or familiarity with these technologies.
Digital gender gap	Women are underrepresented in fields related to science, technology, engineering, and mathematics (STEM), leading to lower participation rates and contributing to the digital divide.
Language	A significant portion of online content is in English, creating a barrier for non-English speakers.
Education level	There is a strong correlation between formal education and the ability to use ICTs effectively. Higher education levels typically lead to better digital literacy.
The job	In many countries, Internet access is primarily available in workplaces and internet cafes, which may not be affordable for everyone.
Physical integrity	People with disabilities often face digital exclusion. Ensuring they have access to technology is crucial.

Table 1: Factors to consider regarding the Digital Gap in the Green Sector.

The findings show that main actors for digitalization and the needs for digitalization are very alike. Technology availability is larger in the countryside in Costa Rica but in general it is highly possible to find homogenous target populations in both countries due to the importance and distribution of the crops, mostly coffee, in both countries. There are several digital gaps that can be pointed out like soil analysis tools, weather forecasting, pest/disease monitoring, local and international price forecasting, production networks, coffee bean quality monitoring tools, apps for climate-smart agricultural practices.

Digital Literacy

It is essential to promote greater adoption of information and communication technologies (ICT) and digital agriculture among small farmers, especially among women and youth. Technologies – from smartphones and precision agriculture to e-commerce, blockchain and drones – can help farmers make better decisions, boost agricultural productivity, manage resources more efficiently and increase competitiveness.

Among other examples, it stands out that the use of climate-smart digital solutions can contribute to reducing greenhouse gas emissions and increasing the region's resilience to climate change by improving the management of its watersheds. Digital technologies can also drive innovation and agricultural entrepreneurship, creating attractive job opportunities, especially for young people, in value chains.

It is necessary to implement technology components in information and communication, this means formalizing the systematic use of ICT, providing incentives for their development for priority value chains and providing training to improve digital literacy. For a successful scale-up of ICT, the value chains in question, the profile of potential users, the existing institutional structure and the telecommunications infrastructure must be taken into account.

Based on the provided information, here's a breakdown of how technology is being used to learn and support production processes:

According to the analysis carried out on the surveys implemented with the various actors in the cocoa and coffee chain in Honduras and Costa Rica, certain specific findings stand out regarding the levels of digital literacy among farmers. Among which it stands out that, although today it is more accessible than ever for a farmer to have access to the internet and a smartphone, the reality is that the availability of a stable and quality connection continues to be a challenge in many rural areas. Although technology has democratized access to information and digital tools, the lack of telecommunications infrastructure limits the potential of digitalization in the agricultural sector. The digital divide persists, and the quality of the internet connection becomes a crucial factor so that farmers can take full advantage of the opportunities offered by technology.

Among the types of available technologies used in rural areas are:

- WhatsApp queries: Being a basic communication application, it is common in any area due to its low connection data consumption. This demonstrates the power of social media to spread information and connect with experts.
- 50% of respondents use websites to learn and get support. This suggests a high level of accessibility and ease of use for agricultural producers.
- Smartphone apps: 42% of respondents use smartphone apps. This indicates a growing trend in the use of mobile technology for agricultural information and support.
- Online training: 42% of respondents use online training. This highlights the growing adoption of digital learning platforms for agricultural knowledge.
- Geolocation applications: The use of geolocation applications is very common. This shows the increasing use of technology for climate and soil forecasting, which is crucial for efficient agricultural practices.

Overall, the data suggests that technology is playing an increasingly important role in supporting learning and agricultural production processes. The use of websites, smartphone applications and online training is particularly prevalent, indicating a growing trend towards digitalization in the agricultural sector.

The following strategies are proposed with the objective of increasing agricultural productivity in Costa Rica and Honduras through technology:

1. Strengthen digital infrastructure:

Expansion of internet coverage: Prioritize investment in telecommunications infrastructure to increase internet coverage in rural areas. This involves building transmission towers, installing fiber optics, and promoting wireless technologies like community Wi-Fi.

Improve the quality of the connection: It is not only about having access to the internet, but also about guaranteeing a stable and quality connection. This involves investing in technologies that enable greater connection speed and signal stability, especially in areas with challenging geographic conditions.

2. Train farmers in the use of technology:

Digital literacy programs: Implement specific training programs for farmers, focusing on the use of digital tools such as mobile applications, online learning platforms and websites.

Practical workshops: Organize practical workshops that demonstrate how to use technology to improve crop management, access to market information, water resource management and early detection of pests and diseases.

Incentives for technology adoption: Offer financial or in-kind incentives to farmers who adopt digital technologies, such as discounts on the purchase of devices or free access to information platforms.

3. Develop technological solutions adapted to local needs:

Specific mobile applications: Develop mobile applications that provide relevant information to farmers in Costa Rica and Honduras, such as climate forecasts, market prices, crop management advice, and access to extension services.

E-commerce platforms: Encourage the use of e-commerce platforms so that farmers can sell their products directly to consumers or wholesale buyers, avoiding intermediaries and obtaining better prices.

Smart irrigation systems: Promote the adoption of smart irrigation systems that optimize water use, reduce waste and increase irrigation efficiency.

4. Promote collaboration between key actors:

Public-private alliances: Promote collaboration between the government, the private sector and civil society organizations to develop and implement technological solutions in the agricultural sector.

Farmer networks: Promote the creation of farmer networks that share experiences, knowledge and technological solutions.

Innovation centers: Establish agricultural innovation centers that serve as spaces for research, development and technology transfer.

5. Monitor and evaluate the impact of interventions:

Continuous evaluation: Implement a monitoring and evaluation system to measure the impact of interventions on agricultural productivity, technology adoption and farmer well-being.

Adjustments and improvements: Use evaluation results to adjust strategies and improve the effectiveness of interventions.

Successful implementation of technology in the agricultural sector of Costa Rica and Honduras requires a comprehensive approach that addresses the specific needs of farmers, digital infrastructure, and training. By investing in these areas, the project can contribute to increasing productivity, improving the quality of life of farmers and promoting sustainable agricultural development.

Skills and Knowledge needed by the Productive Community.

- Technical knowledge in sustainable agricultural practices: This was the most selected competency, highlighting the importance of training producers in sustainable production methods such as organic farming, soil conservation, and integrated pest management.
- Management skills for planning and implementation: Emphasizes the need for producers to have strong skills in planning, budgeting, organization, and decision-making to effectively implement sustainable practices.
- Ability to adapt to climate change and new technologies: Stresses the importance of flexibility and continuous learning to adapt to environmental changes and adopt new sustainable technologies.
- Systemic thinking in the agricultural value chain: Highlights the need to understand the interrelationships between different actors and processes in the agricultural value chain to make sustainable decisions.

- Leadership to inspire others to adopt sustainable practices: Underscores the crucial role of leaders in promoting sustainable production among other producers, communities, and value chain actors.
- Gender equity in agricultural production: Indicates the importance of promoting the equitable participation of men and women in decision-making and the development of the necessary capacities for sustainable production.
- Good communication skills to share information: Highlights the need for effective communication to disseminate knowledge about sustainable practices, collaborate with other actors, and market sustainable products.

Technologies as a Bridge to Close the Digital Gap

According to the majority of answers and comments in the Focus Groups, in the agricultural sector, various technologies can bridge this digital divide and close the gap:

1. **Drones:** drones have emerged as a pivotal technology. Specifically, Latitude Solutions has provided drones equipped to assess soil conditions and manage irrigation systems. These advanced aerial tools facilitate precise monitoring of soil health, enabling farmers to make informed decisions about irrigation needs and soil management. By integrating drone technology, producers can achieve more efficient and effective resource use, which not only enhances crop yields but also promotes sustainable agricultural practices. The adoption of drones represents a significant step towards modernizing agricultural operations and addressing the digital divide that currently exists within these sectors.
2. **Irrigation Technologies:** Advanced irrigation technologies play a crucial role. Notably, pesticide irrigation systems developed by Solab have been introduced as a transformative solution. These systems are designed to enhance the precision and efficiency of pesticide application, ensuring that treatments are delivered uniformly and effectively across crops. By optimizing the use of resources and minimizing waste, Solab's irrigation technologies contribute to better crop health and increased productivity. This innovation not only supports sustainable farming practices but also helps farmers in these regions modernize their operations and improve overall agricultural outcomes. Embracing such technologies is essential for bridging the digital divide and advancing the sector towards greater efficiency and sustainability.
3. **Technological Traps:** In the pursuit of bridging the digital gap within the coffee and cocoa sectors in Honduras and Costa Rica, it is crucial to also address the challenges posed by technological traps. Specifically, this issue is evident in the adoption of technologies designed for crops such as watermelon and melon, which may not directly translate to the needs of coffee and cocoa production. These technological traps can include equipment or solutions that are optimized for different types of agriculture,

leading to potential inefficiencies or misapplications in the coffee and cocoa sectors. To effectively close the digital divide, it is essential to ensure that the technologies adopted are specifically tailored to the unique requirements of coffee and cocoa cultivation. This entails conducting thorough evaluations and adaptations of technological solutions to avoid such traps and ensure that advancements contribute positively to the sector's productivity and sustainability.

4. **Satellite Technology:** the utilization of satellite technology represents a significant advancement. Specifically, familiarity with the Copernicus program offers valuable capabilities for crop monitoring. The Copernicus program, known for its comprehensive Earth observation data, provides high-resolution imagery and analytical tools that are instrumental for tracking crop health, monitoring growth patterns, and detecting potential issues such as pest infestations or nutrient deficiencies. By integrating Copernicus satellite data into their agricultural practices, producers can gain actionable insights that enhance their decision-making processes and optimize crop management. This adoption of satellite technology not only supports more precise and informed farming practices but also bridges the digital divide by bringing advanced, data-driven solutions to the forefront of agricultural innovation in these regions.
5. **Roasting Software:** This technology provides sophisticated tools for managing roasting protocols, which are essential for optimizing flavor profiles and ensuring consistency in product quality. Roasting software enables producers to precisely control variables such as temperature, time, and airflow, facilitating a more accurate and repeatable roasting process. By leveraging these digital tools, coffee producers can enhance their product quality, streamline their operations, and respond more effectively to market demands. The integration of advanced roasting software not only supports the development of high-quality products but also exemplifies how technology can play a crucial role in modernizing agricultural practices and closing the digital divide within the sector.
6. **Coffee Bean Selection Machines:** These advanced sorting machines are designed to enhance the efficiency and accuracy of bean selection, ensuring that only high-quality beans are processed. By employing advanced technologies such as optical sensors and automated sorting mechanisms, these machines can rapidly identify and separate beans based on size, color, and defects. This technological advancement not only improves the overall quality of the final product but also streamlines the production process, reducing labor costs and minimizing human error. The integration of coffee bean selection machines represents a significant step toward modernizing coffee production, providing producers with the tools needed to enhance product consistency and meet market standards more effectively.

VIII. Conclusions and Recommendations

Conclusions

- 1. Identification of Digital Gaps:** The research has revealed significant digital gaps in the green sector, especially among coffee and cocoa producers in Costa Rica and Honduras. These gaps affect farmers' ability to access technological tools, manage information, and improve the efficiency of their operations.
- 2. Specific Needs:** Coffee and cocoa producers face specific challenges related to a lack of training in new technologies, business management, and sustainable agricultural practices. These needs vary depending on the size of operations and the local context.
- 3. Importance of Collaboration:** The workshops and interviews have underlined the importance of establishing collaborative networks between farmers, cooperatives, academic institutions, and non-governmental organizations. These networks are crucial for the exchange of knowledge and the implementation of effective solutions.
- 4. Innovation and Training:** There is considerable demand for innovations in sustainable agricultural practices and training in critical areas such as business management, cultivation techniques, post-harvest handling and certifications.
- 5. Documentation and Resources:** Findings and recommendations from the workshops and interviews have been documented and should be used to inform future projects and strategies in the green sector.

Recommendations

- 1. Digital Capacity Building:** Implement training programs focused on the use of digital technologies to improve farm management and access to relevant information. These programs should include training in the use of digital tools and applications specific to the agricultural sector.
- 2. Strengthening Collaborative Networks:** Encourage the creation and strengthening of networks between producers, cooperatives, academics and NGOs to facilitate the exchange of knowledge and experiences. The creation of digital collaboration platforms can be a useful tool in this regard.
- 3. Promoting Innovation:** Stimulate the adoption of innovative and sustainable agricultural practices by organizing agricultural technology fairs, innovation contests and pilot projects. In addition, support research and development of solutions tailored to local needs.

4. Designing Training Workshops: Organize workshops and courses in key areas such as business management, cultivation techniques, post-harvest handling and certifications. These workshops should be tailored to the specific needs of producers based on the size and context of their operations.

5. Generating and Disseminating Resources: Prepare and distribute reports and educational materials based on the findings of research and workshops. Ensure that these resources are accessible to all stakeholders in the sector and used to guide decision-making in future projects.

This needs assessment serves as a foundational step towards the development of a comprehensive handbook within the DigiBuild project. By identifying the specific digital skills gaps and training requirements of cacao and coffee producers in Honduras and Costa Rica, this report will inform the creation of a tailored training program. Ultimately, the goal is to empower these producers with the digital tools and knowledge necessary to enhance their productivity, sustainability, and market access.

IX. References

Agriculture and Livestock of Costa Rica, Department of. (Jan 2023). Public Policy for the Costa Rican Agricultural Sector 2023-2032. Available at: http://www.sepsa.go.cr/DOCS/2023-Politica_Publica_Sector_Agropecuario_2023-2032.pdf

Central Bank of Honduras. (2023). Memoria 2023. Department of Economic Information Management. Available at: <https://www.bch.hn/estadisticos/GIE/LIBMemoria/Memoria%20Anual%202023.pdf>

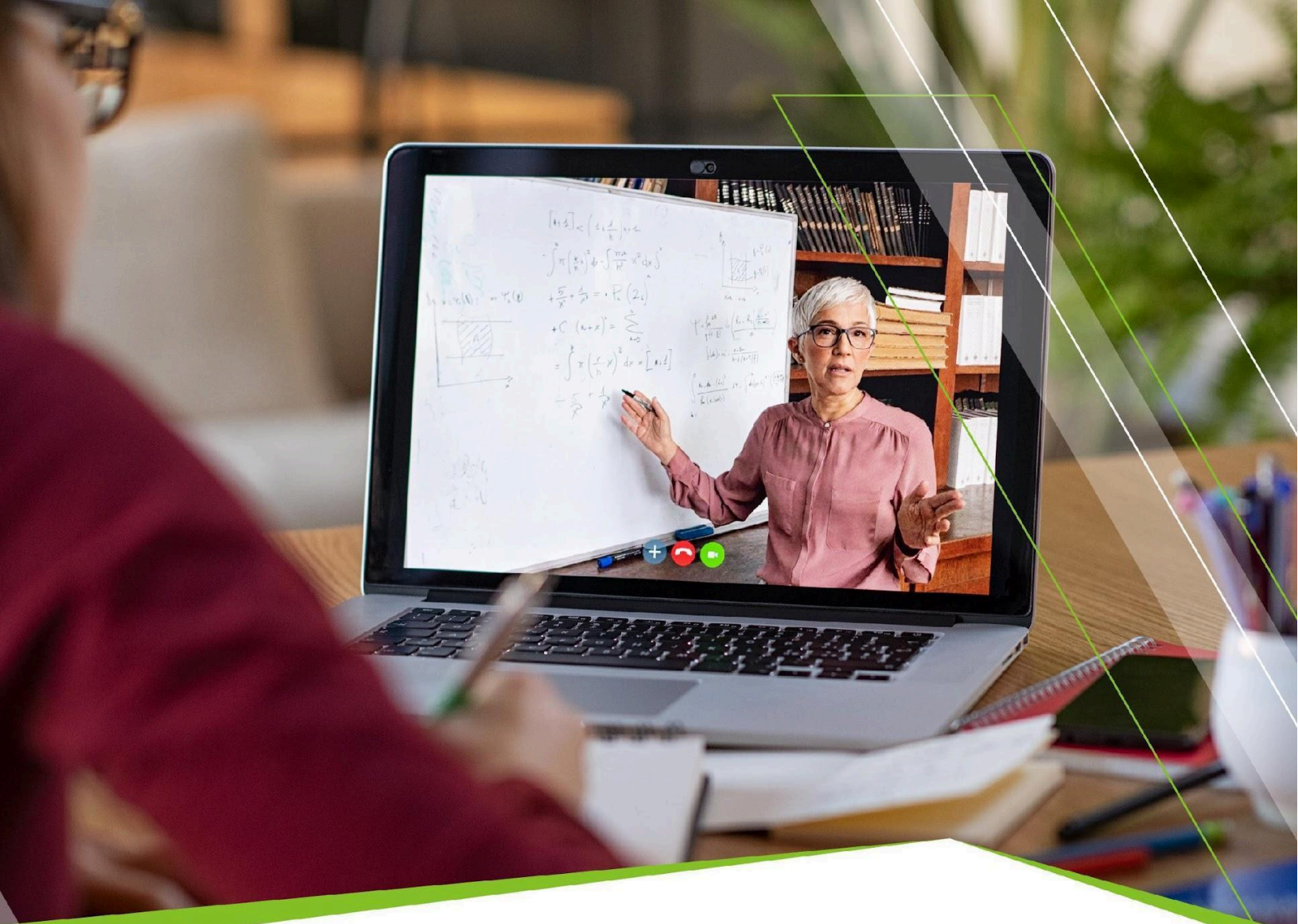
Central Bank of Honduras. (2023). Memoria 2023. Department of Economic Information Management. Available at: <https://www.bch.hn/estadisticos/GIE/LIBMemoria/Memoria%20Anual%202022.pdf>

National Institute of Statistics.(2022). Country indicators figures 2022. Available at: <https://ine.gob.hn/v4/wp-content/uploads/2024/07/cifras-de-pais-datos-2022.pdf>

Statistics, Analysis and Economic Studies Area of the Management Planning and Evaluation Unit (UPEG) & United States Department of Agriculture (USDA). (2020). Cacao: Análisis de Coyuntura. Área de Estadísticas, Análisis y Estudios Económicos de la Unidad de Planeamiento y Evaluación de la Gestión (UPEG). Available at: <https://www.ueg.sag.gob.hn/wp-content/uploads/2022/03/AC-CACAO-V20.4.pdf>

Universidad de Costa Rica. (2023). Hacia la Sociedad de la Información y el Conocimiento. Programa Institucional Sociedad de la Información y el Conocimiento. Available: http://www.prosic.ucr.ac.cr/sites/default/files/recursos/contenido_informe_2023_completo_7.pdf

Vargas-Valderrama, Mirla and Maguiña-Vizcarra, José Eduardo. (2022). Digital Gaps of distance education in EBR students- 2021. Polo de Conocimiento. *Vol.7. No.3.* Available from: <https://dialnet.unirioja.es/servlet/articulo?codigo=8399896>



DIGIBUILD

Defoin

 **euroTRAINING**

FHIA
FUNDACIÓN HONDUREÑA
DE INVESTIGACIÓN AGRÍCOLA

IICA
Representación Costa Rica

NOVEL
Group

Think
DIGITAL

Universidad
CENFOTEC
SOMOS LO QUE SABEMOS

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Co-funded by
the European Union