D3.2 Training Program for the development of the digital microlearning resources

DigiBuild: Building Digitalization in the Green Sector

PRESENTED BY

Formación para el Desarrollo y la Inserción (DEFOIN)

EUROTraining Educational Organization

Instituto Interamericano de Cooperación para la Agricultura (IICA)

Universidad CENFOTEC

Corporación Think SA de CV (Think Digital)

Fundación Hondureña de Investigación Agrícola (FHIA)

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DigiBuild: Building digitalization in the green sector in Honduras and Costa Rica

Digi-build Training Program

Introduction

The Digi-build training programme is designed to equip VET trainees with the skills and knowledge to use digital resources for the agricultural sector, with a focus on digital microlearning resources. The training course combines cutting-edge theoretical content with practical learning experiences, tailored specifically to address the evolving demands of digitization in agriculture and precision agriculture.

The primary objectives of the training programme are to enhance digital competencies in agricultural practices, introduce new smart agriculture technologies and support practitioners in adopting digital solutions for agricultural productivity. By integrating microlearning strategies and certification models, the program guarantees digital literacy and promotes knowledge verification.

This training program is part of the overall objective of the Digi-build project to make agriculture more employable and competitive. It improves the digital skills of agricultural professionals, enabling them to integrate digital marketing, precision agriculture technologies and automation into their businesses. The training also improves the capacity of VET providers and teachers to revise curricula based on the real needs of the labor market, thus making agricultural training more relevant and future-oriented.

The program will be piloted among VET learners to ascertain its effectiveness in filling the skills gaps that currently exist. It will also serve as a handbook to guide VET providers, including detailed steps for integrating digital agriculture into their courses. The training materials will be openly accessible on the Digi-build platform in different languages, ensuring widespread dissemination and use.

The training consists of **5 Learning Units (LUs),** with a total duration of **30 hours**, at **EQF level 4**. Each module has been created to provide an accurate concept of digital agriculture, consisting of basic theoretical concepts, practical applications and case studies.

Microlearning and Microcredentials Approach

The DigiBuild training programme improves the development and recognition of digital skills in agriculture by incorporating a microlearning and micro-certification approach. The delivery of short, targeted learning units focused on specific knowledge or skills, built on demand and optimized for digital and mobile devices, is called microlearning. Especially in rural and resource-poor areas, this method encourages participation, benefits professionals with limited time available, and speed up the transfer of practical knowledge. The program familiarizes trainers with the pedagogical foundations of microlearning through principles such as modularity, contextuality, learner-centered design, and interactivity.

Taking advantage of the possibilities of digital content creation, trainers will create microcontent to achieve specific learning objectives. The resources will include short tutorials, infographics, quizzes, and educational videos, which can be used offline at specific points and on mobile devices. These training materials have been developed based on the EQF level 4 framework and comply with the digital and green skills required by the EU Green Deal and digitization strategies.

The Training programme has a micro-credentialing system that makes sure the skills you learn are recognized. Each successfully completed learning unit or sub-unit will be linked to a digital credential or micro-certification that can be traced back to specific learning achievements and issued via a secure platform. These certificates will be transferable proof of the knowledge, skills, and abilities acquired and are in line with the European Commission's guidelines on micro-credentials (2022). Employers and VET providers can recognize them, and they can be integrated into individual learning records or portfolios.

The DigiBuild training programme offers a progressive and flexible model for developing digital skills in agriculture, which is particularly suited to the real-life conditions of rural and disadvantage areas. By combining microlearning with micro credentials, it provided a scalable and learner centered approach to upskilling that is aligned with EU strategies for the digital and green transition. DigiBuild is therefore a sustainable investment in both human capital and the resilience of the sector, paving the way for digitally skills and climate smart workforce in agriculture.

Overview of Learning Units

Each Learning Unit (LU) is designed to contribute to the overall objectives of the training program. The structure includes a topic overview, expected learning outcomes, and an overview of lessons and subtopics covered in each unit.

DigiBuild Learner Profile

Professional Role:
A technician in the green sector (agriculture, forestry, environmental management, agro-industry), working as a facilitator, extension agent, technical advisor, or change agent involved in processes of digital transformation, sustainability, and rural innovation.

Work Context:
Employed in public institutions, cooperatives, NGOs, rural development programs, technical universities, or as an independent consultant. Regularly engages with rural producers, especially in tropical agricultural zones across Central America.

Educational Background:

Completion of full secondary education, preferably with a focus on technical, vocational or general studies.

Possession of a secondary school leaving certificate or equivalent qualification recognised at EQF level 3.

Current Expected Competencies:

- Ability to interact with rural communities and producers.
- Understanding of tropical farming systems.
- Motivation to integrate digital tools into technical practice
- Awareness of sustainability and climate adaptation needs.

Identified Learning Needs:

- Methods to facilitate digital learning in low-literacy environments.
- Understanding and application of frameworks like the EU Green Deal in local contexts.
- Designing agribusiness models that include technological innovation.
- Promoting digital tools for sustainable and climate-resilient farming.

- Competency in interpreting data and creating visual reports for decision-making.

Post-Microcredential Role:
The learner is expected to become a technical multiplier, capable of:

- Supporting digital transformation processes in rural areas.
- Advising producers and organizations in sustainable innovation.
- Bridging rural actors with international green policy frameworks.
- Enhancing decision-making with digital tools and data-driven approaches.

Job Role at the end of the program:

Digital facilitator or rural extension agent specializing in digital transformation.

LU1: Introduction to the digital agroworld

Description: This module introduces the key concepts of digital agriculture and explores how new technologies can transform the green sector in Costa Rica and Honduras. It is designed to build the capacity of technicians to facilitate digital learning processes for rural producers, especially non-digital natives. The unit bridges European experiences with Latin American realities and emphasizes participatory methods.

Competence: Understands the key concepts, challenges, and opportunities of digital agriculture in tropical contexts and is able to communicate them effectively to non-digital native audiences.

Evidence: Briefing document explaining the current state, challenges, and opportunities of digital agriculture in Costa Rica and Honduras, including a comparative insight from European experiences.

Learning outcomes:

- Understand the potential role of digital agriculture in the contexts of Costa Rica and Honduras.
- Recognize the main concepts and terminology of digital agriculture.
- Develop information literacy skills to research digital agriculture effectively.
- Identify digital gaps among rural producers and how to address them.
- Explore European case studies on digital learning in rural and isolated regions.

Content Overview:

- Understand the role and relevance of digital agriculture in tropical contexts (Costa Rica and Honduras).
- Identify the digital literacy gaps and barriers faced by rural producers.
- Explore the foundational concepts and terminology of digital agriculture.
- Develop skills to search for and evaluate digital resources accessible to non-digital natives.
- Learn from European case studies of rural digital transformation and their applicability to Central America.

Sub-Unit 1: Understanding the Central American Green Sector Profile

Learning Outcome: Analyze the characteristics, challenges, and digital gaps of rural producers in Costa Rica and Honduras.

Topics:

- Profile of tropical farmers and technicians in Central America
- Identified digital barriers and capacity gaps
- Needs analysis results from Costa Rica and Honduras

Sub-Unit 2: What is Digital Agriculture and Why Does It Matters?

Learning Outcome: Explain digital agriculture and evaluate its potential impact in Costa Rica and Honduras.

Topics:

- Definition and pillars of digital agriculture.
- Benefits and challenges for small-scale tropical producers.
- Entities promoting digital agriculture in Costa Rica and Honduras.

Sub-Unit 3: Digital Literacy and Research Tools

Learning Outcome: Apply basic information literacy to find and evaluate digital agriculture content.

Topics:

- Search engines, keywords, prompting and critical thinking.
- Introduction to agricultural apps and platforms.

- Tools and strategies for guiding non-digital natives to learn independently.

Sub-Unit 4: Learning from Others: European Experiences in Rural Digitalization

Learning Outcome: Identify transferable practices from successful European digital agriculture initiatives.

Topics:

- Case studies from rural Europe
- Discover it from the source: stories on digitalisation in agriculture
- Adaptation to rural realities in Latin America.
- Case studies from other industries in Europe that may be applicable for the green sector.

LU2: Technology Tools for Compliance with EU Green Deal

Description: This module supports technicians in understanding and applying the European Green Deal's principles to the tropical agricultural context of Central America. Through comparative analysis, case studies, and hands-on exploration of digital tools, learners will develop the ability to guide producers and cooperatives in aligning their practices with EU sustainability objectives.

Competence: Interprets and communicates EU Green Deal agricultural directives to local cooperatives, producers, and organizations.

Evidence: Compliance roadmap for a case study farm or cooperative, including actionable steps and aligned practices.

Learning outcomes:

- Identify and describe trends in AgTech, FoodTech, bioeconomy, and climate change in Europe, explaining their relevance to the agricultural sector and their potential impacts.
- Explain the fundamental objectives of the European Green Deal and critically analyze its implications, challenges, and opportunities for tropical agriculture, providing at least two concrete examples.
- Understand the differences between the current standards of their countries and the requirements of the Green Deal.

- Propose "best practices" in agrochemical reduction, biodiversity preservation, and carbon capture, and justify how these could be adapted and implemented in specific agricultural contexts in Central America.
- Evaluate the applicability of at least three emerging technologies (e.g., sensors, blockchain for traceability, mobile applications) in optimizing smart agriculture, and design a scheme illustrating how one of these technologies could solve a specific agricultural problem.
- Identify and understand how to utilize various digital tools to diagnose and self-assess an organization's or company's level of alignment with the European Green Deal's sustainability objectives, as well as manage and report its environmental performance.
- Select and adapt a digital sustainability indicator for at least two tropical crops (coffee, cocoa, plantain, oil palm), demonstrating how key sustainability aspects specific to each crop can be monitored and evaluated for the green deal.
- Develop a detailed and viable innovation proposal for a specific tropical crop that integrates at least three principles of the European Green Deal and utilizes at least one digital tool learned, presenting a comprehensive traceability or sustainability plan

Content Overview:

- Understand the structure and goals of the European Green Deal and its agricultural implications.
- Analyze current European trends in AgTech, FoodTech, and bioeconomy.
- Compare EU sustainability standards with Central American policies and identify adaptation needs.
- Explore digital tools that support sustainability compliance, traceability, and monitoring.
- Design context-specific proposals to align tropical crops with Green Deal principles using digital solutions.

Sub-Unit 1: Innovation Trends Driving the Green Transition in Europe

Learning Outcome: Identify relevant innovation trends and assess their relevance for tropical agriculture.

Topics:

- Overview of AgTech, FoodTech, bioeconomy, and climate-smart agriculture.
- How innovation trends influence EU green policy.
- Opportunities for Central America.

Sub-Unit 2: Understanding the European Green Deal

Learning Outcome: Analyze the goals and structure of the Green Deal and its impact on agriculture.

Topics:

- Sustainability Pillars
- Key directives and strategic plans related to Agriculture
- Implications, challenges and opportunities for tropical agriculture

Sub-Unit 3: Bridging the Gap: From EU Policy to Local Practice

Learning Outcome: Compare EU and Central American sustainability standards and propose localized adaptation strategies.

Topics:

- Comparing Sustainability Standards Across Contexts
- Best practices in agrochemical reduction, biodiversity, and carbon capture.
- Identifying alignment opportunities and challenges.
- Adaptation Strategies for EU Compliance

Sub-Unit 4: Digital Tools for Green Compliance

Learning Outcome: Apply digital tools to support traceability, diagnostics, and sustainability planning.

Topics:

- Technologies: blockchain, sensors, mobile applications, geopositioning.
- Digital tools for eco-certifications and compliance reporting.
- Crop-specific indicators for coffee, cocoa, plantain, and oil palm.

Sub-Unit 5: From Theory to Action: Designing a Green Deal-Aligned Proposal

Learning Outcome: Create an innovation proposal incorporating Green Deal principles and digital tools.

Topics:

- Components of a sustainability proposal.
- Traceability project design.

LU3: Smart Farming Technologies for Climate-Resilient Agriculture and Data for Strategic Decisions

Description: This module explores how smart farming technologies—such as drones, sensors, automated irrigation, and data platforms—are revolutionizing modern agriculture. It focuses on their role in enhancing efficiency, sustainability, and decision-making, particularly within tropical cropping systems like coffee and cocoa.

Learners will examine how these technologies contribute to climate resilience, input optimization, and traceability. The module also introduces agro-data interpretation, sustainability indicators, and European best practices that can be adapted to local realities in Central America and other tropical regions.

Competence: Recommends and demonstrates context-appropriate digital tools for climate-smart farming systems and interprets agricultural data to inform technical decisions and improve program performance.

Evidence: Tool application profile (comparison table, use case, decision making, sustainability benefit summary).

Learning outcomes:

- List the primary smart farming technologies and their uses in agricultural production, such as drones, IoT sensors, AI tools, and GIS.
- Describe how climate resilience, decreased environmental impact, and increased productivity are all facilitated by data-driven practices.
- Explain the obstacles and favorable circumstances that smallholder farmers face when implementing digital solutions.

- Analyze examples of agro-data and comprehend how they are used to inform strategic choices about risk assessment, fertilization, and irrigation.
- Acknowledge how smart technologies facilitate access to premium markets, sustainability certification, and traceability.

Content Overview:

- Introduction to Smart Farming Technologies and Climate Resilience
- Adaptation and Implementation of Technological Solutions for Smallholders
- Agro-Data Collection, Visualization, and Interpretation
- Data-Driven Strategic Decision-Making and Sustainability

Sub-Unit 1: Introduction to Smart Farming Technologies and Climate Resilience

Learning Outcomes:

- Recognize the applications and benefits of smart farming technologies in tropical agriculture.
- Identify key climate risks in Central America and link them to tool-based solutions.

Topics:

- Definition and Basic Principles of Smart Farming
- Technological Evolution in Agriculture: From Mechanical Farming to Digital Farms
- Objectives: Productivity, Cost, Sustainability
- Climate Change and Climate Resilience in Agriculture
- Presentation of Key Smart Farming Technologies
- International Trends and Strategies

Sub-Unit 2: Adaptation and Implementation of Technological Solutions for Smallholders

Learning Outcomes:

- Identify how drones and automation systems enhance precision, efficiency, and sustainability.
- Identify challenges and opportunities in implementing smart farming solutions in low-resource settings.
- Recommend and demonstrate the use of digital tools that improve climate adaptation, traceability, and farm promotion.

Topics:

- A general overview: The situation of small farmers
- Obstacles and Difficulties in Adopting Technology
- Tailored Technology Solutions a. Inexpensive IoT and Sensors
- Examples of Implementation and Successful Actions
- Enhancing Adoption: training, networking, financial tools in Latin America

Sub-Unit 3: Agro-Data Collection, Visualization, and Interpretation

Learning Outcomes:

- Interpret basic agro-data to inform technical decisions at the farm or cooperative level.

Topics:

- The value of agro-data in precision agriculture
- How is agri-data collected and who collects it?
- Data Visualisation: from Data to Knowledge
- Interpretation and strategic use of data
- Challenges and perspectives

Sub-Unit 4: Data-Driven Strategic Decision-Making and Sustainability

Learning Outcomes:

- Build technicians' capacity to interpret agro-data and transform it into actionable technical recommendations for tropical farms.
- Recommend sustainability measures tailored to tropical crops using adapted indicators and tools.

Topics:

- The necessity of making decisions in agriculture based on data
- Decision-making techniques and technological tool
- Sustainability via interventions grounded in evidence
- From data to action: Technology's usefulness

LU4: Design Tech-Based Agro-Innovation Business Plans

Description: This learning unit focuses on turning ideas into action through structured business planning, incorporation of digital tools, and financial viability. It combines traditional planning techniques with digital transformation strategies relevant to agriculture, supported by real examples of success in Europe and Latin America.

Competence: Design and evaluate agribusiness plans that integrate digital solutions and financial strategies to build sustainable, scalable ventures in tropical agriculture.

Evidence: A complete business plan including a digital strategy, financial projections, and a case study reflection.

Learning Outcomes:

- Identify the most critical aspects of an agribusiness plan.
- Discover approaches to incorporating digital solutions in agribusiness models.
- Develop a business growth roadmap for establishing or expanding an agribusiness.
- Development of a business plan for a viable enterprise.

Content Overview:

- Business Planning Fundamentals
- From Idea to Action: Developing a Structured Business Plan
- Integrating Digital Tools into Agribusiness Models
- Financial Planning & Investment Strategies for Agri-Food Enterprises
- Case Studies: Digital Agriculture Startups

Sub-Unit 1: Fundamentals of Business Planning in the Agri-Food Sector

Learning Outcome: Introduce the core principles of business planning tailored to agri-food systems, including market analysis, value proposition development, and strategic decision-making.

Topics:

- Basic principles of agricultural entrepreneurship.
- What is entrepreneurship and who is an entrepreneur?
- Characteristics of an entrepreneur
- First steps in entrepreneurship
- What is an agricultural startup?

Sub-Unit 2: From Idea to Action-Innovation Business Plans

Learning Outcome: Guide students through transforming innovative ideas into structured, actionable business plans with clear goals, timelines, and value chains.

Topics:

- What is a business plan
- What is a business idea?
- Process for Generating a Business Idea
- Business model Canvas (BMC)
- What is a business plan?
- Importance of a business plan
- Elements of a Business Plan

Sub-Unit 3: Integrating Digital Tools into Agribusiness Models

Learning Outcome: Explore how to integrate digital technologies—such as data platforms, traceability tools, and mobile solutions—into agribusiness models to improve operations, sustainability, and market access.

Topics:

- What Are Digital Tools in Agribusiness?
- Categories of Digital Tools for Agribusiness
- Mapping Digital Tools into the Business Model Canvas
- Criteria for Selecting Digital Tools
- Digital Maturity and Readiness Assessment
- From Tool to Strategy: Planning Digital Integration

Sub-Unit 4: Financial Planning and Investment Strategies for Agri-Food Enterprises

Learning Outcome: Develop skills in budgeting, cost structure analysis, investment readiness, and evaluating return on investment to identify and attract potential funding sources.

Topics:

- Definition of Financial planning
- Objectives of financial planning
- The difference between a personal and business financial plan
- Financial Planning and Funding Overview
- Where to find support and help?

Sub-Unit 5: Case Studies: Successful Digital Agriculture Startups

Learning Outcome: Analyze real-world startups to extract practical lessons on innovation, scaling, digital adoption, and value creation in diverse contexts.

Topics:

- Staramaki, Greek agriculture enterprise

LU 5: Digital Marketing and Communications for Agriculture

Description: This learning unit builds core digital marketing and communication skills tailored to the agricultural context. Learners will explore how to design compelling messages, choose the right platforms, apply basic color and design theory, and use AI tools to support media planning and content creation. The focus is on enabling rural visibility, product promotion, and technical communication in tropical farming systems.

Competence: Create and manage digital communication strategies using social media platforms, basic web tools, and graphic design to promote agricultural products and share impactful stories from the farm.

Evidence: A content package including a basic communication plan, sample social media posts, visuals created with graphic tools, and a simple digital media calendar.

Learning Outcomes:

- Design basic agricultural communication strategies adapted to digital platforms.
- Create visually attractive posts using basic graphic design principles.
- Apply storytelling and branding to promote farm products and services.
- Use AI tools (like ChatGPT, Canva AI) to streamline content creation and scheduling.
- Support farmers in managing social media presence and basic websites.

Content Overview:

- Identify and differentiate message types and target audiences in agricultural communication.
- Manage platforms like WhatsApp Business, Facebook, and basic websites to build a digital presence.
- Design visual content that communicates agricultural messages with clarity and impact.
- Use AI tools to support efficient content creation, publication planning, and message automation.
- Analyze real-world examples to extract lessons applicable to local agricultural businesses.

Sub-Unit 1: Foundations of Agricultural Communication

Learning Outcome: Understand key concepts in communication and how they apply to the green sector.

Topics:

- What is agricultural communication?
- Types of messages in agriculture: technical, promotional, community-based.

Sub-Unit 2: Social Media Platforms and Web Presence

Learning Outcome: Use social media platforms and simple website tools to promote agricultural activities.

Topics:

- Social media tools for agriculture
- Creating a basic website or landing page
- Creating a digital identity for a rural business
- Making your content searchable with SEO
- Digital safety

Sub-Unit 3: Visual Content Creation and Design Basics

Learning Outcome: Apply design principles and video creation techniques to develop engaging digital materials.

Topics:

- Visual storytelling in agriculture.
- Color theory and contrast.
- Using Canva to designs.
- Product catalogues and prices
- Stickers and business cards
- Video Marketing and content creation

Sub-Unit 4: Using AI to Enhance Communication and Media Planning

Learning Outcome: Leverage AI tools to generate and plan digital content.

Topics:

- Introduction to AI tools for communication (e.g., ChatGPT, Canva AI).
- Generating post captions, schedules, and media calendars.
- Automating replies and content ideas for WhatsApp and social media.

Sub-Unit 5: Success Cases from European Agricultural Digital Marketing

Learning Outcome: Analyze successful examples of digital marketing and communication strategies applied in the European agricultural sector.

Topics:

- Case studies from cooperatives and agribusinesses using social media effectively
- Strategies and lessons learned

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Learning Unit 1: Introduction to the digital agroworld

Digi Build: Building Digitalization in the Green Sector

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Introduction

In this teaching unit, we will explore the phenomenon of digital agriculture, a new paradigm in agricultural practices in which the use of new technologies is fundamental. By the end of this unit, readers will have an overview of the key concepts of digital agriculture and will understand how new technologies can transform the green sector, especially in Costa Rica and Honduras. Readers will also be able to analyse the benefits and challenges faced by smallholder farmers when adopting these new techniques.

In addition, this first unit covers some of the digital skills and resources that may be useful for green sector professionals, farmers and non-digital people when starting the transition to digital agriculture, such as tips for conducting specific and targeted searches on the Internet or useful applications for promoting digital agriculture.

LEARNING OBJECTIVES

- Understand the potential role of digital agriculture in the contexts of Costa Rica and Honduras.
- Recognize the main concepts and terminology of digital agriculture.
- Develop information literacy skills to research digital agriculture effectively.
- Identify digital gaps among rural producers and how to address them.
- Explore European case studies on digital learning in rural and isolated regions.

Sub-Unit 1: Understanding the Central American Green Sector Profile

Before stepping into the world of digital agriculture, it is essential to understand the sector and the context in which it will be applied so that its adoption is appropriate and effective.

Therefore, to begin this training programme, and in particular this first Learning Unit, the DigiBuild project, which seeks to promote and assist the digital transition with a specific focus on the green sector in Costa Rica and Honduras, considers it necessary to first provide a brief analysis of the situation of the green sector in Latin America, with special attention to the situation in Costa Rica and Honduras, partner countries of the project consortium.

1.1. Profile of tropical farmers and technicians in Central America

In general, the green sector in Central America is characterised by small-scale rural production, predominantly traditional and family farming, although the adoption of new technologies is beginning to emerge. In terms of the profile of farmers, there is still a gender gap, with men greatly outnumbering women in this sector.

As part of the DigiBuild project, specific information focused on Costa Rica and Honduras regarding these professional profiles is presented below.

Profile of tropical farmers

In general, **small-scale agriculture** predominates in both countries, based largely on a family farming model. Most of this agriculture is located in rural areas of both countries, organised through networks or cooperatives to promote their businesses.

Both countries have a wide **variety of crops**. In Honduras, the main crops are bananas, coffee, palm oil, melons and livestock, in addition to basic grains such as corn, beans and rice. Meanwhile, in Costa Rica, crops focus on fruits, coffee, cocoa, pineapple, oil palm, sugar cane and livestock, in addition to basic grains and vegetables. Furthermore, both countries are **crop exporters** and therefore have a keen interest in new foreign policies that may affect this activity.

In recent years, both countries have focused their efforts on promoting a model of **sustainable agriculture,** which is reflected in the national policies and initiatives implemented in recent years.

However, farmers in both Costa Rica and Honduras face different challenges in implementing agricultural practices. First, we must not forget the importance of climate change, which makes farmers highly vulnerable to adverse phenomena such as droughts and floods. Second, **access to technology is limited in both countries**, even so, this is even more pronounced in the rural areas where crops are concentrated in both countries. The **digital divide** is one of the biggest problems when trying to introduce new agricultural practices in rural areas where even internet access is sometimes limited. Both countries are also affected by rural **ageing** and **urban exodus** of young people, as well as the **gender gap** in the agricultural sector. Finally, it is also worth highlighting the lack of investment and market volatility, which increases **instability** for farmers.

Profile of green sector technicians

With regard to technical experts in the green sector, they have a key role to play in the transition from traditional agriculture to digital agriculture. Equipped with the knowledge and practices necessary to revolutionise the agricultural sector, they must act as **agents of change**, offering support in the introduction of new technologies (AI, big data, drones, etc.) and promoting the transition to digital agriculture, especially in rural areas where digitisation is not yet a consideration.

This task is not easy and involves dealing with a public that is deeply rooted in its customs and, in many cases, sceptical of new market models and new technologies. Therefore, technicians seeking to promote digital agriculture in these countries must be very aware of the context in which they operate and have the skills to support farmers, who in many cases will not know where to start implementing these new methodologies. They also need to be aligned and constantly updated with new international guidelines, such as those from the European Union on crop sustainability.

On the other hand, these technicians must take into account other social factors such as the promotion of women in the agricultural sector, whose participation continues to be lower than that of men, or the motivation of young people to continue working in this sector and, through them, foster a generational change in the adoption of new technologies.

1.2. Identified digital barriers and capacity gaps

Considering all of the above, the main barriers encountered by the DigiBuild project in promoting the adoption of digital agriculture in Costa Rica and Honduras are outlined below.

- **Limited internet access:** In general, both countries have shortcomings in terms of connectivity and internet access. In Costa Rica, despite its advances in technology

and education, the digital divide and lack of access remain significant in rural areas where infrastructure is still underdeveloped. In Honduras, the situation is even more serious, with a higher rate of low connectivity. The resulting digital divide is not due to a single factor, but is a multifaceted problem influenced by factors such as geography, income, infrastructure and educational attainment.

- **Slow digitisation:** although both countries have made efforts in terms of digitisation, the process of adopting new technologies remains slow and lags behind other countries. This has one main consequence: it harms productivity and makes it difficult for producers to compete effectively in an increasingly globalised market.
- **Low digital literacy**: knowledge and use of ICTs is essential for the advancement of digital agriculture. Unfortunately, in both countries, the level of digital literacy is undeniably uneven among smallholder farmers, especially among women and young people.
- **Limited infrastructure and technology gap**: due to a lack of funding and resources, access to new technologies by farmers, especially those in rural areas, is very limited. This widens the technology gap, which in turn means that many farmers are only familiar with traditional practices and find it difficult to adopt innovative agricultural technologies, even if these are positioned to improve their productivity, crop quality and the sustainability of their work.
- **Lack of investment and technical assistance:** to overcome the digital divide mentioned above, it is necessary to provide technical assistance programmes to farmers to help them overcome the challenges they face and adopt new technologies. So far, the actions taken by governments, non-governmental organisations and the private sector, among others, have been insufficient.

1.3. Needs analysis results from Costa Rica and Honduras

Below are some conclusions on the needs identified in the green sector in Costa Rica and Honduras where the DigiBuild project can contribute, obtained from the results of the research and activities carried out in the DigiBuild project.

Need to strengthen digital infrastructure

In order to continue progressing in the digitisation of societies and the adoption of new technologies, it is necessary to have advanced technology and infrastructure capable of supporting digital change. To this end, it is essential to ensure connectivity throughout the

country, including rural areas. Access to the internet and new technologies is essential for accessing new information, training and opportunities.

Promote digital literacy, especially in rural communities

Reducing the digital divide in productive areas of the green sector is key to sustainable development in Latin America, helping competitiveness, employability and productivity in this region. Therefore, training on new digital features, especially if they come in digital formats that are accessible to everyone, is essential.

Close the gender gap

This is one of the main challenges in the green sector in Costa Rica and Honduras. In both countries, women are underrepresented in nearly all aspects of the value chain. It is therefore essential to create inclusive spaces for female participation in production processes, thus ensuring gender equality and the overall sustainability of the agricultural sector. Furthermore, the greater incorporation of women in these areas also helps to promote generational renewal in the sector.

However, the greater incorporation of women into the green sector also brings a multifaceted challenge that must be addressed from various angles, from improving women's access to academic and practical knowledge, especially for women in rural areas, to promoting women's participation and leadership in agricultural communities, among others. The DigiBuild project seeks to promote its results and training from a gender-inclusive perspective, encouraging the training of women to also act as agents of change in agricultural communities.

Promote youth participation in agricultural practices

Currently, both countries are experiencing a general exodus of people from rural areas to more urban areas. This is particularly the case among young people, who are increasingly migrating to large cities in search of new job opportunities and a better quality of life. However, this also threatens the survival of the green sector in these countries due to labour shortages and the lack of a future generation to take over.

On the other hand, promoting the participation of young people in the transition to digital agriculture is key. In general, the new generations are what we call the ‘digital generations’. These generations, to a greater extent than their predecessors, have grown up in a world governed by digitalisation and tend to be more open to the use of new technologies, as well as having more knowledge and skills in this area. Their involvement in the digitalisation of the green sector in both countries is therefore considered a critical step.

Promote training for technicians and farmers

The DigiBuild project aims to offer and implement specific training programmes for farmers and other professionals in the green sector, focusing on the use of digital tools and new technologies to promote awareness of these tools and encourage digital change. In this way, the project seeks to help bridge the digital divide in these countries, offering new opportunities, especially in rural communities. This is essential in order to address the shortcomings identified in these professionals when promoting and implementing the transition to digital agriculture.

For more information on the green sector in the Honduran and Costa Rican context, we recommend reading the previous results developed in the DigiBuild project, which provide a detailed and comprehensive overview of all the topics discussed in this sub-unit. You can find all of them in English and Spanish on the DigiBuild project website: https://digi-build.eu/

- Green sector current analysis
- Report on experts' groups result
- Upgraded Green sector digital needs analysis
- Handbook to Strengthen the Link between Training Providers and the Labour Market

Sub-Unit 2: What is digital agriculture and why does it matter?

2.1. Definition and pillars of digital agriculture

It is no secret that the current trend faced by the agricultural world is marked by an increased demand for sustainable resources and productivity, as well as market distribution influenced by these factors. According to the Food and Agriculture Organisation of the United Nations (FAO) (Trendov, Varas & Zeng, 2019), the global population is estimated to increase dramatically in the coming years, rising from 7.6 billion in 2018 to almost 9.8 billion in 2050. Added to this is the urban and production change necessary to house this entire population, with an estimated 66% of the world's population living in urban areas by 2050.

This, inevitably, increases the urgency for **transformation** in many areas of production, one of the most important being the agricultural and agri-food sector. This is essential to guarantee sustainability and food for future generations, so a change that embraces the new situation and offers real alternatives and solutions is crucial for humanity, as agriculture currently has to produce food, feed, fibres and fuels at a rate never seen before. However, this must also be

done taking into account the necessary resources that are available, ensuring that the new form of agriculture does not become a problem instead of a solution.

It is within this framework that the Fourth Industrial Revolution or Industry 4.0 is emerging, driving the use of new technologies and digital innovations to transform different sectors. When applied to the agricultural sector, we refer to it as **Agriculture 4.0** or Agri-Industry 4.0 (Javaid, Haleem, Singh & Suman, 2022), and within this, we can place **Digital Agriculture** (Trendov, Varas & Zeng, 2019).

Digital agriculture not only seeks to change farmers' practices, but also to **transform all elements of the agri-food chain in order to adapt it to future needs**. Thus, digital agriculture can be defined as the combination and integration of technology (e.g. engineering, bioinformatics, geographic information systems, etc.) into traditional agricultural practices (e.g. agronomy, horticulture, animal husbandry, etc.) to increase their efficiency and productivity (Zhang & Pierce, 2013). This, as indicated by the FAO, "reflects a change in generalized management of resources towards highly optimized, individualized, intelligent and anticipatory management, in real time, hyperconnected and driven by data" (Trendov, Varas & Zeng, 2019, p.12).

Digital agriculture thus seeks to improve farm management by optimising resource use and pursuing sustainability. Its characteristics are detailed below:

- **Data-Driven technology:** Digital agriculture emphasizes collecting and analyzing data from various sources (sensors, satellites, etc.) to make informed decisions about farming practices.
- **Use of emerging technologies:** such as the Internet of Things (IoT), Artificial Intelligence (AI), Big Data, satellites, etc.
- **Precision Agriculture:** This involves applying inputs (fertilizers, pesticides, water) precisely where and when they are needed, based on real-time data and conditions.
- **Improved Efficiency:** Digital tools and techniques can streamline various agricultural processes, reducing waste, optimizing resource allocation, and increasing productivity.
- **Sustainability:** In some cases, digital agriculture can help reduce environmental impact by optimizing resource use, minimizing waste, and promoting more sustainable farming practices.
- **Automation:** Automated systems, robotics, and drones can automate tasks, freeing up human labor and enabling more efficient farm operations.

- **Enhanced Monitoring:** Sensors and remote sensing technologies allow for continuous monitoring of crop health, soil conditions, and other critical factors.
- **Accessibility and Scalability:** Digital technologies can provide access to information and tools for farmers, both small and large, regardless of their location.

Thus, according to the FAO (Trendov, Varas & Zeng, 2019), the desired outcomes of digital agriculture are more productive systems that are secure, anticipatory and adapted to the consequences of climate change, in order to offer greater food security, profitability and sustainability.

The following table (Table 1) is a visual representation of the differences between traditional agriculture and digital agriculture in general terms:

Topic	Traditional Agriculture	Digital Agriculture
Use of technology	Low or none. Based on empirical knowledge and inherited practices.	High. Intensive use of advanced technologies such as IoT, AI, sensors, drones, etc.
Decision-making	Intuitive and based on the farmer's experience.	Data-driven, predictive models and real-time analysis.
Productivity	Limited by factors such as climate, soil and manual techniques.	Higher productivity thanks to automation and resource optimisation.
Crop control	Manual and general.	Automated, precise, and geolocated.
Use of resources (water, fertilisers, etc.)	Widespread and often inefficient.	Efficient and adapted to each area and crop, reducing waste.
Monitoring and tracking	Visual and on a regular basis.	Continuous, remote and in real time.
Operating costs	High due to inefficiency and intensive use of labour.	Long-term cost reduction thanks to automation.

Sustainability	Some practices may generate negative impacts due to excessive use of inputs.	Some practices promote sustainability through the rational use of resources.
Access to information	Limited and local.	Global, real-time and accessible from multiple devices.
Relationship with consumers	Indirect and traditional (local market).	Possibility of traceability, direct sales and digital connection with consumers.

Table 1: Differences between traditional agriculture and digital agriculture. Table made with IA.

2.2. Benefits and challenges for small-scale tropical producers

However, the adoption of digital agriculture, while potentially offering significant benefits to farmers, is not always easy and in some cases can present major challenges for farmers. Some of these benefits and challenges are detailed below.

Benefits of Digital Agriculture

The digitisation of the agricultural sector, as mentioned above, brings a series of benefits not only for farmers, but for everyone involved in the agricultural value chain. According to the European Union (2025), these are the most notable benefits of using digital technologies in agriculture in Europe, although they are applicable to all countries:

- **Production optimization:** Enhanced agricultural productivity and competitiveness are key goals for the agricultural sector, and digitalization is instrumental in achieving these objectives. Precision farming technologies play a crucial role in production optimization by helping farmers make better decisions, optimize operations, increase productivity and sustainability and reduce inputs, production costs and the environmental footprint of their agricultural activities.
- **Enhanced animal welfare:** digital applications also have the potential to enhance animal welfare, for example, by tracking health conditions of livestock through digital technologies.
- **Improved working conditions:** Automation and optimisation through digital technologies (for example, robotics) reduce the physical and mental workload of farmers and thus promote overall well-being.

- **Increased transparency:** Specific digital technologies such as blockchain are valuable tools for improving traceability and transparency of agricultural products in the value chain. This enables consumers to make more informed choices and builds trust in the quality and origin of agricultural products.
- **Increased competitiveness:** digitalization helps the agricultural sector stay competitive globally by providing innovative solutions and creating new business opportunities for all actors along the value chain.

Challenges of Digital Agriculture

However, it is necessary to be aware that the introduction of digital agriculture also poses some challenges for farmers and others involved in the agricultural and agri-food sector. The European Union (2025) highlights the following challenges:

- **Lack of awareness and skills in agriculture digitalization:** one of the main challenges in the adoption of digital technologies in agriculture is the lack of awareness and skills among farmers. Many may not be aware of the potential benefits of digitalization and may lack the necessary skills and resources to use new technologies effectively. This can hinder the integration of digital tools into farming practices and limit the potential for increased efficiency and productivity.
- **Digital divides in rural areas:** Another obstacle to the adoption of digital technologies in agriculture is the lack of reliable and affordable internet access in rural areas. This hinders the adoption of digital technologies, leading to "digital divides" between farmers in different regions. The disparities in access to technology could exacerbate existing inequalities in the agricultural sector, limiting the potential for farmers to benefit from digital solutions.

  Digital divide in Costa Rica and Honduras:

  The digital divide in Costa Rica and Honduras can still be considered significant, especially when compared to the percentage of connectivity in Europe, where, according to EUROSTAT (2024), 94% of households have access to the internet. These figures are even more striking when comparing statistics between urban and rural areas. In 2024 in Honduras, according to a study conducted by INE Honduras (2024), internet access in rural areas is 41.3% (compared to 65.3% in urban areas) and only 29.6% of the population over the age of 5 uses the internet daily. On the other hand, in Costa Rica, although the digital divide is smaller, differences between urban and rural areas can still be found. According to the Report Towards the Information and Knowledge Society 2023 carried out by the University of Costa Rica, in 2022,

23.8% of households in rural areas were not connected to the internet, compared to 14% in urban areas (Mora Vargas, 2024).

- **Lack of cost-effectiveness for small-scale farmers:** for them, the cost of implementing certain digital technologies might be higher than the potential benefits. This can make it challenging for them to invest in and adopt new technologies that could improve their efficiency and productivity. The lack of cost-effectiveness could limit the potential for small-scale farmers to benefit from digitalization, perpetuating the digital divide in the agricultural sector.

- **Need for trust in data sharing:** concerns about data privacy and ownership among farmers can affect the willingness of data sharing between different actors in the agricultural sector. Building trust in data sharing practices is crucial for the effective use of digital technologies in agriculture. Addressing these concerns and establishing clear guidelines for data sharing could help to overcome this obstacle and facilitate the integration of digital tools into farming practices.

- **Shortcoming in interoperability:** lack of interoperability between different systems is another challenge in the adoption of digital technologies in agriculture. Many digital applications or machines from different brands may not be compatible and unable to share and integrate data, making their use challenging for farmers.

Overall, addressing these challenges is crucial for ensuring that all farmers can benefit from the potential of digital technologies in agriculture. By overcoming these obstacles, the agricultural sector can harness the full potential of digitalisation to drive efficiency, productivity, and sustainability.

2.3. Entities promoting digital agriculture in Costa Rica and Honduras

Below are some organisations that carry out activities aimed at modernising the agricultural sector in rural communities in Costa Rica and Honduras.

Costa Rica

- **Costa Rican Coffee Institute (ICAFE).** ICAFE is a non-governmental public institution that focuses its work on promoting coffee production in Costa Rica. Its objectives also include promoting research and development in agricultural and industrial technology and supporting the production, processing, export and marketing of Costa Rican coffee. ICAFE is also responsible for creating systems such as the

CRcafé App, an application for the traceability and digital management of Costa Rican coffee quality.

For more information about ICAFE visit: https://www.icafe.cr/

- **Tropical Agricultural Research and Higher Education Centre (CATIE).** CATIE is a leading international organisation in research, education and innovation in Latin America and the Caribbean, whose mission is to promote 'Inclusive Green Development' through education and training. It has recently carried out projects such as "Chicas a Volar", an initiative to train and empower rural women in the use of drones.

  For more information about CATIE visit: https://www.catie.ac.cr/

- **Inter-American Institute for Cooperation on Agriculture (IICA)**. IICA is an international organisation specialising in agriculture and sustainable development in the Americas, supporting member states in achieving agricultural development and rural well-being. As such, IICA is a key organisation for the digital and technological transformation of the agricultural sector. IICA has offices in both Costa Rica and Honduras. IICA Costa Rica is part of the consortium for this DigiBuild project, contributing its expertise in the Costa Rican green sector and seeking to apply the project's results in the national context.

  For more information about IICA visit: https://iica.int/es/

- **School of Agriculture for the Humid Tropical Region (EARTH University)**: EARTH University is a global university based in Costa Rica specialising in providing training in agricultural sciences, food systems, ethical entrepreneurship, and social and environmental challenges through experiential learning.

  For more information about EARTH University visit: https://www.earth.ac.cr/

Honduras

- **Honduran Coffee Institute (IHCAFE).** IHCAFE is established as the official body for the coffee sector in Honduras, seeking socio-economic profitability for Honduran coffee growers through the development of competitiveness in the coffee agro-industrial chain in a sustainable manner and promoting the use of new technologies.

  For more information about IHCAFE visit: https://www.ihcafe.hn/

- **Honduran Agricultural Research Foundation (FHIA).** FHIA is a private, non-profit organisation founded with the aim of strengthening and actively participating in the development and improvement of the Honduran agricultural sector by strengthening the process of technology generation, validation and transfer in the national agricultural sector, as well as helping to diversify the country's agricultural production. FHIA is part of the consortium for this DigiBuild project, contributing its expertise in the Honduran green sector and seeking to apply the project's results in the national context.

  For more information about FHIA visit: https://fhia.org.hn/

- **Directorate of Agricultural Science and Technology (DICTA).** DICTA is a Honduran public organisation attached to the Ministry of Agriculture and Livestock (SAG) whose mission is to design, direct, implement and coordinate agricultural research and technology transfer programmes to improve the innovation capacity, productivity and socio-economic conditions of producers in order to promote environmental sustainability. Thus, DICTA is positioned as the leading public institution in scientific and technological development in this sector in Honduras.

  For more information about DICTA visit: https://dicta.gob.hn/

- **Zamorano Panamerican Agricultural School (Zamorano University):** Zamorano University is a highly prestigious institution that focuses its studies on agriculture, seeking to contribute to the agricultural sector and food security in Latin America.

  For more information about Zamorano University visit: https://zamorano.edu/

Sub-Unit 3: Digital Literacy and Research Tools

3.1. Search engines, keywords, prompting and critical thinking

The world of agriculture, as mentioned above, is constantly changing and always moving towards new goals. It is therefore essential that farmers and the entire agricultural community undergo continuous training and keep up their efforts to stay up to date with the latest information on the subject.

To this end, searching for new information on the internet and using the various resources offered by this tool is essential. Thanks to its accessibility and ease of use, the Internet has become an indispensable medium for searching for new information. However, due to the vast amount of information available, it can sometimes be difficult for users to find specific, accurate and quality information.

Search engines to start looking for information on digital agriculture

Firstly, it is necessary to choose the most appropriate search engine to find information. Below are some examples of search engines that can be used to research topics related to agriculture, among others:

- **Google**: general search engine, not specific to agriculture, where general (non-scientific) articles, news and material can be found. Link: https://www.google.com/
- **Google Scholar:** Google's academic search engine, not specific to agriculture, where scientific articles, books and scientific journals can be found. Link: https://scholar.google.com/
- **BASE (Bielefeld Academic Search Engine):** academic search engine, not specific to agriculture. Link: https://www.base-search.net/
- **Semantic Scholar:** free, AI-powered research tool for scientific literature. Non-specific to agriculture. Link: https://www.semanticscholar.org/
- **SIDALC:** International alliance for agricultural, livestock, forestry and environmental information services, through which a large group of institutions from 31 countries share their information and services online. Link: https://www.sidalc.net/search/
- **AGRIS (FAO):** multilingual bibliographic collection of food and agricultural scientific research with special attention to scientific information produced in the global south. Link: https://agris.fao.org/

- **CABI Digital Library:** Research and learning in agriculture, the environment and the applied life sciences. Limited access to subscription. Link: https://www.cabidigitallibrary.org/
- **AGRICOLA:** Bibliographic database from the U.S. National Agricultural Library. Link: https://www.nal.usda.gov/agricola
- **AGROVOC:** relevant Linked Open Data set about agriculture available for public use. Link: https://www.fao.org/agrovoc/
- **CGSpace**: digital research and knowledge repository with articles on topics related to climate adaptation and mitigation and nutrition, health and food security, among others. Link: https://cgspace.cgiar.org/home
- **AgEcon Search:** research in agriculture & applied economics. Link: https://ageconsearch.umn.edu/

Agricultural research keywords

However, it is not only necessary to choose the search engine that best suits your search needs, but also to consider what to search for and how to do so, otherwise any search will be ineffective. Therefore, secondly, it is essential to use 'keywords', which can be defined as short terms or expressions that refer to specific concepts on a particular topic and help users to identify, classify and search for information quickly and accurately.

Below are some examples of searches for information related to digital agriculture:

Topic	Keywords examples
General topics	- Agriculture research - Agricultural innovation - Sustainable agriculture - Agri-food systems - Rural development - Crop science
Technological focus	- Precision agriculture - Smart farming - Agriculture 4.0 - Digital agriculture

	- Internet of Things (IoT) - Artificial intelligence in Agriculture - GIS agriculture applications - Agricultural mechanization
Socio-economic focus	- Value chains in agriculture - Land use policy
European focus	- European agricultural policy - Common Agricultural Policy (CAP) - European Green Deal - European Union Deforestation Regulation (EUDR)

Prompting

The emergence of Artificial Intelligence in our lives has also changed the way we search for information. Nowadays, many people prefer to use Artificial Intelligence tools, such as ChatGPT, rather than traditional search engines, such as Google, to find information on a specific topic. With these AI tools, the search for information begins with the formulation of a 'prompt'. This refers to a question, phrase or instruction that is given to the AI system to obtain a specific answer. However, for the search for information in this type of tool/platform to be effective, it is advisable to follow these tips:

- Define the purpose of the prompt correctly: ask yourself what information you need, what result you are looking for, and what the objective is.
- Use clear and concise language: write well-structured, unambiguous sentences; be direct and precise.
- Provide context: the more relevant additional information you give the AI, the more accurate the response you will get. Specify the format of the response: if you need to receive the information in a specific format (list, table, paragraph, etc.).
- If necessary, provide guidelines and examples to guide the AI (e.g., use a professional tone in the response).
- Include restrictions or conditions: while it is essential to clarify what we want, it is also important to clarify what we do not want or wish to avoid (e.g., do not use academic jargon).

- Review and adjust the prompt: reread the prompt before sending it. If, after sending it, the response is not what you expected, adjust the prompt until you have one that is clear, concise, and provides you with the information you need.

3.2. Introduction to agricultural apps and platforms

In addition to search engines, there are also accessible applications that can be used by farmers and other actors in the digital agricultural world to digitise their agricultural practices. Here are some of them:

Name	Description	Link	Cost
Plantix	Helps farmers diagnose and treat crop problems, improve productivity, and provide new agricultural knowledge	https://plantix.net/en/	Free App
Agua de Honduras	An innovation initiative that provides reliable information on water resources quickly and free of charge	https://aguadehonduras.gob.hn/	Free App
TerraTrac	App specifically designed by TechnoServe to assist smallholders, especially coffee and cocoa farmers, in meeting the European Union Deforestation Regulation (EUDR) requirements. TerraTrac allows users to geolocate farms, map boundaries, and validate that farms are not in deforested areas, ensuring compliance with the new regulations set to be enforced starting in 2025	https://www.technoserve.org/tns-labs/terratrac-eudr-compliance	Free App
Plant-for-the-Planet applications	On the Plant-for-the-planet website, you can find free apps such as TreeMapper (to monitor forest restoration) and Tracer (for deforestation-free agriculture), which are useful for small farmers to control their land and meet the standards of the EDR.	https://www.plant-for-the-planet.org/	Free App

CRcafé	Developed by the Costa Rican Coffee Institute to provide direct support to the national coffee sector. The objective is to help users recognise and characterise producers, farms, and lots in all regions of the country.	https://play.google.com/store/apps/details?id=cr.icafe.bandolapp	Free App
BASF Agro App	App created to help farmers in Costa Rica manage their crops by providing information such as weather forecasts, pest alerts, recommendations.	https://agriculture.basf.com/cr/es/proteccion-de-cultivos/servicios/agro-app	No specific data
Caféarvenses	App developed by the University of Costa Rica that provides access to information related to weeds that frequently appear in coffee-producing areas.	https://play.google.com/store/apps/details?id=com.vriur04.arvenses&hl=es_419	No specific data
CacaoMovil	Provides information on good agricultural practices for cacao, as well as easy tracking of production costs.	https://cacaomovil.com/	Free App
DIMITRA	Agtech company with a mission to help smallholder farmers across the world. Through its mobile applications DIMITRA Connected Farmers (Coffe) and DIMITRA Connected Cacao, smallholder farmers have access to timely technology to manage their crops with actionable data.	https://dimitra.io/	Free Apps
AgritecGEO - DISAGRO	Application that offers digital agriculture solutions to improve decision-making and efficiency for farmers	https://www.disagro.com.hn/agritecgeo-storytelling/	Free App

3.3. Tools and strategies for guiding non-digital natives to learn independently

Are you interested in learning more about digital agriculture but still don't know where to start? Below are some tips to follow when starting an information search on the internet (Cork Institute of Technology, 2025; Márquez González, 2023; Mejía Franco & Calle Pineda, 2020):

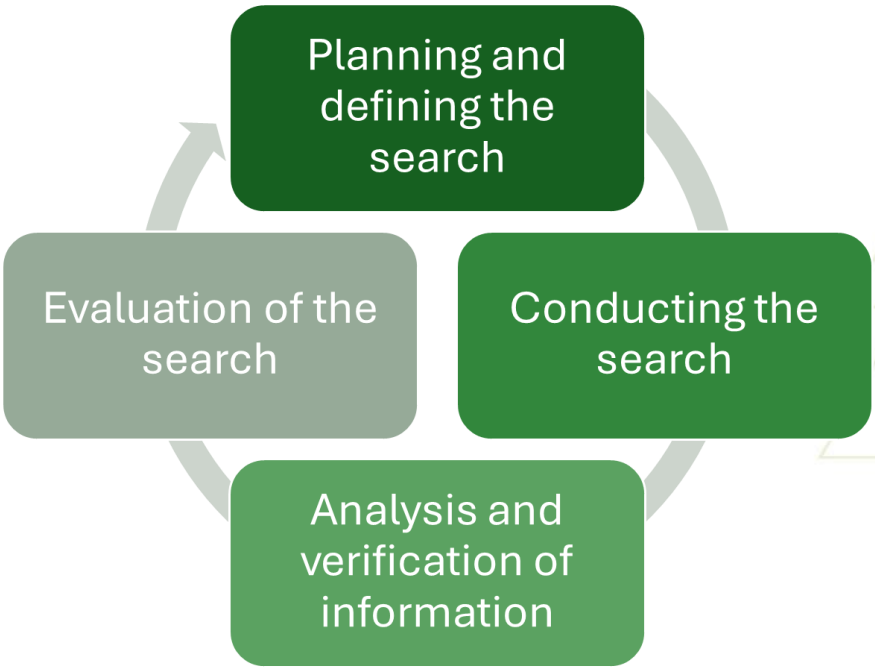
- Define your search: before you start searching, define what you want to find and in what format. The Internet hosts endless amounts of information, so it is very important to specify what you are looking for. One way to do this is to use specific terminology.
- To do this, search for information based on keywords related to your chosen topic. Later in this module, we will define keywords related to digital agriculture to make it easier to find information on the subject.
- Use your browser's 'advanced search' option: this will give you greater control when searching according to your own criteria. Most browsers offer this option. The following link shows you how to activate it in Google.
- Use different browsers: Google isn't the only one out there; there are others like Bing and Yahoo that can help you with your search. Some, like Ecosia, also contribute to the environment by planting trees for every search you make. For more specific searches, focus on specific search engines. Later on, part of the module is dedicated to presenting search engines for specific searches related to agriculture.
- Formulate your search phrases appropriately.
    - Use AND to find information that contains all the words in the search. You can also use the '+' sign between words.
    - Use OR to find information that contains any of the words indicated. You can also use the '|' symbol.
    - Use NOT to exclude words from a search. You can also use the '-' sign.
    - Use quotation marks ('') to search for exact information.
    - Do not use capital letters or accents.
    - Do not include excess words: avoid common words such as 'The', 'of', 'a', etc.

- To search for a definition, type “define” before the term to be defined (e.g. define:agriculture).
- To search for information on a specific site, type ‘site’ before the search (e.g. site:google agriculture).
- To search for information in a specific format, type “filetype” before the search (e.g. filetype:pdf agriculture).

- Compare and verify information: don't settle for the first page/article/platform you find; compare and verify the information you find. As far as possible, use verified pages and research the authors of the article.
- Use AI: always with responsibility, the use of artificial intelligence can help you search and find information. However, check that the information received is accurate and that the sources used are reliable.

From the DigiBuild project, we recommend that the search for information follow these steps:

1. **Planning and defining the search:** this is the first stage of a search, in which the user must define what they are looking for and how they intend to search for it (e.g., which search engine to use).
2. **Conducting the search**: this involves actually carrying out the search.
3. **Analysis and verification of information**: once the search has been carried out, it is time to read and analyse the results obtained, verifying the information in each case.
4. **Evaluation of the search**: After the above analysis, it is necessary to decide whether the information is adequate or not and whether it is useful for our purpose. If it is not sufficient, a new, more specific search in line with the expectations must be carried out.



Sub-Unit 4: Learning from others: European experiences in rural digitalization

4.1. Case studies from rural Europe

Be inspired! Here are some initiatives and projects carried out in Europe where the digitisation of rural areas acts as a cornerstone.

Interreg Alpine Space

Interreg Alpine Space is a European programme belonging to Interreg that co-finances cross-border cooperation projects between seven countries: Austria, France, Germany (south), Italy, Slovenia, Switzerland and Liechtenstein. Its priorities include: 1. Promoting a resilient and green Alpine region, promoting adaptation to climate change and the protection and preservation of nature; 2. Promoting a carbon-neutral and resource-sensitive Alpine region; 3. Promoting digitalisation and innovation supporting a green Alpine region; and 4. Promoting cooperative management and development of the Alpine region.

On its website (https://www.alpine-space.eu/), under the 'Our projects' tab, you can find information on all the projects approved under this programme from 2000 to the present, filtered by theme or country where they have been carried out, among other criteria. In relation to the DigiBuild project and its approach, we encourage you to take a look at the project SmartVillages in particular to inspire you on how digitalisation can be carried out in rural areas.

SmartAgriHubs

SmartAgriHubs is a European project that is part of the Horizon 2020 programme, made up of a consortium of more than 164 countries and whose objective is to 'digitise European agriculture by promoting an agricultural innovation ecosystem dedicated to excellence, sustainability and success.' Thus, thanks to the creation of a broad network, the aim is to connect and promote agricultural and technological innovation in Europe.

On their website (https://www.smartagrihubs.eu/), in the 'Innovation Experiments' section (within the 'SmartAgriHubs' section), you can research any of the 28 innovation experiments carried out, in which different technological and digital innovation solutions have been implemented. From the DigiBuild project, we recommend taking a look at the following experiments to get inspired by the different ways in which digital agriculture can be used: Smart Data Use on Arable Farms - Farmcube, Smart Groundwater and Weather Sensors or Autonomous Greenhouses – Smart Micro Farming and Large-scale Production.

Smart Rural 21

The Smart Rural project was a two and a half-year project supported by the European Commission (DG AGRI) with the overall aim to promote and inspire villages to develop and implement smart village approaches and strategies across Europe, and to draw conclusions and support future policy interventions on smart villages.

On their website (https://www.smartrural21.eu/), you can find a range of resources related to the development of smart villages across Europe, including a repository of useful information on what is happening in EU member states with regard to the planning and implementation of this type of villages, a guidebook on how to start the process of becoming a smart village, and a roadmap with key tools for this purpose.

You can also investigate the cases of the 21 rural communities that the project supported in becoming smart villages and a comprehensive database where you can find smart solutions that have been implemented in these communities. The DigiBuild project recommends exploring this last section to learn about possible solutions that you can apply in your community. In particular, we recommend taking a look at the following smart solutions::

Drones in Agriculture (initiative carried out in Marathon, Greece), Open Food Hub (initiative carried out in Cloughjordan, County Tipperary, Ireland), Rainwater Irrigation System (initiative carried out in Tomaszyn, Poland) and Sustainable Village Foundation (initiative carried out Molenlanden, Netherlands)

4.2. Discover it from the source: stories on digitisation in agriculture

The transition to a more digital model of agriculture is a reality, and many people have already embarked on this journey. In this section, we seek to collect testimonials, talks, and experiences that will help you explore how others are experiencing digital agriculture and how they have begun their journey towards adopting it.

La digitalización agrícola: una herramienta para la supervivencia de las pymes | BBVA en España

In collaboration with BBVA Spain, Paula Ruiz, Head of R&D&I at Trops, and Luis Navarro, Senior Advisor, discuss the importance of digitalisation in the agricultural sector in Spain, the generational change in the sector and how this can be achieved.

Link: https://www.youtube.com/watch?v=TQIHnDuSfgI

¿Cómo la agricultura digital contribuye a la sostenibilidad? | El Agricultor Primero

In this podcast, Ignacio Caride, Head of Digital at Syngenta, in collaboration with Latinoamérica Sur, discusses the challenges of implementing digital agriculture in the region and how the adoption of new digital tools is shaping the future of environmental sustainability.

Link to Spotify (podcast in Spanish): https://open.spotify.com/episode/0TQll2l2Pf5aV0FmyR25aX?si=x016zu2CTdm5QUXxs5C5oQ&nd=1&dlsi=26a65a51860c46fa

SmartAgriHubs FIE: Smart Data Use on Arable Farms - Farmcube | SmartAgriHubs

Digitising decision-making processes by storing data gathered from remote sensing applications and translating it into tailored advice for end-users.

Link: https://www.youtube.com/watch?v=xhgEm86ioDs

SmartAgriHubs FIE: Autonomous Greenhouses – Smart Micro Farming and Large-scale Production | SmartAgriHubs

Combining AI and IoT technologies to establish an automated greenhouse management system able to monitor climatic conditions and carry out robotic crop treatments.

Link: https://www.youtube.com/watch?v=uQKhGgpYjX8

SmartAgriHubs FIE: Smart Groundwater and Weather Sensors | SmartAgriHubs

Developing a web-based system for agrometeorological and groundwater measurements to ease the transfer of information between different farm applications and smoothen the uptake of precision agriculture.

Link: https://www.youtube.com/watch?v=L5h5v8O9Rms

SmartAgriHubs FIE: Sensoring and AI Algorithms for Early Crop Disease Detection - SAIA | SmartAgriHubs

Using digital technologies to produce risk maps so as to facilitate the early detection of plant pests.

Link: https://www.youtube.com/watch?v=og8r67lu6d4

Kytherian olive groves data collection | Smart Rural 21

Data collection from the island's olive groves is carried out within the Smart Rural 21 project and aims to expand the expertise of the 'Terra Kytheria' programme which promotes the local olive oil, supports producers and the economic and social revitalisation of the primary sector of Kythera (Greece). To achieve this goal, a scientifically documented precision farming and certification system for olive cultivation has been developed.

Link: https://www.youtube.com/watch?v=WrcKwMLKp1o

Campus de Excelencia Internacional en Agroalimentación (ceiA3) | ceiA3

The Campus of International Excellence in Agri-Food (ceiA3) is the result of collaboration between the universities of Almería, Cádiz, Huelva, Jaén and Córdoba (Spain). This association seeks to transfer knowledge to other professionals and stakeholders in the agri-food sector, with the aim of promoting its development and addressing the new challenges it faces. The DigiBuild project highly recommends visiting both its YouTube channel (https://www.youtube.com/@ceiA3cienciaA3/videos) and its website (http://www.ceia3.es/), where you can find more information about its projects, training courses and activities.

Link (YouTube): https://www.youtube.com/@ceiA3cienciaA3/videos

TEDx Talks: Digital Agriculture Transforming Farmers' Lives | TEDxUWA

Michael Robertson, director of CSIRO Agriculture and Food, explains how using a simple digital sensor to measure soil moisture facilitates decision-making regarding crop irrigation in Africa, which helps to grow more food with less water.

Link: https://www.youtube.com/watch?v=MQaRqZpkQxk

Digital Agriculture Stories from the field. Welthungerhilfe - Zimbabwe | Hove Tawanda

Agricultores y ganaderos de Zimbabwe comparten sus experiencias tras incorporar el uso de teléfonos móviles y aplicaciones digitales en su trabajo en el día a día.

Link: https://www.youtube.com/watch?v=pXpfRbSdYk8

4.3. Adaptation to rural realities in Latin America.

Based on the examples, stories, and projects highlighted above, we can point to some elements that could be beneficial in Latin American regions, specifically in Costa Rica and Honduras.

- **Promotion of cooperation networks in rural areas of Costa Rica and Honduras.** Similar to the Interreg Alpine Space programme, promoting effective cooperation networks between different rural areas with similar characteristics (e.g. mountainous areas) would help small farmers to connect with each other, receive immediate information and find common solutions for the area.

- **Use of new technologies to control or improve crop productivity.** For example, the use of drones for crop control, as in the Terra Kytheria project (Greece) supported by the Smart Rural 21 programme, or the use of IoT and AI to create smart greenhouses, as in the Autonomous Greenhouses – Smart Micro Farming and Large-scale Production project, supported by the SmartAgriHubs initiative. These new technologies (for example, drones) could even be shared among farmers with nearby crops, reducing the initial cost and thus enabling farmers with limited financial resources to afford this technology through partnerships with others.

- **Creation of community platforms/applications that facilitate local trade.** As in the case of the Open Food Hub initiative supported by the Smart Rural 21 programme, rural communities in Costa Rica and Honduras could benefit from the development of tools (or the use of existing ones) that enable the establishment of a local market and its regulation by local farmers themselves.

- **Rural training and education communities.** With the aim of promoting the exchange of good practices, education and training in rural areas, as well as trying to reduce the digital divide in remote areas, the creation of training and education groups or communities could be a solution. For example, the creation of WhatsApp communities (or any other application such as Telegram or Facebook communities) where local farmers could share short videos or training clips about their work with other farmers. This could be established as a solution, especially in cases where access to training or connectivity is limited and farmers are unable to access more complex information platforms.

However, it is important to bear in mind that adapting these examples to the rural context of Costa Rica and Honduras must always take into account the characteristics of these areas. Thus, the tropical climate, the predominant model of family farming and local associations, the digital divide and lack of connectivity, among other factors, are essential elements to consider when determining what can really work in these communities.

On the other hand, it is also recommended to seek support from government agencies and the assistance they offer for rural development, as well as to seek help or guidance from international programmes or initiatives (an example of this are the 21 villages selected by the Smart Rural 21 programme, which have been supported by this programme to become smart villages).

4.4. Case studies from other industries in Europe that may be applicable for the green sector.

As mentioned earlier in this learning unit, digital agriculture is part of the Fourth Industrial Revolution (Industry 4.0), but it is not the only sector where advances are being made thanks to digitalisation and the use of new technologies. Below are some examples of digitalisation applied to other sectors in Europe:

- **Automotive sector.** For example, companies such as BMW are exploring the application of virtual reality and advanced robotics to improve manufacturing processes (using robots in manufacturing processes) and improve the quality of their employees' work (using virtual reality as a tool for employee training and development). More information here: BMW & Industry 4.0 Revolutionising Automotive Manufacturing.

- **Food Industry.** For example, Nestlé and IBM have partnered to investigate how artificial intelligence and advanced technology can revolutionise the world of packaging in pursuit of new, more product-friendly packaging materials. More information here: Nestlé and IBM leverage AI and deep tech to unlock new packaging innovations.

- **Smart Construction.** For example, the Smart Kalasatama project in Helsinki, Finland, which aims to create an innovative and smart district. This is an example of the application of Industry 4.0 to the construction of new smart cities. More information here: Smart Kalasatama and Smart Kalasatama – The Smart City District of Helsinki.

However, many of the possibilities for how other sectors can be applied and bring benefits to the agricultural sector in Latin America are still to be discovered. For example, the use of private transport such as Uber, commonly used for food delivery services, have you ever considered whether it could be used to order agricultural inputs? What about sharing tractors or harvesters? Another example is Airbnb. Could this model be used to offer land for planting? And another one, To Good To Go. Could this idea be used to identify coastal areas that need to be sold quickly to avoid product loss? Your imagination is the limit! Remember that some of the most successful projects started with the simplest ideas.

Conclusion

Digital agriculture is here to stay. Adopting its procedures is necessary to advance the future of agriculture and begin developing more sustainable practices that are better suited to today's reality. Upon completion of this unit, readers are expected to understand the fundamentals of digital agriculture, and be ready to take their first steps in the agro-digital world.

Learning Activities

Exercise 1: "Reflections on the application of digital agriculture in one's own environment (20 minutes)"

Digital agriculture is the future, and now it's your turn! Start by thinking about how adopting digital agriculture could benefit you and what it would mean for your business (to do this, remember to also consider the challenges you will face). Pest control? Irrigation control? Write down everything you can think of and try to figure out how you could implement them.

Advanced reflection could go towards estimating the cost and reviewing possible subsidies or collaboration of entities to buy in groups and reduce investment costs.

Tip: Before starting this activity, explore all the examples and initiatives presented in the section: Sub-Unit 4: Learning from others: European experiences in rural digitalisation. You may find them inspiring!

Exercise 2: Improve your digital competence when searching for new information (20 minutes)

Use the tips and practices outlined in "Sub-unit 3: Digital Literacy and Research Tools" to expand on the information provided about digital agriculture. To do this, choose a topic within it that interests you (for example: Artificial intelligence in Agriculture) and start your search. Remember to use the most appropriate search engine, keywords identified in the sub-unit and to refine your search as you find information.

Exercise 3: Using digital agriculture applications (20 minutes)

Try downloading one of the applications listed in "Sub-Unit 3: Digital Literacy and Research Tools". Explore how it works and try out all its features.

Exercise 4: Think big! (20 minutes)

Reread subsection *5.4. Case studies from other industries in Europe that may be applicable for the green sector* (within section *Sub-Unit 4: Learning from others: European experiences in rural digitalisation*), especially the last paragraph. What other ideas come to mind? Are there any other platforms that could be adapted to the green sector? Write down all the ideas that come to mind, perhaps the next great initiative is among them!

Assessment

Quizz

1. Digital agriculture seeks to transform agriculture at all costs, even if the sustainability of its practices is sometimes overlooked.

    a. True
    b. False - correct

2. What is a characteristic of digital agriculture?

    a. Use of emerging technologies
    b. Automation
    c. Sustainability
    d. All of the above - correct

3. One of the main benefits of digital agriculture is that it increases transparency in agri-food chain processes.

    a. True - correct
    b. False

4. What are considered to be the benefits of digital agriculture?

    a. Production optimization
    b. Increased competitiveness
    c. Increased working conditions
    d. All of the above - correct

5. The digital divide and lack of technological skills are emerging as one of the main problems in promoting digital agriculture in rural areas.

    a. True - correct
    b. False

6. _____ can be defined as: the use of digital technologies to manage the entire agricultural value chain.

    a. Traditional Agriculture
    b. Digital Agriculture - correct
    c. None of the above options

7. It is always necessary to verify information found on the internet:

a. No, it is not necessary because the internet has its own ways of verifying information.
b. It is not always necessary, for example when it comes from reliable sources.
c. Yes, even if it comes from reliable sources, it is always advisable. - correct

8. The rural exodus of young people to large cities is one of the greatest challenges facing the green sector in Costa Rica and Honduras.

    a. True - correct
    b. False

9. The incorporation of women into the green sector in Costa Rica and Honduras should be seen as a challenge

    a. Multifaceted, to be addressed from various angles, from access to education to participation in decision-making and leadership, among many others. - correct
    b. One-dimensional, in which only access to education should be taken into account.
    c. Not a challenge in the Costa Rican and Honduran green sector

10. The role of technical professionals in the green sector is mainly to act as agents of change, supporting the introduction of new technologies (AI, big data, drones, etc.) and promoting the transition to digital agriculture.

    a. True - correct
    b. False

References

AGRIS (FAO). (Consulted on 27 june 2025). AGRIS. Available at: https://agris.fao.org/

AgEcon Search. (Consulted on 27 june 2025). AgEcon Search. Research in Agricultural & Applied Economics. Available at: https://ageconsearch.umn.edu/

AGRICOLA. (Consulted on 27 june 2025). AGRICOLA National Agricultural Library. Available at: https://www.nal.usda.gov/agricola

Agua de Honduras. (Consulted on 26 june 2025). Agua de Honduras. Available at: https://aguadehonduras.gob.hn/

BASE (Bielefeld Academic Search Engine). (Consulted on 27 june 2025). BASE (Bielefeld Academic Search Engine). Available at: https://www.base-search.net/

BASF. (Consulted on 26 june 2025). ¡Llegó BASF Agro App! | BASF Agro Costa Rica. Available at: https://agriculture.basf.com/cr/es/proteccion-de-cultivos/servicios/agro-app

BBVA en España. (3 july 2023). La digitalización agrícola: una herramienta para la supervivencia de las pymes. Available at: https://www.youtube.com/watch?v=TQIHnDuSfgI

CABI Digital Library. (Consulted on 28 june 2025). CABI Digital Library. Available at: https://www.cabidigitallibrary.org/

CacaoMovil. (Consulted on 26 june 2025). CacaoMovil. Available at: https://cacaomovil.com/

CATIE. (Consulted on 3 july 2025). CATIE. Solutions for Inclusive Green Development. Available at: https://www.catie.ac.cr/

ceiA3. (8 may 2012). Campus de Excelencia Internacional en Agroalimentación. Available at: https://www.youtube.com/@ceiA3cienciaA3/videos

ceiA3. (Consulted on 4 july 2025). Campus de Excelencia Internacional en Agroalimentación. Inicio. Available at: http://www.ceia3.es/

CGSpace. (Consulted on 27 june 2025). CGSpace. Available at : https://cgspace.cgiar.org/home

Cork Institute of Technology. (Consulted on 28 may 2025). A Guide to Effective Internet Searching. Available at: https://library.cit.ie/supports/online-tutorials

DigiBuild project (2024). Green sector current analysis. Available at: https://digi-build.eu/wp-content/uploads/2024/12/D2.1-%E2%80%93-Green-sector-current-analysis-1.pdf

DigiBuild project (2024). Handbook to Strengthen the Link between Training Providers and the Labour Market. Available at: https://digi-build.eu/wp-content/uploads/2025/04/D2.4-Handbook-to-Strengthen-the-Link-between-Training-Providers-and-the-Labour-Market-FINAL_EN.docx.pdf

DigiBuild project (2024). Report on experts' groups result. Available at: https://digi-build.eu/wp-content/uploads/2024/12/D2.3-Upgraded-Green-sector-digital-needs-analysis_EN-1.pdf

DigiBuild project (2024). Upgraded Green sector digital needs analysis. Available at: https://digi-build.eu/wp-content/uploads/2024/12/D2.2-Report-on-experts-groups-result-EN-1.pdf

DIMITRA. (Consulted on 26 june 2025). DIMITRA. Available at: https://dimitra.io/

DISAGRO. (Consulted on 26 june 2025). AgritecGEO. Available at: https://www.disagro.com.hn/agritecgeo-storytelling/

El Agricultor Primero. (6 march 2024). ¿Cómo la agricultura digital contribuye a la sostenibilidad? Available at: https://open.spotify.com/episode/0TQll2l2Pf5aV0FmyR25aX?si=x016zu2CTdm5QUXxs5C5oQ&nd=1&dlsi=26a65a51860c46fa

European Union (2025). The Digitalisation of the European Agricultural Sector. Available at: https://digital-strategy.ec.europa.eu/en/policies/digitalisation-agriculture

EUROSTAT. (December 2024). Digital economy and society statistics - households and individuals. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Digital_economy_and_society_statistics_-_households_and_individuals

FHIA. (Consulted on 3 july 2025). Fundación Hondureña de Investigación Agrícola. Available at: https://fhia.org.hn/

Forum Virium Helsinki. (11 june 2021). Smart Kalasatama – The Smart City District of Helsinki. Available at: https://www.youtube.com/watch?v=ryVbjhFeGGE

Forum Virium Helsinki. (Consulted on 4 july 2025). Smart Kalasatama. Available at: https://fiksukalasatama.fi/en/

Google. (Consulted on 27 june 2025). Google. Available at: https://www.google.com/

Google Scholar. (Consulted on 27 june 2025). Google Scholar. Available at: https://scholar.google.com/

Hove Tawanda. (4 march 2022). Digital Agriculture-Stories from the field. Welthungerhilfe - Zimbabwe. Available at: https://www.youtube.com/watch?v=pXpfRbSdYk8

ICAFE. (Consulted on 26 june 2025). CRCAFE. Available at: https://play.google.com/store/apps/details?id=cr.icafe.bandolapp

ICAFE. (Consulted on 3 july 2025). Instituto del Café de Costa Rica - iCAFE. Available at: https://www.icafe.cr/

IICA. (Consulted on 3 july 2025). IICA. Instituto Interamericano de Cooperación para la Agricultura. Available at: https://iica.int/es/

IHCAFE. (Consulted on 3 july 2025). IHCAFE. Instituto Hondureño del Café. Available at: https://www.ihcafe.hn/

Instituto Nacional de Estadística de Honduras (INE Honduras). 21 october 2024. Conectividad en Honduras: explorando el acceso y uso de las tic en los hogares. Available at: https://temp.ine.gob.hn/2024/10/21/conectividad-en-honduras-explorando-el-acceso-y-uso-de-las-tic-en-los-hogares-junio-2024/

Interreg Alpine Space programme. (Consulted on 2 july 2025). Interreg Alpine Space programme. Available at: https://www.alpine-space.eu/

Interreg Alpine Space programme. (Consulted on 2 july 2025). Smart Villages. Available at: https://www.alpine-space.eu/project/smartvillages/

Javaid, M., Haleem, A., Singh, R. P., & Suman, R. (2022). Enhancing smart farming through the applications of Agriculture 4.0 technologies. International Journal of Intelligent Networks, 3, 150-164.

Marcus Law. (29 october 2024). BMW & Industry 4.0 Revolutionising Automotive Manufacturing. Available at: https://technologymagazine.com/articles/bmw-industry-4-0-revolutionising-automotive-manufacturing

Márquez González, M. C. (2023). Yo te digo como… Hacer búsquedas eficientes en internet. Available at: https://suayedfca.unam.mx/assets/images/pdf/tedigo_como/como_buscar_en_internet.pdf

Mejía Franco, A. L., & Calle Pineda, C. (2020). Tip de TIC-Tips para hacer búsquedas eficientes en Internet. Available at: https://componentes-virtuales-ces.s3.amazonaws.com/centro_educacion_virtual/tip_tic/2020/tip_tic_enero_2020/index.html

Mora Vargas, P. (8 march 2024). *Brecha digital: vivir en zonas rurales y tener menos nivel educativo son factores de vulnerabilidad.* Programa Institucional Sociedad de la Información y el Conocimiento (Prosic), Universidad de Costa Rica. Available at: https://www.ucr.ac.cr/noticias/2024/3/08/brecha-digital-vivir-en-zonas-rurales-y-tener-menos-nivel-educativo-son-factores-de-vulnerabilidad.html

Nestlé. (3 july 2025). Nestlé and IBM leverage AI and deep tech to unlock new packaging innovations. Available at: https://www.nestle.com/about/research-development/news/ibm-ai-powered-sustainable-packaging

Plant-for-the-Planet. (Consulted on 26 june 2025). Plant-for-the-Planet. Available at: https://www.plant-for-the-planet.org/

Plantix. (Consulted on 26 june 2025). Plantix. Available at: https://plantix.net/en/

Semantic Scholar. (Consulted on 27 june 2025). Semantic Scholar. Available at: https://www.semanticscholar.org/

SIDALC. (Consulted on 27 june 2025). SIDALC. Available at: https://www.sidalc.net/search/

SmartAgriHubs. (10 october 2022). SmartAgriHubs FIE: Smart Groundwater and Weather Sensors. Available at: https://www.youtube.com/watch?v=L5h5v8O9Rms

SmartAgriHubs. (13 september 2022). SmartAgriHubs FIE: Sensoring and AI Algorithms for Early Crop Disease Detection - SAIA. Available at: https://www.youtube.com/watch?v=og8r67lu6d4

SmartAgriHubs. (15 november 2021). SmartAgriHubs FIE: Autonomous Greenhouses – Smart Micro Farming and Large-scale Production. Available at: https://www.youtube.com/watch?v=uQKhGgpYjX8

SmartAgriHubs. (26 november 2021). SmartAgriHubs FIE: Smart Data Use on Arable Farms - Farmcube. Available at: https://www.youtube.com/watch?v=xhgEm86ioDs

SmartAgriHubs. (Consulted on 2 july 2025). Autonomous Greenhouses – Smart Micro Farming and Large-scale Production. Available at: https://www.smartagrihubs.eu/flagship-innovation-experiment/18-autonomous-greenhouses

SmartAgriHubs. (Consulted on 2 july 2025). Smart Data Use on Arable Farms - Farmcube. Available at: https://www.smartagrihubs.eu/flagship-innovation-experiment/10-fie-farmcube

SmartAgriHubs. (Consulted on 2 july 2025). Smart Groundwater and Weather Sensors. Available at: https://www.smartagrihubs.eu/flagship-innovation-experiment/20-fie-smart-ground-water-sensors

SmartAgriHubs. (Consulted on 2 july 2025). SmartAgriHubs. Available at: https://www.smartagrihubs.eu/

Smart Rural 21. (6 may 2022). Kytherian olive groves data collection. Available at: https://www.youtube.com/watch?v=WrcKwMLKp1o

Smart Rural 21. (Consulted on 2 july 2025). Guidebook (Final Draft). Available at: https://www.smartrural21.eu/guidebook/

Smart Rural 21. (Consulted on 2 july 2025). Kythera Roadmap Outputs. Available at: https://www.smartrural21.eu///wp-content/uploads/Summary-Report_SR21_TERRA-KYTHERIA_Data-collection.pdf

Smart Rural 21. (Consulted on 2 july 2025). Participant villages. Available at: https://www.smartrural21.eu/villages/

Smart Rural 21. (Consulted on 2 july 2025). Resources. Available at: https://www.smartrural21.eu/resources/

Smart Rural 21. (Consulted on 2 july 2025). Roadmap Toolbox. Available at: https://www.smartrural21.eu/roadmap/

Smart Rural 21. (Consulted on 2 july 2025). Smart Solutions. Available at: https://www.smartrural21.eu/smart-solutions/

Smart Rural 21. (Consulted on 2 july 2025). Smart Solutions. Drones in Agriculture. Available at: https://www.smartrural21.eu/smart-solution/drones-in-agriculture/

Smart Rural 21. (Consulted on 2 july 2025). Smart Solutions. Open Food Hub. Available at: https://www.smartrural21.eu/smart-solution/open-food-hub/

Smart Rural 21. (Consulted on 2 july 2025). Smart Solutions. Rainwater Irrigation System. Available at: https://www.smartrural21.eu/smart-solution/rainwater-irrigation-system/

Smart Rural 21. (Consulted on 2 july 2025). Smart Solutions. Sustainable Village Foundation. Available at: https://www.smartrural21.eu/smart-solution/sustainable-village-foundation/

Smart Rural 21. (Consulted on 2 july 2025). The Smart Rural 21 Project. Available at: https://www.smartrural21.eu/

TechnoServe Labs. (Consulted on 26 june 2025). TerraTrac: Ensuring EUDR Compliance for Smallholder Farmers. Available at: https://www.technoserve.org/tns-labs/terratrac-eudr-compliance/

TEDxUWA. (10 january 2018). Digital Agriculture Transforming Farmers' Lives | Michael Robertson. Available at: https://www.youtube.com/watch?v=MQaRqZpkQxk

Trendov, N. M., Varas, S. & Zeng, M. (2019). Digital technologies in agriculture and rural areas – Status report. Rome. FAO. Licence: cc by-nc-sa 3.0 igo.

Universidad Costa Rica. (Consulted on 26 june 2025). Caféarvenses. Available at: https://play.google.com/store/apps/details?id=com.vriur04.arvenses&hl=es_419

Universidad EARTH. Consulted on 3 july 2025). Universidad EARTH. Available at: https://www.earth.ac.cr/

Universidad Zamorano. (Consulted on 3 july 2025). Universidad Zamorano. Available at: https://zamorano.edu/

Zhang, Q., & Pierce, F. J. (Eds.). (2013). *Agricultural automation: Fundamentals and practices.* CRC Press. 978-1-4398-8058-6 (eBook - PDF)

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Learning Unit 2: Technology Tools for Compliance with EU Green Deal

Digi Build: Building Digitalization in the Green Sector

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Novel Group

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Table of Contents

Learning unit title: Technology Tools for Compliance with EU Green Deal

Year
2025

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Introduction

In this learning unit we examine technological advancements that offer various tools which can alter the way some aspects of the agricultural sector operate. These tools are critical for technicians in understanding and applying the European Green Deal's principles to the tropical agricultural context of Central America. Through comparative analysis, case studies, and hands-on exploration of digital tools, learners will develop the ability to guide producers and cooperatives in aligning their practices with EU sustainability objectives.

LEARNING OBJECTIVES

Learning Outcomes:

- Identify and describe trends in AgTech, FoodTech, bioeconomy, and climate change in Europe, explaining their relevance to the agricultural sector and their potential impacts.
- Explain the fundamental objectives of the European Green Deal and critically analyze its implications, challenges, and opportunities for tropical agriculture, providing at least two concrete examples.
- Understand the differences between the current standards of their countries and the requirements of the Green Deal.
- Propose "best practices" in agrochemical reduction, biodiversity preservation, and carbon capture, and justify how these could be adapted and implemented in specific agricultural contexts in Central America.
- Evaluate the applicability of at least three emerging technologies (e.g., sensors, blockchain for traceability, mobile applications) in optimizing smart agriculture, and design a scheme illustrating how one of these technologies could solve a specific agricultural problem.
- Identify and understand how to utilize various digital tools to diagnose and self-assess an organization's or company's level of alignment with the European Green Deal's sustainability objectives, as well as manage and report its environmental performance.
- Select and adapt a digital sustainability indicator for at least two tropical crops (coffee, cocoa, plantain, oil palm), demonstrating how key sustainability aspects specific to each crop can be monitored and evaluated for the green deal.
- Develop a detailed and viable innovation proposal for a specific tropical crop that integrates at least three principles of the European Green Deal and utilizes at least one digital tool learned, presenting a comprehensive traceability or sustainability plan.

Content Overview:

1. Understand the structure and goals of the European Green Deal and its agricultural implications.
2. Analyze current European trends in AgTech, FoodTech, and bioeconomy.
3. Compare EU sustainability standards with Central American policies and identify adaptation needs.
4. Explore digital tools that support sustainability compliance, traceability, and monitoring.
5. Design context-specific proposals to align tropical crops with Green Deal principles using digital solutions.

Sub-Unit 1: Innovation Trends Driving the Green Transition in Europe

In the 21st century, the agricultural sector has changed the way it operates and its means of production. The rapid technological developments in many professional sectors have brought changes in the way economy and production works. The farming sector is not excluded from these changes, as technology and climate change are directly linked with the increased needs and demands of the current agricultural landscape. For this reason, Sub-Unit 1 will explore existing trends in Agricultural Technology (AgTech), Food Technology (FoodTech), bioeconomy and climate change in Europe. This is important in order to understand the relevance of these trends to the agricultural sector and their potential impacts.

1.1: Overview of AgTech, FoodTech, bioeconomy, and climate-smart agriculture

AgTech

AgTech is a new approach introduced to food production globally. It entails a large set of alternative methods that utilize technology to increase the efficiency, profitability and sustainability of the agriculture industry. The technological tools used in this process range from precision farming tools to machinery with advanced automation capabilities. They allow for faster, more accurate and productive work, while enhancing the cost-effectiveness levels of the operations.

Some of the AgTech tools used in Europe include:

Sensors: The use of sensors in farming activities becomes more and more common, as it offers a wide range of valuable data to farmers regarding some parameters critical to the development and growth of their production. The sensors can be related to transmitting data about a location, the weather, the moisture levels and the electrical consumption, among others:

- Location sensors use GPS to identify the location of machinery, crops, or even animals (e.g. location tags placed on sheep or goats) for field mapping, precision planting, automated machinery guidance and overall, more active monitoring of the technicians' activities or information about future plans. This can be essential for smallholders to plan plots and apply inputs only where needed.

- Soil sensors are being used to inform about the soil characteristics and plant health (crop stress and disease signals), irrigation system performance, crop development and moisture, temperature and nutrient levels providing valuable data concerning the use of water and other resources.
- Weather sensors/stations provide data on current environmental conditions such as temperature, humidity, rainfall and wind. They can also provide alerts and real-time forecasting.
- Sensors related to measuring the energy consumption of each activity or machine can also be established to provide a better picture of the energy efficiency of the farming operations.

Data Analytics Platforms: The use of digital platforms that provide multilevel analyses based on data gathered through the smart tools on the field is mandatory for any agri-professional in order to utilize the tools he has installed in his crops and uncover their potential. The smart tools gather the data and the digital platforms receive the data transmitted through Wi-Fi/Bluetooth connections and provide analyses and even suggestions/solutions based on that data. Thus, it is important to always use both the hardware and the software interconnected parts to have a better understanding of the cultivated area. Data can be gathered also through access to satellite imagery that gives real-time information and insights on crop management. Technicians can benefit from the use of such tools as they are able to be proactive regarding pest outbreaks, extreme weather events, irrigation, crop protection and ensure smoother, more efficient and more adaptable farm operations.

Automated Tractors: Tractors are one of the most common and necessary type of machinery in agriculture. It is traditionally driven by an operator who is responsible for the manual navigation of the machine. Semi-autonomous tractors have existed since late 2000's and perform as assistant systems through their autosteer feature. During the last few years, fully autonomous tractors have entered the agricultural scene. They are equipped with GPS, stereo and RGB cameras, sensors, computational power, communication with other IoT devices through wi-fi connection and AI capabilities (machine learning) in order to deliver operations that do not demand direct human involvement and control.

As a result, they can contribute to:

- reduced labor costs
- effective fuel consumption through optimized driving patterns
- prolonged (24/7), more accurate and productive operations
- more precise appliance of inputs like water, pesticides and fertilizers

- reduced soil damage through mapping and optimized control of the machines
- reduced environmental footprint
- better decision-making and farm management through the collection of valuable field data

There are not many purchase options currently on the market, as autonomous tractors are described as new types of products, expected to thrive in the coming years.

Drones: Drones in agricultural activities can introduce agri-professionals to a new set of perspectives and capabilities when it comes to production. In the last decade, drones are increasingly seen as a modern tool for monitoring crops, serving as a valuable aspect of precision farming.

Depending on the needs of a farm, they offer features like:

- 3D land images for plant health monitoring through advanced analysis of colour information
- Crop health through the use of cameras
- Soil health monitoring through accurate field mapping
- Automated or semi-automated seeds planting
- Irrigation and general crops monitoring and spraying
- Spray application (pesticide, fertilizer, other chemicals)
- Irrigation Monitoring and water waste prevention
- Weather Monitoring (humidity, wind, temperature)

All the imagery and data can be accessed and analyzed through associated apps and websites compatible with the given drone device.

FoodTech

FoodTech is a set of practices applied to ensure high standards of safety, quality and availability of food during multiple stages of the market chain. These stages concern the processing, preservation, packaging and distribution of food.

Processing: During the last few years, European food companies and researchers explore the range of innovative alternatives to conventional animal proteins to enhance nutrition and environmental sustainability. The main two categories of alternative proteins are the plant-based and the non-plan-based alternatives.

- Plant-based alternatives focus on substituting meat and dairy products by making the taste and the texture of food as similar to the conventional version as possible. In order to achieve this, both minimally processed plants (like lentils) and processed and highly processed plant-based materials are being used to mimic the animal proteins.

- Non-plant-based alternatives include algae (wild-harvested seaweed and cultivated seaweed species – Saccharina latissimi and Alaria esculenta); insects (house cricket, lesser mealworm, yellow mealworm and migratory locust) which if processed can be used for animal feed and aquaculture; precision fermentation aims to enhance the nutritional and quality value of fermented products through utilizing algal, fungal and bacteria cells; cultured meat is a completely new (non-authorised in EU yet) method of producing alternative proteins that involves cell sourcing, cell cultivation and tissue formation.

Preservation: Traditional methods used for preserving food like drying (moisture removal), freezing (for microbial growth) or using high heat (for pathogens) may be efficient, but often result in nutrient and quality loss while consuming much energy. In order to overcome these limitations, innovation trends regarding food preservation technologies have been developed to ensure high quality and safety standards. They include:

- High-Pressure Processing (HPP): It preserves the nutritional value of food by putting it in very high-pressure levels (300-600 MPa) in a water environment for a few minutes. This significantly affects the cellular functions of microorganisms and inactivates pathogens, leading to extended shelf life of the minimally processed products while preserving their flavor and texture. This non-thermal method can be applied to different steps of the food chain and in raw materials like in a large number of food and drinks like raw agrifood or juices.

- Cold Plasma Technology: It involves the use of ionized gas that forms reactive species (like electrons and ions) which lead to cellular death. It preserves the color and the flavor of fresh agricultural products like tomatoes or greens for longer periods of time, while it is also a viable option for juices and dairy and meat products. It is a non-thermal process that does not make use of any chemical substances and ensures food safety.

- Pulsed Electric Fields (PEF): It applies short high voltage bursts (20-80 kV/cm) to food to cause electroporation and inactivate microorganisms. As a non-thermal method, it can be applied to juices, soups or other liquid and semi-liquid products without sacrificing their nutritional value and flavors.

Packaging: Packaging plays an important role in ensuring that the food will be safe and of quality for certain periods of time. The main developments around food packaging are:

- Ecological Packaging: Sustainable packaging has come to the forefront in recent years. While not directly linked to food quality and safety, there are active developments that also encompass the preservation of the food. Food packages can be made by biodegradable plastics and compostable materials, recycled materials and edible coating and films.

- Biodegradable Materials: Packages made from fully biodegradable materials do not contribute to waste generation.

- Compostable Materials: Materials that decompose under certain conditions (depending on microbial activity and aerobic conditions) to create a high nutritional compost result for the soil.

- Edible Coating and Films: They are applied to food products in order to prevent moisture and contamination. They do not often cover the whole packaging. In case they are not used as edible products, they are completely biodegradable and do not result in waste. If integrated into the films, antioxidants can contribute to food preservation by slowing down oxidation.

- Renewable Sources: Made from agricultural by-products and plant materials.

- Intelligent Packaging: Packages of this type aim to provide food quality monitoring through the installation of temperature, freshness, time, both internal and external conditions sensors and biosensors. This provides valuable data on whether the food is still safe for consumers.

Distribution: The distribution stage is crucial in maintaining food safety, quality, and reducing environmental impacts throughout the supply chain. Innovations in FoodTech related to distribution focus on traceability, transparency, and logistics optimization.

- Traceability Systems: They aim to record the path each agricultural product takes, starting from the point of origin and until at least the final consumer. It covers every FoodTech's stage and provides valuable information regarding its handling across all levels of the supply chain. In agriculture, it is important to track the inputs used, the practices exercised, the location of the products and the interim storage and transportation procedures. This can be done through:

- Barcodes: They are usually attached to food packages or pallets. When scanned, they provide information about the product origin, the production date and location, the expiration date, the batch number, the movement history and other information

- RFID tags: The tag is placed on a product or container that transmits data to a reader without the need of direct, close proximity contact. They store information that can be updated along the supply chain. If combined with IoT platforms and devices, it can provide even more effective data to its user

- Blockchain: it is a digital database that records and uploads relevant data in chronological order of a product in every stage of the food supply chain, from farm to table. The data cannot be altered unless all stakeholders involved agree. This system gives consumers all information and reduces health and fraud risks. It can also enhance customer's interest in organically sourced products and incentivize them to invest in good quality food products. Regarding small scale farmers, blockchain traceability may help them grow their business by increasing sales or attracting investors

Bioeconomy

Bioeconomy is a relatively new concept in the public European discourse. It entails several sectors of the economy, which may differ depending on the country of reference, like forestry, fishery, food and agriculture. The main interest in bioeconomy across all sectors is the level of innovative production, the use and processing of biological resources and the economic benefits that may derive from the procedure. Bioeconomy creates a closed-loop system that make biomass move along these stages:

- Production of biomass
- Processing
- Production of new products
- Distribution
- Consumption

The agricultural sector is being characterized as the most intense part of the principal production sector, as it has a huge impact in the environmental degradation and biodiversity loss while at the same time remains critical for the production of foods and goods. Thus it is

critical for the Bioeconomy that in the near future it becomes sustainable. The closed-system suggested earlier, is considered the model upon which bioeconomy aims to make productive systems sustainable.

Climate-smart agriculture (CSA)

Climate-smart agriculture refers to innovative approaches that focus on food security through agricultural production increase with the use of green practices that do not contribute to climate change and greenhouse gas emissions. It is based on globally recognized best practices that include:

- Resilient crop varieties based on the agricultural, societal and economic conditions of a region
- Precision farming
- Conservation technique (no tillage, plant diversification, soil management)
- Water management methodologies (precision irrigation)
- Planting without damaging the soil
- Data-driven farming plans
- Integrated pest management
- Agroforestry
- Nutrient management

1.2 How innovation trends influence EU green policy

The European Green policy is constituted by dynamic plans for Europe's economy and society, placing sustainability as the decisive factor for current and future developments in agriculture. But this vision is not developed in isolation. It is shaped and enabled by rapid developments in technology and innovation. Trends such as AgTech, FoodTech, the bioeconomy, and climate-smart agriculture have played a central role in influencing the content, priorities, and enforcement mechanisms of EU green policies.

These innovation trends influence EU Green Policy by:

Providing real-time data that enhance decision making and influence sustainability policies

Technological and digital tools such as sensors, drones, satellite imaging, and data platforms collect large amounts of information about farming conditions, resource use, and environmental impacts. This data helps the EU:

- Define clear policy targets (on pesticide reduction, carbon storage, water use, etc.);
- Monitor environmental progress
- Identify areas where interventions are needed
- Set policy priorities and identify legislation gaps (like CAP conditionalities or GHG reduction targets)

For example, real-time monitoring of pesticide use through digital tools has supported the EU's decision to set a 50% pesticide reduction target by 2030 under the Farm to Fork Strategy (more information on the next Sub-Unit)

Ensure law enforcement through product tracing

Traceability technologies like barcodes, RFID tags, and blockchain systems allow EU regulators and private actors to verify the origin, quality, and environmental footprint of agricultural products.

These tools can be essential for implementing policies such as:

- The EU Deforestation-Free Regulation (EUDR), which requires geolocation of goods (like cocoa and palm oil)

- Organic certification and eco-labelling, which depend on transparent supply chain records

Set funding needs and priorities

EU funding programs such as Horizon Europe, the CAP, and the Digital Europe Programme are heavily influenced by innovation trends. These programs support:

- Development of new AgTech and FoodTech solutions
- Testing of sustainable farming models
- Deployment of digital infrastructure

Innovation informs the EU about the needs of sustainable agriculture, the EU identifies the sectors that need funding and promotes investments in innovation in AgTech, FoodTech, Bioeconomy and Climate change action through its green policies.

Shaping Public Expectations and Political Agendas

Innovations regarding sustainability like alternative proteins, AI farming tools, or biodegradable packaging make people more interested and engaged in the developments around legislative frameworks on green policies. The increased social interest creates heightened demand for change, inclusion and progress on EU policies regarding sustainability and ecology.

The demands can:

- Promote the adoption of stricter environmental standards
- Push EU policymakers to be more decisive on funding or regulating emerging technologies

1.3 Opportunities for Central America

Based on the innovative trends taking place in EU countries in the agriculture sector, there are possible opportunities for Central America to benefit from adopting or taking inspiration from these trends in order to make substantial progress towards the digitalization of its agricultural production, especially in the tropical context.

Precision agriculture for tropical crops

Crops like coffee, cocoa, plantain or oil palm can benefit from the adoption of precision agriculture technologies already deployed in many European agriculture fields. These include:

- Soil and moisture sensors that measure, suggest or even decide on the appropriate use of water for each type of soil and agri-food. This can be especially useful in locations characterized by irregular or difficult to predict weather conditions where the rainfall patterns are irregular or extremely high or low for a specific timeframe

- To support the sensors' efficiency, it is suggested that weather stations along with forecasting apps are installed and operated by the farmers. When combined, the data from the stations and the apps and the sensors, farmers can have a very good picture of the steps they have to undertake to ensure that sensitive crops like plantain are being protected by extreme rainfalls or the prolonged absence of rain. This reduces risk and enhances decision-making

- Drones and sensors can inform about pest outbreaks and help improve yields in crops vulnerable to diseases related to a specific climate, particularly in rainforest or mountainous areas

FoodTech preservation and packaging methods

- Smart packaging and cold chain methods can reduce post-harvest losses in tropical crops like mangoes, papayas, avocados or pineapples
- Modern traceability systems like barcodes and blockchain technological tools can help central American producers not only grow their business in the domestic market, but also to expand their professional activities by exporting their products to the EU market by complying with the European sustainability standards
- Dehydration, fermentation and other processing practices can be exercised and explored to offer added value to the tropical agrifood products, thus enhancing their profitability and market position

Bioeconomy practices

- Based on the European circular economy principles, agriculture waste like corn cobs, vegetable trimmings, coffee husks, coconut shells, palm oil residues and banana stems can be converted to biomass like biofertilizer or bioplastics
- The adoption of biopests can reduce the use of agrochemicals
- Farmer cooperatives and policy development can support the creation of a local green value chain, similar to bioeconomy EU systems

Sub-Unit 2: Understanding the European Green Deal

The European Green Deal (EGD) is the most ambitious existing EU strategy against climate change and environmental degradation. It launched in 2019 and it is a set of policy initiatives that aim to make Europe the first climate neutral continent by 2050. The main EGD policy areas include:

Climate Action:

- 55% GHG emissions reduction until 2030 compared to 1990 levels
- 90% GHG emissions reductions until 2040 compared to 1990 levels
- Climate neutrality until 2050
- Economic growth independent from resource use

In Central America, relevant actions could include:

a) Adoption of practices like soil conservation, cover crops, shade grown coffee
b) Integration of agroforestry in cocoa and coffee farms to reduce carbon
c) Eliminate practices that increase GHG emissions (like "slash and burn" practice)
d) Train/Educate technicians to use digital tools or recognized calculation methods for GHG emissions

Environment and Oceans, as described by the EC:

- protecting biodiversity and ecosystems
- reducing air, water and soil pollution
- moving towards a circular economy
- improving waste management
- ensuring the sustainability of the blue economy and fisheries sectors

In Central America, relevant actions could include:

a) Buffer zones and protected areas around plantations
b) Composting of organic waste from bananas, pineapple or palm oil

c) Use of biological inputs instead of chemicals

d) Use of native vegetation cover in and around farms

Transport:

- 90% GHG emissions reduction until 2050 compared to 1990 levels

In Central America, relevant actions could include:

a) Calculate the carbon footprint of harvesting, packaging and shipping
b) Prefer biodegradable packaging where appropriate (fresh products)

Energy, as described by the EC:

- ensuring a secure and affordable EU energy supply
- developing a fully integrated, interconnected and digitalised EU energy market
- prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources
- build interconnected energy systems and better integrated grids to support renewable energy sources
- promote innovative technologies and modern infrastructure
- boost energy efficiency and eco-design of products
- decarbonise the gas sector and promote smart integration across sectors
- empower consumers and help EU countries to tackle energy poverty
- promote EU energy standards and technologies at global level
- develop the full potential of Europe's offshore wind energy

In Central America, relevant actions could include:

a) Use of solar panels in irrigation and drying procedures

b) Installation of biogas systems in live

c) Adoption of equipment with advanced energy efficiency capabilities in a variety of sectors

Industry:

- Double (green and digital) transitions demand from industries to reduce their dependence from fossil fuels, their carbon footprint and develop new competitive business models.

Agriculture, as described by the EC:

- Make farming and food systems more sustainable
- Strengthen resilience against crises
- Keep ensuring that food is healthy and affordable

In Central America, relevant actions could include:

a) Use of digital platforms to track the product from harvesting to sale
b) Integrate agroecological practices

The EGD fundamental objectives include:

Climate neutrality	Net-zero greenhouse gas emissions by 2050
Circular economy	Sustainable resource use and reduce

	waste (new economic model)
Clean industry	Renewable and efficient energy sources in the EU and global markets
Healthier environment	Nature restoration and zero air, water, and soil pollution
More sustainable farming	Protect and restore ecosystems and natural habitats, while providing healthy and affordable food
Climate justice and fairness	Inclusivity of all professions, regions, unions

2.1 Sustainability Pillars

The main sustainability pillars pThe interconnected sustainability pillars posed by the EGD are:

Environmental Sustainability

- Climate neutrality
- Circular Economy
- Biodiversity
- Zero pollution
- Clean energy

Economic Sustainability and prosperity for a sustainable and competitive economy

- Green technologies
- Sustainable industries
- Sustainable finance that mobilizes green technologies and sustainable industries
- Sustainable agriculture (food systems and security)

Social Sustainability towards an inclusive green transition

- Social justice
- Public health
- Skills development through training in green jobs
- Sustainable urban environments

The three main pillars describe the sustainability goals and visions as demonstrated in the EGD, while also including its main objectives.

2.2 Key directives and strategic plans related to Agriculture

As one of the sectors that contribute the most to climate change, environmental pollution and biodiversity loss, the EGD puts special emphasis on agriculture. For this reason, ambitious directives and plans have been developed that focus on making agricultural production and the agri-food system greener and more sustainable. The EU's efforts in this area include:

Farm to Fork

A key strategy introduced under the EGD framework in 2020 is Farm to Fork, which aims at making the food system more sustainable, secure and safe. It is complementary to the EU biodiversity Strategy and its main goals, as described by the EC, are to:

- ensure sufficient, affordable and nutritious food within planetary limits
- halve the use of pesticides and fertilisers and sales of antimicrobials
- increase the amount of land devoted to organic farming
- promote more sustainable food consumption and healthy diets
- reduce food loss and waste
- combat food fraud in the supply chain
- improve animal welfare

To achieve these goals, the strategy, as described by the EC (2020) foresees that member states should work towards:

- 50% reduction in the use and risk of pesticides
- at least 20% reduction in the use of fertilisers
- 50% reduction in sales of antimicrobials used for farmed animals and aquaculture
- 25% of agricultural land to be used for organic farming
- 10% of agricultural land should consist of high-diversity landscape features

Agriculture professionals in Central America are affected by this strategy:

- Many producers in Central America rely on chemicals that are not approved in the EU.
- Many producers in Central America exceed the Maximum Residue Limits (MRLs) for pesticides
- They need to transition to integrated pest management (IPM) and safer biopesticides, which require training, new investments, and certifications

Example: Banana and pineapple producers in Costa Rica must reduce chlorpyrifos (for insect pest control) and other chemical inputs banned in the EU

- Farmers need to find alternative insecticides or pest control techniques (like pheromone traps and biological controls)
- Farmers must learn about and train themselves and their staff on biological application of agriculture techniques and methods

Example (2): Many coffee producers in Honduras use fungicides and insecticides like Carbendazim (banned in the EU) and Diazinon (low MRLs, while banned in organic agriculture)

- Coffee producers must make the transition to fungicides permitted in the EU and search for organic alternatives of insecticides like Bacillus subtilis (soil bacterium)
- They must keep track of chemical use to comply with EU regulations

Common Agricultural Policy (CAP)

The CAP is a traditional set of policies dedicated to farmers and agriculture professionals in the EU. It is revised every 5 years to ensure that it continues to address new challenges and cover all the important aspects and developments in European agriculture. The existing CAP (2023-2027) aims to motivate farmers to embrace farming practices that are friendly to the environment. Some of the main obligations of the farmers under CAP Good Agricultural and Environmental Conditions include:

- The maintenance of permanent grassland in ratio with arable land
- The protection of wetlands and peatlands
- The use of buffer strips along watercourses
- A sufficient level of soil cover to prevent soil erosion

- The exercise of crop rotation instead of crop diversification

Under Eco-Schemes, farmers commit to:

- Exercise organic farming
- Prefer low input practices
- Do extensive grazing on permanent grasslands
- Use cover crops for soil protection and carbon sequestration
- Practice carbon farming techniques

Under Rural Development (CAP Pillar II), farmers agree to:

- Implement specified practices for 5–7 years (like no pesticides, planting certain crops, rotating animals)
- Maintain detailed records (inputs, harvests, compliance)
- Allow on-farm inspections and evaluations

Agriculture professionals in Central America are not directly affected by this strategy, as it applies only to EU member states. Despite this:

Although Eco-Schemes are voluntary for EU farmers, some of their commitments appear to be implemented in EU trade expectations. European importers may prefer to source from regions and producers that match and comply with certain ecological practices.

Central American farmers are at a disadvantageous market position when competing with EU farmers, as they do not receive the financial benefits that their counterparts in the EU receive through the CAP.

EU Deforestation Regulation (EUDR)

The EUDR (2023) refers to products originating from recently deforested land. The products are specified and include cocoa, coffee, palm oil, soy, rubber and cattle. The list also includes their byproducts like chocolate or tyres. According to the regulation, the producer that exports these products to the EU or from the EU has to prove that they do not originate from deforested agricultural land.

The EUDR objectives, according to the EC, aim to:

- avoid that the listed products Europeans buy, use and consume contribute to deforestation and forest degradation in the EU and globally

- reduce carbon emissions caused by EU consumption and production of the relevant commodities by at least 32 million metric tons a year
- address all deforestation driven by agricultural expansion to produce the commodities in the scope of the regulation, as well as forest degradation

Agriculture products represent 86,7% of Honduras' and 36,1% of Costa Rica's of 2024 total exports to the EU (EC, 2024). The two countries export products including coffee, cocoa, bananas, soy, rubber, pineapples and palm oil (and derivatives) to the EU. This regulation means:

- Exporters must collect geolocation data from farms and prove the deforestation-free origins of their products to enter the EU market

- Cooperatives and supply chain actors will need to purchase, be trained, use and benefit from digital traceability tools in their daily operations and encourage other professionals in their sector to use such tools to enhance their credibility and maximize benefits

- Failure to comply could lead to exclusion from the EU market and a competitive disadvantage

Agriculture professionals in Central America are affected by this strategy:

- Farmers in remote or informal areas may lack digital mapping tools or official land titles (unregistered land or unclear ownership), thus making compliance challenging and potentially leading to exclusion from the EU supply chain

- Smallholders may face challenges due to incomplete legal documentation despite promoting sustainable practices
- They may be required to obtain or renew certifications that align with deforestation-free requirements, which will result in additional financial costs

For more information on EU-Costa Rica Trade in Goods, you can visit: https://webgate.ec.europa.eu/isdb_results/factsheets/country/details_costa-rica_en.pdf

For more information on EU-Honduras Trade in Goods you can visit: https://webgate.ec.europa.eu/isdb_results/factsheets/country/details_honduras_en.pdf

For more information on EU Green Deal strategies, you can visit: https://www.sciencedirect.com/science/article/pii/S0264837720304257

2.3 Implications, challenges and opportunities for tropical agriculture

The European Green Deal, though EU-centered, exerts global influence on food systems. Countries with a tropical climate may face implications and challenges in adopting the EGD's fundamental objectives and directives.

Implications

Higher Sustainability Demands for Exports

The EGD increases regulatory pressure on non-EU countries exporting food to Europe. Agricultural products must meet strict sustainability criteria:

- Traceability (blockchain, digital records)
- Reduced pesticide and fertilizer use
- Carbon and biodiversity footprint monitoring

Shifts in Production Models

- Farmers and cooperatives will need to adopt:
- Organic or agroecological practices
- Eco-certifications (e.g., EU Organic, Rainforest Alliance)
- Climate-smart practices (e.g., agroforestry, regenerative farming)

Knowledge and Access to Technology

- Many producers in tropical countries lack access to:
- AgTech solutions for monitoring and reporting
- Training in EU-aligned sustainable practices
- Infrastructure for digital traceability or certification

Challenges

- Cost of compliance: Digital tools, certifications and investments in infrastructure may raise the cost of sustainability adoption practices. This may discourage many farmers in tropical contexts, while many small producers will not be financially able to start making this transition
- While many agri-professionals may be motivated to promote EGD compliance, their efforts may face legal obstacles, as Central American regulations may be very different from or even opposed to EU standards
- Some producers may be excluded from EU markets if they are unable to comply with export requirements

Opportunities

Despite implications and challenges, EGD strategies offer important opportunities for tropical agriculture:

- EU market access: Producers who align with the EU green criteria have the chance to grow their business by exporting to the EU market
- Future proof business: Producers can benefit from the early adoption of sustainable practices as demonstrated in the EGD, thus be compliant and ready for future changes in national laws and environmental requirements
- Professionals that embrace EGD objectives will have a competitive advantage over the competition as they will have better access to the green market

Sub-Unit 3: Bridging the Gap: From EU Policy to Local Practice

As the European Union advances its sustainability agenda through the Green Deal and related regulatory frameworks—such as the EU Regulation on Deforestation-Free Products—it becomes increasingly important to understand how these high-level policies translate into actionable practices on the ground, especially in regions like Central America. This sub-unit explores the intersection between EU sustainability standards and local agricultural realities, focusing on the challenges and opportunities that arise when aligning both. Participants will examine key differences and similarities in regulatory approaches and will be guided in proposing practical, locally adapted strategies that support compliance while strengthening regional agricultural systems.

3.1 Comparing Sustainability Standards Across Contexts

In recent years, the European Union has introduced ambitious sustainability regulations aimed at ensuring that agricultural imports do not contribute to environmental degradation, particularly deforestation. These standards—such as those set by the EU Green Deal and the Regulation on Deforestation-Free Products (EUDR)—set a high bar for transparency, traceability, and environmental responsibility across the supply chain. Meanwhile, Central American countries have their own sustainability frameworks, often shaped by local realities, resource limitations, and varying institutional capacities. This section explores key differences and overlaps between EU and Central American sustainability standards and invites agricultural professionals to consider how localized strategies—rooted in available technologies, community engagement, and incremental innovation—can help close the compliance gap.

Honduras: Relevant National Regulations

1. **Forest, Protected Areas, and Wildlife Protection Law (Decree 98-2007)**

The **Forest, Protected Areas and Wildlife Law (Decree 98-2007)** is Honduras' primary legal instrument for the conservation and sustainable use of forest resources. This law prohibits land-use change in forested areas without prior authorization from the Forest Conservation Institute (ICF). It establishes a framework for forest management, biodiversity protection, and regulation of logging, while also allowing for community forestry initiatives under strict guidelines. The law mandates the registration of forest areas, requires management

plans for any intervention, and sets penalties for illegal deforestation. However, while it is comprehensive on paper, its enforcement is often challenged by limited institutional capacity, land tenure conflicts, and insufficient geospatial monitoring. Unlike the EU Deforestation-Free Regulation, which requires geolocation and traceability for each parcel involved in the supply chain, the Honduran framework lacks systematic integration with agricultural export systems. As a result, compliance with EU requirements demands the addition of digital traceability tools and improved inter-agency coordination between agricultural and environmental authorities.

2. National Environmental Information System (SINIA)

The National Environmental Information System (SINIA) is a government-led platform developed under the Ministry of Natural Resources and Environment (MiAmbiente) in Honduras. Its main goal is to organize, integrate, and disseminate environmental information to support decision-making, policy development, and public transparency.

SINIA serves as a central hub for collecting data related to:

-Land use and land cover

-Forests and biodiversity

-Water quality and hydrology

-Protected areas and ecosystems

-Climate change indicators

The system compiles data from various governmental and academic institutions, including the Forest Conservation Institute (ICF), national meteorological services, and environmental monitoring projects. It also plays a role in reporting obligations under international environmental agreements, such as the Convention on Biological Diversity (CBD) and REDD+ (Reducing Emissions from Deforestation and Forest Degradation).

However, SINIA currently faces challenges related to:

-Limited interoperability with agricultural and trade databases
-Gaps in real-time data collection
-Weak coverage of parcel-level traceability, which is required under EU regulations like the EUDR

-Low accessibility and usability for local actors and rural stakeholders

To align with the EU Green Deal standards—particularly traceability and deforestation monitoring—SINIA would need to be upgraded or complemented by tools that integrate geolocation data, supply chain tracking, and producer-level records.

3. Voluntary Certifications

Certifications such as **RSPO (Roundtable on Sustainable Palm Oil)**, **Rainforest Alliance**, and **UTZ Certified** are **non-governmental, voluntary standards** developed by international organizations or private coalitions. They aim to promote sustainable practices in agriculture and forestry, ensuring:

-Environmental conservation
-Labor rights and fair working conditions
-Good agricultural practices
-Product traceability

Why are they considered voluntary?

1. **Not part of national law**:
   In Honduras and Costa Rica, there are no legal requirements for producers or exporters to be certified under these schemes in order to operate or trade.

2. **Driven by market demand, not legislation**:
   Many exporters adopt these certifications because international buyers—especially in Europe or the U.S.—require them as a condition to purchase, not because they are legally mandated by local governments.

3. **Optional and replaceable**:
   Producers may choose other internal sustainability measures or audit systems as long as they meet buyer requirements or international regulations, such as the EU Deforestation-Free Regulation (EUDR).

📌 **Example:**

A Honduran palm oil producer is **not legally required** to have RSPO certification. However, if they want to sell to a European company that only buys RSPO-certified oil, the producer will **voluntarily adopt** the certification to access that market.

Comparison with EU Green Deal Standards

While voluntary certifications focus on sustainability through market-driven initiatives, the EU Green Deal and its associated regulations—such as the EUDR—impose mandatory, legally binding requirements for products entering the EU market. The Green Deal sets strict standards on traceability, deforestation-free sourcing, and environmental impact, enforced by law and subject to penalties for non-compliance. Unlike voluntary certifications, which offer flexibility and are selectively applied, EU standards apply universally to all relevant commodities and exporters targeting the EU. In this context, voluntary certifications may serve as a stepping stone, but they are not sufficient by themselves to guarantee compliance with the EU's legal frameworks.

Voluntary vs. Mandatory Standards

Feature	Voluntary Certifications (e.g., RSPO)	EU Green Deal / EUDR
Legal requirement	❌ No	✅ Yes (for EU market access)
Adoption drivers	Market demand / private buyers	Legal compliance
Traceability required	Partial (varies by scheme)	Full geolocation per plot required
Focus areas	Sustainability, labor, biodiversity	Deforestation-free, transparency, legality
Flexibility	High – depends on buyer	Low – standardized for all commodities

Reflection Question:

> Are there producers in your region already certified under any voluntary standard? How could their current systems be expanded or upgraded to meet EU legal requirements?

Costa Rica: Relevant National Regulations

Costa Rica is internationally recognized for its strong environmental policies and commitment to sustainable development. While the European Union has formalized its sustainability expectations through binding legislation such as the EU Green Deal and the Regulation on Deforestation-Free Products (EUDR), Costa Rica has implemented its own set of national frameworks that address many of the same goals—such as forest protection, ecosystem conservation, and supply chain traceability.

Unlike the EU, where compliance is legally enforced across all member states and expected from all trading partners, Costa Rica relies on a combination of legal tools (like Forest Law No. 7575) and incentive-based mechanisms, such as the Payment for Environmental Services (PES) program, to promote sustainable land use. Moreover, the country supports producers through voluntary programs and national certifications that encourage environmental responsibility without being mandatory.

This section explores how Costa Rica's approach aligns with—or differs from—EU sustainability standards, particularly in terms of deforestation control, digital traceability, and supply chain transparency. Understanding these parallels helps identify opportunities for Costa Rican producers to position themselves favorably in EU markets while complying with the evolving regulatory landscape.

1. **Forest Law No. 7575 (1996)**

Forest Law No. 7575 (1996) is the cornerstone of Costa Rica's Forest conservation policy. It strictly prohibits land-use changes in forested areas without prior approval from the Ministry of Environment and Energy (MINAE), making deforestation for agricultural expansion illegal unless authorized. The law promotes the sustainable use of forest resources, prioritizes conservation, and supports reforestation efforts. It also provides the legal basis for Costa Rica's Payment for Environmental Services (PES) program, which compensates landowners for protecting forests and providing ecosystem services. This legislation reflects the country's commitment to halting deforestation and aligns closely with the EU's goals under the Green

Deal and the EUDR, though it operates within a nationally tailored, incentive-based framework.

2. Carbon Neutral Country Programme (PPCN)

Costa Rica's Carbon Neutral Country Programme (PPCN) is a mechanism organized by the Climate Change Directorate (DCC) of the Ministry of Environment and Energy (MINAE) in the country's national framework against climate change. It is a voluntary scheme, launched in 2012, in which the state encourages the industry (including all sectors, from hotels to medical suppliers) to develop low GHG emissions models regarding their value chains and report on their GHG onventory. The main motive is the granting of state recognitions regarding the efficient management of GHG emissions. The categories under which the companies can be awarded are:

- Organization
- Communities
- Products

The PPCN 2.0 version launched in 2018 to include in its awarding program both public and private organizations, governmental structures and bodies and communities, concerning their performance in managing GHG emissions in accordance with the National Decarbonization Plan of the country. The new awarding system is based on five levels that allow consumers to identify the level of an organization's performance on GHG management. The new recognition categories introduced as part of the awarding program are:

- preparation of GHG inventories
- GHG reduction actions
- GHG reduction actions (additional)
- Compensation for not reduced GHG emissions
- Additional GHG emissions compensation

3. Payment for Environmental Services (PES) Program

Costa Rica's Payment for Environmental Services (PES) program is an internationally recognized model for incentivizing sustainable land management. Established under Forest Law No. 7575, the program provides direct financial compensation to landowners who conserve forests, protect water sources, promote biodiversity, or capture carbon through

reforestation. It is managed by FONAFIFO (National Forestry Financing Fund) and is funded through a mix of fuel taxes, water usage fees, and international climate finance.

Key characteristics of the PES program include:

-Voluntary participation for private and community landholders
-Contracts of 5 years or more, based on specific environmental services
-Use of GIS monitoring systems and remote sensing to verify compliance
-Focus on conservation rather than productivity

This system has enabled Costa Rica to reverse deforestation trends, protect over 1 million hectares, and empower small and medium-sized producers to participate in environmental stewardship.

While both systems aim to protect forests and encourage sustainability, Costa Rica's PES is voluntary and nationally focused, offering incentives to landowners. In contrast, the EU's Green Deal and EUDR are mandatory, focusing on regulating imported products and requiring exporters to prove legal and sustainable origins of commodities through traceability and geolocation.

Therefore, while PES doesn't fulfill EU compliance directly, it provides a strong foundational framework that—if coupled with traceability and transparency tools—can support Costa Rican producers in meeting EU market expectations.

4. **Payment for Environmental Services (PES) Program**

Costa Rica has developed several **voluntary, nationally tailored programs** to promote sustainable practices in the agri-food sector. These initiatives are not mandatory by law but are highly encouraged by national authorities to enhance competitiveness, environmental performance, and alignment with international markets.

Key features:

-Covers economic, social, and environmental pillars of sustainability
-Includes modules on resource efficiency, waste management, labor rights, and climate adaptation
-Supports alignment with international certifications and trade requirements
-Encourages self-assessment and continuous improvement. This code functions as a tool for

market positioning, especially for small and medium enterprises seeking access to environmentally demanding markets like the EU.

5. Voluntary Certifications and National Sustainability Programs in Costa Rica

Costa Rica has developed several voluntary, nationally tailored programs to promote sustainable practices in the agri-food sector. These initiatives are not mandatory by law but are highly encouraged by national authorities to enhance competitiveness, environmental performance, and alignment with international markets.

Sustainability Code for the Agri-Food Sector
Developed jointly by the Ministry of Economy, Industry and Commerce (MEIC) and the Ministry of Agriculture and Livestock (MAG), this code serves as a comprehensive voluntary guideline for Costa Rican agri-food businesses to improve their sustainability performance.

Key features:

- Covers economic, social, and environmental pillars of sustainability
- Includes modules on resource efficiency, waste management, labor rights, and climate adaptation
- Supports alignment with international certifications and trade requirements
- Encourages self-assessment and continuous improvement.

This code functions as a tool for market positioning, especially for small and medium enterprises seeking access to environmentally demanding markets like the EU.

Agricultural Blue Flag Program

This program is an extension of the national Blue Flag Ecological Program, adapted specifically to agriculture. It is managed by the MAG and other institutions and aims to recognize farms that adopt environmentally responsible practices.

Key features:

- Voluntary and incentive-based recognition system

- Evaluates farms based on criteria such as: Soil conservation, water protection, agrochemical management and waste reduction
- Farms that meet the criteria receive an annual Blue Flag award, improving their public image and access to green markets.

The program promotes a culture of sustainability at the farm level, especially in key export sectors like banana, coffee, and pineapple.

3.2 Best practices in agrochemical reduction, biodiversity, and carbon capture

Context and Purpose

The European Union's Green Deal and Farm to Fork Strategy aim to transform agri-food systems into more sustainable, environmentally friendly models. For producers of cacao and coffee in Latin America, aligning with these goals is becoming **increasingly necessary** to access the EU market. Field technicians play a key role in this transformation by helping farmers adopt practices that reduce environmental risks and increase ecological resilience.

This section introduces **practical, field-based strategies** to:

- Reduce the use and impact of agrochemicals
- Promote and protect on-farm biodiversity
- Enhance carbon capture and soil regeneration.

These strategies contribute not only to compliance with EU regulations (e.g. EUDR, F2F, Biodiversity Strategy 2030) but also to long-term productivity, climate resilience, and market access.

1. Agrochemical Reduction: Safer, Smarter, and Targeted Use

EU Goal: Reduce pesticide use by 50 % by 2030

Best Practices:

- **Integrated Pest Management (IPM):** Combine biological, cultural, and mechanical control before using chemical inputs.

- **Precision application:** Use calibrated backpack sprayers and proper weather conditions to reduce drift and overuse.
- **Biocontrol alternatives:** Promote natural predators, fungal antagonists, or neem-based products.
- **Record keeping:** Document every application—product, dose, date, pest targeted—for traceability and audits.

Field Tip for Cacao/Coffee: Use shade regulation and pruning to reduce fungal pressure (e.g. *Moniliophthora* in cacao, *Hemileia* in coffee), decreasing fungicide dependence.

2. Biodiversity Conservation: Beyond Yield, Toward Ecosystem Health

EU Expectation: Agricultural areas contribute to habitat conservation and ecosystem services

Best Practices:

- **Agroforestry systems:** Maintain or reintroduce native tree species within plantations to create habitat for birds, insects, and small mammals.
- **Living fences and buffer zones:** Use native shrubs to connect forest fragments.
- **Avoid total weeding:** Allow patches of groundcover to support soil fauna and pollinators.
- **Wildlife monitoring:** Basic tracking of fauna (e.g. birds, bees, bats) using participatory tools with farmers.

Field Tip: In cacao and coffee farms, diversified shade with native trees improves pollination and pest control naturally.

3. Carbon Capture: Soil and Tree-Based Approaches

EU Focus: Agriculture must contribute to climate neutrality

Best Practices:

- **Compost and organic matter application:** Enhance soil carbon storage and fertility.
- **Cover crops and mulching:** Prevent erosion, fix nitrogen, and add biomass to the soil.
- **Tree planting:** Agroforestry species not only provide shade and microclimate regulation but also sequester atmospheric carbon.

- **Soil conservation structures:** Terraces, contour planting, and infiltration ditches reduce carbon loss through erosion.

Field Tip: Promote leguminous shade trees (like *Inga spp.* or *Erythrina*) which fix nitrogen and increase carbon storage.

Role of Field Technicians

Field technicians should:

- Train farmers on how these practices link to EU market requirements
- Monitor field-level implementation using checklists and mobile tools
- Coordinate with exporters or cooperatives for traceability and certification support
- Encourage farmer-to-farmer exchange to replicate successful models

3.3 Identifying alignment opportunities and challenges.

As the European Union strengthens its environmental and trade policies—particularly through the EU Green Deal, the Farm to Fork Strategy, and the EU Regulation on Deforestation-Free Products (EUDR)—cacao and coffee producers in Honduras and Costa Rica are being called to demonstrate more than product quality. They must now ensure their production systems are sustainable, traceable, and environmentally compliant.

Field technicians play a vital role in identifying where current practices align with EU expectations and where gaps remain. This section aims to help them evaluate both opportunities (what is already working) and challenges (what needs improvement), particularly in smallholder systems, cooperatives, and agroforestry settings.

Both countries present strong potential for alignment through:

- Use of agroforestry systems
- High adoption of voluntary sustainability certifications (e.g., Rainforest Alliance, Organic).
- Existing frameworks for traceability and monitoring (e.g., SINIA in Honduras, PSA in Costa Rica)

Yet, they also face key barriers, such as:

- Limited access to digital tools for geolocation and traceability
- Gaps in documentation of pesticide use and land-use change
- Lack of integrated systems for verifying compliance across fragmented landscapes

This section provides field-oriented insights to help technicians and project teams map alignment levels, propose improvements, and prepare for EU-oriented supply chain audits**.**

3.4 Adaptation Strategies for EU Compliance

1. Agrochemical Reduction: Smarter, Documented Use

Strategies:

- Develop **Agrochemical Application Logs** for each farm (paper or digital), recording product, quantity, date, and purpose.
- Train farmers in **Integrated Pest Management (IPM)** through demo plots and pest scouting techniques.
- Promote **biofertilizers and biopesticides**, supported by on-farm fermentation systems (e.g., bokashi, bioferments).
- Establish **"**Zero Residue" pilot zones to prepare for stricter EU Maximum Residue Limits (MRLs).

  Technician Role: Provide monthly follow-ups, verify records, and cross-check with EU-allowed product lists.

2. Biodiversity Enhancement: Landscape and Plot-Level Interventions

Strategies:

- Map ecosystem elements on each farm: riparian areas, shade tree diversity, live fences.
- Promote the integration of native and nitrogen-fixing tree species in coffee/cacao plots.

- Encourage the maintenance of wild vegetation strips for pollinators and pest control species.
- Connect farms through community biodiversity corridors—especially in fragmented landscapes.

Technician Role: Use mobile apps or printed maps to monitor habitat elements and recommend improvements annually.

3. Carbon Capture: Soil and Shade Tree-Based Solutions

Strategies:

- Support the creation of on-farm composting areas, using coffee pulp, cacao husks, or manure.
- Promote ground cover crops and mulching to reduce erosion and improve carbon storage.
- Encourage planting of long-lived shade trees that also have economic or ecological value.
- Introduce basic carbon monitoring tools like organic matter field kits or bulk density measurements.

Technician Role: Create simple carbon tracking templates; select pilot farms to test results.

4. Traceability and Geolocation

Strategies:

- Support farmers to **digitally map** their plots using smartphones and free GIS tools (e.g., KoboToolbox, ODK).
- Assist cooperatives in **consolidating farm-level data** into central systems, using unique farm IDs.
- Organize **traceability workshops** showing how EU buyers require parcel-level origin data.
- Test mobile apps (like FarmTrace, CropIn, or Agroclima) for field-level tracking and documentation.

Technician Role: Lead digital literacy efforts and provide ongoing technical support for updates.

5. Institutional and Group-Level Strategies

Strategies:

- Foster **group certification schemes** to reduce cost and administrative burden for smallholders.
- Align internal cooperative policies with EU environmental criteria.

- Create a **technical working group** between field staff, exporters, and government entities (e.g., SENASA, MAG, ICF) to share data and tools.
- Leverage public incentives (e.g., PSA in Costa Rica) or climate finance for sustainable transition.

Technician Role: Act as liaisons between farms and institutions, helping translate policy into field reality.

✅ **Key Message to Field Technicians:**

> "EU compliance is not about doing more—it's about doing smarter, documenting better, and making sustainability visible."

Sub-Unit 4: Digital Tools for Green Compliance

4.1. Technologies: blockchain, sensors, mobile applications, geopositioning

Technological advancements in a growing number of economic sectors are evident, and agriculture is no exception. Digital tools like blockchain, sensors, and mobile applications can facilitate planning, financial and strategic decision-making, and improve the productivity levels of agricultural operations. Therefore, it is important that agri-professionals possess both the knowledge and the skills to make good use of the technological tools currently available on the market.

Wireless Sensors

Sensors play an important role in smart agriculture. They facilitate agricultural production by providing critical information on various parameters like moisture, humidity, plant growth and health, temperature, wind speed, and rainfall. The data from the sensors is transmitted to digital platforms, websites, and applications to be used by their users.

How to use Soil Sensors in Smart Agriculture:

- Sensors should be placed in multiple spots across the farming field, not in one single part or spread uneven.

Why? – Different zones of an agricultural field are not equal in terms of soil characteristics, topography, or water-holding levels. This creates different levels and types of plant growth, as the specific characteristics regarding soil moisture, temperature, or salinity may vary greatly from zone to zone. As a result, underground sensors should be placed strategically (ideally after field analysis) to allow better, more focused, and analytical measurements tailored to the farm's specific soil attributes.

- Multiple sensors should be installed underground and at various depths in each farm zone.

Why? – At least two sensors should be placed in each agricultural zone instead of only one. This practice allows for the collection of more and better-quality data in categories like compaction, drainage, infiltration, and temperature. The more sensors installed at different depths, the more detailed, reliable, and comparable the results the technician will get.

- Different types of sensors can be applied for wider measuring

Why? – It is suggested that different soil sensors are applied across a field, instead of focusing on one type. Moisture, temperature, pH, and nutrient sensors can monitor different aspects of soil behavior and provide more complex and informative results to their user. This will hopefully contribute to better decision-making.

- Compare the collected data among the different farming zones and identify reasons behind poor growth or other parameters related to crop performance

Why? – The accurate measurement and detailed data a farmer gets from the wireless sensors give the chance to identify areas for improvement. Immediate and targeted interventions, like irrigation adjustments or improvements in drainage, can be made and facilitate planning and production growth.

Benefits of Soil Sensors:

- Easy installation and remote control
- Improve crop production
- Maximize efficiency
- Reduce operation costs long-term
- Increase profit
- Facilitate future planning

Geopositioning

Geopositioning (GPS) tools are becoming more and more famous among the agri-professionals. Using satellite-imagery, they indicate the active and passive location of fields, soil spots, infrastructure, machinery, smart devices.

How to use Geopositioning in Smart Agriculture:

- GPS tags can be placed for accurate Field and Yield mapping

Why? – GPS mapping provides agriculture professionals with the ability to map their farming fields and have them available in a digital map. For better results, sensors, GPS and Geographic Information Systems (GIS) must be used in cooperation. This enables them to proceed to yield mapping, by having a clearer picture on crop performance, differences in field attributes and other characteristics. This procedure lets farmers optimize farming routes, planting and harvesting cycles and reduce costs.

- Guide automated Steering machines

Why? – Automated machines can navigate the field autonomously by following pre-saved and predetermined routes and directions, instead of applying the same automated moves and functions as if they were not GPS-enabled. This automated control lets farmers give clear navigation and targeted guidelines to automated machines. In return, faster, more effective and more uniform agricultural operations are ensured, while phenomena like soil erosion and compaction are being avoided.

- Extended operations

Why? – Machines that use GPS to navigate the field enable farmers to continue their operations even in unfavorable conditions such as low-light, low-visibility conditions.

Benefits of geopositioning:

- Enhanced precision operations
- Efficient resource use
- Time efficiency
- Cost effective
- Prolonged productivity

Satellite Tools and Platforms

Tools like Google Earth Engine (GEE), Copernicus Land Monitoring Services (CLMS), Collect Earth (FAO + Google), Global Forest Watch (GFW) can help professionals:

a) run spectral analysis to detect and report on **land use change** like:

- Vegetation cover
- Soil exposure
- Built-up areas
- Water bodies

b) analyze land surfaces with **spectral indice** (land reflection of different wavelengths of light) to:

- monitor vegetation status of crops
- track deforestation in support of EU Deforestation Regulation (EUDR)
- identify climate-related stress like droughts, waterlogging, or heatwaves
- Take decisions based on measurable satellite-based data

Key Spectral indexes include:

- Normalized Difference Vegetation Index (NDVI) for measuring vegetation health and density (crop stress and growth)
- Normalized Difference Water Index (NDWI) for measuring water levels in soil and plants (irrigation)
- Enhanced Vegetation Index (EVI) for measuring biomass and vegetation density
- Soil Adjusted Vegetation Index (SAVI) for monitoring sparse vegetation areas

Measurements regarding land use change, vegetation status, spectral indices, surface soil temperature can be made through publicly available digital tools like:

- Google Earth Engine for land use change
  - Sign up with your Google account
  - Click: https://code.earthengine.google.com/
  - Define Area of Interest (AOI)
  - Select Satellite Datasets
  - Create Image Collections by Year
  - Calculate NDVI or land cover differences
  - Export map as GeoTIFF to use in reporting

- Copernicus Land Monitoring Services (CLMS) for vegetation status
  - Visit the site and navigate to Vegetation Monitoring Products.
  - Download vegetation indices like NDVI or Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) for your AOI.
  - Use GIS software like QGIS to load the raster files.
  - Visualize vegetation health maps with color-coded scales.
  - Compare different dates or growing seasons to identify trends or stress.
  - Integrate with local field data to validate findings.

- Collect Earth for Spectral indices
  - Install and launch Collect Earth.
  - Load sampling points over your area.
  - Use Google Earth imagery to visually assess vegetation health, water presence, or burned areas.
  - Cross-reference with spectral index maps from GEE or Copernicus.
  - Record field or visual observations supporting spectral index data.
  - Export

- Global Forest Watch (for soil surface temperature)
  - Open the GFW map and zoom to your region
  - Search for Land Surface Temperature or other climate layers
  - Use the timeline to detect temporal changes
  - Identify hotspots or zones with abnormal temperature differences
  - Export data

Each of the aforementioned tools can be used in a variety of ways ranging from land use change to soil surface temperature. They are not exclusively used in the way described in this short guide.

Blockchain

Blockchain technology is a digital system where transactions are being recorded (organized in blocks) which are linked and presented in chronological order. It is not controlled by a central authority, its data cannot be altered and its blocks are visible to all participants in the blockchain. It can be exceptionally useful in agri-food supply chains and support traceability mechanisms in the agriculture sector, independent from farm size.

How to use Blockchain in Smart Agriculture:

- Choose a traceability platform for agriculture
- Make your farm more digital and support supply chain data

Why? - By entering variable data into the blockchain ledger (like GPS location, crop type, input usage, seed source, planting date, harvest time, quantity, storage conditions, packing) the producer can increase his visibility, reputation and professional reliability to other parts (like transporters, processors, exporters) of the supply chain and the consumers.

- Create a professional digital identity

Why? - by using a QR code or an RFID tag consumers can access important information about the product. This increases the visibility and facilitates “relation-building" between the producer and the consumer.

- Make use of smart contracts

Why? - By automating payments upon delivery confirmation, blockchain traceability becomes more immersive and promotes trust

- Access new markets

Why? - By building trust and improving professional reputation, producers have higher chances of expanding their access to new markets that otherwise would not be accessible

Benefits of Blockchain for traceability:

- Improved transparency and trust
- Better access to markets and possibly better prices
- Trust and connection building with consumers
- Possible proof of compliance for complying with sustainability standards
- Fast and secure payments

How to solve a specific agricultural problem

For the purposes of this part of sub-unit 4, inefficient irrigation in coffee production is being used.

Agricultural problem: In tropical regions like Honduras and Costa Rica, coffee producers face some important issues with water management. Due to changing climate patterns, traditional irrigation practices are no longer effective. As a result, phenomena such as overirrigation and underirrigation occur often. Overirrigation leads to waterlogging, plant diseases and nutrient loss, while underirrigation leads to plant damage, reduced size or quality of the products and uneven results. This makes yield production, quality and growth difficult to sustain or improve, thus often resulting in production losses, financial damage and environmental degradation.

In order to fight against this persisting challenge, smart agriculture is considered the best solution. The deployment of sensors will create a data-driven irrigation management system through real-time soil and environmental monitoring that will provide producers with a number of viable options on a daily basis.

Step-by-step guide to solve this agricultural challenge:

Step 1: Identify the irrigation problem

How? - Observe visual signs of leaf curling, yellowing, or irregular fruit drop

- Take into account similar signs observed in the past and what they meant

- Identify field zones that are often overirrigated or underirrigated

Step 2: Based on the field analysis, search the market and install the appropriate sensors

How? - Choose appropriate soil moisture sensors

- Install the sensors at multiple depths (e.g. 15–30 cm) and critical spots across the farm field
- Support the system with climate sensors like rain, temperature, humidity, solar radiation types
- Connect the sensors to a wireless data network

Step 3: Connect sensors to a mobile app/website platform capable of providing and analyzing:

- Current soil moisture
- Humidity
- Nutrient levels
- Rainfall history and forecasts
- Recommendations based on the combination and analysis of the data

Step 4: Set guidelines to the sensors form your smart device depending on the period, weather, forecasted weather, the app suggestions and other factors. This way the irrigation system will become more automated, regular and adjusted to the real needs of the coffee crops, able to adapt to changing conditions.

For example:

- If soil moisture is adequate you can delay irrigation and save water

- If soil is dry and there is no rainfall forecasted you can irrigate specific field zones, thus avoiding uniform watering
- If rainfall is expected you can skip irrigation and monitor the water levels after the rainfall stops

Step 5: Monitor, Evaluate, and Optimize based on real needs

- Monitor and identify patterns
- Evaluate the data provided and the options you make based on the data to track progress and identify good, less good or bad practices to improve your operations
- Optimize your workflow based on real needs, not on traditional methods

How the Sensors Solved the specific Agriculture Problem:

- Real-time soil health data prevented unnecessary watering which may result in nutrient loss and crop disease
- Sensors allowed for more stable yields through ensuring timely irrigation when roots are dry
- The provided data helped coffee producers to take well-informed decisions and apply water only when and where needed
- The future monitoring and evaluation of the coffee fields may motivate producers to make significant progress through constant learning and better planning.

4.2 Digital tools for eco-certifications and compliance reporting

An agri-professional interested in acquiring eco-certifications and complying with regulations and sustainability frameworks such as the European Green Deal must be able to use tools that will help in diagnosing and assessing his business alignment with the sustainability objectives of these frameworks, as well as managing and reporting its environmental performance. There are various digital tools that help professionals in the agriculture sector to assess and report their environmental performance in relation to the EGS's sustainability goals.

How to use digital tools for eco-certification and compliance reporting

Step 1: Identify the EGD sustainability objectives you want to comply with

Step 2: Use data from the digital tools (sensors, IoT, etc.) and import them to specialized digital tools that assess and diagnose the sustainability level of your operations.

Example:

- SAI Platform, available here:

  https://www.scsglobalservices.com/latin-america/services/farm-sustainability-assessment

- CoolFarm, available here: https://coolfarm.org/
- Agrosavia, available here:https://www.agrosavia.co/

Step 3: Use benchmarking tools to compare your sustainability performance to EGD targets and certification labels (e.g. EU Organic certification)

Step 4: Report Performance and Demonstrate Compliance through automated report generation offered by some digital tools or compile it based on the sustainability evaluations provided by the digital tools.

Step 5: Continue to make progress towards reaching the sustainability objectives of EGD and run frequent assessments and evaluations of your performance using the digital tools.

4.3 Crop-specific indicators for coffee, cocoa, plantain, and oil palm

Indicators for Coffee:

- Water usage per kg: Water efficiency
- Use of chemicals: Pesticide and fertilizer usage levels
- Organic matter: Soil fertility and carbon levels
- Soil erosion: soil degradation risks

Indicators for Cocoa:

- Deforestation: Land use changes due to coca production
- GHG emissions

- Agroforestry system

Indicators for Plantain:

- Chemicals level and input frequency
- Soil cover
- Irrigated systems efficiency regarding water usage

Indicators for Oil palm:

- Deforestation risk
- Peatland conversion area
- Biodiversity
- Water pollution

Digital indicator for sustainability monitoring and evaluation of tropical crops in regards to EGD

a) Verification of deforestation-free coffee supply chain through GPS monitoring:

In tropical contexts, like in Latin America, coffee is often associated with deforestation practices that aim to facilitate and raise coffee production in the deforested areas. The EUDR asks for proof that any goods (including coffee) that enters the EU market is not produced in deforested agriculture lands.

In order to find and provide proof for EUDR, interested parts should collect:

- Satellite data
- GPS and GIS data
- Blockchain data
- KPI's

Providing this information should be sufficient to comply with EUDR deforestation regulations.

b) GHG Emissions per ton of palm oil:

The goal is to measure the amount of GHG emissions per ton of palm oil produced from land use, fertilizer application, processing, and transport.

In order to find and provide proof for Climate Neutrality objective, Carbon Border Adjustment Mechanism (CBAM) and Farm to Fork of the EGD, interested parts should:

- Install sensors to measure input rates, soil moisture, methane capture
- Drones to monitor canopy cover
- Energy consumption monitoring systems and fuel use during transportation
- Use an internationally recognised GHG calculation model
- Record GHG emissions levels via blockchain technology for traceability and verification

Sub-Unit 5: From Theory to Action: Designing a Green Deal-Aligned Proposal

The European Green Deal challenges the agricultural sector not only to produce more sustainably, but also to demonstrate innovation, traceability, and environmental responsibility through tangible actions. In this final sub-unit, participants will take the knowledge acquired throughout the course and apply it to design a real-world sustainability proposal. Whether focused on traceability, biodiversity, or agrochemical reduction, the goal is to integrate Green Deal principles and digital tools into a project that responds to local realities in cacao or coffee production. This is where theory meets practice—where technicians become facilitators of change.

What Should This Sub-Unit Achieve?

This sub-unit should guide participants to design a project that meets all the necessary requirements to align with the European Green Deal, with a focus on:

- Environmental and social sustainability
- Traceability and verifiable origin (EUDR)
- Zero deforestation
- Agrochemical reduction
- Biodiversity conservation
- Carbon capture and soil regeneration
- Use of digital tools for monitoring and documentation

All of this should be structured in a simple but complete proposal, as if participants were preparing a real project for a cooperative, NGO, government program, or even a European buyer.

To continue with the proposal construction process, it is necessary to consider the following guidelines and regulations:

- **European Green Deal:** A comprehensive strategy targeting climate neutrality by 2050, including agriculture reforms, reduced pesticide/fertilizer use, and biodiversity goals The European Green Deal - European Commission

- **Farm to Fork Strategy:** Aims to reduce pesticide use by 50%, fertilizers by 20%, and expand organic agriculture to 25% of EU farmland by 2030 European Green Deal - Wikipedia

- **EU Biodiversity Strategy 2030 & Nature Restoration Law:** Enforce protecting and restoring habitats, promoting agroforestry, reducing pesticide use, and planting 3 billion additional trees by 2030 European Green Deal - Wikipedia

- **EUDR (EU Deforestation Regulation):** Requires traceability and geolocation of cocoa and coffee since 31 Dec 2020, plus legal compliance verification Regulation on Deforestation-free products - European Commission

Additional Reference Links

- **EUDR Overview by European Commission** (Regulation details and due diligence rules) Deforestation Regulation implementation - European Commission

- **'10 Key Things' Guide on EUDR Compliance** by White & Case (corporate readiness tips) 10 key things you STILL need to know about the new EU Deforestation Regulation | White & Case LLP

- **Insights on EU Green Deal Agriculture Focus** (pesticide/farm management targets) Insights on European Green Deal – Farm Management

Forms and Tools to Use:

Participants should receive models or templates such as:

- Sustainability proposal form (based on Topic 1 components)
- Farm-level traceability sheet (including coordinates, crop, farmer name, planting date, agrochemical history)
- Visual evidence log (geo-tagged photos of plots, shade trees, compost, etc.)
- Monitoring & evaluation sheet (indicator table)

They can also use low-cost or offline tools like Excel, KoboToolbox, Google Earth, or printed maps.

What Should Be Done in the Practical Activity?

The **main hands-on activity** should be to develop a **sustainability innovation proposal**, as if it will be evaluated by a sustainability committee. The proposal must:

- Clearly define the problem, solution, and expected impact

- Include at least one concrete sustainable field practice
- Explicitly meet traceability and environmental requirements
- Include a digital or technological component
- Be aligned with one or more Green Deal-related EU policies

Example:
A technician proposes installing shade-grown coffee demo plots with geolocation, compost use, agrochemical tracking, and biodiversity monitoring — using a mobile app for documentation.

Considering the above guidelines, let's start with the execution of **a Green Deal-Aligned Proposal:**

Topic 1: Components of a Sustainability Proposal

Creating a Green Deal-aligned sustainability proposal requires clear structure, evidence-based justification, and practical, locally adapted actions. Field technicians should be able to guide or co-develop proposals that are **simple but technically sound**, especially when working with smallholder producers or cooperatives in the coffee and cacao sectors.

Below are the essential components of a sustainability innovation proposal, with guiding questions and field-level considerations:

1. Title and Project Summary

A short, descriptive title and a concise summary of the proposed solution.

Example:
"Agroforestry for Biodiversity and Carbon Capture in Smallholder Cacao Farms in Olancho, Honduras"

2. Problem Statement

Clearly define the environmental, agronomic, or market-related challenge the project seeks to address.

Guiding Questions:

- What sustainability issue is affecting your production system?
- Is it related to EU regulations (e.g., deforestation, agrochemical overuse)?
- Who is most affected (farmers, exporters, ecosystems)?

Example:
High deforestation pressure in cacao-growing areas due to limited economic alternatives and lack of shade management.

3. Objectives and Expected Outcomes

What is the project trying to achieve, and what will success look like?

Guiding Questions:

- Are your goals measurable and realistic?
- How will your solution contribute to the Green Deal goals?
- What environmental or social impacts are expected?

Example *Objective:*
Introduce biodiversity-friendly shade systems in 20 cacao farms over 12 months.

4. Description of Activities

Outline the main actions or steps to be taken.

Field-Based Actions May Include:

- Shade tree planting
- Composting or soil regeneration
- Use of mobile tools for traceability
- Biodiversity monitoring
- Farmer training sessions

Example Activity:
Use GPS-enabled phones to map cacao plots and identify areas for native tree replanting.

5. Tools and Digital Integration

Include any digital tools or platforms that support sustainability and traceability.

Examples:

- KoboToolbox or ODK for field surveys
- QGIS or mobile apps for farm mapping
- Digital traceability platforms (CropIn, FarmTrace, Excel + GPS)
- Biodiversity tracking forms

Tip: Even low-tech solutions like phone photos with coordinates can support traceability.

6. Stakeholders and Roles

Identify key actors and their responsibilities.

Include:

- Farmers
- Technicians
- Cooperatives/exporters
- Local authorities or NGOs

Example:
Farmers implement pruning and planting; technicians train and document.

7. Timeline and Budget (Simplified)

Suggest a basic timeline (e.g., 6–12 months) and estimated resources.

Field Tips:

- Keep it simple (monthly milestones)
- Use in-kind resources when possible
- Identify available public support (e.g. PSA in Costa Rica, extension programs)

8. Monitoring and Evaluation

Describe how you will track progress and success.

Tools and Indicators May Include:

- Number of trees planted
- Soil health changes
- Reduction in pesticide use
- Geolocation records
  Farmer interviews or photos

Example:
Before-and-after photos + field logbooks to document changes in shade cover and chemical inputs.

Topic 2: Traceability Project Design

Why Traceability Matters?

Traceability is a central requirement under the **EU Deforestation Regulation (EUDR)** and other Green Deal frameworks. Exporters must now prove that products like coffee and cacao:

- Are **not linked to deforestation**
- Are **legally produced**
- Can be traced to a specific **farm or plot**
- Include **geolocation data** (polygon or point coordinates)

This means producers and cooperatives must implement systems to track the origin and journey of each batch, starting at the farm level. Technicians must guide this process by helping producers collect and manage the required information.

Key Components of a Traceability Project

A well-designed traceability project includes the following:

1. Objective and Scope

Define what will be tracked, why, and who is involved.

Examples:

- Trace cacao beans from 30 farms in Atlántida
- Document field inputs (e.g., agrochemicals, compost) for organic coffee lots
- Monitor land-use change and shade levels to ensure zero deforestation

2. Geolocation Mapping

Capture geographic data to identify each plot or farm.

Minimum requirement (per EUDR):

- Coordinates of the farm (point)
- Preferably: Polygon mapping of the entire production plot

Tools:

- Smartphone GPS apps (e.g., KoboCollect, QField, ODK)
- Handheld GPS units
- Google Earth Pro (offline mapping)

Tip: Always record latitude/longitude, date, and farm ID. Use a unique code for each plot.

3. Producer and Plot Information

Create a farmer registry that includes basic data.

Suggested fields:

- Producer name / ID

- Community or municipality
- Size of plot (ha)
- Crop (coffee or cacao)
- Date of planting
- Organic or conventional
- Associated certification (if any)

Tool: Build a simple Excel or KoboToolbox form to gather and store this data.

4. Input and Field Practices Record

Track field practices and inputs over time.

Why? Because the **Green Deal's Farm to Fork strategy** demands safer, reduced chemical use, and these must be recorded.

Data to collect:

- Fertilizers, pesticides used (product, quantity, date)
- Compost applications
- Shade tree planting
- Soil improvement actions

5. Harvest and Post-Harvest Monitoring

Link production lots with traceability data.

Track:

- Date of harvest
- Quantity produced
- Lot number
- Drying/fermentation site
- Delivery to cooperative or exporter

Best practice: Assign unique lot codes and trace them back to the mapped farm.

6. Data Management and Digital Tools

Choose tools that fit the local context.

Options:

- **Low-tech:** Paper + Excel sheets
- **Mid-tech:** KoboToolbox, ODK forms with GPS + photos
- **Advanced:** Platforms like **FarmTrace, CropIn,** or custom apps

Important: Keep it simple, accurate, and usable without constant internet access.

7. Compliance with EUDR

Ensure your traceability system includes the following:

- Farm coordinates (point or polygon)
- Legal land status (no deforestation post-Dec 2020)
- Proof of legal production (permits, documentation)
- Product traceability from plot to buyer

Field Technician Role in Traceability Projects

- Map farms and train producers on data collection
- Validate that production areas are outside deforested zones
- Maintain updated registries and photo evidence
- Liaise with cooperatives/exporters to consolidate data
- Support implementation of digital traceability platforms

Real examples: cocoa traceability, biodiversity initiatives.

Conclusion

The EU Green Deal is often characterized as a critical development in addressing the adverse effects of climate change and environmental degradation. Technological advancements offer an increasing number of solutions in a variety of sectors. In recent years, the agricultural sector has seen major developments in the integration of technology into its daily operations and across different stages.

Innovation trends in agricultural technology, food technology, bioeconomy, and climate-smart agriculture are currently driving the green transition in Europe. From sensors to automated tractors, from alternative preservation methods to blockchain, from biological resources to nutrient management, innovation trends aim to change the way, the pace, and the efficiency with which agriculture operates, while providing important opportunities for Central America to make significant steps towards smart agriculture.

The EU Green Deal, through strategies and sustainability plans such as Farm to Fork, the Common Agricultural Policy, and the EU Deforestation Regulation, provides real opportunities for tropical agriculture. Implications and challenges remain, along with opportunities like facilitated access to the EU market for Central American producers. Costa Rica's and Honduras' national contexts and regulations must come into greater alignment with EU standards and adopt adaptation strategies for EU compliance in agrochemical reduction, biodiversity enhancement, carbon capture, traceability/geolocation, and institutional and group-level strategies.

For the Green Deal to have an effect in Central America, digital tools must be adopted by a large percentage of the agricultural world. Tools like blockchain, sensors, mobile applications, satellites, and geopositioning offer valuable data and contribute to better decision-making and increased levels of compliance with EU sustainability standards, eco-certifications, and reporting. It is also important that, through this Learning Unit, professionals in agriculture in Costa Rica and Honduras can have a clearer picture of how to create agricultural projects that align with the EU Green Deal and other EU strategies on sustainability.

Learning Activities

1.Case study description:

You are a technician working with 25 smallholder cocoa farmers in Costa Rica. The region faces increasing deforestation and agrochemical use. You want to create a Green Deal-aligned proposal focusing on biodiversity and traceability.

Task:
List four key components you would include in your sustainability proposal and briefly explain how each addresses EU Green Deal objectives.

Possible answers:

Problem Statement – defines deforestation and chemical overuse challenges.

Description of Activities – agroforestry and composting to enhance biodiversity.

Digital Tools – use GPS or similar services for mapping and monitoring.

Monitoring & Evaluation – indicators like tree cover or pesticide usage reduction

Traceability System – geolocation and farmer registry for EUDR compliance.

Stakeholder Roles – define roles of farmers, technicians, exporters.

2. Case study description:
An oil palm processing group in Honduras wants to calculate their GHG emissions to align with the Carbon Border Adjustment Mechanism (CBAM) and EU Green Deal. They have drones and sensors but need guidance on designing the monitoring approach.

Task:
Design a GHG monitoring system using at least three types of tools or data sources. Explain how each will help meet climate neutrality and traceability standards.

Possible answer:

- Soil and fertilizer sensors to monitor methane and nitrous oxide from field practices
- Drones to assess land cover and detect peatland use
- Blockchain or digital logbooks to track and verify emissions and energy use across transport and processing stages

Assessment

1. What is one primary function of location sensors used in AgTech applications?

A. Monitoring weather changes
B. Transmitting video footage of crops
C. Measuring soil temperature for fertilizer application
D. Identifying the position of machinery and animals for precision mapping

2. How do data analytics platforms support agricultural decision-making according to the course content?

A. They analyze field data to provide actionable insights and recommendations

B. They send email alerts about international trade prices

C.They create marketing plans for farm exports

D. They replace the need for sensors in the field

3. In the FoodTech section, what is the main goal of *cold plasma* preservation?

A. Freezing products at lower cost

B. Heating food to high temperatures

C. Killing microorganisms without altering flavor or color

D. Removing heavy metals from vegetables

4. How do innovation trends influence EU funding decisions, according to the material?

A. They determine which countries get the most food imports

B. They reduce the need for regulatory frameworks

C. They slow down the adoption of digital infrastructure

D. They inform funding programs about sector needs for sustainable development

5. What is one key benefit of using FoodTech preservation and packaging innovations in Central American tropical crops?

A. Increasing pesticide efficiency

B. Reducing post-harvest losses and expanding market access

C. Replacing barcodes with manual tracking

D. Promoting over-ripening for better taste

6. What is a major challenge tropical producers may face when trying to comply with the EGD?

A. Differences between Central American and EU regulations

B. Lack of rainfall data

C. Lack of farming equipment

D. Overproduction of organic crops

7. Which directive under the EGD sets targets such as a 50% reduction in pesticide use and a 25% organic farming target?

A. Farm to Fork Strategy

B. EU Deforestation Regulation (EUDR)

C. Common Agricultural Policy (CAP)

D. Renewable Energy Directive

8. What is a key difference between the EU Deforestation-Free Regulation (EUDR) and Honduras' Forest Law (Decree 98-2007)?

A. The EUDR allows land-use change in forests, while Decree 98-2007 does not

B. The EUDR requires full geolocation traceability, while the Honduran law does not integrate with agricultural exports

C. The Honduran law applies only to palm oil, while the EUDR applies to all crops

D. The Honduran law includes mandatory EU certifications

9. In what way does Costa Rica's approach to sustainability differ from the EU's EGD framework?

A. It emphasizes forced compliance through law

B. It focuses on economic growth through fossil fuel use

C. It restricts farmers from exporting to the EU

D. It relies on incentives and voluntary participation rather than legal mandates

10. Which of the following combinations best represents the minimum set of data required to comply with the EUDR for a coffee farm?

A. Soil pH, planting date, cooperative name

B. GPS coordinates, legal land status, product traceability

C. Harvest date, input records, farm size

D. Pesticide usage, shade tree density, biodiversity index

11. What is the primary role of digital benchmarking tools in the eco-certification process?

A. To visualize drone imagery of soil erosion

B. To compare current farm performance against sustainability standards and targets

C. To report pesticide use to local governments

D. To verify carbon taxes are paid correctly

References

What is AgTech?. (2018). United States Studies Centre. Retrieved from: https://www.ussc.edu.au/what-is-agtech

What is AgTech?. Retrieved from: https://agriculture.vic.gov.au/farm-management/agtech/agtech-basics/what-is-agtech

The self-driving tractor: understanding autonomous tractors in agriculture. (2025). Monarch. Retrieved from: https://www.monarchtractor.com/blog/understanding-autonomous-tractors-in-agriculture

Driving automation on the farm: Self-driving tractors look to fill agriculture's labor shortage. (2024). Agriculturedive. Retrieved from: https://www.agriculturedive.com/news/autonomous-tractors-driverless-vehicles-deere-agtonomy-ai-farming-labor/730007/

Scope of autonomous tractors in revolutionizing agricultural operations. (2023). In book: Advanced Innovative Technologies in Agricultural Engineering for Sustainable Agriculture (pp.31-41). AkiNik Publications. Retrieved from: https://www.researchgate.net/publication/373247305_Scope_of_Autonomous_Tractors_in_Revolutionizing_Agricultural_Operations

Drone technology in agriculture. Croptracker. Retrieved from: https://www.croptracker.com/blog/drone-technology-in-agriculture.html

Drones in agriculture: A review and bibliometric analysis. (2022). Abderahman, R. et al. Computers and Electronics in AgricultureVolume 198, July 2022, 107017. Retrieved from: https://doi.org/10.1016/j.compag.2022.107017

Drones in Precision Agriculture: A Comprehensive Review of Applications, Technologies, and Challenges. (2024). Guebsi, R. et al. Drones 2024, 8(11), 686. MDPI. Retrieved from; https://doi.org/10.3390/drones8110686

Food Science and Food Technology - Overlapping but Different Disciplines. Institute of Science + Technology. Retrieved from: https://www.ifst.org/food-science-food-technology

Alternative protein sources for food and feed. (2024). EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA). PE 757.806 – April 2024. Retrieved

from:
https://www.europarl.europa.eu/RegData/etudes/STUD/2024/757806/EPRS_STU(2024)757806_EN.pdf

High-pressure processing: food safety without compromising quality. (2022). Efsa. Retrieved from: https://www.efsa.europa.eu/en/news/high-pressure-processing-food-safety-without-compromising-quality

Advancements in food preservation technologies: enhancing food quality, safety, and sustainability. (2024). Brazilian Journal of Technology 7(4):e76174. Retrieved from; DOI:10.38152/bjtv7n4-045

Innovative and Sustainable Food Preservation Techniques: Enhancing Food Quality, Safety, and Environmental Sustainability. (2024). Lisboa, H. M. et al. Sustainability 2024, 16(18), 8223. Retrieved from: https://doi.org/10.3390/su16188223

Novel food packaging technologies: Innovations and future prospective. (2018). Majid I. et al. Volume 17, Issue 4, October 2018, Pages 454-462. Retrieved from: https://doi.org/10.1016/j.jssas.2016.11.003

Transforming agricultural supply chains: Leveraging blockchain-enabled java smart contracts and IoT integration. (2024). El Mane A. et al. ICT Express Volume 10, Issue 3, June 2024, Pages 650-672. Retrieved from: https://doi.org/10.1016/j.icte.2024.03.007

Chapter: Sensors in Agriculture. (2023). Yadav Rishikesh, Kumar R. In book: Recent Trends in Agriculture Volume 2 (pp.61-81)Publisher: BS Global Publication House. Retrieved from: https://www.researchgate.net/publication/375519915_Chapter_Sensors_in_Agriculture

How Can GPS be Used in Precision Farming. Endeavor Magazines. Retrieved from; https://www.littlegatepublishing.com/2024/06/how-can-gps-be-used-in-precision-farming/

Bioeconomy: EU is moving towards its goals, but environmental challenges persist. (2023). European Commission. Retrieved from: https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/bioeconomy-eu-moving-towards-its-goals-environmental-challenges-persist-2023-02-28_en

Common agricultural policy and bioenergy. European Commission. Retrieved from: https://agriculture.ec.europa.eu/cap-my-country/sustainability/economic-sustainability/bioeconomy/cap-and-bioenergy_en

Key policy objectives of the CAP 2023-27. European Commission. Retrieved from: https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27/key-policy-objectives-cap-2023-27_en

Regulation on Deforestation-free Products. European Commission. Retrieved from: https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (Text with EEA relevance). EUpean Union. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1115&qid=1687867231461#d1e32-243-1

European Union's Farm to Fork Strategy – for a fair, healthy and environmentally-friendly food system. Food and Agriculture Organization of the United Nations. Retrieved from: https://www.fao.org/agroecology/database/detail/en/c/1277002?utm_source=.com

Farm to Fork strategy: towards a more healthy and sustainable food system.(2020). European Commission. Retrieved from: https://ec.europa.eu/newsroom/intpa/items/682193/en?utm_source=.com

Overview: EU Farm to Fork and Green Deal Initiatives. (2025). Agrinfo. Retrieved from: https://agrinfo.eu/book-of-reports/overview-eu-farm-to-fork-and-green-deal-initiatives/

EU Regulation on Deforestation-free Products (EUDR). (2025). Forest Governance and Policy, Retrieved from: https://forestpolicy.org/policy-law/eu-regulation-deforestation-free-products-eudr

Program for sustainable and competitive agriculture in Costa Rica. (2025). Hennings, E. FIDA. Retrieved from: https://webapps.ifad.org/members/eb/144/docs/spanish/EB-2025-144-R-29-Informe-de-dise-o-del-Proyecto.pdf?utm_source=.com

Payments for Environmental Services Program | Costa Rica. United Nationa Climate Change. Retrieved from: https://unfccc.int/climate-action/momentum-for-change/financing-for-climate-friendly-investment/payments-for-environmental-services-program?utm_source=.com

Payment of Environmental Services. FONAFIFO. Retrieved from: https://www.fonafifo.go.cr/en/servicios/pago-de-servicios-ambientales/

LEY FORESTAL, ÁREAS PROTEGIDAS Y VIDA SILVESTRE. (2007). Biblioteca Virtual. Retrieved from: https://www.tsc.gob.hn/biblioteca/index.php/leyes/118-ley-general-de-areas-protegidas-y-vida-silvestre?utm_source=.com

¿Quiénes Somos?. Sinit territorial. Retrieved from: https://sinit.hn/quienes-somos/

Gap Analysis Between the 2018 RSPO Principles and Criteria (P&C) and EU Deforestation Regulation (EUDR). Roundtable on Sustainable Palm Oil. Retrieved from: https://rspo.org/wp-content/uploads/Gap-Analysis-RSPO-vs-EUDR.pdf

RSPO and Legislation. (2025). RSPO. Retrieved from: https://rspo.org/why-sustainable-palm-oil/eudr/?utm_source=.com

Get Deforestation Out of Europe's Coffee, The coffee industry must race to get in compliance with the EUDR. (2025). Coffeewatch. Retrieved from: https://coffeewatch.org/get-deforestation-out-of-europes-coffee/

Forest Law (Law No.7575). (1996). Climate Change Laws of the world. Retrieved from: https://climate-laws.org/document/forest-law-law-no-7575_618a

Costa Rica's Country Program On Carbon Neutrality 2.0: Category Municipalities. Energypedia. Retrieved from: https://energypedia.info/wiki/Costa_Rica%E2%80%99s_Country_Program_On_Carbon_Neutrality_2.0:_Category_Municipalities

Policy Support in Costa Rica. UN Environment Programme. Retrieved from: https://www.unep.org/ndc/policy-support-costa-rica

THE NATIONAL CARBON NEUTRALITY PROGRAM (PPCN). (2020). World Bank. Retrieved from: https://documents1.worldbank.org/curated/en/740471617599669995/pdf/Partnership-for-Market-Readiness-Costa-Rica-Program-The-National-Carbon-Neutrality-Program.pdf

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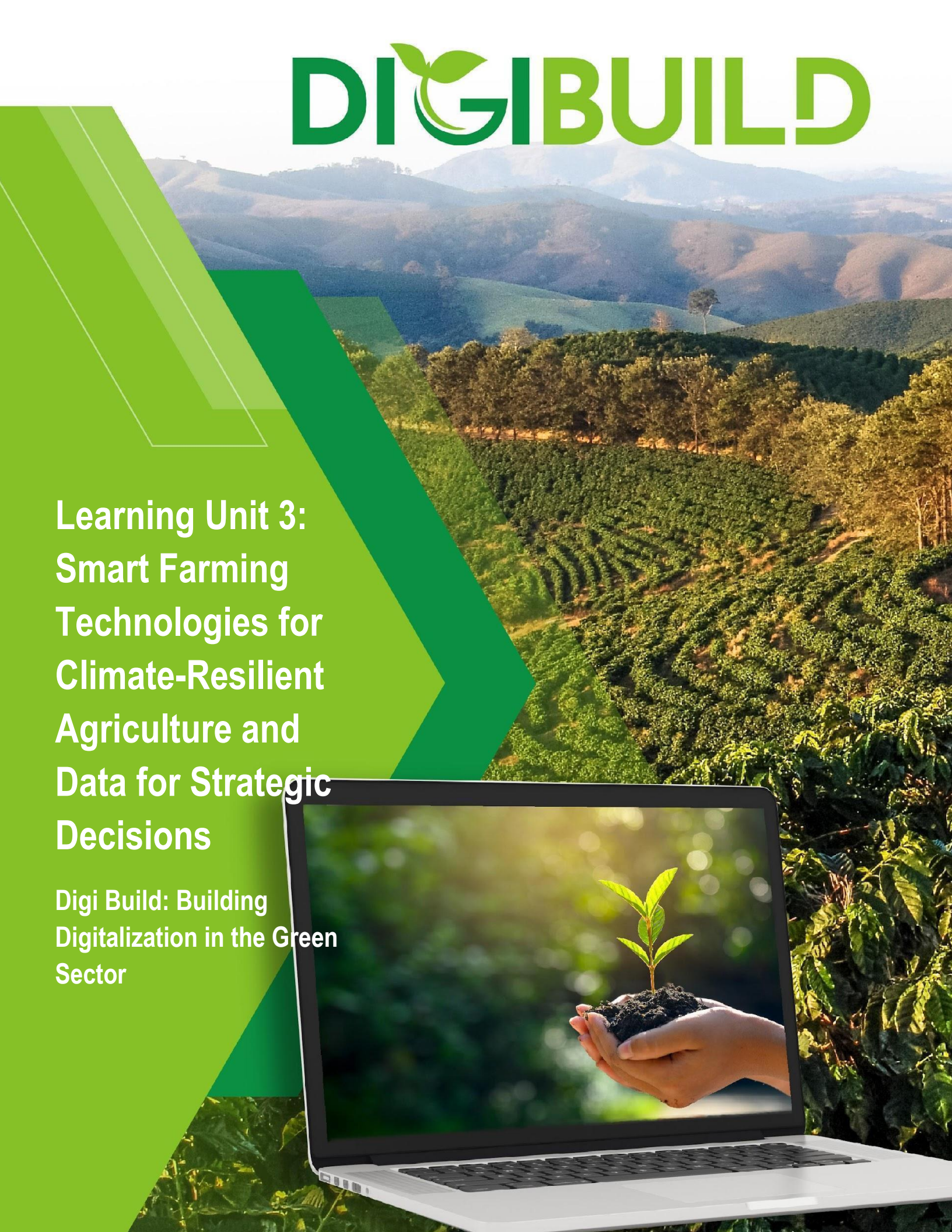
Learning Unit 3: Smart Farming Technologies for Climate-Resilient Agriculture and Data for Strategic Decisions

Digi Build: Building Digitalization in the Green Sector



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Learning unit title: Smart Farming Technologies for Climate-Resilient Agriculture and Data for Strategic Decisions

Year
2025

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Introduction

This module examines the role of smart farming technologies in enhancing the resilience of agricultural systems to climate change and in data-driven strategic decision-making. Through the presentation of drones, sensors, geographic information systems (GIS), artificial intelligence, and automatic irrigation systems, it is highlighted how these technologies improve efficiency, reduce costs, and enhance sustainability. Particular emphasis is placed on small farms, with practical solutions for adopting these technologies and utilizing agri-data for strategic decision-making. The application of such practices in crops such as coffee and cocoa is already showing positive results in terms of production, quality, and access to certified markets.

LEARNING OBJECTIVES

Learning Outcomes:

- List the primary smart farming technologies and their uses in agricultural production, such as drones, IoT sensors, AI tools, and GIS.
- Describe how climate resilience, decreased environmental impact, and increased productivity are all facilitated by data-driven practices.
- Explain the obstacles and favorable circumstances that smallholder farmers face when implementing digital solutions.
- Analyze examples of agro-data and comprehend how they are used to inform strategic choices about risk assessment, fertilization, and irrigation.
- Acknowledge how smart technologies facilitate access to premium markets, sustainability certification, and traceability.

Content Overview:

1. Introduction to Smart Farming Technologies and Climate Resilience
2. Adaptation and Implementation of Technological Solutions for Smallholders
3. Agro-Data Collection, Visualization, and Interpretation
4. Data-Driven Strategic Decision-Making and Sustainability

Sub-Unit 1: Introduction to Smart Farming Technologies and Climate Resilience

1.1 Definition and Basic Principles of Smart Farming

Smart Farming is the modern approach to agricultural production that utilizes advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Geographic Information Systems (GIS) and Big Data to make agriculture more efficient, sustainable and resilient. Its core principle is to collect, process and use data from the agricultural environment to make informed decisions.

At the centre of Smart Agriculture is the producer-user of the technology, who now has access to monitoring and forecasting tools to maximise yields, reduce losses and reduce environmental impacts.

1.2 Technological Evolution in Agriculture: From Mechanical Farming to Digital Farms

Agriculture has come a long way:

- First wave (Mechanization): replacement of manual labour with tractors and machines.
- Second wave (Green Revolution): adoption of fertilizers, pesticides and improved varieties.
- Third wave (Information Agriculture): data analysis for more accurate management.
- Fourth wave (Digital Smart Agriculture): Integration of sensors, software and machine learning.

The transition to digital farms marks a new paradigm in agriculture, where crop control is done in real time, with minimal resources and maximum knowledge of what is happening to the soil and plants.

1.3 Objectives: Productivity, Cost, Sustainability

Smart Agriculture serves three strategic objectives simultaneously:

- Increasing Productivity: Through precise control of inputs, such as water and fertilizer, and predicting yields based on real data.
- Reducing costs: Reduce unnecessary interventions, fuel, losses and human resources.
- Sustainability: Rational use of natural resources helps protect soil, water and biodiversity.

1.4 Climate Change and Climate Resilience in Agriculture

Climate change has become one of the most important drivers of instability for agricultural production, causing:

- Extreme weather events (droughts, floods)
- Microclimate changes
- Expansion or emergence of new diseases and insects

The concept of climate resilience refers to the ability of agricultural systems to respond, adapt and recover from such impacts. To achieve this, innovative practices are needed, such as:

- Cultivating resistant varieties
- Redesigning irrigation patterns
- Using predictive models for diseases and climate threats
- Precise application of inputs to reduce the ecological footprint

1.5 Presentation of Key Smart Farming Technologies

IoT Sensors:

IoT sensors are placed on the ground or on plants and record data for:

Soil moisture:

- Air and soil temperature
- pH and salinity
- The continuous flow of data enables smart interventions such as automatic activation of irrigation systems or hazard warnings.

Drones, are used for:

- Field mapping
- Crop anomaly detection
- Precision spraying
- Low cost and high efficiency, they improve surveillance and contribute to early decision making.

GIS (Geographic Information Systems)

GIS allows geospatial analysis of parcels based on topography, soil composition, accessibility and historical data. It supports tailored crop management.

AI and Big Data, AI processes large volumes of agricultural data for:

- Predict yields
- Detect disease or crop stress
- Optimize crop practices

Precision Agriculture

Precision agriculture applies inputs (water, fertilizer, pesticides) exactly where and when they are needed, reducing costs and environmental impact

1.6 International Trends and Strategies

The transition to smart and sustainable agriculture is not an isolated effort, but is part of broader strategies:

- The EU's Farm to Fork strategy

Pillar of the EU Green Deal, aims at a fair, healthy and environmentally friendly agri-food system. It includes:

- Reduction of pesticides and antibiotics
- Promoting the digital transition
- Strengthening resilience and traceability

- Digitisation Indicators

Adoption of Smart Agriculture varies by geographical region.

In the EU, countries such as the Netherlands, France and Denmark are leading the way in digitisation.

- In Latin America, Brazil and Argentina are leveraging drones and big data for extensive soybean and corn crops.
- The convergence of digital and environmental goals is creating a new ecosystem of opportunities and challenges for agricultural innovation.

Smart Agriculture offers a powerful framework for achieving productive, economic and environmental sustainability. In conditions of climate uncertainty, the use of technologies is not a luxury but a necessity for the survival and well-being of rural communities. Enhancing climate resilience through innovation, partnerships and knowledge is a key driver of the agri-food transformation taking place globally.

Want to learn more about this topic?

Ευρωπαϊκή Επιτροπή – Farm to Fork Strategy https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

EU Green Deal – European Commission https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

FAO – Climate-Smart Agriculture Sourcebook (2017) https://www.fao.org/climate-smart-agriculture-sourcebook

World Bank – Precision Agriculture and the Future of Farming in Europe (2017) https://documents.worldbank.org/en/publication/documents-reports/documentdetail/913991519228243267

OECD – Digital Opportunities for Better Agricultural Policies (2019) https://www.oecd.org/publications/digital-opportunities-for-better-agricultural-policies-571a081c-en.htm

SARE – Building a Sustainable Business Guide https://www.sare.org/resources/building-a-sustainable-business/

Sub-Unit 2: Adaptation and Implementation of Technological Solutions for Smallholders

2.1 A general overview: The situation of small farmers

Smallholder farmers, who typically farm less than 10 square kilometers and work with limited finance, infrastructure or information, form the backbone of agricultural production both globally and globally.

For this group, the transition to smart agriculture needs a tailored strategy to ensure that technology is appropriate, reasonable and cost-effective for their size and requirements.

2.2 Obstacles and Difficulties in Adopting Technology

Even with the abundance of digital alternatives, small producers frequently encounter:

- A limited capacity to obtain financing or subsidies for equipment purchases.
- Inadequate understanding of the technology or instruction in using digital technologies.
- Rural locations have poor internet and mobile coverage.
- Incapacity to expand solutions made for big farms.
- Organisational or cultural impediments (age, resistance to change).

Low-cost, user-friendly, and locally-adaptable technology are necessary for smallholders to successfully integrate smart agriculture.

2.3 Tailored Technology Solutions a. Inexpensive IoT and Sensors

a. Low Cost IoT and Sensors

- Open-source boards (e.g. Arduino) with cheap humidity/temperature sensors for local recording.
- Solar systems for self-powered measurement points.
- SMS-based alerts for growers without smartphones.

b. Farmer mobile applications

Applications like Gaiasense, WeFarm, Plantix, and AgriApp provide:

- Advice on crops by species
- Forecast for the weather
- Photo-based disease detection
- Recording of fields and stocks

Benefits: Easy to use, requires little technical expertise, and can be used offline.

c. DaaS, or drones as a service

Although purchasing a drone is costly, a model is being developed in which businesses or cooperatives provide drone mapping and monitoring services to numerous small producers collectively (for example, through agricultural extension services or clusters).

d. Agri Labs: Shared Digital Infrastructures

Establishment of regional AgTech Hubs or cooperative frameworks:

- Equipment for shared technology
- Instruction in the use of tools
- Data analysis from several producers (soil, agro-meteorological stations, etc.)

2.4 Examples of Implementation and Successful Actions

1. Colombia -Digital Coffee Traceability using blockchain & mobile apps

- Platform: Farmer Connect
- Region: Antioquia, Huila
- Field: Coffee Production

Small coffee producers in Colombia are participating in digital traceability projects through mobile apps, which enable:

1. Recording cultivation and harvest data
2. Access to market and certification information
3. Connection to end consumers via blockchain (e.g. "Thank My Farmer" app)

Goal: Transparency, enhancing producer value, access to premium markets

Feature: Applied to small producers with no pre-requisite equipment

2. Peru - CocoaCloud: data and weather analysis for Cocoa Farmers

- Actors: USAID, TechnoServe
- Area: San Martín, Ucayali
- Scope: Cocoa production

CocoaCloud offers personalized alerts on weather and disease risks via SMS or app. It uses:

- Historical weather and crop data
- Infestation prediction models
- Field-by-field management recommendations

Goal: Strengthen resilience to climate risk
Outcome: Disease reduction >20%, income increase 15% in small producers

2.5 Enhancing Adoption: training, networking, financial tools in Latin America

The adoption of technology solutions by smallholder farmers in Latin America requires a supportive ecosystem that combines:

- accessible technology,
- targeted training,
- local networking, and
- innovative financial tools.

Particularly in the coffee and cocoa sectors, geographic dispersion, rural poverty, and climate vulnerability require solutions that are practical, scalable, and socially embedded.

Want to learn more about this topic?

FAO (2022) – Digital Agriculture Profiles for Latin America https://digitalagrihub.org

Sustainable Food Lab (2018) – Smallholder Engagement in Value Chains https://sustainablefoodlab.org

CGIAR (2020) – Digital Innovations in Agriculture: Scaling for Impact

https://bigdata.cgiar.org

Sub-Unit 3: Agro-Data Collection, Visualization, and Interpretation

3.1 The value of agro-data in precision agriculture

Precision agriculture is fundamentally based on the ability to collect, analyse and exploit data from the agricultural environment. Ag-data includes information from sensors, satellites, drones, agricultural machinery and digital applications, covering soil, microclimate, crop and inputs.

The rational use of this data enables:

- Improve productivity,
- reduce costs and losses,
- protect the environment,
- optimising the farmer's decisions based on evidence-based information (data-driven farming).

3.2 How is agri-data collected and who collects it?

Data collection is mainly done through technological solutions and is largely automatic. The role of the farmer varies depending on the technology:

- Automatic collection (without intervention)

Most technologies collect data without human intervention:

- IoT sensors record real-time soil moisture, temperature, pH, electrical conductivity, etc.
- Drones with multi-spectral cameras scan the crop to detect stress or problems.
- Agricultural machinery (tractors, combine harvesters) with GPS automatically record data on movement, fuel consumption and efficiency on a point-by-point basis.
- Satellite data are collected from open sources (e.g. Sentinel-2) and exploited through digital platforms.

In these cases, the farmer does not manually collect the data, but monitors, activates or supervises the technologies.

- Semi-automatic or manual collection

Particularly on small farms:

- The farmer enters data into applications (e.g. date of sowing, fertilisation or harvest).
- Can take photos of plants and analyse them through disease detection applications.
- It uses handheld devices (e.g. for pH or temperature measurement).

- Collection from third parties

In areas where no equipment or expertise exists:

- Cooperatives, agricultural advisors or technology service providers collect data (e.g. through Drones as a Service).
- FMIS platforms collect and manage data from multiple producers.

As FAO (2022) notes, successful use of data depends not only on its availability, but also on training the producer to interpret and integrate it into daily practice.

3.3 Data Visualisation: from Data to Knowledge

Visualisation is essential for understanding data. Tools used:

- Heat maps: e.g. for humidity or vegetation density.
- Geospatial imagery (GIS): multiple layers (topography, soil, weather data).
- Dashboards and graphs: for indicators of water consumption, yield, nutrition.
- AI/ML tools: for predicting yields or disease probability.

The use of attractive and simple visualization makes data more accessible to the farmer and facilitates decision making.

3.4 Interpretation and strategic use of data

The essential value of data lies in their interpretation:

- Correlation of variables (e.g. yield and moisture),
- Trend analysis (e.g. when the temperature increase starts),
- Creating "prescription maps": maps of guided fertiliser or pesticide application,
- Implementation through DSS (Decision Support Systems): decision support systems for irrigation, fertilisation, harvesting.

In this way, the farmer moves from 'empirical knowledge' management to evidence-based farming.

3.5 Challenges and perspectives

The use of agri-data is not without difficulties:

- Lack of technical skills in the farming population.
- Difficulties in interfacing between different technologies.
- Difficulties in dealing with different types of data.
- Cost of equipment and training.

However, advances in open platforms, accessibility to mobile applications, and support from public and private actors create favorable prospects.

Want to learn more about this topic?

Enhancing precision agriculture: A comprehensive review of machine learning and AI vision applications in all-terrain vehicle for farm automation, https://www.sciencedirect.com/science/article/pii/S2772375524000881

Drones in Precision Agriculture: A Comprehensive Review of Applications, Technologies, and Challenges, https://www.mdpi.com/2504-446X/8/11/686

A review of visualisations in agricultural decision support systems: An HCI perspective, https://www.sciencedirect.com/science/article/abs/pii/S0168169918319069

Precision Farming: A Review of Methods, Technologies, and Future Prospects, https://ijeab.com/upload_document/issue_files/27IJEAB-104202484-PrecisionFarming.pdf

Sub-Unit 4: Data-Driven Strategic Decision-Making and Sustainability

This section examines the next step, which is how agro-data is incorporated into decision-making in actual agricultural settings, whereas LU 3 examined the collection, visualisation, and interpretation of agro-data.

4.1 The necessity of making decisions in agriculture based on data

In addition to increased output, agriculture in our days needs to manage resources sensibly, adapt to climate change, and adhere to social and ecological norms. Data-driven decision-making is a crucial strategic management tool in this situation.

Precision agriculture technologies enable farmers to:

- track field conditions in real time,
- recognise issues early on,
- carry out focused interventions at the lowest possible cost,
- Make choices based on facts rather than your opinion.

Agricultural systems can become more resilient, sustainable, and efficient as a result of the shift from empirical to intelligent agriculture.

4.2 Decision-making techniques and technological tools

Data is exploited using particular instruments and techniques:

- Platforms that analyse data and recommend actions to farmers (such as when to fertilise, water, or protect plants) are known as decision support systems (DSS).
- Prescription maps, also known as input application maps, are created from geospatial data and indicate the precise amount and location of input applications.
- Water balance, nutrient requirement maps, and the NDVI vegetation index are examples of intelligent agriculture indicators.
- Algorithms for prediction: Used to calculate yield, the best time to harvest, and risks (diseases, drought).

For instance, a farmer determines when and how much to irrigate a crop by considering:

- sensor data on soil moisture,
- forecast for the weather,
- Analysis of water yield and cost.

This procedure lowers environmental impact, boosts efficiency, and decreases water waste.

4.3 Sustainability via interventions grounded in evidence

All the basic concepts of sustainable agriculture are supported by the use of data:

- Sustainability of the environment: By lowering inputs, safeguarding soil, minimising pollution, and boosting biodiversity.
- Economic sustainability: Targeted resource management that lowers expenses and increases efficiency.
- Social sustainability: Encourage transparency, traceability, and certification for moral farming.

Utilising tools like digital field diaries, blockchain platforms, and geospatial monitoring improves adherence to standards (such as Fair Trade, Organic, and Rainforest Alliance) and provides access to high-value markets.

Sustainability in agriculture means meeting current food and income needs without compromising the environment or future generations. Precision agriculture, through the use of smart technologies, provides powerful tools to align productivity with ecological responsibility. By applying the right input, at the right time, in the right place, precision agriculture reduces waste, conserves natural resources, and minimizes environmental damage.

Key sustainability goals addressed by precision agriculture include:

- **Soil conservation** through minimal tillage and targeted nutrient application.
- **Water stewardship** via optimized irrigation scheduling.
- **Biodiversity preservation** by reducing overuse of chemicals that affect surrounding ecosystems.
- **Economic viability** for farmers through cost-effective, input-saving technologies.

Efficient Resource Use: Water, Fertilizers, Energy

1. **Water Efficiency**
   Smart irrigation systems, soil moisture sensors, and weather-integrated platforms help deliver precise volumes of water. This reduces over-irrigation and runoff, vital in cocoa-growing regions with variable rainfall or in drought-prone coffee zones.

2. **Fertilizer Optimization**
   Soil and leaf sensors, combined with georeferenced data, identify nutrient deficiencies at the micro-level. Fertilizers are applied variably across the field, avoiding unnecessary use and minimizing nitrate leaching into water bodies.

3. **Energy Conservation**
   Automation systems reduce the need for fuel-powered machinery operating inefficiently. Solar-powered weather stations and irrigation pumps are increasingly used in remote cocoa plantations to cut down on fossil fuel dependence.

These practices help not only in environmental preservation but also in cost savings and improved crop quality.

Climate-Smart Agriculture and Carbon Footprint Reduction

Precision agriculture enables **climate-smart farming**, which focuses on:

- **Increasing resilience** to climate variability by providing data for risk prediction (e.g., drought or pest outbreaks).
- **Reducing greenhouse gas emissions**, for example by optimizing nitrogen fertilizer application, a major source of nitrous oxide.
- **Storing carbon** in soil through conservation agriculture practices like cover cropping and reduced tillage.

Technologies such as drones for aerial spraying, AI models for crop growth prediction, and real-time monitoring systems help adapt farming practices to changing climate conditions with minimal impact.

In cocoa and coffee production, these methods are essential as tropical zones are highly vulnerable to climate change, affecting flowering, bean development, and disease cycles.

Traceability and Certification Support Through Digital Systems

As consumer demand for ethical and sustainable products rises, traceability has become critical in global value chains.

Digital agriculture supports certification by:

- Recording **input application logs** (fertilizer, pesticide use).
- Documenting **harvest dates, yields, and quality grades**.
- Linking this data to **blockchain systems** for tamper-proof traceability.
- Ensuring compliance with **Fair Trade, Organic, Rainforest Alliance**, and other international standards.

These systems not only build consumer trust but also open access to premium markets and improve bargaining power for producers.

4.4 From data to action: Technology's usefulness

The following sums up the essence of data-driven agriculture, which is not just confined to technology:

- the ability of farmers to manage data in addition to being producers.
- in the capacity to avoid rather than treat (e.g., forecast infestations).
- the integration of climate resilience principles with agricultural strategy.

This meets the contemporary demands of the agri-food industry by transforming data-driven decision-making into a useful tool for resilience and sustainability.

Want to learn more about this topic?

Data-Driven Decision Making in Precision Agriculture: The Rise of Big Data in Agricultural Systems, https://www.researchgate.net/publication/334626672_Data-Driven_Decision_Making_in_Precision_Agriculture_The_Rise_of_Big_Data_in_Agricultural_Systems

Unlocking the potential of precision agriculture for sustainable farming, https://www.researchgate.net/publication/385639681_Unlocking_the_potential_of_precision_agriculture_for_sustainable_farming

Conclusion

With the use of technologies like sensors, drones, big data, and artificial intelligence, precision agriculture presents the chance to maximise output through well-informed decision-making. Field-gathered agri-data, such as crop photos, temperature, humidity, pH, and climate, can be examined and transformed into knowledge that increases output and lowers losses.

The ability to use low-cost, open-source technologies and mobile applications to adapt smart farming solutions to small farms is especially crucial. The spread of these technologies depends heavily on accessibility, instruction, and technical assistance.

Sustainable agriculture and technology use go hand in hand because technology helps protect soil, lowers carbon emissions, and reduces excessive use of resources like water, fertiliser, and energy. Using digital tools to connect with certifications and traceability improves transparency and opens up high-value markets.

Future agriculture is built on knowledge, foresight, and teamwork in a setting of severe climate and economic challenges. Technology is emerging as a catalyst for resilient, productive, and ecologically conscious agriculture, and farmers are evolving into strategic data managers.

Learning Activities

1. List of Smart Farming Technologies

Instructions:

Read the section and write a list of 5 technologies used in precision farming (e.g., drones, sensors, GIS systems, etc.). For each one, write 1-2 sentences explaining what it does and why it is useful.

Example answer:

- Drones – Used to photograph fields and detect problems in crops.
- Moisture sensors – Measure soil moisture for proper irrigation.

2. Matching Technology with Purpose

Instructions:

Complete the table below by matching each technology with its correct purpose. (Write the correct number from column B next to each item in column A.)

A. Technology	B. Purpose
Drones	Crop yield prediction
AI (Artificial Intelligence)	Field mapping and timely monitoring
Moisture sensors	Soil water control
GID	Analysis of geographical and historical crop data

Assessment

1. What is the main objective of smart farming?
A. Creating new plant varieties
B. Automating harvesting
C. Utilizing data for decision-making
D. Enhancing manual labor

✓ Correct: C

2. Which of the following does IoT equipment for farmers include?
A. Radar and antennas
B. Weed control systems
C. Humidity, temperature, and pH sensors
D. Solar panels only

✓ Correct: C

3. What is one of the main advantages of drones in agriculture?
A. Harvesting crops
B. Predicting market prices
C. Identifying problems and mapping fields
D. Replacing irrigation

✓ Correct: C

4. What is one of the main difficulties small producers face in adopting technologies?
A. Lack of seeds
B. Excessive water use
C. Limited access to training and expertise
D. Insufficient supplies

✓ Correct: C

5. Which application provides advice to farmers and works even without an internet connection?
A. Amazon Farming
B. CocoaCloud
C. Gaiasense or AgriApp
D. Zoom Farming

✓ Correct: C

6. What kind of service is "Drones as a Service"?
A. A service that sells drones to producers
B. Collective use of drones for mapping and monitoring
C. Mechanical harvesting with robots
D. Crop certification
✓ Correct: B
7. What are "Agri Labs" according to the text?
A. Soil laboratories at universities
B. Research centers for animal feed
C. Digital infrastructure and collaboration hubs
D. Agrochemical companies
✓ Correct: C

8. How is agri-data collected on small farms without equipment?
A. Through automatic satellites
B. From third parties such as cooperatives or agricultural advisors
C. Only by the producer himself
D. It cannot be collected
✓ Correct: B

9. What is the importance of data visualization in agriculture?
A. It saves computer memory
B. Reduces fertilizer costs
C. Helps producers understand information and make decisions
D. Replaces agricultural labor
✓ Correct: C

10. What was one of the results of using CocoaCloud in Peru?
A. Reduction in labor costs
B. Increase in market prices
C. 20% reduction in disease and 15% increase in income
D. Full automation of harvesting
✓ Correct: C

References

1. European Commission. (2020). A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. Brussels: European Commission. https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en
2. European Commission. (2019). The European Green Deal. Brussels: European Commission.https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
3. Food and Agriculture Organization of the United Nations (FAO). (2017). Climate-Smart Agriculture Sourcebook (2nd ed.). Rome: FAO. https://www.fao.org/climate-smart-agriculture-sourcebook
4. World Bank. (2017). Precision Agriculture and the Future of Farming in Europe. Washington, DC: World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/913991519228243267
5. Organisation for Economic Co-operation and Development (OECD). (2019). Digital Opportunities for Better Agricultural Policies. Paris: OECD Publishing. https://www.oecd.org/publications/digital-opportunities-for-better-agricultural-policies-571a081c-en.htm
6. Sustainable Agriculture Research and Education (SARE). (2003). Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural Businesses. Minnesota: Minnesota Institute for Sustainable Agriculture. https://www.sare.org/resources/building-a-sustainable-business/
7. EIT Food. (2021). The Future of Food: Digital Agriculture and Innovation.
8. AgFunder Network Partners. (2022). Agri-FoodTech Investment Report.
9. FAO. (2023). *Status of digital agriculture in Europe and Central Asia* https://www.fao.org/documents/card/en/c/cc6463en/
10. European Commission. (2023). *Digitalisation of agriculture and rural areas: State of play and the way forward*. https://agriculture.ec.europa.eu/publications_en
11. OECD. (2023). *Unlocking the potential of digital technologies in agriculture*. https://www.oecd.org/agriculture/topics/digital-agriculture/
12. CGIAR Platform for Big Data in Agriculture (for precision/data-driven case studies) https://bigdata.cgiar.org

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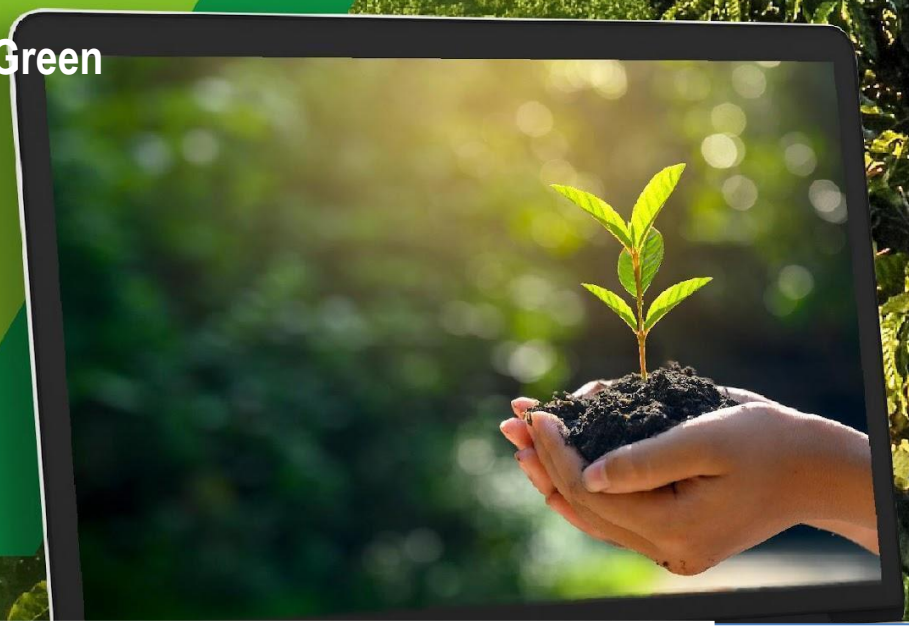
Learning Unit 4: Design Tech-Based Agro-Innovation Business Plans

Digi Build: Building Digitalization in the Green Sector



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Learning unit title: Design Tech-Based Agro-Innovation Business Plans

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Introduction

The role of agriculture is becoming increasingly important in modern societies. In a context of rapid technological development, the agri-food sector is challenged to follow and integrate in this process. The ability to develop and implement innovative, technology-supported business models is essential for farmer-entrepreneurs and stakeholders seeking sustainability, growth and progress.

This training module is focused on describing the process of developing a business plan within the context of Agri-entrepreneurship based on technological progress. The module aims to prepare participants with the most critical skills and knowledge required in developing efficient business plans appropriate to the digital agribusiness environment.

Through a systematic step-by-step approach - from the basics to digital integration and investment planning - participants will understand the power of technology to transform agribusiness. Further, realistic case studies and practical applications will be developed, offering direct insight into the proper use of digital innovation in agri-business.

LEARNING OBJECTIVES

Learning Outcomes:

- Identify the most critical aspects of an agribusiness plan.
- Discover approaches to incorporating digital solutions in agribusiness models.
- Develop a business growth roadmap for establishing or expanding an agribusiness.
- Development of a business plan for a viable enterprise.

Content Overview:

- Business Planning Fundamentals
- From Idea to Action: Developing a Structured Business Plan
- Integrating Digital Tools into Agribusiness Models
- Financial Planning & Investment Strategies for Agri-Food Enterprises
- Case Studies: Digital Agriculture Startups

Sub-Unit 1: Fundamentals of Business Planning in the Agri-Food Sector

1.1 Basic principles of agricultural entrepreneurship

Today, there is a lot of talk about farmers becoming "entrepreneurs". However, what really is entrepreneurship? What qualifications are needed to become an entrepreneur? How can one develop and maintain an entrepreneurial mindset? How can one cultivate entrepreneurial skills? In what ways do entrepreneurial farmers adapt to the evolving agricultural landscape? What tactics do they use? Entrepreneurship consists of two components. The first is the managerial skills required to start and sustain a successful agricultural enterprise. The "entrepreneurial spirit" is the second. Both are important. It is possible to teach management skills, but not entrepreneurship. Many farmers possess some of the characteristics of an entrepreneur and are already very good managers.

Both farmers who are already running an agricultural business and those who wish to start such a business for the first time can benefit from the information provided in this course. In each nation both situations arise. Many current farmers wish to introduce high-value, market-oriented businesses in order to change their farming practices. In addition, a large number of young farmers - both men and women, young and old - are starting their first agricultural business. Extension advisors can use this module to help all these prospective farmer-entrepreneurs. It is useful for field-level extension agents to know what works and what does not, even if they will rarely be responsible for creating and designing entrepreneurship development training. Occasionally they may work closely with subject matter experts who have experience in managing training programmes or even assist external trainers.

1.2 What is entrepreneurship and who is an entrepreneur?

Entrepreneurship is starting and developing a company, delivering something new to the market, or superiorly organising the means of production. Entrepreneurship is the activity of setting up a business or an enterprise and taking financial risks in the hope of profit. Entrepreneurship refers to the approach of developing and managing a business venture to earn profit by taking several financial risks in the corporate world. Entrepreneurship is the capability and willingness to set up, develop, organise, and manage an enterprise along with any of its risks to make a profit. Entrepreneurship is creating a business while building, scaling, and managing its risks to generate a profit.

Entrepreneur Definition: An entrepreneur is a creator, a challenger, and a driving force. Someone that produces something new, either an initiative, a business, a company, or an organisation. They may be the beginning of a venture, project, or activity. An entrepreneur is a person who starts a business, diagnoses and solves problems, is innovative, opportunistic, self-starting, open-minded, risk-taking and desires to make revenue from the enterprise.

Farmers as entrepreneurs: Farmer-entrepreneurs consider farms as businesses. They see their farms as a way to make money. They are enthusiastic about their farming efforts and are prepared to take measured risks in order to increase farm profitability and business expansion.

The environment of entrepreneurship: The environment in which farmers-entrepreneurs work is dynamic and complex. Together with other farmers, suppliers, traders, transporters, processors and many others, they are part of a larger group of people. Each of them plays a role in the production of goods and their journey along the value chain to market. All must be entrepreneurs. To improve the overall performance and profitability of the system, they also need to value each other and work together.

The mechanics of entrepreneurship: Nevertheless, in order to guide their agribusinesses through the phases of business development - from establishment and survival to rapid growth and maturity - successful farmer-entrepreneurs are technically competent, creative and forward-thinking. However, these farmers face a number of barriers, including social and economic norms, knowledge and financial resources, as well as their own managerial capacity to handle risk and change while taking advantage of opportunities.

1.3 Characteristics of an entrepreneur

Several characteristics make entrepreneurs successful. Here are some of them:

Must Have the Ability to Take a Risk: Setting up any new business or enterprise involves significant risk. Thus, an entrepreneur needs to be fearless, innovative and risk-taking, which is a fundamental trait of an entrepreneur.

Innovative Mindset: This includes discovering new ideas and implementing them in business. The entrepreneur must evaluate current business modes and identify new methods and approaches for operating the business more effectively.

Passion: Passion demands you to perform even when you do not get paid in the end. This is true if you are starting a small business. Your entrepreneurial activity will involve establishing your small business. Entrepreneurs should always be passionate about their objectives and ready to sacrifice everything for their dreams to be achieved.

Confidence: If success is a recipe, then confidence is the crucial ingredient. As an entrepreneur, you should be confident in yourself and your services. While undertaking a business activity, you will encounter critical obstacles and difficulties. At that time, you should not lose your confidence and face the situation with courage.

Visionary and Leadership Qualities: To become successful, the entrepreneur should have a sharp and distinct vision of his new enterprise. However, many resources and employees are needed to transform the concept into reality. Leadership is required to motivate and guide your employees toward the right success track.

Decision Making: You must have good decision-making capabilities to be a successful entrepreneur. You should be ready to make the right decision immediately to bypass any

mistakes. This is a must-needed skill that every entrepreneur with an entrepreneurial mindset should seek to acquire.

Entrepreneurs have many qualities that help their businesses be successful. However, an entrepreneur does not have to possess all the qualities. In that case, he must either learn or hire the services of those who possess the qualities he does not have.

1.4 First steps in entrepreneurship

The first step of your entrepreneurial journey is identifying a "problem" that a sufficient number of potential buyers have and who are willing to pay for the solution of this "problem". Based on the identified problem, a business idea is formed. After identifying the problem and the solution (product - product or service), it is necessary to research the market potential and the competition.

Following is the design and layout:

- Idea
- Product
- Business model
- Founding a company
- Financial planning
- Acquiring financial resources
- Marketing - promotion
- Sales
- Establishing business connections
- Taxes
- Accounting

1.5 What is an agricultural startup?

An agribusiness start-up is a company that uses technology and innovative business models to improve agriculture, food production or supply chains. These startups are not typical agricultural businesses, but rely on data-driven solutions, automation and sustainability to address existing problems in agriculture.

Is Agtech, Agritech distinct from agriculture startups? Yes, even though these terms are interchangeably used, they imply different meanings:

- **Agtech (Agricultural Technology):** A broad term describing any technology applied to farming, including farm management software, IoT sensors, and precision farming equipment.
- **Agritech (Agricultural Innovation):** A subclass of agtech that focuses on new farming approaches, automation, and AI-powered processes for improving productivity.
- **Agricultural Startups:** A more general term describing companies innovating in all aspects of agriculture, from hardware to software to biotech to alternative food production.

And agrifoodtech?

Agrifoodtech is a new category that overlaps with food production and agriculture. It includes:

- **FoodTech** companies building plant-based substitutes, lab-grown meat, or advanced supply chain technologies.
- **Agri-biotech** companies creating genetically modified crops, vertical farms, or bioengineered alternatives to boost sustainability.

How are agri-startups driving the tech revolution in the agriculture industry?

From robot-based harvesting to blockchain supply chains and AI-powered yield predictions, farm startups are importing game-changing solutions that are transforming the industry.

Adopting an entrepreneurial mindset is the first step in establishing a new agricultural business. With digital technologies transforming the food and agriculture industries, successful entrepreneurs must not only have resources but also identify and seize opportunities for innovation. From using precision farming tools, data-driven decisions or digital platforms to engage with customers, the modern agricultural entrepreneur has a mix of traditional knowledge and technological insight. From the following sections, we will build on this foundation to observe how new technology-driven business models can be built, tested and developed.

Want to learn more about this topic?

“AGRICULTURAL ENTREPRENEURSHIP”

https://www.researchgate.net/publication/366004474_AGRICULTURAL_ENTREPRENEURSHIP

Indeed Editorial Team (2021); “12 Pros and Cons of Being an Entrepreneur”; https://www.indeed.com/career-advice/finding-a-job/pros-and-cons-of-being-entrepreneur

“ Developing an Entrepreneurial Mindset in The Agriculture Sector: A Case for Farm Owners in ESwatini.” By Student No. 2B9026 Name PHIRI ZANELE PENELOPEhttps://www.researchgate.net/publication/382181374_Title_Developing_an_Entrepreneurial_Mindset_in_The_Agriculture_Sector_A_Case_for_Farm_Owners_in_ESwatini_By_Student_No_2B9026_Name_PHIRI_ZANELE_PENELOPE

Sub-Unit 2: From Idea to Action-Innovation Business Plans

2.1 What is a business plan

The business plan includes the ideas, goals and strategies that entrepreneurs have in mind for their business, its products and services. It is a written document that helps the business to: a) structure and organise itself; b) make decisions; c) record, analyse and understand the market, customers, consumers and competition; d) achieve its objectives; and e) obtain financial support from credit institutions and institutions. Before it is drawn up, all data, plans and information must be carefully collected and the objectives of the business must be defined. The structure and basic features of a business plan can help the farmer-entrepreneur: (a) to establish the feasibility of the planned business activity; (b) to write a comprehensive document that will form the basis of discussions with external partners (such as consultants, banks and suppliers); and (c) to create a tool that will allow comparative analysis and evaluation over time of actual actions and results in relation to the planned

It is important to remember that a written document presenting an investment proposal must be realistic, feasible, comprehensive, concise, understandable and attract the interest of the investor-financier.

2.2 What is a business idea?

A business idea is a short and precise description of the basic operations of an intended business. A good business starts with a good business idea that brings out the following:

- Which needs your business will fulfill for the customers.
- What product or service your business will sell. In farming as a business, products may include primary products e.g. coffee beans or commercial maize or secondary products if the farmer wishes to add value to coffee beans or maize by converting into coffee powder.
- For processors, the business products will include the processed products.
- Who your business will sell to. Outlets may include middlemen, processors, community members, supermarkets, etc.
- How your business is going to sell its products or services, e.g. direct to customers or retailers.

A good business idea requires that one matches what the customer wants with skills and experience needed to provide it, knowing what it costs to provide it, and knowing how much the customer is willing and able to pay for it.

However, one must remember that these factors are always changing and hence there is a need to keep an eye on these factors.

2.2 Process for Generating a Business Idea

Step A: List of viable business opportunities. Make a list of all potentially viable business opportunities through experience, field visits, brainstorming, etc e.g.

Idea	
List Idea	Description
Organic Cocoa Bean Production	Cultivating cocoa with organic methods for premium market access
Farm-to-Hotel Marketplace	A digital platform connecting farmers to the hospitality sector directly
Cold Chain Logistics for Produce	Providing last-mile cold storage and delivery solutions for perishable crops

Step B: Analyze the business ideas and select the best ones.

It involves the process of screening the idea list to key priority ideas – the ones that are most suitable for the business. Think carefully about each idea using the following helpers:

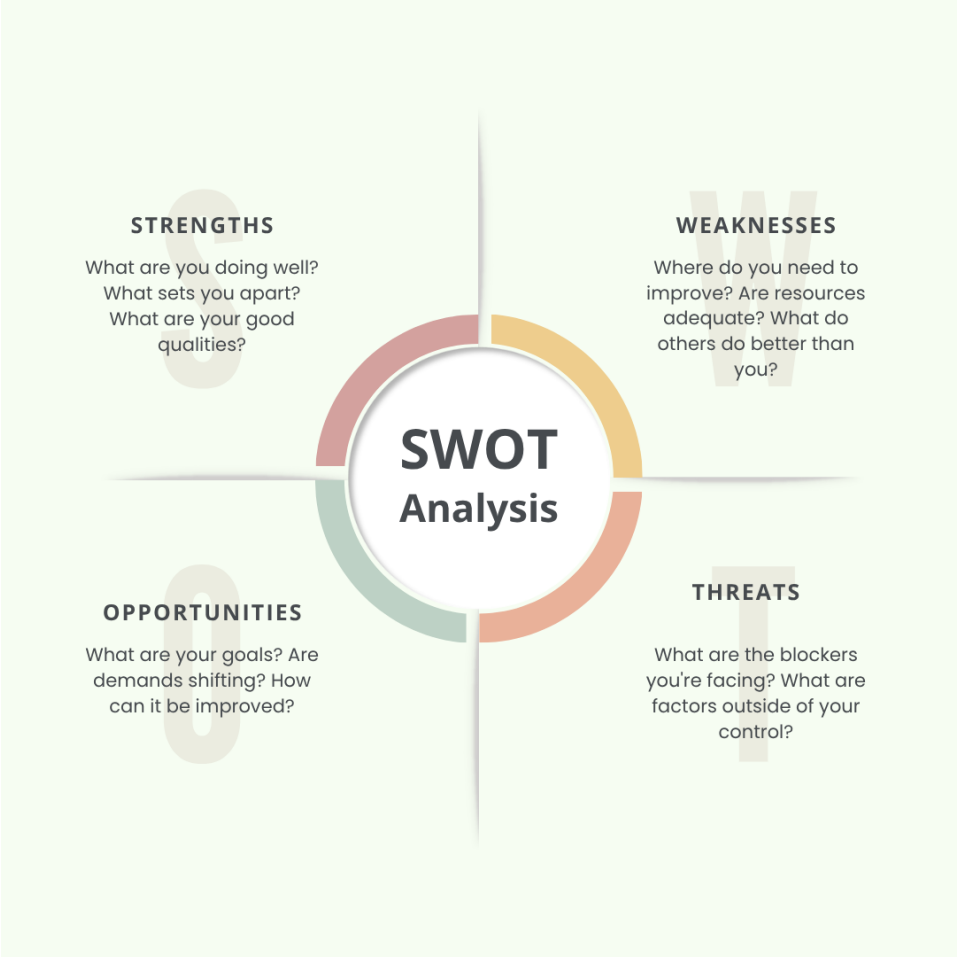
- Which need do you want the product (s) or service (s) to satisfy for the customers?
- What product(s) or service(s) do your customers want? What quality of your product does your customers want? What information do you know about the products or services for this business?
- Who will be your customers for this particular business? And will they be enough? Who are your competitors?
- How will you be able to supply goods and services the customers want?

- How much do you know about the quality of goods and services the customers want?
- Does running this sort of business suit your personal characteristics and abilities?
- How do you know there is a need for this business in your area?
- Do you imagine yourself running this business in ten years' time?

Other important factors to consider

- Where can you get advice and information about this business?
- Will this be the only business of this kind in your area? If there are other similar businesses, how will you be able to compete successfully?
- Why do you think this business will be viable?
- Does this business need equipment, premises or qualified staff?
- Do you think you will be able to get the finances to provide what is needed? Where will you get the resources to start this business?

Step C: Analyze the prioritized business ideas on the basis of the market considering factors that will help you accept or reject a business idea (SWOT analysis)



The SWOT (Strengths, Weaknesses Opportunities and Threat) analysis involves isolating the internal (SW) and external (OT) factors affecting a farm business. It helps to focus on possible problem areas and potential advantages of each idea.

a) Strengths

"Strength" is something that the farming business already has that is "good" e.g. sound management capacity, special skill, financial, labour and natural resources, or a characteristic that gives the farming business an important ability or advantage such as being a low-cost high-quality producer.

b) Weaknesses

Weakness is a short-coming in the farming business or something that is done poorly in comparison with similar farming businesses, or a condition that creates disadvantages for the farming business, such as;

- Poor market positioning
- Limited management capacity
- Lack of a critical resource

c) Successes and Failures

Past successes and failures should be identified. These could be tabulated to help identify those aspects which should be concentrated on in the future (successes) and which aspects to avoid (failures). The farm should be eager to answer and understand the "WHY" of the successes and the failures.

d) Opportunities and Threats (External factors affecting the firm) EPEST is a convenient tool to investigate the external environment:

E – Economy – macro-economic factors including input costs and taxes, exchange rates, etc.
P – Political/Legal – political factors can influence farming positively or negatively depending on whether the farmer views these factors as opportunities or threats. E.g. Agricultural policies, import/export legislation in agriculture may impose certain limitations.
E – Ecological/Climate – Agro-climatic factors can be a threat or an opportunity to the farming business depending on the coping mechanism adopted by the business.
S – Socio/cultural – These factors in the external environment influence the views, values, attitudes, opinion and lifestyle of the people which are conditioned or developed by cultural, ecological, demographic, religious, training and ethical conditions. These factors will influence decisions to be made in a farming business and must therefore be isolated.
T – Technological – Technological changes in the external environment may present positive opportunities for the farmer. The capacity to adapt to new technology may present opportunities by presenting a competitive advantage over other farmers.

The following questions could be used as a guide to the logical conclusion of the SWOT Analysis:

- Are there more strengths than weaknesses?
- Are there more opportunities than threats?
- How will I deal with the weaknesses?

This step marks the end of the initial process in preparing to start a business. The next step is to provide a summary of the business idea.

Step D: Validate and validate the business idea

Make sure you validate the idea before creating your plan:

- Have you talked to potential customers?
- Have you pilot tested interest in the product or service?
- Have you created prototypes or piloted?

Think in the startup mindset:

Minimum Viable Product (MVP): What is the minimum, lowest-cost version of your product or service that you can offer to test the market?

Step E: Is this an innovation-based idea?

- What is new or improved in this business (product, process, model)?
- Is it using new technology or information technology in a fresh way?
- Does it provide a better solution than the existing one?
- Can it scale using digital tools or automation?

Step F: How is the technology feasible to implement?

- Does the required technology (software, hardware, connectivity) exist?
- Do you or your team have the skills or training required?
- Will you need external partners, technicians or service providers?

Step G: Reflection on sustainability and impact

- Will the business reduce its environmental footprint or reduce waste;
- Does it benefit other people economically (e.g. job creation, fair trade)?
- Does it address gender equality, youth entrepreneurship or rural development?

Summary of business idea

Use this step to write a short summary of your business idea, such as:

- Customer need addressed
- Product or service offered
- Target market and delivery method
- Main innovation/technology used
- Your value proposition
- Initial resources required and next steps

This outline forms the basis of your entire business plan.

2.3 Business model Canvas (BMC)

The Business model canvas (BMC) Module represents an approach and a tool with which entrepreneurs, especially potential entrepreneurs, effectively redefine or start their entrepreneurial journey. The Module presents the structure, approach, and key advantages of using the canvas business model. The Business Model Canvas helps visualise what is important and forces users to address key areas. It can also be used by a team (employees and/or advisors) to understand relationships and reach agreements.

2.3.1 Benefits and how to start Business Model Canvas

A business model is a plan describing how a business intends to make money. It explains who your customer base is, how you deliver value to them, and the related financing details. And the business model canvas lets you define these different components on a single page. The Business Model Canvas gives entrepreneurs a comprehensive snapshot of every aspect of their business – everything from the value proposition and customer segments to operations and the financials. However, the tool is no more complex than nine boxes representing business segments drawn across one sheet of paper. A large part of its effectiveness is in its simplicity. The exercise forces owners to stay focused and concise as they map their business according to each box to hone their business strategy and plan. Identifying planning gaps between these nine building blocks is the real value of the Business Model Canvas. A Business Model Canvas lets you put your entire business down on paper and assess your strategy, planning gaps and risk exposure.

2.3.2 Design of Business Model Canvas

Key Partners: Who are the buyers and suppliers you need to form relationships with? What other alliances will help you accomplish core business activities and fulfil your customer value proposition?

Key Activities: What are the most important activities you must engage in to fulfil your value proposition, secure distribution channels, create and strengthen customer relationships, optimise revenue streams, and more?

Key Resources: What resources do you need to create value for your customers and sustain your business?

Value Proposition: What core problem does your business solve? What benefits does your business deliver? And what products or services will you offer to meet the needs of your customers?

Customer Segments: Whom will your business serve? Will you serve a single customer type or multiple customer segments? Which customers are the most critical for your business' success?

Customer Relationships: What types of relationships will you forge with your customers? What are the relationship expectations from each customer segment?

Sales Channels: Through what means will you reach your targeted customers and deliver your products and services to them? Which will be the most cost-effective? How are your sales channels integrated?

Cost Structure: What are all the costs that you will incur while operating your business? There are two primary types of cost structures: value-driven and cost-driven. A part of this segment is determining which structure makes the most sense for your business and factoring that into your cost strategy.

Revenue Stream: How will you charge for our product or service? What are customers willing to spend? How much will each revenue stream contribute to your overall annual revenue?

Find here an online tool to create your own Business Model Canva https://canvanizer.com/

2.4 What is a business plan?

It is a tool for guiding the business. It lays down:

- The objectives of undertaking the enterprise
- All the resources required in implementing the enterprise
- When (time) the resources will be required
- Where (source) the resources will come from in order to achieve the outputs of the business/ enterprise
- Who will be responsible for the various business activities

2.3 Importance of a business plan

It helps the business to:

- allocate resources properly,
- handle unforeseen complications,
- make good business decisions

Since it provides specific and organized information about the business and how it will repay borrowed money,

- it is a useful tool/document used to negotiate for resources for an enterprise/business.
- it also informs suppliers and others about the business operations and goals.

2.4 Elements of a Business Plan

a) The general elements of a business plan comprise;

- Cover Page/Title Page
- Executive Summary
- Introduction
- The Market Analysis
- The Marketing Plan
- The Operating Plan

- Organization Plan
- Financial Plan
- Appendices

b) Farm business decisions should be made, in the same way as other businesses, that is, on the basis of sound economic information.

c) Farming business decisions should be made within the context of a Farm Business Plan. The Business Plan can be very simply written and does not need to be a complex document.

d) For smallholder farmers a business plan, even a basic plan, will provide the logical framework for good business decisions.

2.4.1 The Cover Page/Title page

- Business Plan (name of document)
- Name of Association/Producer
- Prepared by
- Name
- Date

2.4.2 Executive summary

This section should be completed AFTER the business plan is finished. It is a ONE PAGE SUMMARY and should cover:

2.4.3 Introduction

The Introduction is the readers' first impression of the business and should cover the following areas:

- the business name
- the business structure
- key personnel and their relevant experience

- description of the product and/or service
- its current market position and the potential for growth
- the business' objectives both in the short and long terms
- the reason the business will be successful
- financial projections
- funds sought and usage

2.4.4 Market description

Some of the considerations when describing markets:

a) Industry trends

- Identifying the industry trends will help you determine if the business you are beginning is in an industry that is prospering, stabilizing or declining.
- Explain at what stage of the product life cycle your business will be entering.
- Also explain why your product/service will capture a share of the existing market.

b) Market size

- What is the present size of the market for the product you have or service you offer?
- Is it local, regional, national and/or international?
- Is it made up of consumers only, processors, institutions, governments or others?
- Is the market expanding or contracting?
- Information concerning your market can be obtained from discussions held with potential distributors, dealers, suppliers and customers. Published data is also a good resource for learning about your market.

c) Market segmentation

- Is the market for your product segmented?
- Indicate who your customers will be in each segment, their age, sex, lifestyle, interest, geographic location.
- How many are there in the areas you are going to service?
- Do seasons affect your customers' buying patterns and the offering of the product by the business?
- How do you plan to attract and keep your target market?

d) Competition and Comparative advantage

- It is important to make a realistic assessment of your major competitors' strengths and weaknesses (SWOT analysis).
- Compare your products to those of your three largest competitors on the basis of price, performance, service and other features.
- How large are these competitors when you compare them to your business based on potential sales, number of employees and number of customers?
- What has been their recent trend in sales, market share and profitability?
- If your major competitors have not been doing well, explain why you expect to succeed.
- Indicate why you think people would change their current buying habits to become your customers.
- How will your competitors react when you enter the market?
- What is your comparative advantage?

2.4.5 The marketing plan

The marketing plan describes how the business intends to meet its sales target. It includes the marketing 4Ps that is:

- a description of the product/service (PRODUCT),
- pricing strategy (PRICE),
- distribution/sales and marketing strategy (PLACE)
- promotion strategies (PROMOTION).

It also includes the details of the market research and market targets.

a) Product (s)/Service (s)

- This includes a full description of the range of products to be sold and/or services offered including quantities produced compared to other products/services on the market.
- Indicate/emphasize any similarities/differences between your business and those of your major competitors and explain how these similarities/differences will benefit your business.

b) Price Strategy

Pricing is an important decision that must be made carefully. The price determined must be "right" if the business intends to penetrate the market, maintain its market position and produce the profits projected. In this section of the business plan, indicate;

- The pricing technique that you will use? Explain why.
- Discuss the relationship between the price and image you want to create. E.g. if your price is higher than similar products, explain the reason for such a difference. What makes your products worth more? If the prices are set below the competitor's product explain how the business will do this and still maintain profitability?
- What are your prices? Include a list of prices you intend to charge.

c) Distribution/Sales Strategy

In this section, the method you intend to use to sell and distribute your product is discussed. Pertinent issues to focus on include:

- How will you get your product to your customers and potential customers? (Will you use family labor as your sales force or will you hire sales representatives and/or distributors? What will be the associated costs?)
- What are the advantages of the distribution methods you have chosen?

d) Marketing Strategy

The marketing strategy should include a list of the customers who will be targeted and the best place to sell the products in order to meet the targets.

- What method will be used to identify potential customers, and how will they be contacted?
- What features of the product (price, quality, delivery, service, etc.) will be emphasized for each customer type to generate sales?
- From which point will you sell the product and what are the associated costs? E.g. Cost of space rental in a market
- If your business has established markets, include letters of "intent to purchase" from each.
- Will you target one market or various markets? And what are the implications?

Risk associated with one market, if various markets are targeted,

- Different grades sold to different markets? Prices expected?
- The range of different buyers needs to be met e.g. different supermarkets, hotels, restaurants.
- Is there different quality presentations in each market?
- What are the timing requirements e.g. weekly daily deliveries?

e) Promotion Strategy

- How do you intend to promote your product/service so prospective customers are aware of it?

- What type of advertising techniques will be used (i.e., mail, radio, television, Internet, magazines, newspapers, etc.) to help promote your product?

Want to learn more about this topic?

Business Planning for Innovation Projects, https://www.innovatorinternational.com/wp-content/uploads/2024/01/BUSINESS-PLANNING-FOR-YOUR-INNOVATION-PROJECTS-Issue-1.0compressed.pdf

Agritech Startup: Business Plan**, https://www.scribd.com/document/586204364/Business-Plan-for-Agritech-Startup**

Establishing a business plan for an agricultural enterprise, https://cgspace.cgiar.org/server/api/core/bitstreams/eabea5bf-8560-490a-8600-65d0735e95b3/content

Sub-Unit 3: Integrating Digital Tools into Agribusiness Models

3.1 What Are Digital Tools in Agribusiness?

Digital solutions are technologies that help farmers, processors, cooperatives, or agri-startups:

- Monitor and maximize production;
- Reduce cost and environmental impact;
- Facilitate market access and traceability;
- Automate communications, logistics, and money flows.

They can be as simple as mobile applications or complex as those based on AI, IoT, or blockchain.

3.2 Categories of Digital Tools for Agribusiness

Category	Examples
Farm Management Tools	Crop planning software, input tracking, inventory tools
Precision Agriculture	Drones, satellite imagery, soil/plant sensors, GPS-guided equipment
Market & Sales Platforms	Online marketplaces, e-commerce, B2B platforms, farm-to-table apps
Financial & Risk Tools	Mobile banking, digital wallets, crop insurance apps
Traceability & Certification	Blockchain traceability, QR code labelling, certification databases
Decision-Support Systems	AI-based yield prediction, weather apps, pest forecast models
Logistics & Supply Chain	Fleet tracking, cold chain monitoring, inventory scheduling

3.3 Mapping Digital Tools into the Business Model Canvas

Each component of the Business Model Canvas (BMC) can be digitally enhanced:

BMC Component	Digital Integration

Value Proposition	Use IoT to guarantee freshness; offer mobile access to farm origin data
Customer Segments	Analyse buyer behavior using CRM tools or web analytics
Channels	Sell through e-commerce platforms or SMS-based ordering systems
Custom Relationships	Automate support through chatbots, newsletters, or social media
Revenue Streams	Accept mobile payments; offer subscription-based services
Key Resources	Add drones, cloud software, or mobile devices
Key Activities	Include remote monitoring, app-based crop planning, digital compliance
Key Partners	Work with agtech providers, IT firms, e-logistics services
Cost Structure	Factor in tech subscriptions, platform fees, training costs

3.4 Criteria for Selecting Digital Tools

Not all technologies are equal or useful. Ask:

- Relevance: Does it address a real need in your business?
- Scalability: Will it still function if you grow or get bigger?
- Cost-benefit: Will the long-term benefits outweigh the cost?
- Ease of use: Can you and your staff use it without ongoing technical assistance?
- Offline capability: Can you use it where connectivity is low?
- Training & Support: Is support available in your language and context?

Idea: A digital calendar, messaging group, or Excel tracker is a move towards digital integration.

3.5 Digital Maturity and Readiness Assessment

Before committing fully to digital tools, consider your organization's current digital readiness:

Area	Key Questions
Infrastructure	Reliable internet, power, mobiles?
Skills	Are you or your staff confident in using digital tools?
Attitude	Are you ready to adopt digital innovation, or against putting in place new technology?
Support System	It's their availability of Agri-tech suppliers, training centers or cooperatives to support?
Budget	Can you invest in low-budget tech, or secure finance?

3.6 From Tool to Strategy: Planning Digital Integration

In order to meaningfully incorporate digital tools, tie them to your strategic goals:

- What inefficiency or challenge do you want to solve?
- What part of your BMC can be improved through digital technology?
- Do you pilot first before full take-up?
- How will success be defined (e.g., less waste, faster sales, more customers)?

This sub-unit helped participants understand the role of digital tools in modern agribusiness and how to:

- Evaluate tools based on their business needs
- Use map technologies in their business model
- Develop a digital strategy in terms of their goals and readiness

Want to learn more about this topic?

A comprehensive review on smart and sustainable agriculture using IoT technologies https://www.sciencedirect.com/science/article/pii/S2772375524000923

Guide on digital agricultural extension and advisory services Use of smartphone applications by smallholder farmers https://openknowledge.fao.org/server/api/core/bitstreams/f188cc38-d16e-4da6-adc5-45e1dc0ac96d/content

Sub-Unit 4: Financial Planning & Investment Strategies for Agri-Food Entreprises

This part presents the enterprise's financial plan along with financial information. Investors can use the financial information to assess your plan's viability, the amount of money needed, and your capacity to pay back the loan.

4.1 Definition of Financial planning

Financial planning is defined as a document that has records of a business owner or company's financial situation along with planning on the spending of money to achieve a certain goal by working by a well-devised plan. It is basically a financial budget plan, which helps organize the business and includes a set of goals that are supposed to be followed by the firm or business owner to save and spend accordingly. It helps distribute various monetary expenses such as rent, while at the same time saving some amount of money as short-term or long-term savings.

Financial Planning is the process of estimating the capital requirement and determining the competitive elements required for financial planning. This is a plan which has been defined as a document that contains a person's current money situation with the long-term monetary goals and the strategies to achieve those goals based on the current fund. A financial plan may be devised and drafted independently or with the assistance of a financial planner. The first step in the creation of a financial plan is to involve collecting the numbers from the web-based accounts into a document or a spreadsheet.

4.2 Objectives of financial planning

There are two main objectives of financial planning:

- **Ensuring Availability of Funds When Required**: The foremost and most important objective of financial planning is to keep in check that funds are available in cases of emergency or whenever it is required for use. Sufficient funds should be available with the firms for various purposes.

- **Check Unnecessary Fundraising by the Firms**: Insufficient funds are just as bad as surplus funds. Idle money will only result in a loss for a firm as against investment. Therefore, proper allocation of funds is a very important part of financial planning.

4.3 The difference between a personal and business financial plan

A financial plan is sometimes referred to as an investment plan, while personal financing focuses on specific areas like risk management, estates, colleges, or retirement.

Becoming a small business owner can be incredibly rewarding, but typically doesn't come without some stresses, especially when it comes to financing and making sure you have the capital to keep things moving smoothly. You've likely been managing your own personal finances for years, so it might be tempting to just apply the same principles you use for your personal finances to your business. But there are important differences to consider.

An important difference between personal and business finance is the use of leverage as an investment strategy, which basically means you borrow money to invest in your future. Leverage is a common practice that supports small businesses and helps them expand through the access to capital.

Using leverage in personal finance can mean devastating losses, as in your car or even your house. But in business, it allows you to increase your ability to invest in your company without having to personally put forward all the capital.

If you leverage your business, this is not necessarily a bad thing. In fact, it can be highly beneficial! It is just important to not obtain more loans than you are able to pay back.

It is important to separate your business and personal finances, which for most small businesses includes a business checking account and credit card, and oftentimes, a small

business loan. Avoid paying personal debts or bills from your business accounts and vice versa. Make sure your business finances are official by registering your business and obtaining a federal tax identification number.

This approach will make book-keeping easier, filing your taxes less complicated, and will make you a more credible candidate for loans and other financing

4.4 Financial Planning and Funding Overview

a) Financial Strategy

Involves answers to the following:

- What finances are required to commence the business?
- Where will this money come from?
- Have you applied for finance yet?
- Where will you seek finance?

b) Source of Funds

- Summarize the establishment costs and the amount of money needed over the next three years to carry out the development and/or expansion of your business.
- Indicate how much of this money you expect to obtain yourself (through your own investments) and how much you anticipate borrowing from banks, microfinance organizations, savings and credit cooperatives, etc.

c) Desired financing

Break down the amount of funding needed and identify the sources. Include personal contributions (equity) as well as external funding requests.

Source of Financing	**Amount (Currency)**
Amount requested (e.g. loans/grants)	…
Owner's equity (savings, shares)	…
Other sources (specify)	…
Total	…

d) Use of Funds

Explain how the funds will be used to support the business. Provide a breakdown of expenditures in the following areas:

Use of Funds	Amount (BIF/RWF/US$)
Land	…
Building	…
Equipment	…
Improvements	…
Land	…
Building	…
Equipment	…
Improvements	…
Inventory	…
Working Capital	…
Product Development	…
Marketing	…
Other (specify)	…
Total Amount Needed	…

4.5 Where to find support and help?

Services and programmes provided by entrepreneurial eco-system

- Mentorship
- Advising (marketing, finance, taxes, human resources,..)
- Idea counselling
- Assistance with business model preparation and planning
- Training
- Assistance with acquiring financial resources
- Events (networking)
- Office Infrastructure

Want to learn more about this topic?

Financial needs in the agriculture and agri-food sectors in the European Union https://www.fi-compass.eu/sites/default/files/publications/financial_needs_agriculture_agrifood_sectors_eu_summary.pdf

Strategic Investment Planning and Policy **https**://www.fao.org/investment-centre/about-us/how-we-work/investmentplanningpolicy/en

Four lessons for financial innovation in agrifood systems https://www.ifpri.org/blog/four-lessons-for-financial-innovation-in-agrifood-systems/

Sub-Unit 5: Case Studies: Successful Digital Agriculture Startups

Staramaki, Greek agriculture enterprise

Staramaki is an innovative agricultural committed that turns wheat stems, which are normally regarded as agricultural waste, into premium drinking straws that are completely biodegradable. The company, which was founded in a rural area of Greece, is a prime example of how an eco-business model can successfully integrate innovation, sustainability, and rural development.

This innovative approach not only offers an environmentally friendly alternative to plastic straws but also optimizes agricultural waste utilization. The enterprise's rural setting plays a pivotal role in its operations, allowing for local sourcing of raw materials, which significantly reduces the carbon footprint associated with transportation. This strategic location also fosters close collaboration with local farmers, ensuring a consistent and quality supply of wheat stems.

Staramaki operates as an eco-business for various reasons. Their utilization of wheat stems as the primary raw material not only taps into a naturally occurring resource in the region but also ensures a minimal carbon footprint due to reduced transportation needs. The end product, wheat straws, stands out as a 100% biodegradable solution, presenting a sustainable alternative to the environmentally detrimental plastic straws and directly tackling the issue of single-use plastics.

1. By harvesting wheat stems post grain collection, the business ensures optimal utilization of the plant, thereby diminishing agricultural waste.
2. Environmental principles are further embedded in their operational processes. They employ mechanical means for harvesting the wheat stems, which lowers the environmental strain typical of traditional harvesting.
3. An emphasis on water efficiency is evident in their methodology: rinsing is carried out between each processing step, ensuring minimal water wastage.
4. The strategic use of industrial dehydrators in their storage system optimizes both energy and water consumption. Remarkably, many of their procedures, such as preselection and trimming, are manually executed. This approach not only ensures precision but also reduces the energy typically expended in automated processes.

Conclusion

The goal of Learning Unit 4 of the Digi.BUILD Training Program was to give participants the skills and information they needed to develop sustainable and profitable business strategies for agricultural companies. The unit guided learners from ideation to company execution by combining digital innovation, sustainability concepts, entrepreneurial theory, and financial planning.

Participants studied the foundations of agro-entrepreneurship, such as the traits of prosperous businesspeople and how to turn obstacles in agriculture into chances for profit. The focus was on using market research, SWOT analysis, BMC and organised planning to match corporate concepts with consumer demands.

Essential elements including product and service description, marketing strategy, operational planning, and financial forecasting were covered in the step-by-step business plan development process that was given. In order to gain the trust of investors and guarantee the longevity of the business, particular attention was paid to financial planning, funding techniques, and the differentiation between personal and business funds.

The case study of Staramaki, a creative Greek eco-business that turns wheat stems into biodegradable straws, provided a model for successful rural entrepreneurship and the circular economy.

In order to help agro-entrepreneurs navigate the early stages of development and build their firms, the unit concluded by emphasising the value of support networks, such as access to infrastructure and funding, advisory services, and mentorship.

All things considered, the unit gave students the confidence to create and deliver business plans that are sound financially, ready for the market, and in line with the objectives of the agricultural industry's green and digital transition.

Learning Activities

Activity 1: Digital Tool Mapping

Task: Choose a crop or agri-product and complete a Business Model Canvas. Then, suggest one digital tool per canvas block to support/improve it.

Deliverable: Completed BMC template with annotated digital tools.

Goal: Reinforce the alignment between business models and technology.

Activity 2: Business idea

My business idea:	
Type of business: retail, wholesaling, processing, manufacturing, etc.	
My products or services will be:	
My customers will be	
The needs of the customers that will be satisfied are:	
Skills, knowledge and experience that I have with this type of business are:	
I have chosen this type of business idea because:	

Assessment

Short quiz (10 multiple choice + 2 matching items):

- Match digital tool to business goal (e.g. “traceability” ⇨ “blockchain”).
- Identify which BMC block is best supported by a given tool.

References

CBI. (2023). *Doing business with European cocoa buyers*. Centre for the Promotion of Imports from developing countries. https://www.cbi.eu/market-information/cocoa/doing-business

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2020). *Value proposition design: How to create products and services customers want* (2nd ed.). Wiley.

Osterwalder, A., Pigneur, Y., & Smith, A. (2020). *Business model generation: A handbook for visionaries, game changers, and challengers* (Updated ed.). Wiley.

SARE. (2010). *Building a sustainable business: A guide to developing a business plan for farms and rural businesses*. Sustainable Agriculture Research & Education (SARE). https://www.sare.org/resources/building-a-sustainable-business/

Swisscontact. (2020). *Business model canvas for youth entrepreneurship* (2nd ed., preview version). https://www.swisscontact.org/_Resources/Persistent/e/9/7/9/e9796901fc1b986bb855d5ec0b63e53b5388cd4b/13_Business_Model__ENG__Edisi_2_preview.pdf

Zilberman, D., & Lybbert, T. (2022). Technology and innovation in agriculture: A key to sustainable and inclusive development. *Annual Review of Resource Economics*, *14*, 1–20. https://doi.org/10.1146/annurev-resource-111820-032340

Ghezzi, A., & Cavallo, A. (2020). Agile business model innovation in digital entrepreneurship: Lean startup approaches. Journal of Business Research, 110, 519–537. https://doi.org/10.1016/j.jbusres.2018.06.013

Joyce, A., & Paquin, R. L. (2021). The triple layered business model canvas: A tool to design more sustainable business models. Journal of Cleaner Production, 304, 127074. https://doi.org/10.1016/j.jclepro.2021.127074

FAO. (2022). AgriTech: Innovations for sustainable agriculture and food systems. Food and Agriculture Organization of the United Nations. https://www.fao.org/documents/card/en/c/CB9479EN

OECD. (2023). Fostering innovation in agriculture: Policy responses to new challenges. https://www.oecd.org/agriculture/topics/agricultural-innovation/

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Learning Unit 5: Digital Marketing and Communications for Agriculture

Digi Build: Building Digitalization in the Green Sector

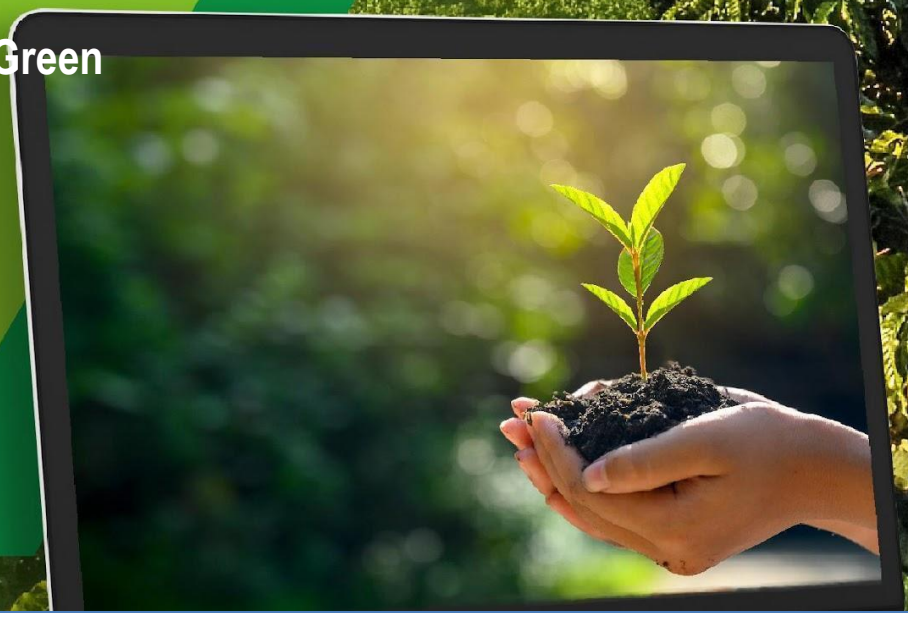

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Table of Contents

Learning unit title: Digital Marketing and Communications for Agriculture

Year
2025

Author(s)
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Introduction

In today's economy of agriculture, to be seen is very important. Social media is everywhere, and it is an affordable and accessible way for small and medium scale farmers and agripreneurs to promote their products. Platforms that are already known to most of us like Facebook and Instagram, even TikTok are widely used in Latin America and also Europe, with opportunities to promote products and increase the sales.

LEARNING OBJECTIVES

Learning Outcomes:

- Design basic agricultural communication strategies adapted to digital platforms.
- Create visually attractive posts using basic graphic design principles.
- Apply storytelling and branding to promote farm products and services.
- Use AI tools (like ChatGPT, Canva AI) to streamline content creation and scheduling.
- Support farmers in managing social media presence and basic websites.

Content Overview:

1. Identify and differentiate message types and target audiences in agricultural communication.
2. Manage platforms like WhatsApp Business, Facebook, and basic websites to build a digital presence.
3. Design visual content that communicates agricultural messages with clarity and impact.
4. Use AI tools to support efficient content creation, publication planning, and message automation.
5. Analyze real-world examples to extract lessons applicable to local agricultural businesses.

Sub-Unit 1: Foundations of Agricultural Communication

1.1 What is agricultural communication

Agricultural communication is the act of making and sharing information about farming with a wide range of people, including farmers, rural communities, consumers, policy makers, and agribusinesses. The main job of this group is to make sure that people who work in agriculture are well-informed, well-equipped, and connected to the larger system of agricultural development, policy, and market innovation. It is important for rural development. It helps people share information, change their behavior, and feel more powerful through both old and new ways (Asir, 2022; FAO, 2014).

Agricultural communication concerns people in agriculture, especially small and medium enterprise farmers, to understand each other and work together. In times of climate change, environmental impact, and resource management, communication can also help people be strong and fair. It gives a voice to people who are often left out, encourages environmentally friendly practices, and lets people take part in making decisions (FAO, 2014).

1.2 Types of messages

Agricultural communication encompasses a wide spectrum of message types. These include:

Technical messages that are meant to teach or inform people, and they often focus on improving farming methods, sharing new technologies, or bringing in new ideas like seeds that can survive drought, pest control methods, or tools for precision farming. Researchers, extension agents, or agri-tech companies usually send these messages, and they are based on scientific data (Asir, 2022). A technical message might be a step-by-step guide on how to compost or how to use GPS tools to water plants.

The main goal of promotional messages is to sell and market things. Agribusinesses use advertising to boost demand, set their products apart, and build brand value. They often do this through mass media or digital platforms (FAO, 2014; Marketing Communications, 2024). A Facebook campaign that involves the benefits of organic food from a specific farm is an example of a promotional message.

Messages for the community focus on changing behavior, building a sense of community, and getting people involved. They include messages that encourage farmers to work together, raise awareness about sustainability, or support local food campaigns. People often talk about them in informal settings like communal meetings, community radio, or WhatsApp groups. The goal is to bring people together and help them understand each other in a farming or rural community (Asir, 2022). Messages telling farmers to use shared transportation systems to get to the market can also be examples of community messages.

Knowing your audience is the key to good agricultural communication. The person who is communicating, whether they are a cooperative, an NGO, an agripreneur, or a government agency, must adapt the content and tone to the target group's level of literacy, cultural background (Asir, 2022).

Farmers and producers get more out of clear, useful, and actionable messages that are often given in their own dialects or in images (like infographics or demonstration videos). The tone would have to be polite, helpful, and easy to understand. People need clear and interesting messages that explain the benefits of products. For example, health and sustainability. The tone here should be convincing but easy to understand. People who make policies or invest respond to messages that are full of data and talk about scale, impact, and return on investment. Of course, here the tone has to be formal and more strategic.

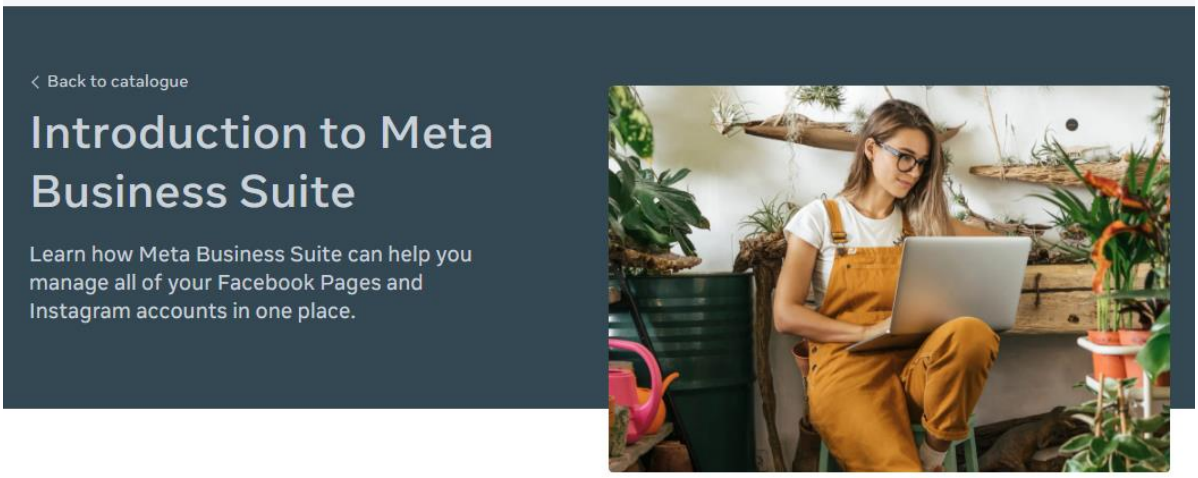
Sub-Unit 2: Social media Platforms and Web Presence

2.1 Social media tools for agriculture

Social media is a powerful tool in agriculture, for promotion and networking but also for sales. But how do we choose the right platform?

Facebook

It is good for community engagement, for creating events and watching how many participants are coming or are interested, creating a business page with contact details, and including longer posts with photos. Posts can include text, photos, videos and links. You can schedule posts in advance by using the Meta business suite. Facebook ads allow paid promotion of posts to reach larger or targeted audiences. And through the messenger app, customer can ask you questions directly. You can share photos of your farm, production methods, and offers to attract customers. Learn to manage your online presence with Meta Business Suite here.



Manage your online presence with Meta Business Suite

WhatsApp business for customer interaction

What is the WhatsApp Business Platform? With this tool you can show your products and services in a mobile storefront and group similar items into collections to simplify the shopping experience for your customers. The WhatsApp Business API is specific to messaging with your customers on WhatsApp. Messages sent on the Messenger Platform cannot reach customers on their WhatsApp numbers. Business can choose from: Directly accessing the WhatsApp Business Platform by signing up here. You must be a developer in order to do so as this requires being able to call our APIs and set up webhooks, or accessing the Platform by working with one of the approved Business Solution Providers.

WhatsApp is the **simplest and most direct digital tool** you can use to share what you're selling and receive orders. With Whatsapp, you can: share **weekly product availability,** take **orders through chat,** send images and price lists, confirm deliveries, send reminders and updates. There's no need for a website or app just your phone.

WhatsApp Business offers **extra features** that are perfect for farmers and small sellers: Business profile with address, hours, website, auto-reply messages, labels to track customer types (e.g., "Ordered," "Paid," "VIP")

Download for Android: https://play.google.com/store/apps/details?id=com.whatsapp.w4b
Download for iPhone: https://apps.apple.com/app/whatsapp-business/id1386412985

Email Marketing Basics

Email is a powerful way to stay connected with your customers, especially loyal buyers who are interested in regular updates from your farm. Unlike social media, email communication goes straight to a customer's inbox and doesn't rely on algorithms — making it a more direct and personal channel.

Why Use Email?

Send product availability updates (weekly or monthly)

Announce new harvests, special offers, or seasonal events

Share stories from your farm, new projects, or family updates

Confirm orders and delivery details

Build long-term relationships with your customers

Getting Started with Email Marketing

You don’t need to be a tech expert. Most platforms offer easy templates and drag-and-drop editors.

Recommended beginner-friendly tools:

Mailchimp (https://mailchimp.com): free for small contact lists, includes templates and automation

Constant Contact (https://constantcontact.com): simple to use, good support

Emblue (https://embluemail.com): widely used in Latin America with regional support

Tips for Email Success

Start small: Even 20–30 customer emails are enough to begin

Be consistent: Send updates once a week or every two weeks

Use photos: Show your products and farm life to keep it engaging

Make it personal: Use the customer’s name and mention familiar products

Respect privacy: Ask permission before adding someone to your email list (this is called "opt-in")

Instagram

Here you can share your farming processes, methods, or even talk directly to your followers in stories and posts. This platform is more visual and relies less on text and descriptions. It is excellent for short visual storytelling, reaching younger consumers, and showing your daily farm life. It focuses on images and short videos (reels), captions allow no clickable links (except one in bio), hashtags can increase visibility (e.g., #OrganicCostaRica #CoffeeHarvest), Instagram Stories disappear after 24 hours, but can be saved in your

highlights. What you can do is create short videos that show processes (farming, harvesting, packaging) and post quick updates in stories or behind-the-scene short clips to increase interest. Learn to set up a business account on Instagram here, on their official help center.

With Reels, you can record and edit short videos. Learn how to add music, effects and voiceovers to the clips you record, manage who can see your reels or use your audio, and discover creators on Instagram. Learn how to post reels here.

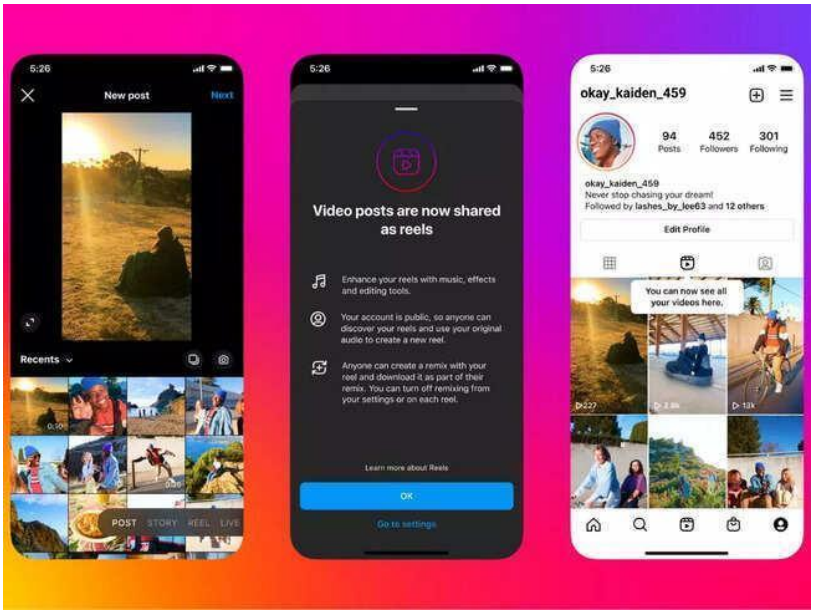
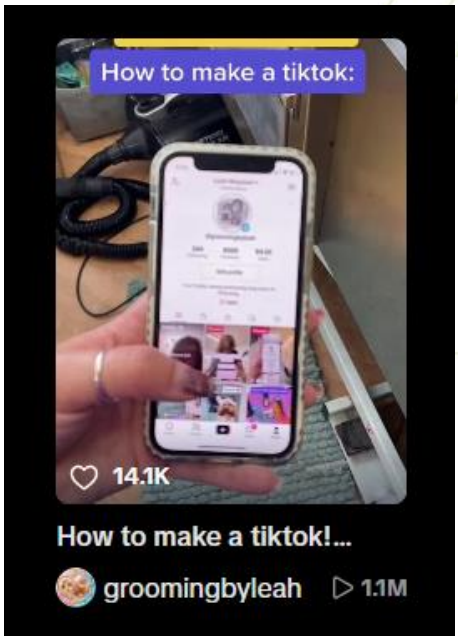


Figure 2 Source

With Stories, you can share photos and videos that disappear from your profile, Feed and messages after 24 hours, unless you add them to your profile as story highlights. Learn how to do that here.

TikTok

TikTok is useful for fun and short videos that can go viral. You can post educational or humorous farm content, and the content has to be engaging to attract younger audiences. TikTok has some built-in editing tools that make it easy to create visually appealing content. You can trim and split the videos to control the pace of the story, and add music through a big library of songs and voice overs. You can find a TikTok tutorial for beginners here. You can learn how to set up your profile here and how to create videos here.



Boost your social media engagement

Understanding what are social media engagement metrics is only half the battle. The next step is utilizing this knowledge to improve your content strategy.

Use hashtags wisely: hashtags can extend your reach, but overusing them can have the opposite effect. Stick to relevant hashtags that resonate with your content and audience. **Engage with your audience**: engagement is a two-way street. Respond to comments, share user-generated content, and participate in conversations to build a more engaged community. **Post consistently**: consistency is key in social media marketing.

The 80/20 rule

The 80/20 rule is a simple yet powerful concept. It suggests that 80% of your social media content should focus on providing value to your audience whether educational, entertaining, or problem-solving. Only the remaining 20% should be explicitly promotional

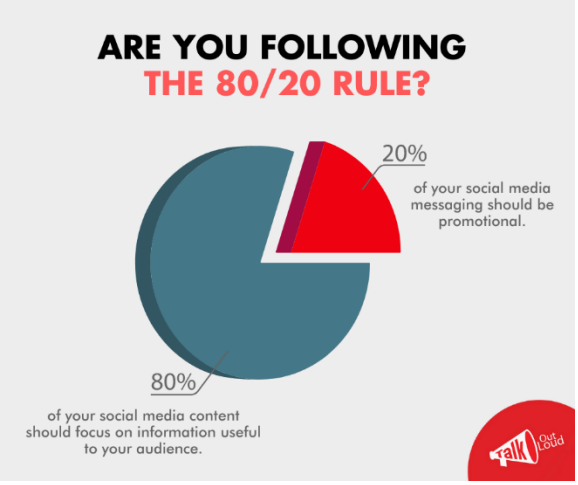


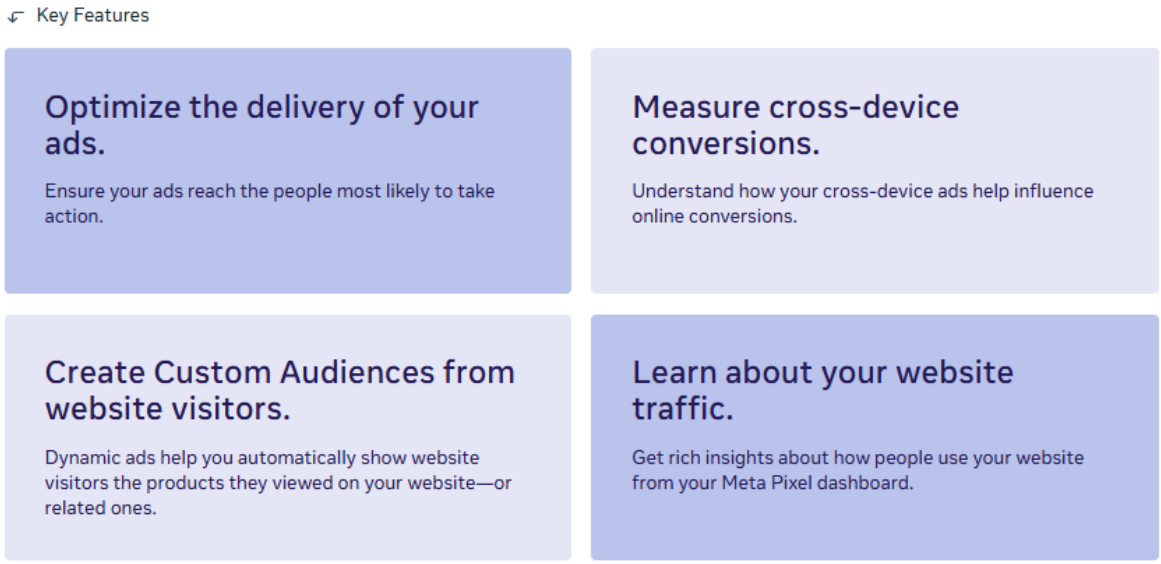
Figure 1 Source

Meta Pixel to Track Conversions from Facebook and Instagram

If you are using Facebook or Instagram ads to promote your farm, **Meta Pixel** is a valuable tool that helps you understand what happens after someone clicks on your ad.

Meta Pixel is a small piece of code you add to your website or landing page. It helps you:

- **Track visitors** who come to your website after clicking an ad
- **See what they do**, such as visiting the product page, clicking "Order Now," or filling out a form
- **Measure results**, like how many sales or leads came from your ads (Return on Ad Spend - ROAS)
- **Improve ad targeting**, by reaching people who are more likely to buy (retargeting)



To use the Meta Pixel:

1. Go to your **Meta Business Suite** account https://www.facebook.com/business/tools/meta-pixel
2. Open **Events Manager**
3. Create a Pixel and follow the step-by-step setup instructions
4. Copy the Pixel code and paste it into your website header (Wix, WordPress, and others have guides to help you)

Over time, the Pixel will help you spend your ad money more wisely and reach customers who really want your products.

Metrics

Social media engagement metrics are quantifiable data points that illustrate how users interact with your content. They provide insights into how well your content is resonating with your audience and can guide your future content strategy. Engagement metrics include likes, comments, shares, retweets, clicks, and more. While these metrics can vary by platform, their core purpose remains the same: to offer a glimpse into the level of interest and interaction your content gathers.

Some key metrics you should focus on are:

Likes: A straightforward metric that indicates the number of people who appreciated your content.

Shares: This metric signifies that your content has resonated enough for users to share it with their own networks.

Comments: Comments are a more personal form of engagement that can give you deeper insights into how your audience feels about your content.

Clicks: This metric helps you understand how effective your call-to-actions are and whether your audience is interested in learning more about your content.

Followers: While not a direct engagement metric, the number of followers you have can impact your overall engagement rate.

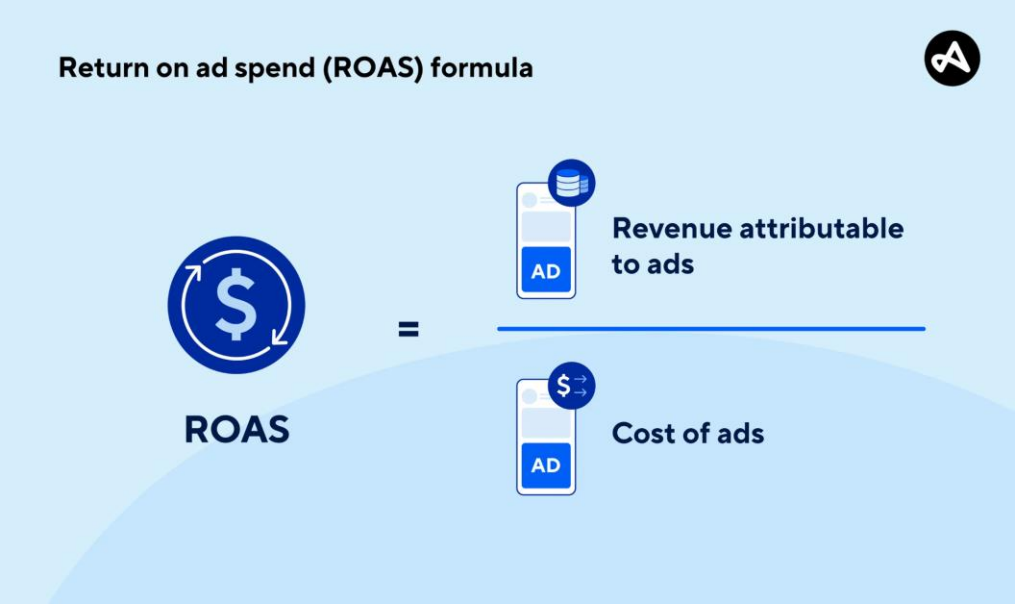
Mentions: When users tag your brand in their posts or stories, it's a strong indicator of brand awareness and engagement.

Tracking Conversions and ROI

While engagement is important, it's also essential to track how many of your online interactions result in **real business actions** such as WhatsApp messages, orders, or purchases. These are called **conversions**. Tracking conversions helps you understand which content actually leads to sales or customer actions, not just likes or views. Even if you don't have a full website, you can still measure your conversions. For example:

Count how many **messages or inquiries** come after you post a story or promotion; Use tools like **bit.ly** to shorten and track how many people click on your WhatsApp link or product catalog; Ask customers where they saw your offer on Instagram, Facebook, TikTok, etc.
You can even calculate simple conversion rates:

Conversion Rate = (Orders ÷ Messages) × 100
So for example: 10 orders from 50 messages = 20% conversion
or, for websites: (Forms received ÷ Visitors) × 100



If you run paid ads, you should also monitor your **ROAS (Return on Ad Spend)**:
ROAS = Revenue ÷ Ad Spend. This shows whether your ads bring in more money than they cost. So for Example: You spend $10 on an Instagram ad and get $50 in orders. ROAS = 5.0 (which is great) Read more: https://www.adjust.com/glossary/roas-definition/

Other Key Meta Ads Metrics to Know

If you're running Facebook or Instagram ads (through Meta Business Suite), there are some additional metrics that help you measure your results more effectively:

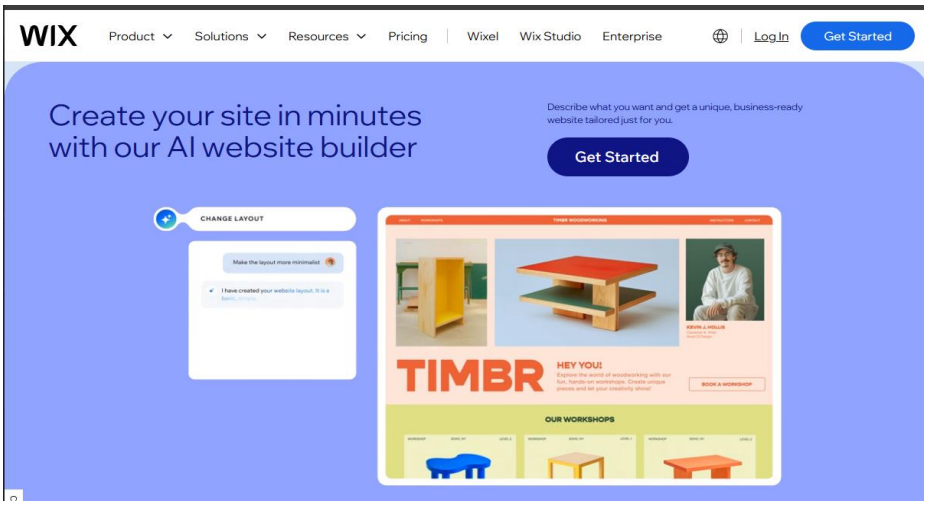
Reach: How many unique people saw your ad
Impressions: How many total times your ad was displayed (including repeat views).
CTR (Click-Through Rate): The percentage of people who clicked your ad after seeing it — a good indicator of how interesting your ad is.
CPC (Cost Per Click): How much you paid for each click. Lower is better.
CPM (Cost Per 1,000 Impressions): Useful for understanding how much it costs to show your ad to a large audience.
Leads or Conversions: How many people completed an action you wanted (e.g., order, sign-up, visit your store).
Video Views / Watch Time: If your ad is a video, this shows how many people watched and how long they stayed engaged.

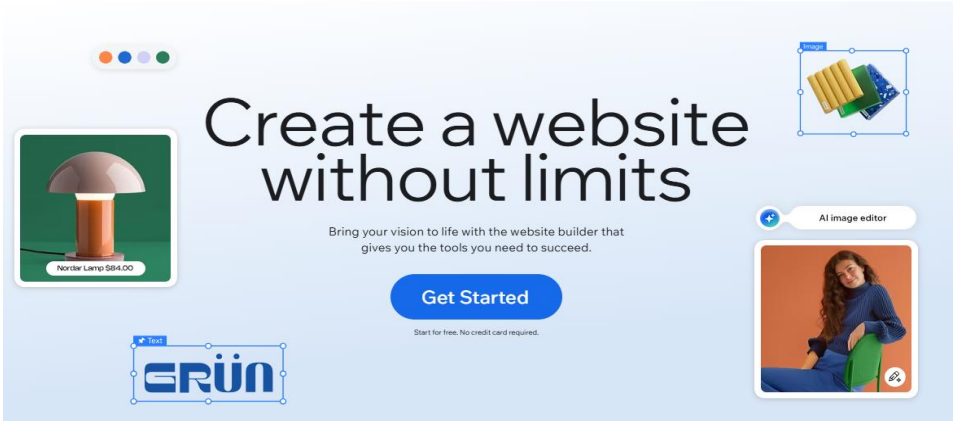
2.2 Creating a basic website or landing page

The website is like a storefront of a physical shop, you can let people know about your farm, discover your products, reply to them and place orders. Unlike social media, websites are found through Google search and offer more control over layout and branding.

Wix

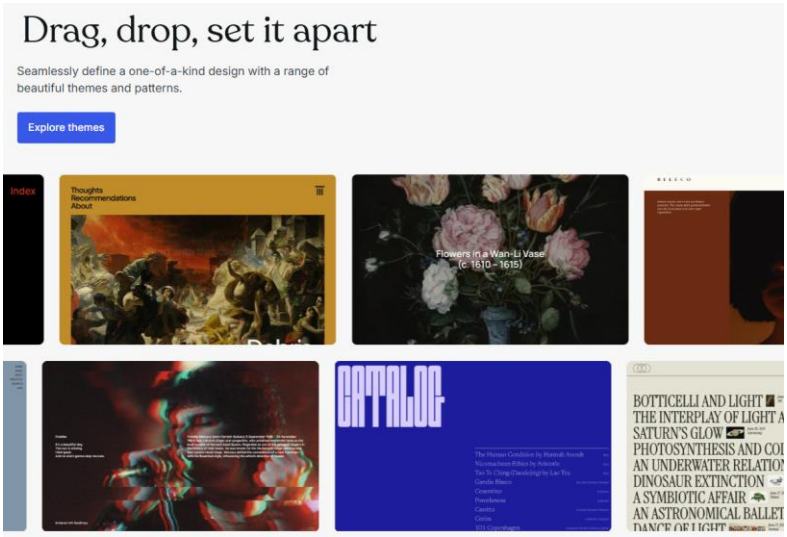
Wix now also includes an AI assistant. You can describe what you want and get a unique, business-ready website tailored just for you, or start from a designer-made template. It includes a drag-and-drop builder, very visual and mobile-friendly. There is a tutorial available here.





WordPress.com

This one has a more blog-like style layout with more content flexibility. You can always start for free, with upgrade options later. There is a full course on coursera.com available here on how to build a complete website.



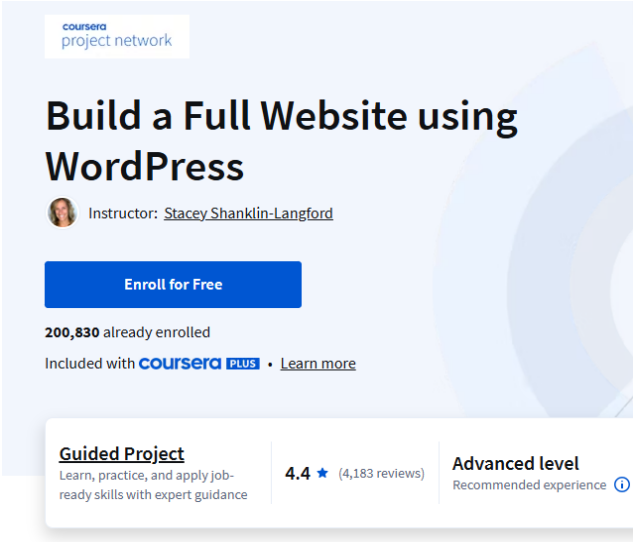


Figure 6 Source

Google Sites

Is free and simple to use with a Google account. With it, it is easy to embed maps, YouTube videos, and contact forms. A tutorial is available here.

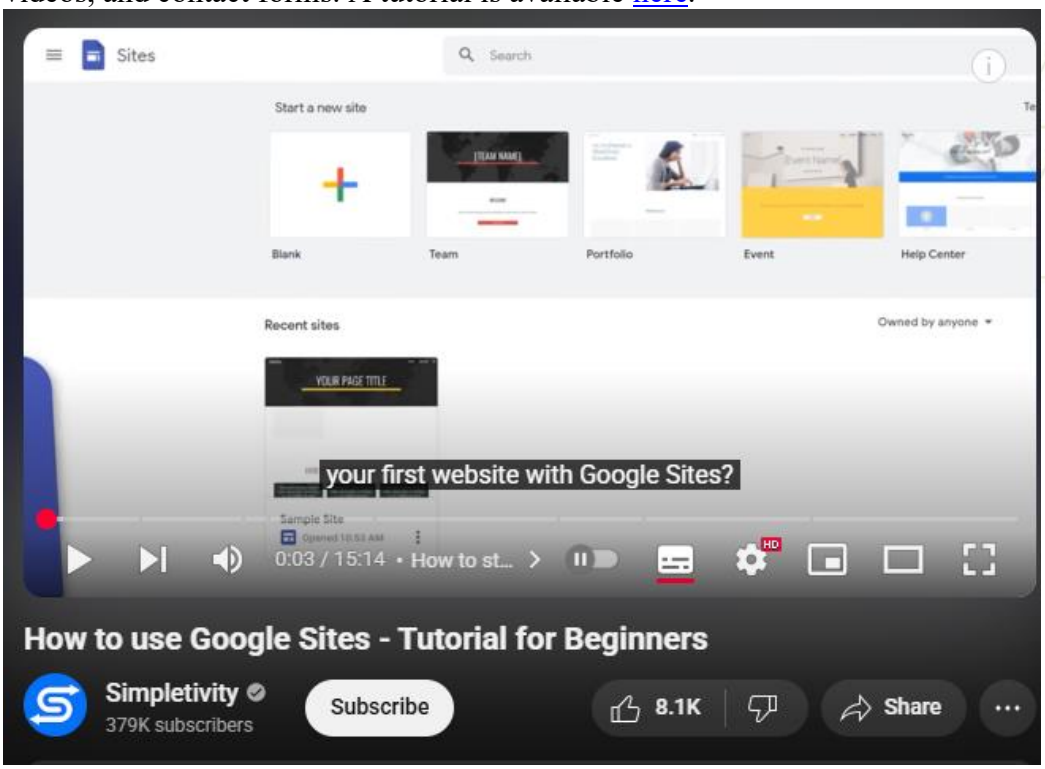


Figure 7 Source

What to include on your farm website or blog

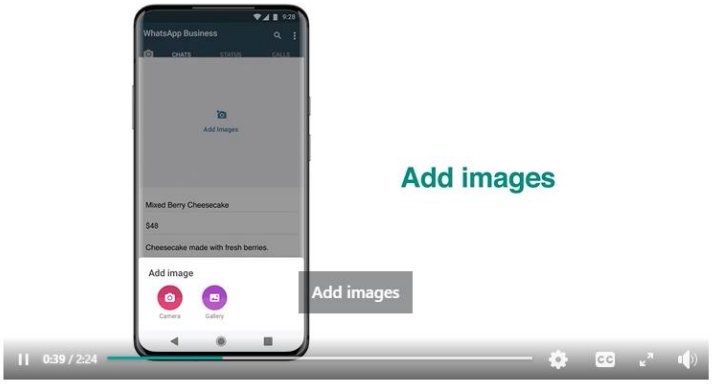
- Home page: name, logo, tagline (e.g., “fresh from the mountains of costa rica”), brief farm introduction.
- About page: the story of your farm, values, people
- Products or services page: pictures, prices, harvest times, buying instructions
- Contact page: Google map embeds, Whatsapp link, email, and phone
- Blog/news page: share updates e.g., new harvest news, event invites

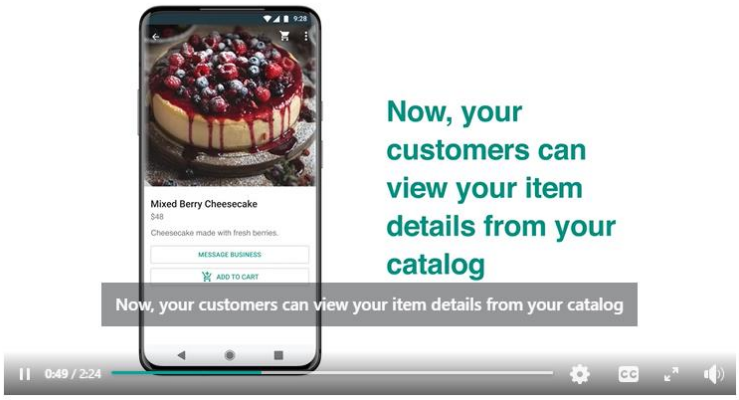
2.3 Creating a digital identify for a rural business

Catalog

Businesses on the WhatsApp Business app can create a catalog to share its products and services with customers. A business's catalog is displayed on its business profile. Every product or service in a business's catalog has a unique title, at least one image displaying the product or service, and lists the country of origin for that product or service. Products or services may also contain other details such as: additional images and videos displaying the product or service, the price of the product or service.

Find a full tutorial here.





Related resources

- How to **create and maintain a catalog**
- How to **create and manage collections in your catalog**

- How to **view a catalog**

Cart

The shopping button next to your business name appears in your chat or business profile. Using this shopping button, customers can browse your catalog and add items to their cart from your catalog. Once added, customers can access their cart by tapping **Cart** in the catalog menu or in their message with the business. From there, they can also change the quantity of each item in their cart. When they're ready to check out, customers can send the items in their cart to your business account as a WhatsApp message.

Ads

Marketing messages is now business broadcasts in some countries. Business broadcasts might not be available to you yet. If you're seeing *business broadcasts*, please refer to **this article**. Once you've set up an ad in WhatsApp, you can pay for ads and manage your payments by tapping > **Advertise** > **Ad account settings** > **Ad payments**. Once you've set up marketing messages in WhatsApp, you can pay for marketing messages and manage payments by tapping > **Marketing messages** > > **Account settings** > **Payments**

Goals in Digital Marketing

Before you create ads or digital content, it's important to decide what your goal is. Each goal requires a different message, platform, and strategy.

Here are the four most common goals:

Awareness: Make people know your farm exists. Use photos, videos, or stories about your farm on Instagram, Facebook, or TikTok. Focus on storytelling and brand recognition. Leads: Get people to contact you (via WhatsApp, form, or message). Your content should clearly invite action: "Send us a message to pre-order mangos."

Sales: Motivate direct purchases. Use offers, discounts, or "limited quantity" posts. You might use Facebook ads or WhatsApp product catalogs. Retention: Keep your existing customers loyal. Send updates through WhatsApp or email newsletters, offer loyalty rewards, or thank repeat buyers. **Example**: A short video showing how you harvest pineapples can build Awareness. A WhatsApp message with a "2-for-1 cocoa offer this weekend" aims for Sales.

Pay for ads and marketing messages

Prepaid funds can be used to pay for your ads and marketing messages in advance. We'll deduct from prepaid funds before charging other payment methods.

To add funds to your account, tap **Add funds** > select an amount to add > select or add a payment method > tap **Next** > **Confirm**.

When setting up paid ads, it's helpful to know the difference between **branding campaigns** and **performance campaigns**:

Branding Campaigns aim to **increase awareness and trust**. They are not focused on getting instant sales but on helping people remember your farm. Use eye-catching visuals, farm stories, or educational posts. These ads are good for long-term growth. **Performance Campaigns** are designed to **get specific actions**: clicks, messages, orders, or sign-ups. These usually include promotions, limited-time offers, or direct calls to action like "Order now via WhatsApp."

If people already know your farm, performance ads work better. If not, start with branding to build trust first.

WhatsApp Broadcast

Marketing messages is now *business broadcasts* in some countries. Business broadcasts might not be available to you yet. If you're seeing business broadcasts, please refer to **this article**. Broadcast list messages can only reach customers that have your business's number in their contact list. To reach customers who don't have your business's number in their contact list, you can turn your broadcast message into a marketing message.

To turn a broadcast list message into a marketing message:

1. Open your most recent broadcast group.

2. Tap **marketing message** on the banner at the top of the group. A marketing message draft of the broadcast message will open.

3. Tap **Edit** to make any edits to the marketing message. You can also add an actionable button to the draft that your customers can tap.

4. Tap **Next** to review the marketing message.

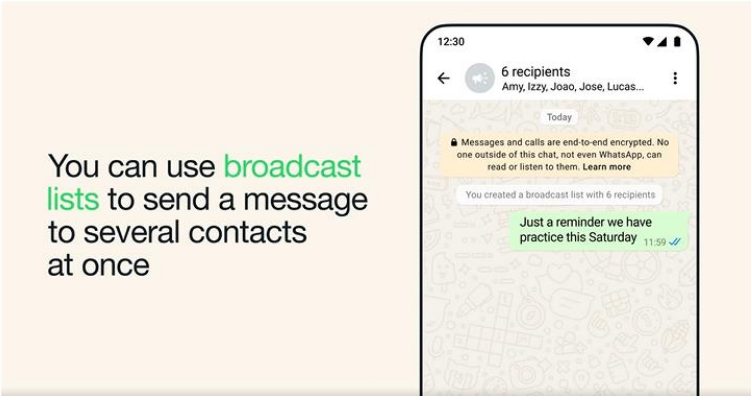
5. Tap **Send now** to send the marketing message or **Schedule** to send the message later.

A full tutorial by WhatsApp is available here.

How to use broadcast lists

You can use broadcast lists to send a message to several contacts at once.

Broadcast lists are saved lists of contacts that you can repeatedly message without having to select the contacts each time. Broadcast lists aren't supported on Windows, Mac, or Web. Make sure all contacts in the broadcast list have saved your number in their address book. You can create as many broadcast lists as you like. You can include up to 256 contacts in each broadcast list.



Watch the full tutorial here.

2.4 Making your content searchable with SEO

SEO

Search Engine Optimization includes a set of simple actions that improve how search engines like Google identify and rank your website or blog. Better SEO means more visibility. **Use clear page titles:** Example: “Buy Organic Tomatoes – Santa Rosa Farm”, Avoid “Home” or “Welcome”. **Include relevant keywords** in your text. Use terms people are likely to search. E.g.: “Where to buy honey in Costa Rica”, “Coffee farm tour near San José”. You can use Google Trends to discover local keyword trends.

Beyond writing good content and using keywords, there are tools that can help you understand how your farm’s website or blog is performing on search engines like Google. These tools help you find problems, track traffic, and discover what people are searching for:

Google Search Console: Free tool by Google that shows you which search terms bring people to your website and helps you fix errors. Great for beginners. **Google Trends:** Helps you find popular and seasonal search topics. You can compare terms like "organic pineapple" vs. "natural pineapple" to see which is more searched. **SEMRush** or **Ahrefs**: Professional tools for keyword research, competitor analysis, and website audits. These are paid but very powerful. **Screaming Frog:** A desktop app that scans your website for broken links, missing tags, and other SEO issues. It’s especially helpful when your site starts growing.

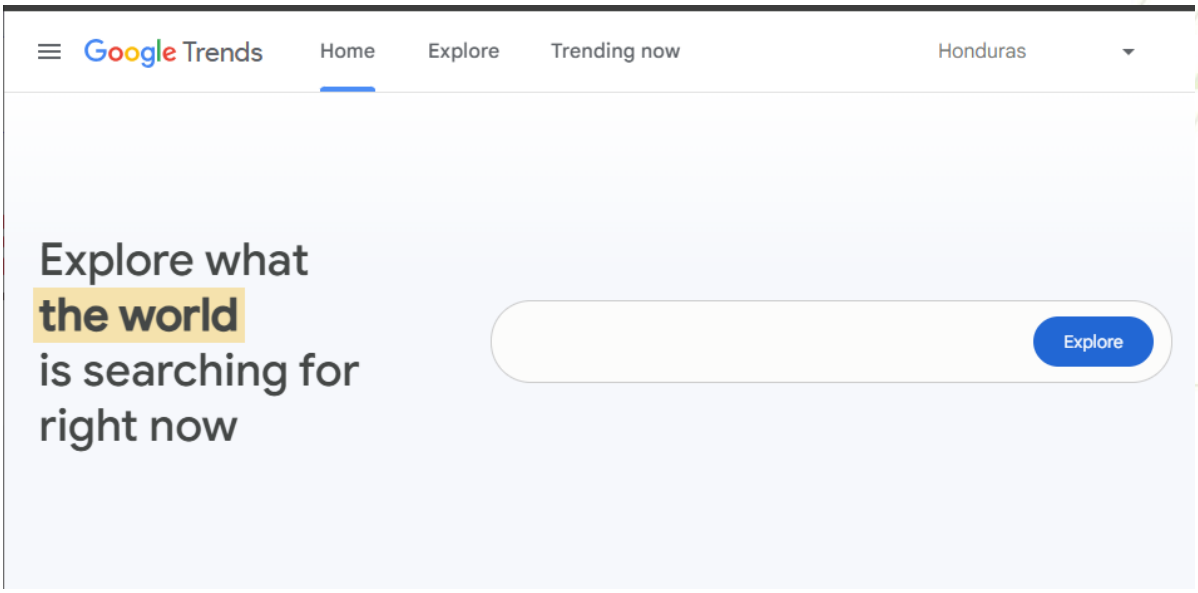


Figure 4 Source

Three Pillars of SEO

To make your website easier to find on Google, it's important to know the **three main types of SEO**:

On-Page SEO: This is everything you can control *on* your website like the words you use (keywords), the headings (H1, H2), image names, and descriptions. You are already doing on-page SEO when you write helpful content and include terms like "organic avocado Honduras."
Off-Page SEO: This is about how other websites connect to yours. When another website links to yours (this is called a **backlink**), it shows Google that your content is trusted. Getting backlinks from local cooperatives, farmer directories, food blogs, or partner businesses is a great way to increase your site's credibility and ranking.
Technical SEO: This focuses on how well your site is built behind the scenes. It includes speed, mobile-friendliness, security (HTTPS), and whether Google can "read" your site properly. Tools like Screaming Frog or Google Search Console help check this.

Why Backlinks Matter

Backlinks are when another website adds a link to your website. They act like a vote of confidence. If a trusted site, like a local agriculture group, newspaper, or organic food marketplace, links to your farm's website, it tells Google: "This is a reliable site." This improves your ranking.

💡 *Tip: Ask your partners, cooperatives, markets, or satisfied customers to link to your site from theirs!*

Formatting Your Website for SEO

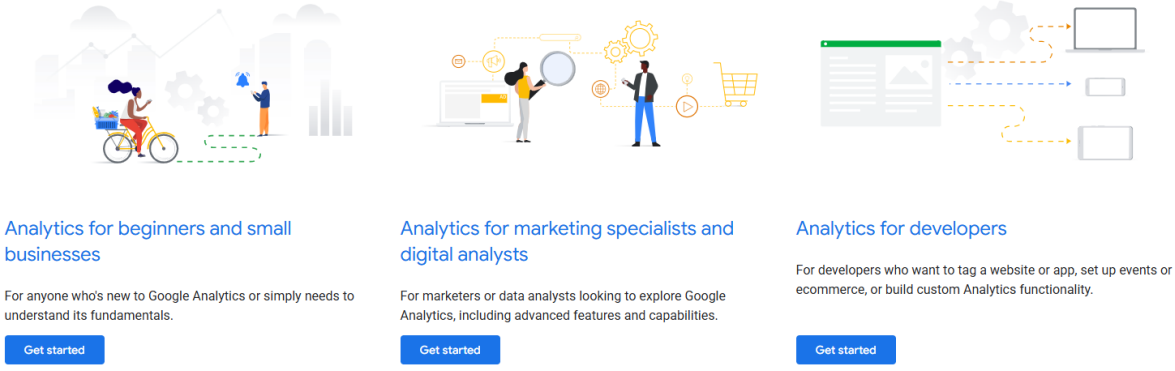
Use headings (**H1**, **H2**, etc.) properly: Your **main title** should be an H1 (e.g., "Organic Coffee from Costa Rica")se **H2** or **H3** subheadings to structure your content and include more keywords

Use headings (H1, H2, etc.) properly, like your main title should be H1 (e.g., "Organic Coffee from Costa Rica"), then the subheadings help structure content and include more keywords. **Add alt text to images, so that e**very should describes what is shown, e.g., "Farmers harvesting pineapples in Olancho". This will helps Google understand your content and make your site more accessible. **Keep your content local and specific,** so add your village, city, or region and keep using phrases your audience would say during their Google search (e.g., "pesticide-free vegetables in Heredia"). To learn more, visit the Search Engine Optimization (SEO) Starter Guide developed by Google available here.

Google Analytics

Google Analytics is the go-to platform for millions of website and app owners seeking to gain a deeper understanding of their website and app performance. With Google Analytics, you can fine-tune your digital strategy, optimize your campaigns, and take your online presence to new heights.

It offers you a more personalized approach as you can choose between Analytics for beginner, Analytics for marketing specialists, and Analytics for developers. As a SME in agriculture, you would have to choose the first category.



🛠 How to Start

Visit www.analytics.google.com and sign in with your Google account. Follow the setup wizard to link your website. Copy and paste the provided tracking code into your site (your website builder like Wix or WordPress will guide you). Within a day, you'll start seeing visitor data in your dashboard.

Below you can find a full guide from the official Google site to help you: https://support.google.com/analytics/answer/9304153

Metric	**What it Tells You**
Users	How many people visited your site
Sessions	How many visits happened (users can return)
Bounce Rate	% of visitors who leave after one page
Average Session Duration	How long people stay on your site
Traffic Source	Where visitors came from (e.g., Facebook, Google)

Meta Pixel

If you're using **Facebook or Instagram ads** to promote your farm or products, **Meta Pixel** (formerly Facebook Pixel) is one of the most useful tools you can add to your website or landing page. Meta Pixel is a small piece of code that you install once on your site. After that, it helps you:

-See who visited your site and what actions they took after clicking your ad.

-Understand how much revenue or how many orders you get from each campaign

-Show ads to people who already visited your site (retargeting) or similar people who are more likely to convert

To get started, go to **Meta Business Suite > Events Manager > Create Pixel**. Platforms like Wix, WordPress, and Shopify make installation easy. Combining Meta Pixel with Google Analytics gives you a full picture of your website visitors and your ad results, helping you make smarter marketing decisions.

Google my business

It is important that when customers search for "farmers near me" or something similar, like "buy fresh mint" Google will show your business to the results. To make sure it shows up, set up the Google My Business (GMB). It is free and you can be listed on both Google Maps and Google search, increasing your business opportunities with the users.

It allows you to have:

- Location on Google Maps
- Opening hours
- Phone number and website
- Photos of your products or fields
- Customer reviews

Go to google.com/business and click **"Manage now".** Sign in with your Google account. Add your business: Name, Category (e.g., "Organic Farm" or "Agricultural Cooperative"), Address, Phone number. Then **Verify your listing,** because Google will mail you a code

or let you verify by phone/email (this could take a few days). You can see a step-by-step guide by Google, [available here](#).

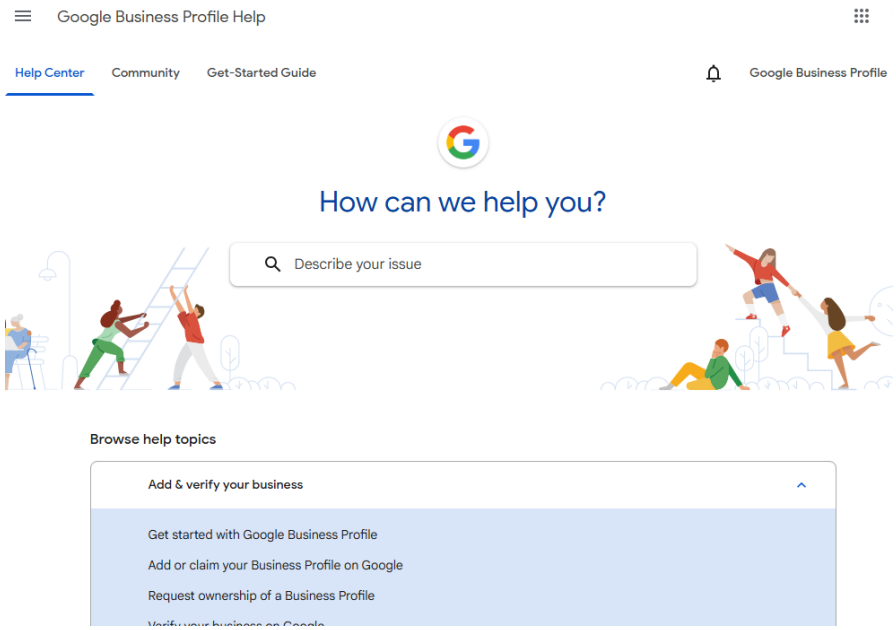


Figure 5 Source

2.5 Digital safety

As more rural businesses go online, digital safety becomes just as important as physical security. Choosing secure digital tools, protecting your login information, and properly managing access to your social media accounts help you prevent fraud, data theft, and service disruption.

Choosing a Secure Domain Name

Choosing a domain name is one of the first and most important steps in building your online presence. Think of it as the digital address of your farm. Just like people find your physical stand at a local market, they will find your website using this name. For small farms and agricultural businesses, a good domain name should be clear, simple, and trustworthy.

A strong domain name is short, easy to spell, and easy to remember. Ideally, it includes your farm's name or product specialty for example, *fincasantamaria.com* or *cafeorganicocr.com*. Try to avoid long and complicated names, or ones with confusing

symbols, numbers, or excessive hyphens. A customer should be able to hear your farm's name once and type it into their browser without guessing or making mistakes.

Before deciding, check if your chosen name is already taken. You can use websites like www.whois.domaintools.com to search. If the name is free, that's great. If not, try small changes that don't affect how people understand your brand. At the same time, be cautious not to choose a name that is too similar to famous brands or registered trademarks, as this could lead to legal problems or confusion.

Choose the right extension

The extension you choose for your domain is also important. Most small businesses use ".com" because it's familiar and trusted globally. However, if you are a cooperative, ".org" might work well. You can also consider local endings like ".cr" for Costa Rica or ".hn" for Honduras. These are called *country code extensions* and help show that your business is local.

Before you purchase the domain, it's a good idea to also check whether your chosen name is available on social media. You want your Instagram handle, Facebook page, and WhatsApp Business profile to match your website name as closely as possible. This consistency helps customers recognize you across platforms and makes your digital identity stronger.

Where to register

Once you've chosen your domain, make sure to register it through a trustworthy service. Recommended providers include Google Domains, Namecheap, and Hostinger. These platforms are user-friendly and offer useful features like security alerts and automatic renewals. Buying a domain typically costs between 10 and 15 US dollars per year.

Activate SSL

As soon as you register your domain name, one of the first steps you should take is to **activate an SSL certificate.** This adds a security layer to your website by encrypting the connection between your site and its visitors. You'll know a site is protected when the address starts with https:// and there's a little **lock icon** next to it in the browser bar.

Why is this important? First, it protects your customer's data, such as names, phone numbers, and orders especially if you have a contact form. Second, Google favors secure websites in search results, so activating SSL helps you rank higher. And third, modern browsers may show warning messages like "Not Secure" if your site doesn't use HTTPS, which can scare visitors away even if your site is safe in every other way.

Most modern website platforms like Wix, WordPress.com, and Google Sites offer SSL for free and will install it automatically once your domain is connected. However, if you register your domain through platforms like Namecheap, GoDaddy, or Google Domains, you should look for an option to activate SSL right after checkout. In some cases, you may need to press "Enable SSL" or follow a short setup guide.

Add Domain Privacy + HTTPS

After registering your domain, always activate two critical features: privacy protection and HTTPS. Privacy protection hides your personal contact details from public records on the internet. Without privacy protection, anyone can look up your name, address, phone number, and email which can lead to spam, scam emails, or unwanted calls. Without this protection, you may receive spam, phishing emails, or even fake domain renewal scams. Domain Privacy is offered by most providers as a free or low-cost add-on during registration.

HTTPS (shown as a small lock next to your website address) encrypts your site and protects visitors' data. It is especially important if your website includes a contact form or order page. Most providers offer HTTPS for free, or your website builder (like Wix, WordPress, or Google Sites) can activate it automatically.

To illustrate, imagine you run a farm called *Finca El Manantial* in Costa Rica. You decide to register the domain *www.fincaelmanantial.cr*. You also create a business profile on Instagram under the handle *@fincaelmanantial*, and set up a professional email like *ventas@fincaelmanantial.cr*. You enable privacy protection, ensure HTTPS is activated, and your name appears the same across platforms. Now, your business looks credible, secure, and easy to find both online and offline.

Note: The steps to activate SSL depend on where you registered your domain or which website builder you are using. Usually, SSL can be enabled from your hosting account's dashboard (e.g., Hostinger, GoDaddy, Wix). Look for a setting like "Enable SSL" or "HTTPS settings" after connecting your domain. If you don't see it, check the help section of your provider or contact their support team for help.

Add 2FA

Another important step is enabling **Two-Factor Authentication (2FA)** on all accounts linked to your domain, especially your domain registrar, email, and social media accounts. 2FA adds a second layer of security by asking for a code (usually from your mobile phone) when logging in. This protects your business even if your password gets stolen. Hostinger, Google, Facebook, and WhatsApp all offer this option in their security settings.

Two-Factor Authentication (2FA) is available in the security settings of most platforms you use including your email provider, domain registrar, Facebook, Instagram, and WhatsApp Business. To turn it on, go to the Settings or Account section of each app or website, and look for options like "Two-Factor Authentication," "2-Step Verification," or "Login Security." It usually takes just a few minutes and gives your accounts much stronger protection.

Protecting Login Credentials and Managing Access

Use strong, unique passwords for every account like your email, website, Facebook, and Instagram. Avoid simple words like farm123 and instead use a mix of letters, numbers, and symbols (e.g., Red!Tomatoes2025). Use a password manager like Bitwarden or Google Password Manager to store them safely. Always turn on Two-Factor Authentication (2FA) for your most important accounts. This adds a second step when logging in, like a code sent to your phone, and protects you even if your password is stolen. If others help with your farm's digital pages, don't share your password. Use tools like Meta Business Suite to give people roles (Admin, Editor) on your Facebook or Instagram pages. This way, you stay in control and can remove access anytime. Read more on how to give, edit or remove Facebook page access here.

Want to learn more about this topic?

Sustainable and Digital Agriculture

https://www.undp.org/sgtechcentre/sustainable-and-digital-agriculture-1

Benefits of digital agriculture by Digitization, News

https://regaber.com/en/blog/beneficios-de-la-agricultura-digital/

Digital agriculture: enough to feed a rapidly growing world?

https://www.ey.com/en_id/insights/digital/digital-agriculture-data-solutions

Want to learn more about this topic?

"Coherent Market Insights" presents a global sustainable fashion market size and share analysis, highlighting opportunities and threats

https://www.coherentmarketinsights.com/industry-reports/global-sustainable-fashion-market.

"Maximize Market Research" discusses the sustainable fashion market's growth opportunities and strategies

https://www.maximizemarketresearch.com/market-report/sustainable-fashion-market/213432/

Sub-Unit 3: Visual Content Creation and Design Basics

This sub-unit introduces the basics of how to design and produce simple digital materials to promote your agricultural products. You don't need to be a professional designer because with the help of free tools like Canva or Adobe Express, you can create attractive materials such as posters, flyers, social media graphics, packaging labels, or product announcements that look professional and help your farm stand out online.

3.1 Visual storytelling in agriculture

Visual storytelling is the use of images and video to show real life on the farm, from planting and harvesting to family work and traditions. It helps customers connect with your story emotionally, understand your values, and trust your products.

Canva is a free online design tool that works directly in your web browser or via mobile app. It allows you to choose from thousands of templates and customize them with your farm's name, products, prices, and photos. No design experience is required.

3.2 Color theory and contrast

Creating designs that look harmonious together makes your company look more professional. **Use the same colors** in all your materials. Choose 2–3 main colors that reflect your farm or natural products (like green, brown, yellow). **Choose 1–2 fonts** and use them everywhere, titles and body text should be the same style in all posts or posters. **Add your logo** to each design so customers recognize you.

To make text readable and posts stand out, use contrast: Light text on dark backgrounds, dark text on light backgrounds, avoid placing text on busy images. **Use real images from your farm** avoid stock photos when possible. This way, whether a customer sees your post on Facebook, your flyer in a shop, or your label at a market, they know it's you.

3.3 Using Canva to design

You can create Instagram or Facebook posts with prices and offers, design printable posters for local markets, add your farm's logo, contact details, and branding colors, and save designs as images or PDFs for sharing or printing. To start designing, go to https://www.canva.com. Once you create an account, you can choose from the categories like flyer, post, poster and add your own photos from your phone.

Canva is not just for posts and flyers as you can also use it to build your **entire visual identity** as a farm or small agribusiness. You can **create your own logo** using free logo templates. Just type "logo" in the search bar and choose a style that fits your farm (e.g., modern, rustic, organic); **design product labels** for honey jars, egg boxes, or vegetable bags; **make packaging tags or stickers** with your logo, contact info, or social media handle.

3.4 Product catalogues and prices

A product catalog is a simple but useful addition to share what you sell and how people can buy it. We will explore how we can create simple catalogues on Canva, so you can download, print, and share them via messengers or email.

Item	Example
Product name	**"Organic Cherry Tomatoes"**
Photo	**Clean, natural image of product**
Price/unit	**"5.50 per 500g"**
Availability	**"Harvested Tuesdays and Fridays"**
Description (short)	**"No pesticides, grown in open soil"**
Contact info	**WhatsApp number, email, Facebook**

Let's visit canva and work on it: https://www.canva.com/magic-design/

You can customize it by replacing text with your product names and prices, uploading your own farm photos, adding your contact details (WhatsApp, phone, etc.), changing colors to match your farm identity. Instead of using the AI catalog, you can always search directly in the Canva template library for "Farm product catalogue", "Vegetable price list".

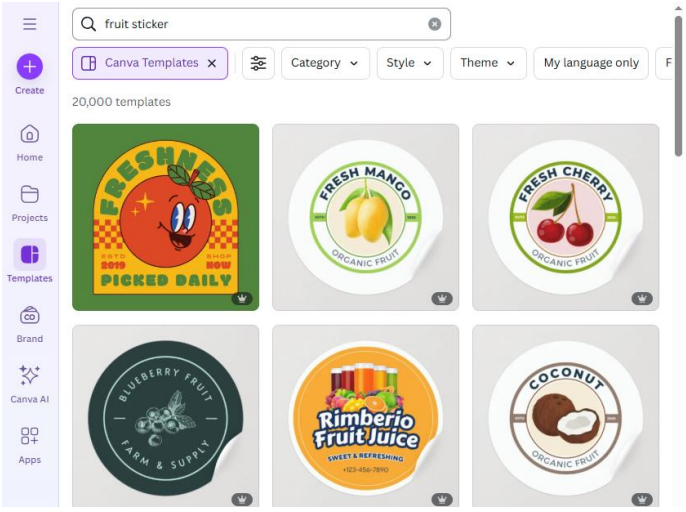
After you finish editing it, click **Download > PDF (Print)** or **PNG** depending on how you plan to share it.

3.5 Stickers and business cards

Stickers

Stickers placed directly on fruit like apples, mangoes, avocados, or bananas are a small but powerful form of **personalized branding**. These stickers help buyers recognize your farm, build trust, and even provide basic info like origin, quality, or farming method.

Thanks to tools like Canva, you can now design your own fruit stickers. Use bold, easy-to-read fonts without cursive, use **contrasting colors** (light text on dark background or vice versa), make sure your logo is **centered** and clear, and keep **less than 4 words** of text. Stickers add a professional touch and farm identity, help customers remember your name, highlight key info like “organic,” “local,” or “handpicked”.



Business cards

Do you still need a business card(opens in a new tab or window) in the digital age? In short, yes. It’s best to think of a business card as a small piece of marketing that you can give to any existing or potential customer. Business cards also communicate a sense of security to the recipient, showing that you are part of an established business that is ready and willing to work together.

Business cards alongside designed email signatures, letterheads, branded envelopes(opens in a new tab or window) all help to create a consistent brand experience for customers or partners of your business or brand.

What to add to your business card

When first starting to create your business card, you have to assess what elements you're going to include. However, there are a few non-negotiables that you should consider:

- **Your name.** It's important that your name is clearly visible and that it uses an easy-to-read font.
- **Your company.** You want the recipient of your business card to associate your name with the business you own or work for.
- **Your current title.** It's important for the cardholder to easily link how you can help them.
- **Contact information.** Another essential piece of information to provide is your contact information. Whether it's your best contact number, email address, or both.

Other items you can add to your business card includes:

- **Your company logo.** Many people opt to add their company logo to their business card as a visual replacement for the company's name on the card. This adds a sleek visual element to the business card and breaks up the text elements.

Example:
Maria Rodriguez

Owner – Finca Valle Verde

Organic fruit & vegetables from Olancho

+504 9876 5432

finca.valleverde@gmail.com

Olancho, Honduras

Instagram: @fincavalleverde

3.6 Video Marketing and content creation

Videos are one of the most powerful tools in digital marketing today. Videos allow to show your farm, your harvesting process, your products and everything that can built a connection with the audience that interests you. With one phone with a good camera, and connection to the internet, to create a nice video.

Video in agriculture can build **trust** by showing the real growing, harvesting, and packaging of food, demonstrating sustainable practices, and reaching more people through platforms like Facebook, Instagram, YouTube, and TikTok. It can also create **emotion** through real movement and a personal touch. Videos can be created in various formats, including product introductions, farm tours, "a day in the life of agripreneurs" videos, educational videos, and behind-the-scenes clips.

Sharing videos on platforms like Facebook, Instagram, TikTok, YouTube, and WhatsApp can increase reach and engagement. Recording farm videos requires using smartphones with good camera quality, filming in daylight, keeping them short and clear, maintaining a clean background, and using subtitles to ensure viewers can understand the content.

How to record your video

You don’t need a professional camera, just a modern smartphone is enough.

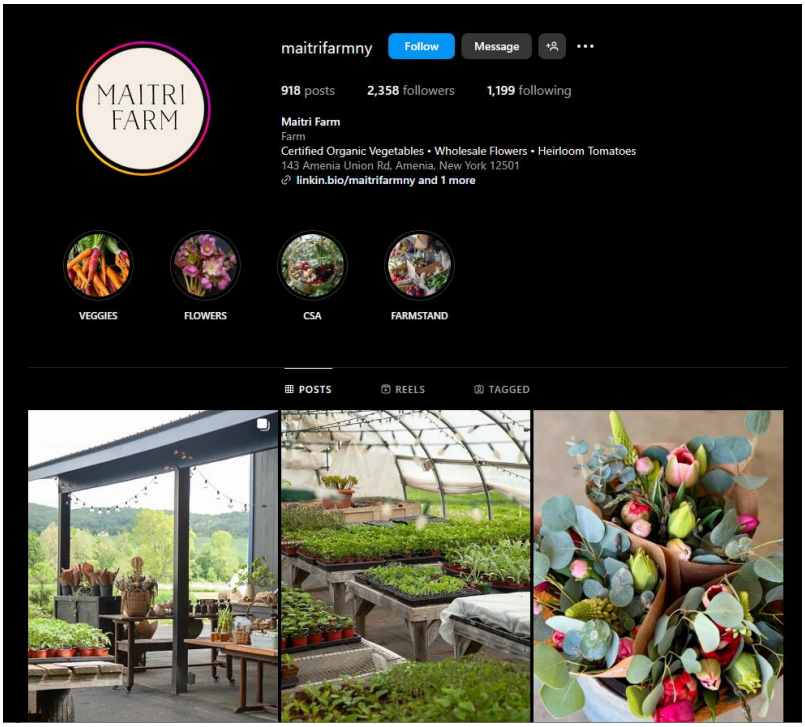
- **Use natural light** during the day for bright, clear shots.
- **Hold your phone horizontally** (for YouTube/Facebook) or vertically (for TikTok/Instagram Stories).
- **Keep the background clean**: Avoid noise (e.g., traffic, machines).
- **Stay steady**: Use a box, tripod, or lean your phone against something heavy.
- Record in a quiet area or add a **voice-over** later.

Editing

Editing is about **cutting out mistakes, adding text or music, and making your video look clean and focused**. **CapCut** is easy to use, free, and works well for TikTok/Instagram available here. **Canva Video Editor** is also online and free; great for branding available here.

Example:

-This farm effectively uses Instagram. Read more here.



Want to learn more about this topic?

The role of social media engagement in building relationship quality and brand performance in higher education marketing

https://www.researchgate.net/publication/368339154_The_role_of_social_media_engagement_in_building_relationship_quality_and_brand_performance_in_higher_education_marketing

Sub-Unit 4: Using AI to Enhance Communication and Media Planning

Why Use AI in Your Agricultural Marketing?

AI tools can do more than just create content — they can help small farms and rural businesses **save time**, **communicate more clearly**, and **stay visible online** even when resources are limited. You don't need to be a tech expert to start using AI in practical ways. AI can help you:

Write clearer, more persuasive messages (for example, ads, product descriptions, captions, emails)
Design marketing visuals faster using tools like Canva's Magic Design or Adobe Express
Maintain a consistent presence on social media with scheduled posts or suggested content ideas
Plan around farm activities (e.g., schedule promotions based on your harvest calendar or seasonal demand)
Answer frequently asked questions automatically on WhatsApp or Facebook (e.g., delivery times, prices)

4.1 Introduction to AI tools for communication (e.g., ChatGPT, Canva AI).

You can think of AI tools as **a virtual helper** for your business, not something technical, but something practical. Instead of spending 30 minutes writing a product post or answering the same question over and over, you can let AI assist you. **Example**: Use ChatGPT to write a WhatsApp message like: "Good morning! This week we have fresh tomatoes and mint. Let us know if you'd like to reserve a delivery for Friday!" Or use Canva Magic Design to create a flyer that automatically includes your farm name, logo, and products just by typing a short description.

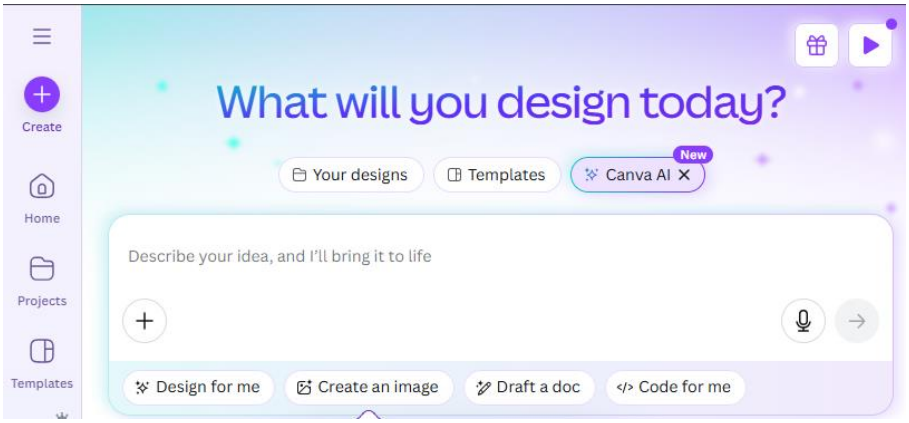
These tools are especially useful for rural businesses because they:

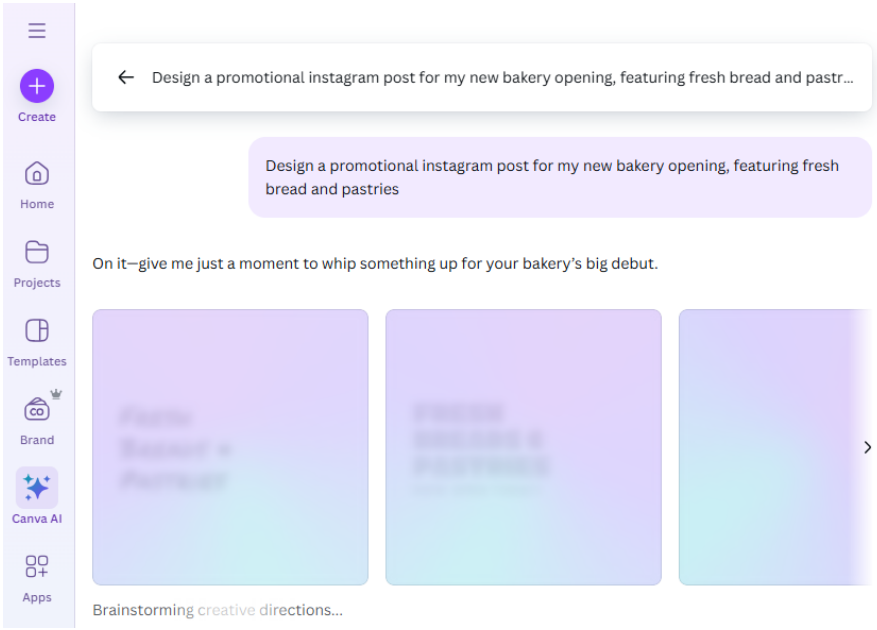
Save time on writing and editing
-Help maintain a regular online presence, even during busy farm seasons
-Make professional visuals without needing design skills
-Allow quick replies and easy translation for diverse customer groups
-Help schedule content around real farm events (like harvest or market days)

Canva AI

Canva's AI tools help you create visual content such as product posters or social media graphics much faster, even if you have no design experience. This is especially useful for farmers who need quick updates for weekly markets or harvest promotions.

These tools are helpful for small business owners and farmers who don't have time to create everything from the beginning. You can generate ideas, remove backgrounds, write short texts, or adapt your design to different sizes with a few clicks.





Magic Design is an AI generator that helps you create designs in seconds. Simply describe what you want to receive, and this tool will create it for you. Keep in mind that with resize automatically you can turn an Instagram post into a Facebook story or flyer without redoing the layout.

4.2 Generating post captions, schedules, and media calendars.

Prompting for Common Communication Tasks can include examples like "Write a friendly Instagram caption for a small farm in (location) promoting pesticide-free (fruit). Add emojis and 3 hashtags", "Write a short product description for organic (product). Mention no pesticides and rich flavor", "Create a 7-day Facebook post plan for a farm that grows lettuce, mangoes, and herbs" and then it gives you something like:

Day	Post Idea
Mon	“Fresh lettuce available now!” photo post
Tue	“Mango fun fact” carousel
Wed	Customer testimonial
Thu	Video: watering the herbs
Fri	Offer: “Buy 2 get 1 free on basil”
Sat	Market day photo
Sun	Behind-the-scenes farm family photo

Also you can adjust the chat’s tone and style by saying “Rewrite this product description in a more professional tone” Or “Make this message more informal” or “Translate this into Spanish but keep the same tone.”

You can also use AI to plan your content around your harvest schedule or seasonal events. For example, you might post about mangoes in May or offer herb bundles before holidays.

Some indicative generative AI tools

Here are some useful tools you can explore, depending on your needs: Jasper for AI-powered marketing content, Anyword for writing support, Shortwave for email writing and management, Notion AI for creating a second brain , Mem for organized notes, Runway for freeform and creative videos, Wondershare Filmora for polishing video, Midjourney for the best AI image results.

4.3 Automating replies and content ideas for WhatsApp and social media.

Before using any automation tool, it's important to understand your own communication flow. Ask yourself: What messages do I send **every day or week**? What tasks take **a lot of time but little thinking**? Where do I miss chances to respond, confirm, or follow up? For example, if you're always replying with your weekly price list, confirming delivery details, or reminding clients about pickup days, these are great places to start automating. The goal is not to remove personal connection but to save time for real conversations, planning, and work in the field.

When someone discovers your farm, they usually go through a few steps:

Awareness when they see your product or post. **Interest** when they ask a question or visit your WhatsApp/catalog. **Decision** when they place an order or ask for prices. **Delivery** when you confirm and fulfill the order. **Follow-up** when you remind them next week or say thank you. Automation can support each of these stages by sending info faster, confirming orders automatically, or following up with regular clients.

There are two main ways to set up auto-replies on WhatsApp: Using the WhatsApp Business app (easy, no coding), and using WhatsApp Business APIs (for large companies or developers). In this unit, we focus on the WhatsApp Business app, which is free and works on your phone.

Below you can find a full tutorial on how to set it up, here.

Step 1: Open the App

Download and open **WhatsApp Business.** Tap the three dots (⋮) on the top right. Go to **"Business tools"**

Step 2: Create a Greeting Message.

Tap **"Greeting message", t**urn it ON, tap the pencil 🖉 icon to write your message. "Hi! 👋 Welcome to our farm! We're happy to hear from you. We'll reply soon!" or "Thanks for writing! We're closed now but will get back to you first thing tomorrow"

Step 3: Save Quick Replies for FAQs

Tap **"Quick replies" and a**dd common answers like: /prices → "Here's our price list for the week: [list]" and /hours → "We're open Mon–Sat, 8am–5pm." To use them, type / while chatting and pick your saved reply.

Tools on Marketing Automation

WhatsApp is a great place to begin, but other tools can help you automate parts of your farm communication too: **Mailchimp** to schedule email updates and newsletters to loyal customers, **Zapier** to connect different tools (e.g., send a WhatsApp message when someone fills out a Google Form). **HubSpot** to manage contacts, track orders, and create automated reminders or messages

Sub-Unit 5: Success Cases from European Agricultural Digital Marketing

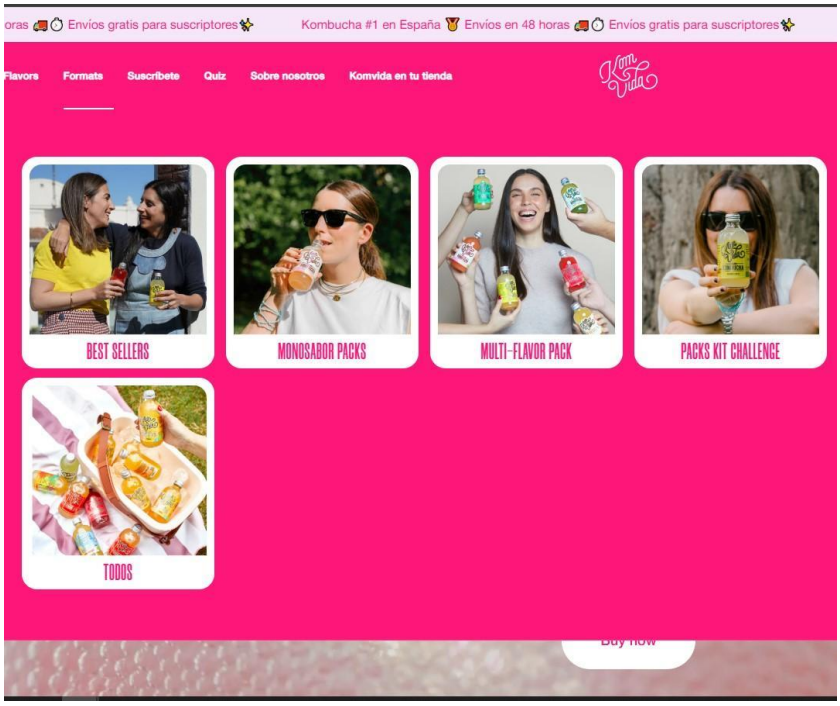
5.1 Case studies from cooperatives and agribusinesses using social media effectively

Komvida Kombucha (Extremadura, Spain)

Komvida Kombucha (Fregenal de la Sierra, Badajoz) Founded by Beatriz Magro and Nuria Morales, this kombucha brand is produced in a small village in Extremadura and is now distributed in more than 7,000 points of sale. Thanks to a solid digital strategy focused on values such as sustainability, health, and rural female employment, Komvida has connected

with a young and committed audience through social media, influencers, and e-commerce. (Innovaspain, 2020; El País, 2024).

This success is credited to a strong digital marketing strategy centered on rural branding and values like sustainability, health, and empowering rural women which resonate with young, eco-conscious consumers. (MIOTI, 2025).



Authentic storytelling and highlighting local values can help even remote farm businesses gain nationwide (and international) visibility and trust. Tropical farms in Latin America can similarly have some unique local culture or social missions in digital campaigns to appeal to wider health- and ethics-minded markets.

Read more:

https://komvida.com/pages/nuestra-historia-1

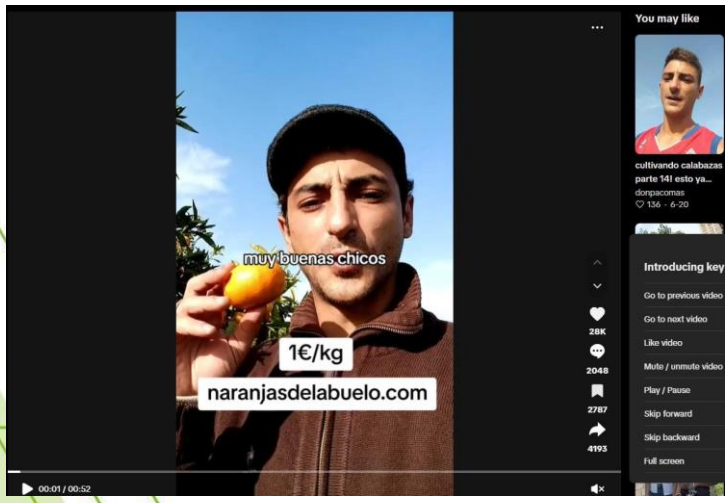
EntreSetas – Nazaret Mateos (Palencia, Spain)

EntreSetas is a one-woman organic mushroom farm in rural Castile & León. Owner Nazaret Mateos pioneered a low-resource, eco-friendly method for cultivating gourmet mushrooms. Her savvy use of digital content and social media turned this small farm into a celebrated example of innovation. This case shows that even a tiny farm can punch above its weight by telling its story and demonstrating transparency in methods. (MIOTI, 2025).

Read more: https://www.entresetas.com/sobre-entresetas/

Don Paco in TikTok – (Valencia, Spain)

A young farmer, known as @donpacomas on TikTok, became a viral sensation by sharing the everyday reality of his family's orange grove. Through short, honest videos he demonstrated how he created a website to sell his grandfather's oranges online, cutting out middlemen. In one viral video, he openly calculated the slim profits from selling 4,000 kg of mandarins at €1/kg, revealing he "was willing to lose money this year to educate people about farming" (El HuffPost, 2025). Radical transparency and personal storytelling can powerfully engage consumers.



Read more:

https://www.huffingtonpost.es/virales/un-agricultor-vende-internet-naranjas-campo-abuelo-esto-gana.html

Vanetta Food (Galicia, Spain)

Vanetta Food is a small Galician eco-food company that embraced digital marketing to reimagine local cuisine. They create vegan versions of traditional dishes (like zorza or cachopo) and have leveraged social media to become mainstream. By sharing enticing food visuals and collaborating with foodie influencers, Vanetta built buzz well beyond the usual vegan community. Cultural storytelling (e.g. reinventing local recipes) combined with good use of visual platforms can expand a small food producer's market.

Read more: https://vanettafood.com/filosofia/

Carne D'Erva – Regenerative Beef Startup (Ribatejo, Portugal)

Carne D'Erva ("Grass-Fed Meat") exemplifies how a small local farm brand can scale up through an all-digital strategy. Started by two friends raising cattle on pasture in the Ribatejo plains, this carbon-neutral regenerative beef venture chose to sell exclusively online. With the help of a marketing agency, Carne D'Erva built a strong rural brand identity and an e-commerce platform conveying their values: animal welfare, slow-grown quality, and sustainability (Agroportal, 2020; Visão, 2024). The result, as the CEO of their agency noted, "proves a local brand with a conservative business (cattle) can achieve impressive growth using digital alone"

Read more: https://www.agroportal.pt/carne-d-erva-estrategia-digital/#:~:text=Este%20crescimento%20exponencial%20deve,os%20resultados%20falam%20por%20si

And https://historia.carnederva.pt/

Quinta do Arneiro (Mafra, Portugal)

Quinta do Arneiro is an organic family farm near Mafra that has thrived by combining traditional community engagement with modern digital outreach. For years they delivered weekly farm boxes (cabazes) of seasonal 100% organic produce directly to Lisbon-area households. The farm's vibrant Instagram and Facebook pages serve as digital shopfronts. They even opened an on-farm restaurant to let visitors taste the organic lifestyle.

Read more: https://quintadoarneiro.pt/en/how-everything-started/ and https://sol.sapo.pt/topicos/quinta-do-arneiro/#:~:text=agricultura%E2%80%9D

5.2 Strategies and lessons learned

From the case studies above, we see that small-scale organic farms and initiative can use digital marketing to reach consumers. Authentic storytelling like the daily life on Don Paco's TikTok and the community in Komvida's case build trust. Rural branding can turn what is perceived as a disadvantage (like remote locations) into brand strengths like indigenous farming techniques, biodiverse landscapes and "humble" farming. Transparency and trust are also very big on the cases we studies, as being open about one's practices and challenges like costs and seasonality can engage the consumers and make them relate to the producers. Also being transparent about costs can somehow justify higher prices and loyalty. As we see, successful farms use all tools like Instagram and TikTok to reach different audiencies. But except for the online experience, they can offer in-person experiences like visiting the farm. These strategies are highly transferable to tropical farming settings, where telling the story of sustainably grown tropical products and connecting directly with consumers

Want to learn more about this topic?

The Implementation of Digital Marketing in Brand Promotion

https://www.researchgate.net/publication/372407095_The_Implementation_of_Digital_Marketing_in_Brand_Promotion

Conclusion

Digital marketing and communication in agriculture are increasingly shaping how professionals in the sector work and engage communities, consumers, and agribusinesses in rural development. In the era of climate change and environmental crises, effective communication can empower individuals who might otherwise have limited opportunities to participate in decision-making related to the adoption of ecological practices in agriculture.

One of the main tools helping farmers establish an online presence is social media - platforms such as Facebook, WhatsApp, Instagram, and TikTok - while email remains a more traditional and direct means of digital communication. Social media help agri-professionals to advertise their businesses, connect with customers of various age groups, and engage them for longer periods of time. Metrics are a crucial factor in planning the next steps of a digital campaign, especially when combined with conversions, ROI, and other key advertising indicators.

In addition to social media, having an online presence through a dedicated business website is equally important. Numerous tools make website creation fast and easy, even for users who are not familiar with new technologies - examples include Wix, WordPress, and Google Sites. When combined with SEO tools, an agri-professional can significantly enhance their online visibility and drive potential business growth.

The content shared by agricultural professionals plays a crucial role in determining the success of their digital efforts. From Canva to video marketing, editing techniques, and the use of AI, content is what digital users interact with in online communications. Several success stories from around the world highlight that digital marketing and communication are powerful tools that can transform the perception of agriculture and support its growth in business, economic and ecological terms.

Learning Activities

Preliminary exercises

Activity 1: Where is My Audience? (5 min)

Identify which platform suits your farming business.

1. Open your Facebook, Instagram, and WhatsApp apps.
2. Think about your current or future customers:

Are they older or younger?

Do they live in cities or rural areas?

3. Match each audience to the platform:
    a. **Facebook**: Older buyers, community events, long updates.
    b. **Instagram**: Young adults, strong visuals.
    c. **WhatsApp**: Regular clients, fast orders.
4. Write in your notebook or notes app:

"I will focus on _____ for my business because _____."

Activity 2: What Should I Post? (8 min)

80% of your posts should **educate, inspire, or connect**. Only 20% should be **selling your products**.

1. On paper or phone notes, write 5 post ideas:

3 that are educational or storytelling (e.g., harvest update, “my mango trees today”)

2 that promote a product (e.g., “Fresh eggs! 2.50 each.”)

Activity 3: Take and Share Your Story (10 min)

1. Apply visual storytelling with photos.
2. Use your phone to take 2 pictures:

- 1 of something real from your farm today (e.g., crop, animal, person working).
- 1 of your product (nice lighting, simple background).

3. Open Instagram or Facebook. Don’t post — just **practice** making a post.

4. Add a **caption** using local language and **1–3 hashtags** (e.g., #OrganicCostaRica).
5. Save the post as a draft. Write in your notes:

"My caption: _____"
"Hashtags: _____"

Activity 4: Your First Weekly Calendar (7 min)

Plan consistent, simple content.
1. On paper or in your phone calendar, sketch a simple weekly plan:
    - Monday: Harvest update photo
    - Wednesday: Tips for better tomatoes
    - Friday: Offer: "Buy 2kg, get 1 free"
2. Write down three posting days and what you'll share.

More advanced exercises:

Activity 1: Build Your Visual Identity

Create a simple visual style guide (colors, fonts, and logo) using Canva.

1. **Open Canva** and search "logo" in the template library. Choose a logo style (e.g., rustic, organic).
2. Customize:
    - Farm name (e.g., "El Paraíso Natural")
    - Add simple symbols: leaves, barn, sun, animals.
    - Choose 2–3 natural colors (green, brown, yellow).
    - Select 1 title font and 1 body font that are easy to read.
3. Save your logo and reuse it in the following activities.
4. Take a screenshot of your final logo and write in Notes:

- My brand colors: _____
- My fonts: _____
- My style is: Modern / Rustic / Playful / Natural

What you should have now is:

- Your logo file (.PNG)
- Visual identity description (colors & fonts noted)

Activity 2: Design a Product Catalogue

Use a Canva template to create a 1-page catalogue of your farm products with prices.

1. Go to Canva Product Catalogue Templates or search "vegetable price list."
2. Choose a 1-page template and customize:
    - Add 4–6 products (name, short description, price/unit, harvest dates)
    - Insert 2–3 farm photos (real, from your phone)
    - Add contact info: WhatsApp, email, location
    - Insert your logo and keep font/colors consistent
3. Export as PDF or PNG for mobile sharing.
4. Share the file with a family member or colleague and ask: "Can you tell what I sell, how to order, and how much things cost?"

What you should have now is:

- 1-page PDF or PNG product catalogue

Activity 3: Set Up Your WhatsApp Business Profile (10–15 min)

Create a complete, professional business profile.

1. Download WhatsApp Business and open it.
2. Tap ⋮ > Business Tools > Business Profile.
3. Fill in:
    - Business name (e.g., “Finca Sabor Verde”)
    - Address, hours, farm description
    - Add your logo and farm photo as profile image

Assessment

Quiz 1

1. Which two platforms prioritize visual content most?
2. Give two examples of non-promotional posts that can build trust.
3. Why is it important to post consistently rather than randomly?
4. What's one reason to use local language in your posts?
5. True or False: Using over 20 hashtags improves post visibility.
6. Multiple Choice:
7. Which of the following is not an engagement-boosting strategy?

a) Posting behind-the-scenes photos

b) Ignoring customer comments

c) Creating harvest countdowns

d) Sharing user photos of your produce

Quiz 2

1. What three elements make your brand identity consistent across designs?
2. What's the benefit of using real farm images vs. stock photos?
3. **True or False**: Using more than five different fonts in one flyer is good for creativity.
4. **Multiple Choice**:
   What Canva feature helps you quickly adapt one design to many platforms?
   a) Canva Flash
   b) Resize Tool
   c) SmartCut

   d) FilterBoost
5. **Matching** – Match the Canva use to the goal:
   - __ Logo template
   - __ Flyer layout
   - __ Product label
   - __ Video editor

   a) Brand identity
   b) Visual promotion for a local market

c) Packaging branding
d) Short promotional clip creation

Quiz 3

1. What feature in WhatsApp helps group customers by purchase stage?
2. **True or False**: A WhatsApp catalog must include product images.
3. **Multiple Choice**:
   What is the purpose of "Quick Replies"?
   a) Track unpaid orders
   b) Send pre-written answers faster
   c) Collect reviews
   d) Schedule social media posts
4. **True or False**: Customers can check out and pay directly inside WhatsApp.
5. **Short Answer**: List two items you should include in your WhatsApp business profile.
6. **Matching** – Match each tool with its use:

7. __ Catalog

8. __ Labels

9. __ Business Profile
   a) Customer grouping
   b) Displaying available products
   c) Showing farm info and contact details

Answers:

Quiz 1:

1. Instagram, TikTok
2. Farm updates, planting process, educational tips, behind-the-scenes photos
3. Builds customer expectations and algorithm favorability
4. Makes content more relatable and searchable locally
5. **False** – Too many hashtags can lower visibility
6. **b** – Ignoring customer comments

Quiz 2:

1. Colors, fonts, logo
2. Builds trust and shows authenticity
3. **False** – Too many fonts make design look unprofessional
4. **b** – Resize Tool
5.

- Logo template → a
- Flyer layout → b
- Product label → c
- Video editor → d

Quiz 3:

1. Labels
2. **True**
3. **b** – Send pre-written answers faster
4. **False** – Orders are placed via chat, but payments happen externally
5. Business name, location, working hours, contact info, profile photo
   - Catalog → b
   - Labels → a
   - Business Profile → c

References

Agroportal. (2020, June). *Plataforma Reforma Agrária: A economia local ao serviço da soberania alimentar*. Retrieved July 1, 2025, from https://www.agroportal.pt/plataforma-reforma-agraria-a-economia-local-ao-servico-da-soberania-alimentar/

Ahmed Sodal Asir (2022). *Agricultural Communication*. Somali National University. Chapter published on ResearchGate. https://www.researchgate.net/publication/365777566

El HuffPost. (2025, February 3). *Un agricultor vende por internet las naranjas de su abuelo y comparte los resultados: "Estoy dispuesto a perder dinero"*. Retrieved July 1, 2025, from https://www.huffingtonpost.es/virales/agricultor-vende-internet-naranjas-abuelo-comparte-resultados-dispuesto-perder-dinero.html

El País. (2024, February 27). *La kombucha de Extremadura que se ha colado en la nevera de los 'millennials'*. Retrieved July 1, 2025, from https://elpais.com/economia/negocios/2024-02-27/la-kombucha-de-extremadura-que-se-ha-colado-en-la-nevera-de-los-millennials.html

FAO (2014). *Communication for Rural Development Sourcebook: Module 1 – Communication for Development*. Rome: Food and Agriculture Organization of the United Nations. Available at: https://www.fao.org/4/w3240e/w3240e10.htm

Google. (n.d.). *SEO Starter Guide: The Basics*. Google Search Central. Retrieved May 28, 2025, from https://developers.google.com/search/docs/fundamentals/seo-starter-guideGoogle for Developers

Google. (n.d.). *Get started with Google Business Profile*. Google Business Profile Help. Retrieved May 28, 2025, from https://support.google.com/business/answer/7039811google.com+7support.google.com+7Dalton Luka+7

Innovaspain. (2020, February 24). *Kombucha: la bebida de los millennials (y de los mayores también)*. Retrieved July 1, 2025, from https://www.innovaspain.com/komvida-kombucha-extremadura/

Meta. (n.d.). *Set up a business account on Instagram*. Meta Business Help Center. Retrieved May 28, 2025, from https://www.facebook.com/business/help/502981923235522Facebook

Meta. (n.d.). *Get started with Meta Business Suite*. Meta Business Help Center. Retrieved May 28, 2025, from https://www.facebook.com/business/tools/meta-business-suite/get-startedFacebook

Meta. (n.d.). *Get started with the WhatsApp Business Platform*. Meta for Developers. Retrieved May 28, 2025, from https://developers.facebook.com/docs/whatsapp/business-management-api/get-started/FirstCom Academy+4developers.facebook.com+4developers.facebook.com+4

MIOTI Tech & Business School. (2025, June). *Cómo el marketing digital impulsa el nuevo emprendimiento rural*. Retrieved July 1, 2025, from https://mioti.es/blog/marketing-digital-emprendimiento-rural/

Observador. (2023, November 15). *Don Paco, o agricultor espanhol do TikTok que partilha os lucros e perdas da sua quinta.* Retrieved July 1, 2025, from https://observador.pt/2023/11/15/don-paco-o-agricultor-do-tiktok-que-partilha-os-lucros-e-perdas-da-sua-quinta/

Wix. (n.d.). *About the Wix AI Assistant*. Wix Developers. Retrieved May 28, 2025, from https://dev.wix.com/docs/develop-websites/articles/workspace-tools/developer-tools/ai-assistants/about-the-wix-ai-assistantdev.wix.com+1dev.wix.com+1

Coursera. (n.d.). *Build a Full Website using WordPress*. Coursera. Retrieved May 28, 2025, from https://www.coursera.org/projects/build-a-full-website-using-wordpressvideo+5Coursera+5WPcomMaven+5

Google. (n.d.). *Get started with Google Business Profile*. Google Business Profile Help. Retrieved May 28, 2025, from https://support.google.com/business/answer/7039811

Canva. (n.d.). *Canva Magic Design*. Canva. Retrieved May 28, 2025, from https://www.canva.com/magic-design/

WhatsApp. (n.d.). *How to create and maintain a catalog*. WhatsApp Business Help Center. Retrieved May 28, 2025, from https://faq.whatsapp.com/commerce/catalogs/how-to-create-and-maintain-a-catalog

WhatsApp. (n.d.). *How to use broadcast lists*. WhatsApp Business Help Center. Retrieved May 28, 2025, from https://faq.whatsapp.com/iphone/chats/how-to-use-broadcast-lists

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