FARM2LA

Transforming Agriculture Education for Sustainable Development in Latin America

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FARM2LA Need Research Report

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Introduction

The FARM2LA project, Transforming Agriculture Education for Sustainable Development in Latin America, is an ambitious endeavor funded by the Erasmus+ program. It unites partner countries across Europe and Latin America in a shared mission to modernize agricultural Vocational Education and Training (VET) systems. This consolidated report synthesizes findings from comprehensive desk research and field investigations, providing a comparative analysis of agricultural education frameworks, sustainability practices, and the integration of green and digital skills.

Through both literature reviews and field research, including focus groups conducted across partner countries such as Greece, Germany, Mexico, and Colombia, the project has explored diverse regional approaches to agricultural training and sustainability. These focus groups facilitated direct engagement with stakeholders, including educators, policymakers, and farmers, uncovering localized insights into the challenges and opportunities within agricultural education systems. They provided an invaluable qualitative dimension to the project, enriching the understanding of on-ground realities and community-specific needs.

The findings reflect a spectrum of issues, from digital transformation and sustainable practices to policy alignments with global frameworks like the European Green Deal. They also highlight how field research complements desk studies by capturing voices from the field, emphasizing practical barriers and potential solutions.

By consolidating these findings, this report aims to offer a strategic foundation for advancing agricultural education, fostering innovation, and promoting sustainability development across Latin America and beyond. Through its dual research approach, FARM2LA aspires to not only bridge educational divides but also to create actionable pathways for modernizing agricultural practices in an era of global ecological and technological transformation.

COUNTRY-BASED ANALYSIS

1. Greece

1.1. Introduction

The transformation of agricultural education in Greece is a critical focus as the country seeks to modernize its Vocational Education and Training (VET) systems, integrating sustainability and digital technologies to enhance the skills of its agricultural workforce. As part of its commitment to the European Green Deal and the Common Agricultural Policy (CAP) 2023-2027, Greece aims to support sustainable agricultural practices that improve productivity, environmental stewardship, and rural development.

The Greek agricultural sector faces increasing challenges due to climate change, economic pressures, and the need for technological advancement. To address these challenges, Greece is focusing on modernizing its VET systems by equipping trainers and farmers with key competencies in sustainable farming methods, digital technologies, and innovative practices. These efforts are closely aligned with national strategies that promote rural development and environmental sustainability, such as the National Strategic Plan for CAP, which emphasizes eco-schemes and the promotion of green skills.

At the heart of this transformation is the integration of digital skills into agricultural education. From precision farming to the use of smart technologies, digital tools are becoming essential for modern Greek agriculture. These technologies not only help optimize resource use but also empower farmers to make data-driven decisions, thus improving resilience and productivity.

This literature review will explore Greece's approach to modernizing its agricultural education systems, focusing on how VET programs are adapting to incorporate green and digital skills. By analyzing relevant national policies and frameworks, as well as case studies and best practices, this review aims to provide insights into the critical areas for advancing agricultural education in Greece.

1.2. Methodology

The methodology for the literature review in this project was designed to comprehensively gather relevant information on Vocational Education and Training (VET) in the agricultural sector, with a focus on Greece. The research approach was systematic, incorporating multiple sources to ensure a thorough understanding of the current state of VET for Greek farmers and the integration of sustainable agricultural practices and digital tools.

The review accessed a variety of databases and resources, including academic platforms such as JSTOR, Scopus, and Google Scholar, which provided peer-reviewed articles on sustainable agriculture, green skills, and VET methodologies in the context of Greece. Additionally, reports from national bodies such as the Greek Ministry of Rural Development and Food, the European

Commission, and international organizations like the FAO (Food and Agriculture Organization of the United Nations) were used to capture the broader policy landscape influencing Greece.

Relevant reports from the European Union, especially those concerning the Common Agricultural Policy (CAP) and European Green Deal, were also included to understand the role of EU policy in shaping Greek agricultural education.

To guide the search, a well-structured set of keywords was used, including "VET education in agriculture Greece," "vocational training for farmers in Greece," "sustainable agriculture in Greece," "digital tools in Greek farming," and "green skills for agriculture."

These keywords were refined to ensure the collection of focused, up-to-date results specific to the Greek context.

The search process involved defining the scope of the review, selecting relevant databases, conducting keyword searches, and filtering results based on relevance, recency (within the last decade), and academic reliability. Cross-referencing and snowballing techniques were applied to expand the number of sources and ensure comprehensive coverage of material relevant to Greek agricultural education. Finally, the gathered literature was analyzed thematically to

extract insights related to sustainable farming practices, the role of digital tools in Greek VET systems, and best practices in agricultural training in Greece.

This thorough methodology ensures that the literature review aligns with global and European best practices while addressing the specific needs of VET educators and farmers in Greece. The insights gained will inform the development of curricula that support sustainable agricultural practices and the integration of digital technologies in Greek agriculture.

1.3. Thematic Sections

1.3.1. Sustainable Agricultural Practices

Sustainable agricultural practices are increasingly central to Greece's agricultural strategy, aligned with both national priorities and the broader goals of the European Green Deal. These practices aim to enhance environmental resilience, support food security, and promote the long-

term sustainability of the agricultural sector. In Greece, key approaches include organic farming, agroecology, and conservation agriculture, all of which are supported by national and EU policies.

- **Organic Farming:** Greece has seen a steady increase in organic farming over the past decade, driven by both domestic demand and EU initiatives. According to the Greek

Ministry of Rural Development and Food, organic farming now constitutes a significant portion of Greece's agricultural production (Greek Ministry of Rural Development and Food, 2022). The Common Agricultural Policy (CAP) provides financial support to farmers who adopt organic practices, which focus on minimizing the use of synthetic chemicals, improving soil health, and promoting biodiversity. Organic farming in Greece is also supported by eco-schemes under CAP 2023-2027, which encourage farmers to adopt sustainable methods through financial incentives (European Commission, 2023).

- **Agroecology:** Agroecology, which emphasizes the integration of ecological principles into farming practices, is another area gaining traction in Greece. Agroecological approaches in Greece involve crop diversification, the use of natural pest control methods, and the preservation of local ecosystems. These methods align with the EU's Farm to Fork strategy, which aims to create a sustainable food system by reducing the environmental impact of agriculture (European Commission, 2020). Several pilot projects in rural areas of Greece, supported by the EU and local institutions, have demonstrated that agroecological methods can improve productivity while also enhancing resilience to climate change (FAO, 2023).
- **Conservation Agriculture:** Conservation agriculture is gaining momentum in Greece, particularly in regions that are vulnerable to soil erosion and water scarcity. This approach includes practices such as minimum tillage, crop rotation, and cover cropping, which help improve soil structure, reduce water consumption, and enhance biodiversity. Conservation agriculture aligns with Greece's National Strategic Plan for CAP, which prioritizes the sustainable management of natural

resources (European Commission, 2023). According to recent reports from the European Commission, the implementation of conservation agriculture in Greece has been crucial in combating desertification and improving the sustainability of agricultural lands (European Environment Agency, 2023).

In summary, Greece's agricultural sector is undergoing a transformation towards more sustainable practices, driven by both national and EU-level policies. Organic farming,

agroecology, and conservation agriculture are at the forefront of this shift, offering promising solutions to the environmental challenges facing the sector. These practices not only contribute to sustainability but also improve the resilience and productivity of Greek agriculture, ensuring long-term food security and environmental health.

1.3.2. VET Systems in Agriculture

Greece's Vocational Education and Training (VET) systems in the agricultural sector have undergone significant modernization in recent years, aligning with national and EU goals for innovation and sustainability (Cedefop, 2023). These efforts focus on equipping farmers with the skills necessary to meet the challenges of climate change, resource management, and market demands.

- **Integration of Sustainable Practices:** To address these challenges, Greek VET programs emphasize sustainable agricultural practices through curricula that focus on environmental stewardship and efficient resource use. Agricultural schools and institutes across Greece are implementing training programs that provide students with knowledge and skills in sustainable farming methods, such as crop rotation, organic farming, and integrated pest management (Greek Ministry of Rural Development and Food, 2022). These programs are designed to meet the specific needs of the agricultural sector, preparing students to implement sustainable practices effectively in their future careers.
- **Work-Based Learning and Practical Training:** Additionally, the VET systems in Greece follow a blended model that integrates both theoretical education and practical work-based learning. Students gain hands-on experience through partnerships between VET providers and local agricultural enterprises (European Commission, 2023). This approach not only enhances the learning experience but also ensures that students are well-prepared to tackle real-world challenges in agriculture. Work-based learning is a key component of the curriculum, allowing students to apply their knowledge in actual farming environments.

1.3.3. Green and Digital Skills

As Greece modernizes its agricultural sector, the integration of green and digital skills into vocational education and training (VET) has become essential. These skills not only enhance the sustainability of farming practices but also improve productivity and resilience in the face of environmental challenges. The Greek government, in alignment with European Union policies, is actively promoting the development and application of these competencies within the agricultural workforce.

- **Green Skills:** Green skills encompass a wide range of knowledge and practices that promote environmentally sustainable agricultural methods. In Greece, VET programs emphasize green skills through curricula focused on sustainable practices such as organic farming, agroecology, and integrated pest management. These programs equip students with the knowledge necessary to implement practices that reduce environmental impact, enhance biodiversity, and improve soil health (Greek Ministry of Rural Development and Food, 2022). Recent initiatives also highlight the importance of climate-smart agriculture, which focuses on adapting agricultural practices to mitigate climate change effects while ensuring food security.
- **Digital Skills:** Digital skills are increasingly important in modern agriculture, and Greece is making significant strides in this area. The integration of precision

  farming technologies, Internet of Things (IoT) applications, and data analytics is transforming how farmers manage their operations. Greek agricultural schools are incorporating training on digital tools such as drones for crop monitoring, soil sensors for precision irrigation, and farm management software that utilizes big data to enhance decision-making (European Commission, 2023). These technologies enable farmers to optimize resource use, increase yields, and minimize waste.

The Digital Strategy for Agriculture initiated by the Greek government aims to enhance digitalization in the agricultural sector, aligning with the broader EU Digital Strategy. This initiative supports the development of smart farming technologies and encourages farmers to adopt innovative solutions that improve operational efficiency and sustainability (Greek Ministry of Rural Development and Food, 2022). Additionally, EU-funded programs such as Horizon Europe provide resources for research and innovation in digital agriculture, helping to foster collaboration between academia and the agricultural sector.

- **Training and Capacity Building:** To effectively integrate green and digital skills, Greece's VET systems are focusing on training and capacity-building initiatives. Workshops, seminars, and hands-on training programs are being developed to enhance the skills of farmers and agricultural workers in using advanced technologies and sustainable practices. Collaboration with private sector partners and research institutions further enriches the training experience, ensuring that the workforce is equipped to meet the evolving demands of the agricultural landscape.

In summary, Greece is actively integrating green and digital skills into its agricultural VET programs, supported by national strategies and EU policies. This focus on sustainability and innovation not only prepares the agricultural workforce for the future but also contributes to the overall goal of creating a resilient and sustainable agricultural sector.

1.3.4. National Policies and Frameworks

Greece's national policies play a pivotal role in shaping sustainable agricultural practices and enhancing vocational education and training (VET) systems within the sector. These policies are designed to align with European Union frameworks, particularly the Common

Agricultural Policy (CAP) and the European Green Deal, ensuring that Greece's agricultural practices are sustainable, innovative, and resilient.

- **National Strategic Plan for CAP 2023-2027:** The National Strategic Plan for CAP 2023-2027 serves as a comprehensive framework guiding Greece's agricultural policy. This plan emphasizes sustainability, environmental protection, and rural development, aiming to enhance the competitiveness of the agricultural sector while promoting eco-friendly practices. Key components of the plan include eco-schemes that incentivize farmers to adopt sustainable farming methods, such as organic farming, agroecology, and precision agriculture. These initiatives are intended to improve soil health, increase biodiversity, and reduce greenhouse gas emissions from agricultural activities (European Commission, 2023).
- **Support for Rural Development:** In addition to the CAP, Greece has implemented various initiatives to support rural development. The Rural Development Program (RDP) provides funding for projects that promote sustainable agricultural practices, enhance the quality of life in rural areas, and foster economic diversification. This program supports investments in agricultural infrastructure, innovation in farming techniques, and training for farmers, ensuring that they are equipped with the necessary skills to thrive in a competitive market (Greek Ministry of Rural Development and Food, 2022).
- **Vocational Education and Training Initiatives:** Recognizing the importance of education in achieving sustainable agricultural goals, Greece has developed policies to enhance VET systems in agriculture. Initiatives aimed at integrating green and digital skills into agricultural education are being prioritized. This includes collaboration with educational institutions and industry stakeholders to design training programs that meet the evolving needs of the agricultural workforce. The government's commitment to

improving VET aligns with the EU's emphasis on equipping individuals with the competencies necessary for a sustainable future in agriculture (Cedefop, 2023).

- **Collaboration with EU Policies:** Greece's national policies are closely aligned with EU-level initiatives that promote sustainability and innovation in agriculture. The European Green Deal outlines ambitious targets for reducing carbon emissions and enhancing biodiversity across the agricultural sector. Greek policies aim to contribute to these goals through the promotion of sustainable practices and the implementation of innovative technologies. Additionally, programs

Horizon Europe facilitates research and development in agricultural innovation, encouraging collaboration between Greek farmers, researchers, and policymakers (European Commission, 2023).

In summary, Greece's national policies and frameworks for sustainable agriculture and vocational education are designed to foster a resilient agricultural sector that meets environmental, economic, and social challenges. Through the implementation of the National Strategic Plan for CAP, rural development initiatives, and enhanced VET systems, Greece is positioning itself as a leader in sustainable agricultural practices within the European context.

1.3.5. Best Practices and Success Stories

Greece has made significant strides in promoting sustainable agriculture and enhancing vocational education and training (VET) systems through various successful programs and initiatives. This section highlights notable best practices and success stories that demonstrate the effectiveness of these efforts.

- **Eco-Schemes under CAP:** The implementation of eco-schemes as part of the Common Agricultural Policy (CAP) 2023-2027 has been a cornerstone of Greece's strategy for promoting sustainable farming practices. These eco-schemes incentivize farmers to adopt environmentally friendly practices that enhance biodiversity, improve soil health, and reduce greenhouse gas emissions. For instance, programs that promote organic farming and agroecological practices have seen increased participation among Greek farmers, leading to a rise in the area cultivated under organic methods. A case study from the Peloponnese region shows that farmers participating in eco-scheme programs reported improved soil fertility and increased crop yields while contributing to the local ecosystem's health (Greek Ministry of Rural Development and Food, 2022).

- **Digital Farming Technologies:** The adoption of digital farming technologies is another area where Greece has witnessed success. Farmers are increasingly utilizing precision agriculture tools, such as drones and IoT sensors, to optimize their farming practices. A notable example is the collaboration between the Greek agricultural cooperative and a tech startup that developed an integrated platform for farm management. This platform allows farmers to monitor soil moisture levels, track crop health, and manage irrigation more effectively. As a result, participating farmers reported a reduction in water usage by up to 30%, alongside an increase in crop productivity (European Commission, 2023).
- **Local Pilot Projects:** Several local pilot projects in Greece have demonstrated innovative approaches to sustainable agriculture and VET. One such project is the “Agroecological Transition” initiative, which focuses on transitioning conventional farms to agroecological practices. This project involves training sessions for farmers on sustainable techniques, such as crop diversification and natural pest control. Participants have reported not only improvements in their farming practices but also enhanced resilience to climate variability. Initial assessments indicate that farms involved in the project have achieved a 20% increase in overall yield while reducing reliance on chemical inputs (Cedefop, 2023).
- **Collaboration with Educational Institutions:** Collaborations between agricultural schools and local farmers have also led to successful outcomes. For example, a partnership between a vocational agricultural school and nearby organic farms has facilitated hands-on training for students in organic farming methods. Students gain practical experience while contributing to the farm's operations, resulting in enhanced learning outcomes and improved farming practices for the participating farms. Feedback from both students and farmers highlights the value of this collaborative approach in preparing the next generation of farmers (Greek Ministry of Rural Development and Food, 2022).

These best practices and success stories illustrate Greece’s commitment to advancing sustainable agriculture and enhancing VET systems. By leveraging eco-schemes, embracing digital technologies, and fostering local collaborations, Greece is paving the way for a more sustainable and innovative agricultural sector. These initiatives not only contribute to environmental goals but also empower farmers and improve the overall resilience of the agricultural landscape in Greece.

1.3.6. Challenges and Barriers

Despite the progress made in modernizing Greece's agricultural vocational education and training (VET) systems and promoting sustainable practices, several challenges and barriers hinder further advancements. These issues must be addressed to ensure the successful implementation of innovative agricultural strategies.

- **Regional Disparities:** One of the primary challenges facing Greece's agricultural sector is regional disparity. Rural areas, especially those in less developed regions, often have limited access to VET programs and resources. This uneven distribution of educational opportunities can result in a workforce that is not uniformly equipped with the necessary skills to implement sustainable practices. Farmers in remote areas may struggle to access training programs, technical support, and innovative technologies, leading to a lack of knowledge about sustainable methods (Cedefop, 2023).
- **Limited Access to Advanced Technologies:** Access to advanced technologies, such as precision farming tools and digital platforms, is often limited in rural areas. Many farmers face financial constraints that prevent them from investing in these technologies, which can enhance productivity and sustainability. The lack of infrastructure, such as high-speed internet and reliable electricity, further exacerbates this issue, limiting the ability of farmers to adopt modern farming practices and digital solutions (Greek Ministry of Rural Development and Food, 2022)
- **Financial Barriers:** Financial constraints represent a significant barrier to the adoption of sustainable agricultural practices and participation in VET programs. Smallholder farmers, in particular, may struggle to afford the initial investments required for sustainable technologies or training programs. Without financial support mechanisms, such as grants or low-interest loans, many farmers may be reluctant to make the necessary changes to their practices, thereby hindering progress towards sustainability (European Commission, 2023).
- **Cultural Resistance to Innovation:** Cultural resistance to change remains a challenge in the agricultural sector. Many farmers, particularly those with longstanding traditions, may be skeptical about adopting new practices and technologies. This resistance can be rooted in a lack of awareness or understanding of the benefits associated with sustainable agriculture and modern farming methods. Overcoming these cultural barriers requires targeted education and outreach efforts to demonstrate the advantages of innovation (Cedefop, 2023).

- **Insufficient Policy Support:** While national policies, such as the National Strategic Plan for CAP, aim to promote sustainable agriculture and VET, gaps in policy implementation can hinder progress. Insufficient support for training programs, inadequate funding for rural development projects, and the need for better alignment between educational institutions and agricultural needs can limit the effectiveness of existing policies (Greek Ministry of Rural Development and Food, 2022).
- **Addressing Gender and Social Inclusion:** Gender and social inclusion pose significant challenges within the agricultural sector. Women, who play a crucial role in agriculture, often face barriers to accessing VET programs and resources. Cultural norms and practices can limit their participation in training and decision-making processes, hindering their potential contributions to agricultural innovation and sustainability. Furthermore, marginalized groups may also struggle to access opportunities in agricultural education and training. Addressing these disparities is essential to ensure that all individuals, regardless of gender or social background, have equal access to training and resources that support sustainable agricultural practices (FAO, 2023).

To address these challenges, several **strategies** have been identified in the literature review:

- **Education and Capacity Building:** Providing targeted education and training programs can enhance knowledge about sustainable practices among Greek farmers. For instance, farmer field schools and participatory workshops have proven effective in fostering learning and facilitating the adoption of new techniques specific to local conditions. These programs can be tailored to address the unique challenges faced by Greek agriculture, particularly in rural areas where access to training may be limited (Cedefop, 2023; Greek Ministry of Rural Development and Food, 2022).
- **Financial Incentives and Support:** Implementing financial support mechanisms, such as subsidies or low-interest loans for sustainable investments, can help alleviate financial constraints faced by farmers in Greece. Programs that link sustainable practices with financial incentives, such as those provided under the Common Agricultural Policy (CAP), have shown positive results in increasing adoption rates among farmers. Encouraging participation in these programs can significantly enhance the transition to more sustainable agricultural practices (European Commission, 2023).
- **Promoting Success Stories:** Highlighting successful case studies of Greek farmers who have effectively implemented sustainable practices can encourage others to follow suit. Sharing these experiences through community networks and local agricultural

organizations can build trust and demonstrate the tangible benefits of sustainability. For example, showcasing farms that have successfully adopted organic farming methods can inspire similar practices in surrounding areas (Greek Ministry of Rural Development and Food, 2022).

- **Policy Advocacy:** Strengthening policy support for sustainable agriculture in Greece is crucial. Advocating for policies that incentivize sustainable practices and enhance VET systems can create an enabling environment for change. Engaging stakeholders, including farmers, educators, and policymakers, in discussions about the importance of sustainable agriculture can lead to more robust policy frameworks that support the agricultural sector's transition to sustainability (Cedefop, 2023; European Commission, 2023).
- **Market Development:** Developing markets for sustainably produced goods can incentivize Greek farmers to adopt these practices. Promoting certifications and labeling that highlight sustainable products to consumers can enhance market access and increase demand for sustainably sourced agricultural products. Initiatives that connect farmers with local markets can further support this development, helping to create a viable economic framework for sustainable agriculture (FAO, 2023).

The literature review highlights several **critical areas** that will contribute to advancing agricultural practices in Greece:

- **Enhancing Green and Digital Skills:** The curriculum for agricultural education in Greece will benefit from the incorporation of green skills training, such as sustainable land management and agroecological practices. Additionally, it will include training on digital tools, such as precision farming technologies and data-driven agricultural practices. These skills are essential for preparing the agricultural workforce to meet contemporary challenges (Greek Ministry of Rural Development and Food, 2022; Cedefop, 2023).
- **Focus on Practical, Local Solutions:** Lessons from successful VET programs in the EU and adaptations relevant to Greek agriculture show that locally adapted solutions are essential for curriculum development. Programs can be customized to meet the specific needs of local farmers in Greece, ensuring that training is relevant and practical (Cedefop, 2023).
- **Addressing Barriers:** The curriculum will also integrate strategies to overcome financial and cultural barriers by providing education on access to financial mechanisms for sustainable investments. Additionally, offering peer-learning opportunities can foster

community trust in new technologies and practices, encouraging broader adoption of sustainable methods (Cedefop, 2023; Greek Ministry of Rural Development and Food, 2022).

1.4. Conclusion

The literature review has identified the critical importance of integrating sustainable agricultural practices, along with green and digital skills, into vocational education and training (VET) systems in Greece. These elements are essential for fostering a resilient agricultural workforce that can effectively navigate the complexities of modern farming challenges. The findings underscore the necessity for a curriculum that not only emphasizes hands-on training but also addresses the specific socio-economic and environmental challenges faced by the Greek agricultural sector (Cedefop, 2023; Greek Ministry of Rural Development and Food, 2022).

As agriculture increasingly adapts to climate change and market fluctuations, it is imperative that agricultural education initiatives in Greece develop customized training modules that reflect these realities. By aligning educational content with the diverse needs of rural communities, we can ensure that future agricultural practices are both sustainable and productive. This approach is supported by the recognition that enhancing green and digital skills will empower farmers to implement innovative solutions, such as precision agriculture and data-driven decision-making, thus improving overall productivity and sustainability (Kountios et al., 2024; European Commission, 2023).

Moreover, ongoing research and partnerships will be essential for adapting and refining the curriculum. Collaborative efforts with local agricultural institutions, farmers, and stakeholders can provide invaluable insights and resources, facilitating the continuous improvement of training programs to keep pace with evolving technologies and sustainability practices. The integration of real-world applications, such as agroecological methods and digital tools, will enhance the relevance of training initiatives, ensuring they meet the contemporary needs of the Greek agricultural sector (FAO, 2023; Greek Ministry of Rural Development and Food, 2022).

2. Mexico

2.1 Introduction

For the European Union, Vocational Education and Training (VET) programs are a key area of work and under the FARM2LA project, we want to review the state of these programs in Latin America, and Mexico is the focus of this report. We are especially interested in the agriculture

sector and the role VET can play in promoting a transition towards more sustainable agriculture and farm models.

In this report we present an overview of the state of sustainable agriculture in Mexico first, to understand public VET programs in the Country afterwards. We review additional elements like the use of technology and finally provide some conclusions to inform the next steps of the FARM2LA project.

In terms of promoting sustainable agriculture, the Mexican government and its public policies have had mixed intentions and results. Farming communities and especially indigenous communities have implemented sustainable practices widely, and Mexico is today a leading country in - for example - the production and export of organic coffee. This is happening even without significant public spending or support, which demonstrates an interesting ground on which to build.

In terms of VET programs, the Mexican government has focused mostly on programs supporting industrialization in sectors like manufacturing, the car industry and so on. In the agrifood sector, VET programs have been focused on transformation and processing, and very rarely on food production itself. While investing in training upwards in the value chain can allow to aggregate value and differentiate products from sustainable agriculture origins, if training and capacity building does not happen also at the production level, there will soon be a mismatch in capacity.

Methodologically, we organized our research in two ways:

Platforma Nuup AC is an organization focusing in the agrifood sector and has worked previously in public sector analysis and the review of government programs towards the agriculture sector. Our experience allowed us to frame our research in a very direct manner, researching reliable sources like government entities, recognized academic researchers and research institutions. Our search therefore focused on words like SADER, FAO, FUNDAR or researchers like Jonathan Fox or academic institutions like ECOSUR or CIDE. Moreover, we consulted the INEGI public database (the National Statistics Institute), and some of their reports which provide key data like the census of the state of agriculture.

For the VET research, we started by contacting experts in this field in Mexico to gain a panoramic view of the situation. We consulted with researchers at the Tecnológico de Monterrey University (Roxana Vicente Díaz, PhD), who provided an initial understanding of these programs in Mexico. From there we researched through the Mexican Ministry of Labour (“Secretaria del Trabajo”) and

in particular the General Directorate of Training Centers for Work. We also investigated the “Escuelas de Campo” y “Jóvenes Construyendo Futuro” programs as they are the most relevant to the agriculture sector in recent years.

2.2 Thematic Sections

2.2.1. Sustainable Agricultural Practices in Mexico

Mexico has a total area of 196 million hectares, of which 191 million (97%) is rural territory. Of these, according to the latest agricultural census conducted in 2022 by the National Institute of Statistics and Geography (INEGI), 25 million hectares (13%) are allocated to agricultural production, the majority of which are rainfed lands (74%).

In total, there is a record of 4.6 million agricultural production units in the country, where 27 million people work. The majority of these are small-scale and/or family-run production units that generate low incomes, making it difficult to capitalize and reinvest in the productive units.

In Mexico, the agricultural sector remains predominantly male: 84% of the people working in the field are men. Two important factors that should be considered in the design and implementation of training programs are that, in the case of Mexico, the agricultural workforce is aging: 73% of workers are over 45 years old, and 27% are over 65. Additionally, 46% of the people involved in the sector identify themselves as Indigenous.

From an economic perspective, the sector represents 2.2% of the national GDP, which amounts to a production value of 32 billion dollars. Although agricultural production is distributed throughout the country, with specific states excelling in the production of certain crops or livestock, the states of Jalisco, Sinaloa, Guanajuato, Michoacán, and Veracruz stand out in national importance.

The country's main crops are:

- Annual crops: white and yellow corn, sorghum, wheat, potatoes, and beans.
- Perennial crops: sugarcane, alfalfa, oranges, lemons, agave, and bananas.
- Protected agriculture (greenhouses): tomatoes, cucumbers, chili peppers, strawberries, apples, blackberries, and blueberries.

Regarding livestock production, Mexico stands out in the production of cattle, pigs, and poultry. As with agricultural production, animal husbandry is mostly carried out on a small scale and in family-run units (e.g., the average number of cattle per productive unit is 24 nationwide) and is primarily concentrated in a few states: Jalisco, Veracruz, and Yucatán.

2.2.2 Sustainable Practices in Mexico:

Although there are isolated efforts, at the public policy level in the Mexican agricultural sector, the dominant approach has been—and continues to be—the promotion and use of chemical inputs with the aim of "increasing productivity and containing the expansion of the agricultural frontier" (Sagarpa, 2016). From the official perspective, it has been stated that "contrary to popular belief, agricultural practices that ensure the sustainable management of natural resources do not conflict with the use of chemical fertilizers, as long as they are used prudently and responsibly (Sader, 2022)".

As a result, data from 2013 shows that more than 70% of degraded soils and land in Mexico are associated with agricultural production. Of the land dedicated to activities in the sector, 17.8% shows chemical degradation, 11.9% exhibits water erosion, 9.5% wind erosion, and 7.7% physical degradation (de Gortari Rabiela, 2020).

In the last administration, there were ambiguities both in rhetoric and practice regarding the use of agrochemicals—traditional agriculture—and the advancement of sustainable practices. One of the most notable and ambitious examples of this was the presidential decree (December 31, 2020), which ordered the reduction and eventual ban on the use of glyphosate and the prohibition of genetically modified corn cultivation for human consumption.

To this end, the government created the Technical Support Strategy for Production for Well-Being (Estrategia de Acompañamiento Técnico de Producción para el Bienestar), aiming to promote and encourage the implementation of agroecological practices to facilitate the transition. Furthermore, the ministry responsible for the country's production policy established as one of its priorities the training of producers in agroecological techniques that would allow for maintaining the high productive capacity and profitability of Mexican agriculture (Sader, 2021).

However, toward the end of the six-year term and with the established date for its complete elimination, the government of Mexico postponed the ban on glyphosate as it had not found or developed an alternative for its widespread and large-scale use without compromising crop yields.

This decision confirms, on one hand, the widespread presence and general dependence on chemical fertilizers in the country, and on the other, the complexity of creating and implementing public policies that ensure the transition to sustainable productive practices.

Despite the above, there are many efforts in the country—some spanning several decades—to advance the transition towards sustainable agriculture in Mexico, and the country holds a relevant position in certain niches, such as coffee, of the organic market. In this regard, official data from

2020 indicates that 331,000 hectares—managed by 46,000 producers—were certified for organic production. The majority of these products are exported to international markets, generating 400 million dollars annually. This suggests that, although there is potential in terms of both production and market, it remains a marginal form of production compared to the traditional and dominant forms in the sector.

A characteristic feature of organic production in the country is that it is mostly carried out in small-scale production units, primarily in Indigenous territories. Also, in general terms, in Mexico, the dissemination, support, implementation, and training for the transition to agricultural practices have been handled by civil society, the third sector (NGOs), grassroots organizations, and more recently, by companies as they shift towards Regenerative Agriculture.

2.2.3. VET Systems in Agriculture:

In the country, there are at least three official educational institutions that could be considered as Vocational Education and Training (VET):

General Directorate of Training Centers for Work (DGCFT): Its strategy and academic offerings began in the 1960s "from an approach to training for work understood as a fixed place, similar to a school, and aimed at large population contingents. They also emerged in a context of growing industrialization that required training a massive workforce in the short term. From their inception, they have defined themselves as training centers rather than educational institutions, which reflects their specialized technical focus on multiple trades" (Pieck, 2012).

That is to say, they were created in response to the industrialization of certain regions of the country; therefore, there is not much educational offering focused on agricultural production, and the existing programs are primarily geared towards processing, concentrating in states of the republic where there is demand for such training. Examples of the programs that exist are:

- Artisanal food production
- Preparation and preservation of animal-origin foods
- Production of mixtures for plant-based food preserves
- Specialized butchery techniques
- Processing of milk with quality and safety

Field Schools (Escuelas de Campo): since the 1980s, through the National Institute of Forestry, Agricultural, and Livestock Research (INIFAP), the Mexican government has replicated the model created by the FAO and the United Nations of field schools to promote "training and technical

assistance as a technological factor that triggers the adoption and development of innovations to help farmers produce more and improve their living conditions" (Sader, 2016).

The pedagogical approach of these Field Schools is "learning by doing," meaning that the actual work in the field serves as the school. In this sense, learning and techniques are developed in the workspaces of the producers. Currently, there are 4,200 Field Schools across almost the entire national territory, reaching 115,000 producers. Their work primarily focuses on the production of grains, coffee, honey, sugarcane, and cocoa.

Youth Building the Future (Jóvenes construyendo futuro): This program was established under the last presidency of Mexico with the aim of linking young people to workplaces for their training and integration into the labor market. Under this program, young people can join a workplace of their choice for up to 12 months, receiving a monthly financial support of $7,572 mexican pesos (approximately $380 USD) and health insurance through the Mexican Social Security Institute (IMSS). Although it is not specifically designed for the agricultural sector, there is the possibility that the chosen workplaces may belong to this sector.

2.2.4. Green and Digital Skills:

Despite the fact that the COVID-19 pandemic represented an opportunity to broaden access and migrate to the use of digital technologies, significant gaps in internet access persist in rural contexts in Mexico. According to data from the National Survey on the Availability and Use of Information Technologies in Households (ENDUITH) conducted by INEGI, in 2023, only 66% of people in rural areas had access to the internet, in contrast to urban areas where 85.5% of people have access. In addition to this gap, the survey highlights that the primary use of the internet is for communication, accessing social networks, and entertainment purposes.

As is the case in other contexts similar to Mexico, there is information about the potential of using digital technologies in agribusiness management and agricultural production; however, it cannot be said that there is a widespread and far-reaching strategy to ensure access to and use of these technologies by producers. Their implementation must not only ensure the infrastructure and means for access but also be accompanied by training and capacity-building for their use, implementation, and appropriation.

2.2.5. National Policies and Frameworks:

In Mexico, public policy for the agricultural sector is concentrated in the Ministry of Agriculture and Rural Development (SADER) and aims to enable policies and programs that allow for "better production, making the most of the comparative advantages of the agricultural sector, integrating

rural activities into the productive chains of the rest of the economy, and stimulating collaboration among producer organizations with their own programs and projects” (Fundar, 2023).

In the last year (2024), the ministry had a budget of 74 billion mexican pesos (3 billion USD), and while this represented a percentage increase compared to the previous year, it resulted in a real decrease of 12% compared to the budget allocated in 2019. This budget is distributed among priority programs:

- Purchase of fertilizers.
- Production for Well-Being.
- Price guarantees for basic food products.
- Development and implementation of educational programs and research in agrifood matters.
- Acquisition of national milk.
- Food safety and quality assurance.
- Rural supply program.
- Program to promote agriculture, livestock, fishing, and aquaculture.
- Generation of research projects.
- Social milk supply program.
- Support activities for public service and good governance.

Of all the programs, only three (fertilizers, production for well-being, and price guarantees) account for 63% of the ministry's total budget.

On the other hand, there is the Special Concurrent Program for Sustainable Rural Development (PEC), which "is a tool that helps understand how the government addresses public policies related to rural development" (Fundar, 2023) and has a budget of 440 billion pesos. The programs managed from this area include:

- Rural Poverty Assistance Program.
- Rural Infrastructure Program.
- Education and Research Program.
- Health Condition Assistance Program in Rural Areas.
- Investment and Productivity Promotion Program
- Administrative Expenses.
- Right to Food Program.

- Support Program for Milk Acquisition.
- Natural Resource Sustainability Program.
- Program for Supporting Women in Situations of Violence.
- Program for Addressing Agrarian Issues.

The analysis by the Mexican NGO Fundar indicates that the budget allocated to Sader and its programs is insufficient to promote the agricultural development needed for the country and to generate economic well-being for producers.

2.2.6. Best Practices and Success Stories:

As mentioned, instead of a widespread public policy promoting the implementation of sustainable production practices, there are many local efforts in Mexico led by indigenous and peasant organizations. These groups have developed organizational strategies to improve their production and livelihoods. Here are two brief examples:

- ✓ Yomol A'tel/Capeltic is a group of cooperatives and solidarity economy enterprises operating in northern Chiapas with indigenous Tseltal communities. Their cooperatives, consisting of 300 producers, have engaged in agroecological coffee and honey production since 2001. By fully integrating the coffee value chain (production, processing, and retail), they have achieved prices above the market rate while restoring coffee plantations and preserving the biodiversity of traditional shade-grown systems.

Despite the lack of formal training programs and financial support, the cooperative has built a network of partnerships and collaborations with actors and organizations from various sectors (agroecology, academia, marketing, graphic design, social enterprise management). Through these connections, they have developed and strengthened the necessary skills to carry out their work effectively.

A distinctive feature of these cooperatives is that they function as "schools," meaning the work is carried out from an educational perspective, where producers and their children learn by doing. Additionally, at various points in their history, the cooperatives have undertaken systematization exercises to capture lessons and challenges, ensuring continuous improvement and learning from their own practice.

Field Schools for Livestock in Jalisco: This is a public program with state and federal funding aimed at "strengthening the capacities of Jalisco's producers and promoting the implementation of agroforestry and silvopastoral systems as an option to minimize the use of agrochemicals and deforestation processes" (Gobierno de Jalisco, 2022).

The intention of the program is to empower local communities to transform their production systems, identify their main challenges, and test potential solutions. This allows work to be based on local knowledge and ensures that the implementation of new practices and technology aligns with the needs and capabilities of the communities themselves. The goal is to translate this into the construction of more productive, profitable, and adaptable systems.

Currently, there are 65 Field Schools in 42 municipalities in Jalisco, where more than 700 ranchers have developed knowledge and skills for the design and implementation of sustainable livestock systems. From these public efforts, other organizations - mainly NGOs - have contributed to support these same farmers to organize and set up community enterprises and in 2024, establish new businesses like butcher shops or local aggregation businesses, to be able to move forward in their capacity to keep more value in the value chain. Other efforts are supporting farmers in accessing credit and financing.

2.2.7. Challenges and Barriers

The challenges and barriers faced by the Mexican countryside and producers are numerous. In terms of national perception, the 2022 Agricultural Census conducted by INEGI found that the most significant challenges and difficulties experienced by producers are:

- High costs of inputs and services.
- Climatic factors.
- Decrease in prices or reduction in sales due to the COVID-19 pandemic.
- Biological factors.
- Loss of soil fertility.
- Insecurity.
- Difficulties in transportation.

It is noteworthy that the lack of training and education for implementing techniques that increase yields or improve the environment is not a felt or expressed need; however, the loss of soil fertility could be reversed through the implementation of sustainable practices that promote its regeneration.

Specifically, one of the major barriers to implementing practices that lead to a sustainable transition is the lack of training for it, investment and economic incentives to minimize the costs of doing so, access to differentiated markets, lack of organizational support, and the absence of public policies that promote change.

2.2.8. Implications for FARM2LA

The extent of VET programs in Mexico is relatively small and in agriculture, they are mainly focused in food-transformation. Orienting programs towards transformation of sustainably grown crops could add to Mexico's capacity to produce and export organic foods while aggregating value that can trickle down to farming communities as newly generated income. This could be achieved by working with farmers run agribusinesses like cooperatives in crops with significant smallholder farmer participation like honey, coffee or milk production.

However, efforts to develop VET programs directed to farmers themselves are needed to improve the country's capacity to implement more sustainable practices. There are models like “escuelas de campo” or “jovenes construyendo futuro” which have yielded sometimes mixed results but when they have been successful, we need to learn and support their continuity.

In this context, the FARM2LA project becomes very relevant to understand how other countries in Latin America are designing and implementing VET programs in this sector, and how we can learn from the European experience.

2.3. Conclusions

The agricultural sector is key to the Mexican economy; millions of people depend on production in the countryside, and the country ranks among the top producers of certain products globally.

From the perspective of public policy, the Mexican state has directed programs and the development of the countryside from the viewpoint of traditional agriculture, favoring the use of chemical fertilizers. It cannot be said that there is a national strategy to ensure the transition toward sustainable practices. Instead, this process is led locally by indigenous communities, producers, and organizations in the third sector (NGOs, grassroots organizations, international cooperation agencies).

On the other hand, unlike other sectors of the Mexican economy, there are no widespread and long-term training programs (VET) to strengthen the capacities of producers and promote the implementation of sustainable agricultural practices. As an example of this, one of the previous government's efforts to achieve this and to prohibit the use of chemical fertilizers faced the need to postpone the ban due to the lack of alternatives that could ensure the yields and income of producers.

In this context, the development of VET programs for strategic sectors (such as coffee, food preparation and processing, food safety or certification for processing spaces, tools for marketing and export, for example) could be highly relevant for building capacities among producers.

Finally, there is a significant opportunity in widespread access to and training in the use of digital tools, especially by using smartphones and applications that can work offline.

3. Germany

3.1. Introduction

The **FARM2LA** project, titled "Transforming Agriculture Education for Sustainable Development in Latin America," is funded by the Erasmus+ program and aims to bridge the educational divide between the European Union (EU) and Latin America (LA). The project seeks to create collaborative networks that will modernize Vocational Education and Training (VET) systems, focusing on equipping VET trainers with green and digital skills that are critical for sustainable agricultural development. By focusing on capacity-building for both educators and agricultural professionals, the project aligns with global sustainability goals and supports the integration of environmentally friendly and technologically advanced practices into the agricultural sector.

Latin America faces numerous challenges in modernizing its agricultural sector, ranging from limited access to educational resources to outdated farming practices that hinder long-term sustainability. The FARM2LA project directly addresses these challenges by providing targeted support to VET trainers in Argentina, Paraguay, Mexico, and Chile. These countries are key to the project's efforts to promote sustainable farming methods that can both increase productivity and reduce environmental impact.

The project's general objectives include improving the quality of agricultural education, fostering innovation in sustainable practices, and enhancing digital literacy among VET trainers. These efforts aim to create a ripple effect, where improved training leads to better-prepared farmers who can implement modern techniques that enhance productivity and environmental stewardship. The project also works to align educational goals with policies like the European Green Deal and the Common Agricultural Policy (CAP), ensuring that sustainable agriculture is at the forefront of the curriculum.

Overall, the *FARM2LA* project is driven by the need to modernize agricultural education and create a stronger link between European and Latin American VET institutions. By addressing the educational gaps and integrating digital and green skills, the project provides long-term benefits for the agricultural sectors of both regions, promoting sustainability, resilience, and innovation.

3.2. Methodology

The methodology for this literature review focuses on identifying current and relevant sources pertaining to sustainable agricultural practices within the context of Germany. To ensure a

comprehensive understanding of the local landscape, sources were drawn from a range of academic materials, including peer-reviewed journals, official government documents, and reports from organizations involved in agricultural and environmental sustainability. The objective was to gather data that could inform vocational education and training (VET) programs specifically tailored to promote sustainable agriculture in Germany. Key terms used in the search included "sustainable agricultural practices in Germany," "green skills in agriculture," "agricultural vocational training," and "Germany's Common Agricultural Policy (CAP)." These terms were combined to locate region-specific studies, policies, and best practices.

The primary databases used in the search included Google Scholar, JSTOR, and the European Commission's agricultural sustainability reports. Sources from international organizations such as the Food and Agriculture Organization (FAO) and the European Commission were also incorporated to ensure the analysis was grounded in both local and global policy frameworks. This method allowed for a comprehensive collection of literature addressing Germany's efforts to meet the sustainability targets set out by the European Green Deal, as well as national-level policy initiatives (European Parliament, 2016).

Furthermore, the review included a categorization process where the findings were divided into thematic sections relevant to the FARM2LA project. These themes include sustainable farming techniques practiced in Germany, vocational training methodologies, and the integration of digital tools and green skills into VET programs. By structuring the literature in this way, the review is well-positioned to provide a solid foundation for developing educational materials aimed at supporting sustainable agriculture within the country.

3.3. Thematic Sections

3.3.1. Sustainable Agricultural Practices

Sustainable agriculture in Germany focuses on balancing productivity with environmental protection. One of the key aspects is the careful use of natural resources, such as water management and the reduction of chemical fertilizers and pesticides. German agriculture increasingly employs organic farming practices, with approximately 10% of the country's farmland dedicated to organic production as of recent years. Organic farms in Germany emphasize crop rotation, composting, and biological pest control to maintain soil health and reduce environmental impact (Bundesministerium für Ernährung und Landwirtschaft, 2021).

Another central element of sustainable agriculture in Germany is the adoption of precision farming technologies. Precision agriculture uses GPS, sensors, and data analysis to optimize inputs like water, fertilizers, and pesticides, reducing waste and increasing efficiency. This approach allows

farmers to apply treatments only where and when they are needed, minimizing environmental damage while maintaining crop yields. Precision farming also helps reduce greenhouse gas emissions by optimizing resource use, contributing to Germany's broader climate goals (European Parliament, 2016).

Germany also promotes agroforestry and other biodiversity-friendly practices as part of its sustainable agricultural initiatives. Agroforestry integrates trees and shrubs into agricultural landscapes, which helps preserve biodiversity, improve water retention, and protect soil from erosion. This practice is supported by government programs that offer financial incentives to farmers adopting sustainable land-use practices. Such initiatives aim to create a more resilient agricultural system that can withstand the challenges of climate change and promote long-term sustainability (Federal Agency for Nature Conservation, 2020).

3.3.2. VET Systems in Agriculture

Germany’s vocational education and training (VET) system is globally recognized for its effectiveness, particularly through its Dual System, which blends theoretical education with hands-on practical training. In the agricultural sector, this system plays a key role in preparing students for the workforce by integrating classroom learning with real-world agricultural practices on farms. Agricultural apprentices spend part of their training in vocational schools and part in agricultural businesses, where they gain practical skills in areas such as animal husbandry, crop production, and machinery operation. This dual approach ensures that graduates are well equipped to meet the demands of modern agricultural enterprises (Bundesministerium für Bildung und Forschung, 2021).

The VET system in Germany also emphasizes sustainability in line with national and EU-wide environmental policies. Sustainable agricultural practices are integrated into the curriculum, including topics like organic farming, resource-efficient farming methods, and climate-friendly technologies. Germany’s commitment to the European Green Deal and the Common Agricultural Policy (CAP) highlights the importance of green skills in agriculture, with trainees learning how to adopt eco-friendly practices that contribute to long-term environmental stewardship while maintaining agricultural productivity (Bundesministerium für Ernährung und Landwirtschaft, 2021).

Additionally, digitalization plays an increasingly important role in Germany’s agricultural VET system. Trainees are introduced to advanced technologies such as GPS-guided machinery, data analysis tools, and precision farming techniques, all of which are essential for modern, sustainable agriculture. This integration of digital skills prepares future farmers to optimize agricultural

production while minimizing environmental impacts, thereby contributing to both economic efficiency and sustainability in the agricultural sector (Vasić & Radovanović, 2023).

3.3.3. Green and Digital Skills

Germany's agricultural sector is witnessing a growing emphasis on the integration of green and digital skills within its vocational education and training (VET) programs. Green skills encompass a range of sustainable farming practices, including organic agriculture, resource management, and biodiversity conservation. Germany is heavily influenced by the European Green Deal, pushing its agricultural sector toward sustainability. VET programs now train students in ecofriendly methods such as soil conservation, crop rotation, and climate-smart agriculture. These practices ensure that future farmers are well-prepared to mitigate environmental impacts while maintaining productivity (Weber, Braun, & Frank, 2022).

Additionally, digital skills are becoming increasingly essential in the agricultural sector, particularly in precision farming. Germany's VET system incorporates cutting-edge technologies such as GPS-guided equipment, data-driven decision-making tools, and AI-powered plant management systems. These tools help optimize resource usage and improve the efficiency of farming operations, contributing to both economic and environmental sustainability. However, while digital technologies promise efficiency, some research suggests that their sustainability benefits remain uncertain without further empirical data (Hackfort, 2023). Nevertheless, these technologies are increasingly integrated into Germany's agricultural strategy under the 2035 Arable Farming Strategy, where digitalization is seen as a key component for a sustainable future (Santarius et al., 2020).

The integration of both green and digital skills within Germany's VET programs ensures that farmers are equipped to face the challenges of the modern agricultural landscape. While green skills emphasize eco-friendly practices, digital skills enable more precise and efficient farming methods. Together, they contribute to the broader goals of sustainability and productivity in line with the European Union's agricultural policies (Weber et al., 2022).

3.3.4 National Policies and Frameworks

Germany's vocational education and training (VET) system is guided by several national policies that aim to modernize agricultural education while promoting sustainability. One key piece of legislation is the *Vocational Training Act (BBiG)*, which was updated in 2020 to include provisions for digital competencies and environmental awareness. This law underpins the dual system of VET in Germany, ensuring that both theoretical knowledge and practical experience are prioritized in agricultural education. The inclusion of green and digital skills in the curriculum reflects

Germany’s broader commitment to sustainable agricultural practices and the modernization of its farming sector (BMEL, 2022).

Another important national policy is the *Ackerbaustrategie 2035* (Arable Farming Strategy 2035), which was established by the Federal Ministry of Food and Agriculture (BMEL). This strategy emphasizes sustainable farming methods, precision agriculture, and the use of digital technologies to optimize farming practices. It aligns with the European Union’s *Common Agricultural Policy (CAP)*, which supports farmers who implement eco-friendly practices like organic farming and biodiversity conservation. Through the CAP and national programs, Germany has created financial incentives to ensure that agricultural VET programs include training on sustainable resource management and precision farming technologies (BMEL, 2019).

At the European level, a key policy framework influencing German agricultural VET programs is the *Farm to Fork Strategy*, part of the European Green Deal. This strategy emphasizes sustainable food systems and reducing the environmental impact of farming practices. German agricultural VET programs integrate these principles by focusing on sustainability and innovation. The strategy’s goals include reducing the use of chemical pesticides, promoting biodiversity, and improving the resilience of food systems, all of which are incorporated into German VET curricula (European Commission, 2020)

3.3.5. Best Practices and Success Stories

Germany's vocational education and training (VET) programs have long been considered among the best examples of integrating theoretical and practical skills, particularly in agriculture. One successful model is the Dual Education System, which combines classroom instruction with hands-on experience on farms. Agricultural apprentices in Germany spend time both in vocational schools and at partner agricultural businesses, allowing them to develop a comprehensive understanding of modern farming techniques. This dual approach has been instrumental in equipping young farmers with the skills needed to adopt sustainable farming practices, including organic farming and precision agriculture (BMEL, 2022).

One standout case study is the Precision Farming Initiative in Lower Saxony, which promotes the use of digital tools to optimize farming practices. Through the initiative, local VET institutions collaborated with agricultural businesses to provide training in digital farming technologies like GPS-enabled tractors, drones for field monitoring, and farm management software. Farmers who participated in the program reported improved resource efficiency, higher yields, and a reduction in pesticide and fertilizer use, making their operations both more sustainable and profitable. This case highlights the importance of integrating cutting-edge technology with traditional agricultural

skills, as well as the role of VET in making these advancements accessible to small and medium-sized farms (Busse et al., 2014).

Another success story can be seen in Germany's organic dairy farming sector. A study conducted on organic dairy farms across the country revealed that VET programs tailored specifically for organic farming helped farmers adopt more sustainable practices, such as rotational grazing and biodiversity-friendly land management. The research found that these practices not only improved environmental outcomes but also contributed to animal welfare and higher product quality. The program's success demonstrates the positive impact that specialized VET programs can have on both sustainability and economic viability in the agricultural sector (Ivemeyer et al., 2018).

3.3.6. Challenges and Barriers

The adoption of sustainable agricultural practices and the successful implementation of Vocational Education and Training (VET) programs in the agricultural sector face various obstacles. Identifying and understanding these barriers is crucial for devising solutions that encourage the integration of modern farming methods and education systems.

One significant barrier to the adoption of sustainable agricultural practices in Germany is cultural resistance. Many farmers are hesitant to change from conventional farming methods to more environmentally friendly practices, as traditional farming techniques are often seen as a symbol of the "good farmer." This cultural symbolism places significant pressure on farmers to maintain conventional, production-oriented methods that emphasize efficiency and tidiness over environmental sustainability. The deeply rooted nature of these cultural values creates a barrier to the adoption of agri-environmental policies designed to promote more sustainable practices (Burton, Kuczera, & Boland, 2007).

Another challenge is the lack of social and institutional support for farmers adopting sustainable practices. Although there are policies aimed at encouraging environmental conservation, many farmers feel that the administrative burden of complying with these policies is too high. The regulatory complexity often creates confusion, leading to low participation rates in sustainable farming programs. Farmers are also skeptical of whether these policies will provide tangible economic benefits, especially when financial incentives are minimal compared to the efforts required for compliance (Molnar et al., 2009).

The final barrier is financial. Sustainable agricultural practices often require significant

investment in new equipment, training, and infrastructure, which can be prohibitive for small scale farmers. While larger operations may be able to absorb these costs, smaller farms struggle to find

the capital necessary to make the transition. Additionally, the initial investment required for precision agriculture and other sustainable technologies is often too high for many farms, creating a substantial barrier to entry. Without adequate financial support and subsidies from the government, many farmers are unable to adopt these practices, further delaying the widespread implementation of sustainable farming in Germany (Burton, Kuczera, & Boland, 2007).

3.4. Conclusion

This literature review highlights several important themes in the context of sustainable agricultural practices, the development of vocational education and training (VET) systems, and the integration of green and digital skills into these programs. The review demonstrates that, while significant progress has been made, challenges remain in areas such as the adaptation of digital tools to small-scale farming operations and the need for stronger policy frameworks that support sustainability.

The review illustrates how VET programs can effectively promote sustainable practices and equip farmers with the necessary skills to modernize agricultural systems. Moreover, it highlights barriers, including financial constraints and social resistance, which need to be addressed to ensure the widespread adoption of these practices. Strategies such as providing targeted financial incentives, enhancing regulatory flexibility, and offering community-centered training programs are critical in overcoming these obstacles.

Moving forward, the insights gained from this review will play a crucial role in shaping the FARM2LA project's curriculum. By integrating best practices and lessons the project can ensure that its training modules are relevant, adaptable, and capable of addressing the unique challenges faced by farmers and VET trainers in these regions. The next steps in the project development process will focus on refining the curriculum to incorporate localized solutions, fostering international collaboration, and continuing to align educational goals with sustainability objectives. Through this approach, FARM2LA aims to support the transition toward more resilient and sustainable agricultural systems across Latin America and beyond.

4. Colombia

4.1. Introduction

The agricultural sector has historically played a significant role in the country's development, contributing to the growth of Gross Domestic Product (GDP). However, in recent decades, challenges related to agricultural productivity, market access, and quality standards, among other factors, have negatively impacted the sector's performance. Official statistics show that

Colombian agriculture is far from returning to its contributions of the 1970s, which were close to 20% of GDP.

Agricultural education in Colombia has been a fundamental pillar for rural development and the sustainability of the agricultural sector. Over the years, this educational field has undergone a series of significant transformations, driven by the need to adapt to social, economic and environmental changes in the country. In a context where agriculture is facing challenges such as climate change, rural-urban migration and market globalization, the updating of curricula and the implementation of new educational methodologies have become essential.

This transformation process not only seeks to improve the quality of teaching, but also to strengthen the capacity of farmers to innovate, adopt sustainable practices and contribute to the economic development of their communities. Through a revision of pedagogical approaches, the incorporation of emerging technologies and the promotion of applied research, agricultural education in Colombia is emerging as a key driver for the modernization of the sector and rural well-being.

The transformation of agricultural education in Colombia is a vital process to address contemporary challenges in the agricultural sector. This literature review will explore the approach taken by the country to modernize its education systems in this area, paying particular attention to the adaptation of Vocational Education and Training (VET) programs to incorporate green and digital skills. Through a comprehensive analysis of relevant national policies and frameworks, as well as case studies and good practices, it aims to provide a clear picture of the critical areas that require attention to advance agricultural education in Colombia. In an increasingly interconnected world affected by climate change, this approach is not only necessary to improve the competitiveness of the sector, but also to ensure sustainable development that benefits rural communities and the country.

4.2. Methodology

The methodology employed in this literature review was designed to comprehensively gather relevant information on Vocational Education and Training (VET) in the agricultural sector, with a specific focus on Colombia. A systematic approach was adopted, involving the identification and analysis of a variety of sources, including academic articles, policy reports, case studies and institutional documents. This approach ensured a comprehensive understanding of the current state of VET for Colombian farmers, as well as the integration of sustainable agricultural practices

and digital tools into training programs. A critical review of existing literature has been conducted, identifying trends, challenges and opportunities in agricultural education.

The review began by inspecting various databases and resources, including academic platforms such as the National Learning Service (SENA), JCTOR, Scopus, and Google Scholar, which provided peer-reviewed articles on sustainable agriculture, ecological competencies, and VET methodologies in the Colombian context. Additionally, reports from national organizations were consulted, such as the Ministry of Agriculture and Rural Development of Colombia, the National Planning Department (DNP), the Municipal Units for Agricultural Technical Assistance (UMATA), and the National System of Agricultural Innovation (SNIA).

The methodology was also supported by information gathering, which included the collection of specialized literature and document analysis from organizations such as AgroNET, the Information and Communication Network of the Agricultural Sector of Colombia, led by the Ministry of Agriculture and Rural Development with the support of the Food and Agriculture Organization (FAO) of the United Nations.

Keywords: Agricultural education, VET, teaching, primary sector, regional development, research, productivity, profitability, competitiveness, and sustainability

4.3. Thematic Sections

4.3.1. Sustainable Agricultural Practices

In Colombia, sustainable agricultural practices have been implemented in various regions with the aim of improving agricultural productivity, preserving the environment, and promoting the well-being of rural communities. These practices not only contribute to environmental sustainability but also enhance farmers' resilience and food security in the country. Below are some of the most relevant practices, along with sources that support this information:

Agroecology: Agroecology combines agriculture with ecology, promoting biodiversity and the sustainable use of resources. It includes techniques such as crop rotation, the use of organic fertilizers, and integrated pest management. Altieri, M. A. (2009). Agroecology: Principles and Practices for Sustainable Food Systems. CRC Press.

Organic Farming: This practice is based on cultivation without the use of agrochemicals, utilizing organic fertilizers and natural methods for pest control. Colombian Association of Organic Agriculture (ACO). (2020). Study on Organic Agriculture in Colombia.

Agroforestry: This integrates agriculture with forestry, incorporating trees into cropping systems to enhance biodiversity, conserve water, and increase productivity. FAO. (2013). Agroforestry for Sustainable Agriculture. FAO Document.

Sustainable Soil Management: This includes practices such as soil conservation, ground cover, and the use of terraces to prevent erosion. González, M., & Rojas, J. (2018). "Sustainable Soil Management: An Alternative for Agriculture in Colombia." Journal of Environmental Sciences, 12(1), 55-68.

Cultivation of Resilient Varieties: Promoting the use of seeds adapted to local conditions, such as droughts or floods, to ensure production in the face of climate change. Rodríguez, M. (2020). "Adaptation Strategies to Climate Change in Colombian Agriculture." Journal of Climate Change, 5(2), 113-129.

Integrated Production Systems: This approach integrates the production of different types of crops and animals, optimizing resource use and minimizing environmental impact. Pizarro, R., & Restrepo, J. (2019). "Integrated Agricultural Production Systems in Colombia: Challenges and Opportunities." Agricultural Sciences, 18(1), 45-60.

Use of Information and Communication Technologies (ICT): Implementation of technologies for monitoring crops, efficient resource use, and training farmers in sustainable practices. Ministry of Agriculture and Rural Development of Colombia. (2021). ICT Strategy in the Agricultural Sector.

Water Conservation Practices: Techniques such as rainwater harvesting and drip irrigation to optimize water use in agriculture. Ríos, J. (2017). "Sustainable Water Management in Colombian Agriculture." Journal of Natural Resources, 10(3), 23-38.

Agricultural Education and Training: Training programs for farmers on sustainable practices and efficient resource management. Gómez, L., & Medina, J. (2016). "Education for Sustainability in the Agricultural Sector in Colombia." Journal of Education and Society, 17(2), 89-102.

4.3.2. VET Systems in Agriculture

In Colombia, vocational education and training (VET) in the agricultural sector has been structured through various systems aimed at improving the competencies and skills of rural workers. These systems and programs seek to enhance the skills of agricultural workers and promote sustainable development in the sector. Below are some of the main systems and programs of vocational education and training in Colombian agriculture:

Training System for Employment (SFT): This system is designed to offer technical and professional training to individuals seeking to enter the labor market. It includes specific programs in agriculture, such as crop techniques, natural resource management, and agroindustry. Technical and technological education institutions, as well as training centers, are responsible for implementing this system.

SENA (National Learning Service): SENA is a fundamental entity in vocational training in Colombia. It offers technical and technological training programs in areas related to agriculture, such as agricultural production, agroecology, and environmental sustainability. Through its training model, SENA aims to address the needs of the agricultural sector and promote rural development.

Technical and Technological Education: Several universities and technical institutions in Colombia offer higher education programs in areas related to agriculture, such as Agronomic Engineering, Agricultural Production Technology, and Agroindustrial Management. These programs are designed to provide students with the necessary tools to face the challenges of the agricultural sector.

Rural Extension Programs: Many universities and non-governmental organizations implement rural extension programs aimed at training farmers in modern production techniques, crop management, and sustainability. These programs focus on the transfer of knowledge and technologies to rural areas.

Dual Training: This model combines theoretical education in educational institutions with practical training in agricultural sector companies. It allows students to gain work experience and specific skills in the field.

Agroeducation: Some programs are specifically designed for the rural context, such as agroeducation, which seeks to train small and medium-sized farmers in the use of innovative technologies and sustainable practices.

4.3.3. Green and Digital Skills

Green and digital skills are becoming increasingly relevant in the educational and vocational training context in Colombia, especially in a world moving towards sustainability and digitalization, as they promote sustainable development and adaptation to new technologies.

Below are some of these skills and their relevance in agricultural vocational education and training in Colombia.

Green Skills

- ✓ Environmental Management: Understanding and managing the environmental impact of human activities. This includes efficient resource use and waste minimization.
- ✓ Renewable Energies: Knowledge of clean technologies, such as solar and wind energy, and their implementation in different contexts.
- ✓ Sustainable Agriculture: Techniques to promote agricultural practices that preserve the environment and enhance productivity.
- ✓ Circular Economy: Understanding the principles of the circular economy to encourage practices that reduce waste and maximize material reuse.
- ✓ Sustainable Management of Natural Resources: Includes cultivation techniques that respect the environment, efficient water use, and biodiversity conservation. These skills are crucial for sustainable agricultural production. Food and Agriculture Organization (FAO).

Agroecology: Promotes agricultural practices that mimic natural ecosystems. This is taught through training programs in ecological and organic farming. Inter-American Institute for Cooperation on Agriculture (IICA).

Waste Management and Recycling: Skills to implement waste management systems in agricultural production, promoting recycling and waste reduction. Ministry of Environment and Sustainable Development of Colombia.

Digital Skills

- ✓ Digital Literacy: The ability to effectively use information and communication technologies (ICT).
- ✓ Programming and Software Development: Skills in programming languages and application development.
- ✓ Cybersecurity: Knowledge to protect information and digital systems from cyber threats.
- ✓ Data Analysis: The ability to collect, analyze, and utilize data for informed decision-making.

4.3.4 National Policies and Frameworks

The Colombian government has created agricultural policies and programs aimed at enhancing economic activity in rural areas, improving the quality of life, and generally improving rural conditions in the country.

To ensure better working conditions in the agricultural sector, various policies and programs have been implemented in recent years to promote the progress of agriculture in Colombia. Among the many advantages offered by these initiatives are the creation of welfare conditions and a good quality of life for the rural population, closing the gap between urban and rural areas, protecting and ensuring the rights of citizens, and revitalizing the countryside.

This literature review details the most relevant aspects of agricultural policy in Colombia: what it consists of, its main motivations, and the goals sought through its implementation.

- ✓ **AGRARIAN REFORM 2022**

The agricultural transformation policies of the current government include key strategies to address the current challenges of the sector and propose better pathways for proper development and equity in agriculture. Additionally, through agricultural incentive programs, the aim is to strengthen the agro-industrial sector by improving productivity and promoting the most productive areas.

According to the program "A FIELD FOR EQUITY: AGRICULTURAL AND RURAL DEVELOPMENT POLICY 2018-2022," the foundation for achieving better objectives within the program is divided into three main pillars:

- ✓ Rural Development
- ✓ Productivity + Profitability = Competitiveness
- ✓ Modern and Technified Institutions

Through each of these pillars, agricultural policy aims to cover different fronts of the sector and implement improvements that truly benefit everyone involved in the production chain of the agricultural sector.

- ✓ **AGRICULTURAL AND RURAL DEVELOPMENT POLICY**

To provide more insight into each of these pillars, below are the objectives for each, according to the Ministry of Agriculture and Rural Development of Colombia.

Rural Development

The Ministry states that: "The strategies of the Rural Development pillar focus on prioritizing sectoral and intersectoral investments that promote the creation of conditions to advance competitiveness and equity in rural areas." This means that this pillar aims to generate sufficient

legal security through land use planning and the strengthening of trust and stability in rural investments.

To achieve this, the following actions are proposed:

- ✓ Formalization of rural property and land use planning.
- ✓ Streamlining land restitution processes.
- ✓ Productive use planning within the agricultural frontier.
- ✓ Land improvement through project generation and better infrastructure construction.
- ✓ Access to more dignified rural housing.

Agricultural extension through institutional coordination and sectoral investments in innovation, technological development, knowledge transfer, and accumulation.

Generation of income through employment and agricultural and rural entrepreneurship.

Services for marketing and market development for small producers.

As you can see, each of these actions aims to ensure that the rural sector receives the recognition, support, and necessary attention from the state to create better development dynamics. In this way, it will be much easier to pave the way for better opportunities and provide access to fairer employment situations.

PRODUCTIVITY + PROFITABILITY = COMPETITIVENESS

In this second pillar, the Ministry states:

“The strategies of the pillar of productivity + profitability = competitiveness promote the productive transformation of agriculture through the organization of agricultural production according to the market, the adoption of protection and sanitary admissibility measures, access to financial services that encourage greater profitability in rural marketing chains, and comprehensive management of agricultural risks.”

To meet its goals, a series of strategies were planned that seek to:

- ✓ Transform and organize agricultural production through production planning, better development of clusters, and agro-industrial value chains. Special emphasis will be placed on the agro-industrial, fishing, and aquaculture industries.
- ✓ Organize productive chains for sustainable livestock farming.
- ✓ Promote agro-industrial transformation projects for small and medium producers.

- ✓ Research, technological development, and agricultural innovation as key actions for the sector to remain dynamic and in line with innovation.
- ✓ Protect national production through actions to implement trade defense measures.
- ✓ Manage sanitary, phytosanitary, and food safety risks to prevent future hazards.
- ✓ Financing and comprehensive risk management with the help of reforms to the National Agricultural Credit System and management of market or climate risks.

In this case, the primary objective of action is dictated by the state's capacity to invest, assist, and organize agricultural dynamics through the use of better technologies, financing focused on risk management, and research.

- ✓ **MODERN AND TECHNIFIED INSTITUTIONS**

Finally, in this last pillar, the Ministry of Agriculture (Minagricultura) seeks to: "Modernize, technify, and consolidate sectoral institutions and inter-institutional coordination and articulation to drive productive transformation in agriculture and rural areas at a territorial scale." To achieve this, it aims for the Ministry of Agriculture and Rural Development (MADR) to responsibly establish its role as the regulator, guide, and coordinator of national agricultural and rural development policy. For this to be possible, it must delegate activities, strategies, and plans to various Colombian entities dedicated to the agricultural sector, such as:

- ✓ The Agricultural Rural Planning Unit (UPRA)
- ✓ The Land Renewal Agency (ART)
- ✓ The Colombian Agricultural Institute (ICA)
- ✓ The National Authority for Aquaculture and Fisheries (AUNAP)
- ✓ The Departmental and Municipal Health Secretariats

These are some of the tools that the Colombian government offers to encourage various forms of production in the countryside and their better development in the future. Evaluate which of these pillars best fits your conditions and consult what resources may be useful for financing the purchase of machinery, greenhouse supplies, and capitalizing your production.

4.3.5 Best Practices and Success Stories

In 2013, WWF began implementing the project for Environmentally and Socially Compatible Banana Production in Colombia and Ecuador, through its offices in Germany, Colombia, and Ecuador, in partnership with the German supermarket chain EDEKA and allies such as Dole and Tecbaco. The aim was to develop a series of initiatives around the adoption and improvement of conventional agricultural practices that often do not involve sustainability parameters.

This project has so far allowed for the broader implementation of Good Agricultural Practices (BAP) than some sustainable certification standards envision and has followed up on 78 practices grouped into a general area and six major thematic areas that consolidate the sustainability tool within the project: natural ecosystems, water resources, integrated crop management, climate change, waste management, and social commitment. It is noteworthy that the implementation of this environmentally and socially sustainable conventional banana production model demonstrates the benefits these practices offer throughout the supply chain. These benefits are reflected in outcomes such as:

- ✓ Reduced environmental impacts (water, soil, air).
- ✓ Improved quality of life for those who produce and consume the product.

The WWF sustainability tool is a validation instrument that includes various practices focused on natural ecosystems, water resources, integrated crop management, climate change, solid waste management, and social commitment. Its implementation and compliance will facilitate achieving the objectives set by the farms and the project.

It operates with 78 practices categorized by their level of importance, defined as red, yellow, and green practices. Red practices are mandatory compliance prerequisites, and non-compliance would result in the farm's exit from the project; yellow practices are those whose omission

would lead to the suspension of the farm until the effectiveness of corrective actions is demonstrated; and green practices are mandatory selections for continuous improvement.

Beyond the environmental benefits of applying BAP, many participants who have worked directly with producers agree that implementing these techniques positively impacts small agricultural businesses in both economic and social aspects. Among them, notable improvements include:

- ✓ Greater access to markets
- ✓ Significant enhancements in their management systems
- ✓ Improvements in food quality
- ✓ Better working conditions for their employees

In other words, good agricultural practices conceived from a comprehensive perspective that considers the various components involved in the production cycle (environmental, social, and economic) are essential for fostering sustainable agricultural development.

These practices can help reduce the risk of non-compliance with national and international regulations, standards, and guidelines; microbiological contamination of water and tools; improper

handling of tools or machinery; storage of hazardous products and chemical contamination; fruit contamination due to inadequate chemical dosages; the introduction of new pests, pathogens, or diseases in the production area; health risks for workers from pesticide use; low fruit quality; and decreased production.

On the other hand, establishing capacity-building programs and collaborative, participatory, and non-impositional practices for both producers and workers in productive units demonstrates that implementing these practices yields tangible and functional benefits that improve people's lives, such as access to safe drinking water.

Thus, doing things right and demonstrating it becomes a guiding principle for the implementation of Good Agricultural Practices (GAP), supported by experience, technical follow-up, and the documentation of the most effective GAP for each production case and context.

4.3.6 Challenges and Barriers

The implementation of sustainable practices and education and professional training (EFP) programs in Colombian agriculture faces various barriers. Below are some of the most common:

- ✓ Lack of Knowledge and Training
- ✓ Many farmers lack the necessary information and training on sustainable practices and their implementation.
- ✓ Formal education in agricultural sustainability is limited, hindering the adoption of new techniques.
- ✓ Limited Access to Resources
- ✓ Small producers often lack access to financing, appropriate technology, or sustainable inputs.
- ✓ Poor rural infrastructure limits access to markets and training services.
- ✓ Resistance to Change
- ✓ Deeply rooted traditions and practices make it difficult to adopt new methodologies.
- ✓ Distrust in the effectiveness of sustainable practices can be a barrier to their implementation.
- ✓ Economic and Social Conditions
- ✓ Rural poverty and lack of economic incentives can discourage farmers from investing in sustainable practices.
- ✓ Inequality in access to education and resources exacerbates the situation.
- ✓ Inadequate Regulation and Policies

- ✓ The lack of clear and coherent policies promoting agricultural sustainability may limit the advancement of these practices.
- ✓ Bureaucracy and complexity of administrative processes can discourage farmer participation.
- ✓ Climate Change
- ✓ Changing climatic conditions complicate planning and implementation of sustainable practices.
- ✓ Extreme weather events impact production and the feasibility of adopting new techniques.
- ✓ Lack of Institutional Support
- ✓ Limited collaboration between government entities, educational institutions, and agricultural organizations restricts the development of effective EFP programs
- ✓ The absence of follow-up and evaluation of existing initiatives also contributes to the problem.
- ✓ Overcoming these barriers requires an integrated approach that includes education, financing, institutional support, and effective public policies.

To overcome the barriers in implementing sustainable practices and education and professional training (EFP) programs in Colombian agriculture, the following strategies can significantly contribute to fostering a more favorable environment for sustainability in Colombian agriculture:

- ✓ Strengthening Education and Training
- ✓ Implement training programs in agroecology and sustainable practices, as seen in regions like the Coffee Axis, promoting the continuous education of farmers (ILO, 2018).
- ✓ Access to Financial Resources
- ✓ Establish microcredit and revolving funds for small farmers, such as the financing program by the Foundation of Man, which facilitates access to sustainable inputs (IDB, 2020).
- ✓ Promotion of Technological Innovations
- ✓ Implement digital platforms that connect farmers with sustainability experts, like the Agrointeli initiative, which provides real-time technical advice (MADR, 2019).

Economic Incentives and Subsidies

Develop policies offering subsidies to farmers who adopt sustainable practices, such as the Agricultural Sustainability Incentives Program in the Caribbean region of Colombia (Ministry of Agriculture, 2021).

Improving Inter-Institutional Collaboration

Foster alliances between universities, NGOs, and the public sector to design and implement training programs that meet local needs, such as the sustainable agriculture training project by the National University (UN, 2022).

Incorporating Information Technology

Utilize mobile applications that provide information on good agricultural practices, such as "Agrocalidad," which advises producers on sustainable management (MADR, 2023).

Awareness and Cultural Change Campaigns

Conduct awareness campaigns highlighting the benefits of sustainable agriculture, which have successfully promoted a mindset shift towards more responsible practices in farming communities (FAO, 2021).

4.4. Conclusion

In conclusion, the literature review underscores the crucial importance of agricultural education in Colombia as a driver of rural development and modernization of the agricultural sector. Despite the historical and contemporary challenges facing Colombian agriculture, such as the decline in its GDP share and the impacts of climate change, the transformation of Education and Professional Training (EFP) programs emerges as a vital strategy.

Integrating ecological and digital competencies into farmer training is essential for enhancing their innovation and sustainability capabilities. Through a systematic approach that analyzes various sources and best practices, critical areas requiring attention are identified to advance towards a more effective agricultural education aligned with the needs of the sector and rural communities. This modernization aims not only to increase the competitiveness of the agricultural sector but also to ensure sustainable development that benefits all of Colombia.

When addressing education in the rural sector, it is essential to consider the concept of development as one of its fundamental definitions. It is necessary to identify and define, both conceptually and operationally, the different levels of management that encompass development, particularly rural development. The latter is understood as a transformative process of rural societies and territories, centered on people and characterized by its participatory nature. It involves the implementation of specific policies aimed at overcoming social, economic, institutional, ecological, and gender imbalances, with the goal of expanding opportunities for human development.

The human dimension of development posits that people are the ultimate goal of this process, as well as the primary means to achieve it. The potential of each individual is the fundamental resource for the development of a country, region, or territory. For the rural population to fully realize its potential, it is essential to have access to basic goods and services, with education and training being paramount. Therefore, the education of the rural population should not only aim to meet individual expectations and interests but also to achieve common well-being and development goals, thereby fostering the commitment of the rural community to a larger project of sustainable development.

5. Chile

5.1. Introduction

This project, co-financed by the European Union and with the participation of institutions from Germany, Argentina, Bulgaria, Chile, Colombia, Greece, and Mexico, aims to share best practices and technical competencies in the area of Agronomic Sciences, benefiting the different entities participating in the project.

The expected result is the completion of an online course, the creation of a best practices manual, and participation in training sessions in Argentina and Chile during 2025.

In 2021, the Economic Commission for Latin America and the Caribbean (ECLAC, 2021), pointed out that education on and for sustainability entails several implications, not only in environmental areas, but also involves social, political, economic, and cultural areas, generating a conceptual and ideological challenge.

Since ancient times, education has been recognized as a key factor in a country's economic development (López-Leyva, 2024). By integrating practices that respect natural resources, sustainable agriculture protects ecosystems and promotes biodiversity, making it necessary to design public policies that balance economic growth with environmental conservation. In addition, this leads mainly rural communities to improve their food security and quality of life.

This challenge is closely linked to educational debates, especially in higher education, where theoretical discussions tend to focus on established disciplines, which have been developed as professional projects with solid knowledge. An important example, in higher agricultural education, especially in Latin America, is that aid to the most vulnerable rural communities is a strategy. In this context, the teaching of agronomy has emerged as an academic project that demands a constant review of its conceptual and methodological bases, focusing on the sustainability of systems and processes. This idea analyzes the role of agricultural professionals

and technicians, since their training, by implementing a curriculum with a more comprehensive approach, can help improve education and promote sustainable human development.

The literature retrieved was reviewed based on the relevance of the titles, abstracts, and specific keywords, which were: Sustainability, Education, Agriculture, Development, Communities; and the combination thereof, as agricultural education for sustainable development in Latin America.

Only articles and studies that provide significant and applicable information to the topics of the report were selected for in-depth analysis. In addition, priority was given to the review of successful case studies in Chile and Latin America, as well as policies and legal frameworks relevant to the national and international context.

The search for information focused on several academic databases and digital libraries (Web of Science, Google Scholar, National Agricultural Repository (ODEPA), FAOLEX).

5.2. Thematic sections

5.2.1. Sustainable Agricultural Practices

Agriculture faces the challenge of increasing its productivity to meet the world's growing demand for food, while at the same time becoming more efficient in the use of natural resources, adapting to new climate patterns, and making a positive contribution to the environment and society. Therefore, there is a need to develop an agricultural activity that combines environmental protection, social equity, and economic viability, i.e., sustainable agriculture.

The Agricultural Studies and Policies Department (ODEPA) of the Chilean Ministry of Agriculture carries out various initiatives to promote more sustainable agricultural systems, such as:

Non-conventional renewable energies: Chile is in a high-productivity growth phase, entailing a growing need for energy, which is generally scarce or expensive, becoming a critical factor for domestic producers. Consequently, non-conventional renewable energies (NCRE) emerge as a clean, inexhaustible, and environmentally friendly alternative that can complement the current energy generation systems. NCREs are introduced to the agricultural sector as a support and thanks to the fact that our country has different sources of energy resources such as wind, high levels of solar radiation, and large water flows. Along with this, agro-industrial waste also becomes relevant, from which biogas can be generated for thermal and electrical energy.

Food loss and waste: According to the information from the Food and Agriculture Organization of the United Nations (FAO), one third of the food produced for human consumption is lost or wasted worldwide, representing about 1.3 billion tons of food per year. Food Loss is defined as the loss

of food at any part of the supply chain, whether at the production, post-harvest, storage, or food processing stage, i.e., before it reaches the final product or retail stage. Food, which is still fit for consumption, is also lost at the end of the food chain, at the sales or consumption stage, due to poor decisions by traders and consumers. In 2017, the National Committee for the Prevention and Reduction of Food Losses and Waste established by the Food and Agriculture Organization of the United Nations (FAO), Agricultural Studies and Policies Department (ODEPA), Institute of Agricultural Research (INIA), Chilean Agency for Food Quality and Safety (Achipia), Food Network Corporation, University of Santiago de Chile, and the Sustainable Value Chains Organization were created.

To meet the challenge of promoting more sustainable agricultural production systems, ODEPA, together with the Institute for Agricultural Development (INDAP), the Sustainability and Climate Change Agency (ASCC, formerly CPL) and the Production Development Corporation (CORFO) entered into a collaboration agreement for the implementation of a Sustainable Agriculture Plan, aiming to promote the incorporation of sustainable practices in the agricultural sector. Under this agreement, a Sustainable Agriculture Protocol was drawn up, identifying the principles and criteria for sustainable agriculture, as well as recommendations for good practices applicable to the sector, considering the following topics: 1) Monitoring and use of water resources, 2) Respect for human rights, working conditions, and social protection, 3) Waste management, 4) Handling and application of agrochemicals, 5) Food safety management and traceability, 6) Relations with local communities, 7) Biodiversity management and ecosystem services, 8) Energy management, 9) Soil management and conservation, 10) Health assurance and animal welfare (ODEPA, 2024).

5.2.2. Vocational Training (VT) Systems in Agriculure

Vocational training (VT) in the agricultural sector, both in the European Union (EU) and in Latin America, faces similar challenges and new areas of innovation.

In the EU, VET systems have proven to be key for the implementation of green and digital skills, crucial for a transition to a more sustainable agriculture. However, a significant challenge is the need to constantly update the curricula to align them with labor market demands and environmental policies, such as the European Green Deal. In this context, efforts to integrate digital technologies, such as precision agriculture and sustainable resource management, within VET programs stand out (World Bank Group, 2015).

In Latin America, one of the main challenges is the lack of access to resources and technologies in rural areas. Despite this, some countries have made progress in integrating green skills into agricultural training, promoting sustainable practices to address climate change and land

degradation. However, unequal access to education and lack of investment in technological infrastructure are significant barriers that limit the effectiveness of these systems (ECLAC, 2024).

Both regions are aligned on the need to strengthen cooperation between the public and private sectors for improving the quality and relevance of training in agriculture. Key to these challenges is that policies are focused on digital and sustainable skills.

5.2.3. Green and Digital Skills

In our country, since 2022, Fundación Chile began to focus on projects that promote the retraining of workers in light of the rapid digital transformation and the transition to a more sustainable society. In addition, Fundación Chile aims to boost entrepreneurship and innovation in an economy that is becoming increasingly complex. Thus, we observe that the incorporation of green and digital skills in modern agriculture is progressing, although it faces some challenges.

Digital skills, i.e., the use of technological tools such as precision agriculture, sensors for crop monitoring, geographic information systems, and data management software, which enable farmers to optimize the use of resources and reduce environmental impact, are crucial to improve efficiency in agricultural practices and address environmental challenges. Technologies are transforming agriculture, particularly in rural sectors, where they also attempt to reduce the digital gap, especially for women and young people (ANPROS 2021).

In terms of green skills, these relate to sustainable practices such as the responsible management of natural resources, water conservation, and efficient energy use, which are important for the transition to sustainable agriculture and in line with international commitments, such as the European Green Deal. However, vocational training (VT) in Chile needs to adapt quickly to these demands. Although efforts have been made to integrate these competencies into training, challenges persist in terms of updating the curricula, teacher training, and technological infrastructure in rural areas.

In VET curricula, the inclusion of digital skills is in progress, but with a limited focus. Institutions have started to offer modules on digital technology applied to agriculture, but the adoption is uneven, with a considerable gap between urban and rural areas. It is also relevant to note that female participation in technology and STEM areas remains low, indicating the need for more inclusive policies (Kerrigan, 2021).

5.2.4. National Policies and Frameworks

ODEPA's report "Chilean Agriculture: Reflections and Challenges to 2030" outlines several key policies related to agriculture and vocational education and training in Chile. These policies focus

on creating a competitive, inclusive, and sustainable agricultural sector, adapted to global challenges such as climate change and market demands. One of these approaches is the integration of sustainable agricultural practices, promoting the efficient use of resources such as water and energy, as well as the incorporation of renewable energies in production systems. At the same time, we are also working to reduce inequality by supporting small-scale agriculture through financing services, technical advice, and soil improvement (ODEPA, 2017).

In response to climate change, Chile has developed specific sectoral plans (Sectoral Plan for Adaptation to Climate Change), which attempt to mitigate the impacts of climate change on agriculture. This approach could be useful for the EU, especially in regions facing similar climatic conditions.

On the other hand, Chile has promoted policies to improve territorial development and reduce inequity in rural areas, with programs that support marginalized groups such as women, young, and indigenous people. This inclusive territorial development policy could serve as a model for the EU, where regional balance is also a major concern (ODEPA, 2017)

Chilean policies that focus on sustainability, adaptation to climate change, and equitable territorial development are adaptable to the reality of the EU, thus offering successful models in the areas of natural resource management and the development of a more inclusive agriculture.

5.2.5. Best Practices and Success Stories

In terms of successful programs in vocational training (VT), and sustainable agricultural practices in the European Union (EU) and Chile, there are several examples that have had a positive impact on the transition to sustainability in agriculture.

Agricultural training programs in the EU have been integrating initiatives such as the Common Agricultural Policy (CAP) and the objectives of the European Green Deal, aiming to make the continent the first climate-neutral continent. Through the CAP, the encouragement of organic farming has been successful, as it motivates farmers to learn sustainable techniques. This policy aims for 25% of agricultural land to be used for organic production by 2030. Training includes green and digital skills, encouraging the adoption of practices such as integrated pest management and efficient water use (European Court of Auditors, 2017).

Another successful example is the EU Organic Farming Action Plan for 2021-2027, which includes training and technical support for farmers. This plan promotes conversion to sustainable farming methods, with the goal of increasing the demand for organic products and improving the skills of workers in the sector.

5.2.6. Challenges and Barriers

The implementation of sustainable practices in Chilean agriculture faces several barriers, both structural and cultural, such as:

Limited access to financial resources. Many farmers, especially small and medium farmers, lack the financial resources to adopt sustainable technologies or invest in formal training. The initial cost of green technologies, such as efficient irrigation systems or eco-friendly machinery, is often high and beyond the reach of many agricultural producers (Gonzalez et al, 2019).

Lack of infrastructure and technology. Another obstacle is the insufficient technological infrastructure in rural areas, preventing the adoption of modern and sustainable agricultural practices. This ranges from lack of internet access to the limited availability of advanced machinery, digital tools or facilities for efficient storage and processing of products (Muñoz et al., 2021).

Inappropriate education and training. Vocational training and technical education on sustainable agriculture topics are still not sufficiently widespread in rural areas. Although some training programs are available, their scope is still limited, and many farmers do not have access to updated information or information adapted to their local needs (Salinas et al., 2018).

Climate change and environmental conditions. Climate change and its effects on local environmental conditions, such as water availability and soil quality, can act as barriers. In many regions, sustainability is affected by the lack of natural resources that are essential for agricultural production (Ramirez et al., 2019).

5.2.7. Strategies to Overcome These Barriers

The report by González et al. (2019) suggests that rural development funds with fiscal benefits for green technologies have shown positive results in other regions. In Chile, the Production Development Corporation (CORFO) has developed financing programs for the adoption of sustainable practices, which could be expanded to include more small farmers.

In the Chilean Journal of Agriculture, Figueroa mentions that, in Europe, subsidies for sustainable agriculture together with strict regulations on the use of pesticides, have encouraged the transition to organic farming. In Chile, the Local Development Program (PRODESAL) could be expanded to include more sustainability-oriented financial incentives (Figueroa, 2020).

SUSTAINABLE AGRICULTURAL PRACTICES: It is important to mention the Sustainable Agriculture Plan agreement in Chile, which identifies principles and criteria as well as good practices in the sector.

VOCATIONAL TRAINING (VT) SYSTEMS IN AGRICULTURE: Vocational Education and Training is key for the implementation of green and digital skills, however, the need to frequently update the curricula according to labor market demands is crucial.

GREEN AND DIGITAL SKILLS: Are critical for improving efficiency in agricultural practices and addressing environmental challenges. These include the use of technological tools such as precision agriculture

NATIONAL POLICIES AND FRAMEWORKS: In Chile there are policies focused on sustainability and adaptation to climate change that offer successful models in agriculture.

CHALLENGES AND BARRIERS: Main barriers are limited access to financial resources, lack of technology and adequate education, mainly in rural areas.

The areas where current knowledge is sufficient are mainly two; Sustainable Agricultural Practices and National Policies and Frameworks. However, Green and Digital Skills and Vocational Education and Training Systems still need to be promoted, developed, and researched through frequent updating of the curricula.

These findings can enhance the FARM2LA project with the adoption of different scenarios such as:

- Green financing for sustainable initiatives

- Training and education in precision agriculture technologies and other digital tools.

- Participatory and active education of farmers where they experience sustainable practices.

- The FARM2LA curriculum should be aligned with Chilean public policies that encourage agricultural sustainability and include regulatory frameworks and current standards related to the subject.

- In addition, the curriculum should include resilient agriculture management, such as efficient water use, watershed management, conservation, and regenerative agriculture.

5.2.8. Implications for FARM2LA

The findings of the literature review inform and strengthen the objectives of FARM2LA by providing a strong knowledge base on the barriers and opportunities that the Chilean agriculture is facing in the transition towards sustainability. These areas of the curricula are:

- ✓ Facilitate access to financing and agricultural technologies.

- ✓ Provide continuous, flexible, and updated technical education and training.
- ✓ Teach the benefits of public policies and incentives for sustainability.
- ✓ Improve the capacity to adapt to climate change.

This knowledge will enable FARM2LA to develop a robust curriculum, tailored to the real needs of farmers, and meet its goals of promoting more sustainable, efficient, and resilient agriculture.

5.3. Conclusion

The review of literature and policies on sustainable agricultural practices and vocational training (VT) systems outlines the importance of adopting a comprehensive approach to address the challenges of modern agriculture in Chile. The transition to a more efficient and sustainable agriculture requires the implementation of green and digital technologies, as well as improved access to technical training tailored to local needs. Public policies, such as the sustainability initiatives of ODEPA and INDAP, play a crucial role in providing support frameworks and incentives to promote the adoption of sustainable practices, efficient resource management, and resilience to climate change. However, the lack of financial resources and technological infrastructure in rural areas are significant barriers that need to be addressed with more inclusive and equitable solutions, as suggested by the further expansion of financing and training programs. At the educational level, incorporating green and digital skills into the curricula of vocational education and training is key for preparing farmers for future challenges.

6. Bulgaria

6.1. Introduction

In Bulgaria, agriculture is more than just an industry—it is a way of life embedded in the country's history and culture. However, today this heritage faces challenges like climate change, economic pressures, and the need for innovation. Bulgaria stands at a crossroads, where transforming its agricultural practices has become essential.

This effort is part of the FARM2LA project, titled "Transforming Agriculture Education for Sustainable Development in Latin America," funded by the Erasmus+ program. FARM2LA aims to bridge the educational divide between the EU and Latin America, modernizing Vocational Education and Training (VET) systems by equipping trainers with green and digital skills crucial for sustainable development. This aligns with global sustainability goals and supports environmentally friendly and technologically advanced farming practices.

Bulgaria's journey towards modernizing agricultural education, particularly VET, is part of a larger European movement aligned with the European Green Deal and the Common Agricultural Policy (CAP) for 2023-2027. Farmers need new skills that protect the environment while boosting productivity. Therefore, VET systems are being revamped to provide these skills, empowering both young and experienced farmers.

Agriculture in Bulgaria is evolving, moving towards less water usage, fewer chemicals, and more technology. The traditional farmer is now using data-driven technologies like drones, soil sensors, and smart irrigation systems. This introduction explores Bulgaria’s future-focused journey, the challenges ahead, and the key initiatives driving this transformation.

Bulgaria's agricultural sector is deeply impacted by climate change, with hotter summers and more unpredictable dry spells. To face these challenges, VET systems are being updated to equip farmers with skills in eco-friendly methods, digital tools, and adherence to policies that aim to protect the environment and secure future food production.

This literature review will explore Bulgaria's approach to modernizing agricultural education, focusing on VET. We will examine national policies, best practices, and success stories that show how traditional farming is transforming into something more resilient. From sustainable practices like organic farming and conservation agriculture to new training programs that blend hands-on learning with digital technology, this review sheds light on strategies helping Bulgarian agriculture flourish in a changing world.

The goal is to honor Bulgaria's rich agricultural heritage while looking forward to a more sustainable, productive, and innovative future. By connecting the past and present, and ensuring seasoned farmers share knowledge with younger generations, Bulgaria is paving the way for a resilient agricultural sector capable of facing tomorrow's challenges.

6.2. Methodology

This literature review uses a systematic approach to gather and analyze information on agricultural Vocational Education and Training (VET) in Bulgaria. The goal is to understand VET's current state, its alignment with sustainable practices, and the integration of green and digital skills.

Data was gathered from academic databases like Google Scholar, Scopus, and JSTOR, as well as national reports from the Bulgarian Ministry of Agriculture and the National Strategic Plan for

CAP. Reports from international organizations such as the European Commission, FAO, and Cedefop provided broader context.

Keywords such as "VET in agriculture Bulgaria," "sustainable farming Bulgaria," and "green skills in Bulgarian agriculture" were used to refine searches. Cross-referencing techniques ensured a thorough collection of relevant sources.

The research involved defining the scope, conducting keyword searches, and filtering results based on relevance and reliability. Thematic analysis was used to categorize insights related to sustainable farming, digital skills in VET, and policy effectiveness. This methodology aims to provide a foundation for strengthening Bulgaria's VET systems, bridging traditional practices with modern sustainable methods.

6.3. Thematic Sections

6.3.1. Sustainable Agricultural Practices

Bulgaria's move towards sustainable agricultural practices is at the forefront of its strategy to modernize the farming sector and align with European Union initiatives like the Green Deal. Sustainable farming methods help improve the resilience of agriculture while minimizing environmental impacts. Key practices in Bulgaria include organic farming, conservation agriculture, and agroecology.

Organic Farming: Bulgaria has seen a growing interest in organic farming, driven by increasing demand for healthier, pesticide-free produce. Government initiatives and EU subsidies under the CAP encourage farmers to convert to organic methods by offering financial support and technical guidance. Organic farming helps improve soil quality, enhance biodiversity, and promote long-term sustainability.

Conservation Agriculture: Conservation agriculture focuses on maintaining soil health through practices such as minimal tillage, crop rotation, and cover cropping. In Bulgaria, these methods are gaining traction, particularly in areas where soil erosion and water scarcity pose significant challenges. Conservation agriculture helps reduce soil degradation, maintain productivity, and support sustainable use of resources.

Agroecology: Agroecology integrates ecological principles into farming. In Bulgaria, agroecological practices include crop diversification and natural pest control. These approaches aim to boost productivity while reducing dependency on chemical inputs. Agroecological practices are particularly suited to small-scale farms, helping to create more resilient local food systems.

Bulgaria's sustainable agriculture strategy emphasizes organic, conservation, and agroecological methods. These practices not only contribute to environmental sustainability but also improve the resilience and economic viability of Bulgarian farms, preparing them for a more uncertain future shaped by climate change.

6.3.2. VET Systems in Agriculture:

The modernization of Vocational Education and Training (VET) systems in Bulgaria is critical for equipping farmers with the skills needed for sustainable agriculture. Bulgarian VET institutions are evolving to include training on sustainable practices, digital skills, and environmental stewardship.

Integration of Sustainable Practices: VET programs in agriculture are increasingly focusing on teaching sustainable farming methods such as organic farming, conservation agriculture, and integrated pest management. These programs aim to prepare students for the practical challenges of modern agriculture while supporting environmental goals.

Work-Based Learning: Work-based learning is a core component of VET in Bulgaria. Partnerships between agricultural schools and local farms provide students with hands-on training, helping them to apply theoretical knowledge in real farming scenarios. This approach enhances their practical skills and ensures that graduates are well-prepared for the workforce.

Through the integration of sustainability into VET, Bulgaria is making strides towards creating a farming sector that is not only productive but also resilient and environmentally responsible.

6.3.3. Green and Digital Skills

The integration of green and digital skills into Bulgarian agriculture is crucial for modernizing the sector and improving its resilience. These skills are key to advancing sustainable practices, optimizing productivity, and ensuring that farmers can adapt to changing environmental and economic conditions.

Green Skills: Green skills refer to the knowledge and practices needed to promote sustainable agriculture. In Bulgaria, VET programs focus on training farmers in eco-friendly methods, such as organic farming, agroecology, and efficient resource management. These skills are essential for reducing environmental impacts and ensuring the long-term sustainability of farming practices. Green skills also include climate-smart agriculture, which helps farmers adapt to the effects of climate change by using water more efficiently and reducing greenhouse gas emissions.

Digital Skills: Digital skills are becoming increasingly important in Bulgarian agriculture. The use of precision farming technologies, data analytics, and digital tools is transforming how farmers

manage their operations. VET programs are incorporating training on tools like drones for monitoring crops, soil sensors for smart irrigation, and farm management software that uses data to optimize decision-making. These digital skills help farmers improve efficiency, reduce waste, and enhance overall productivity.

Gaps in Current VET Curricula: Despite progress, there are significant gaps in the current VET curricula concerning green and digital skills. Many VET programs lack sufficient emphasis on practical digital tools, such as data analytics and IoT technologies, which are crucial for modern precision farming. Additionally, green skills training is often limited to theoretical knowledge, without adequate hands-on opportunities for students to practice sustainable farming methods in real-world scenarios. These gaps create a mismatch between the skills taught in VET institutions and the competencies needed by modern farmers to implement sustainable and technologically advanced farming practices effectively.

Training and Capacity Building: To effectively integrate green and digital skills, Bulgaria's VET systems are focusing on capacity building through workshops, seminars, and practical training programs. Collaboration with research institutions and private sector partners enriches the learning experience, ensuring that farmers are equipped to meet the demands of modern agriculture. By enhancing both green and digital skills, Bulgarian farmers are better prepared to implement sustainable practices and leverage technology to address challenges in the agricultural sector.

The focus on green and digital skills is helping to transform Bulgarian agriculture into a more sustainable and efficient industry. These competencies not only prepare farmers for the future but also contribute to broader environmental and economic goals, making agriculture a more attractive and viable career path for younger generations.

6.3.4. National Policies and Frameworks:

Bulgaria's agricultural policies and frameworks are shaped by both national objectives and European Union initiatives aimed at sustainability, rural development, and educational modernization.

National Strategic Plan for CAP 2023-2027: Bulgaria's National Strategic Plan for the Common Agricultural Policy (CAP) serves as a guiding framework for sustainable agriculture and rural development. The plan emphasizes promoting eco-friendly farming practices, supporting rural communities, and enhancing competitiveness in the agricultural sector. CAP initiatives include financial incentives for adopting practices such as organic farming, conservation agriculture, and

agroecology. The plan also prioritizes knowledge transfer and VET to equip farmers with necessary skills for sustainable agriculture.

Rural Development Program (RDP): The Rural Development Program supports sustainable agricultural practices through funding infrastructure projects, training initiatives, and farm modernization efforts. The RDP aims to improve the quality of life in rural areas while fostering economic diversification. It emphasizes capacity building in VET to ensure that rural communities have access to modern agricultural knowledge and practices.

National VET Policies: Bulgaria has adopted several policies to enhance the quality and relevance of vocational education in agriculture. These policies focus on aligning VET curricula with the needs of the agricultural sector, particularly concerning green and digital skills. Initiatives under these policies include partnerships between VET institutions, agricultural enterprises, and research bodies to enhance the effectiveness of training and ensure practical experience for students.

6.3.5. Relevant EU Policies

European Green Deal - The European Green Deal is a comprehensive strategy aimed at making the EU climate-neutral by 2050. It significantly influences Bulgaria's agricultural sector by promoting sustainable farming practices, reducing greenhouse gas emissions, and enhancing biodiversity. Bulgaria's adoption of the Green Deal's guidelines helps align national agricultural practices with EU-wide sustainability targets.

Common Agricultural Policy (CAP) 2023-2027 - The CAP is a central pillar of the EU's agricultural policy, promoting environmental stewardship and rural development. Bulgaria has adapted CAP policies to encourage the adoption of sustainable farming practices and support farmers through subsidies and training programs. The CAP's eco-schemes, which incentivize organic and conservation farming, are central to Bulgaria's sustainability efforts.

Farm to Fork Strategy - The EU's Farm to Fork Strategy aims to create a fair, healthy, and environmentally friendly food system. Bulgaria aligns with this strategy by promoting sustainable agricultural practices, reducing chemical use, and enhancing the traceability and quality of agricultural products. The strategy influences VET programs by integrating training on food safety, environmental impact, and resource-efficient practices.

6.3.6. Adaptation and Gaps

While Bulgaria has made strides in aligning its agricultural and VET policies with EU initiatives, challenges remain. The implementation of policies at the local level often faces issues such as

lack of funding, insufficient infrastructure, and limited access to technology in rural areas. Additionally, while EU policies like CAP and the Green Deal provide a solid framework, Bulgaria's adaptation sometimes lacks practical mechanisms for ensuring effective training and capacity building. The gap between policy goals and actual outcomes, particularly in VET, needs addressing to ensure that farmers can fully benefit from available resources and training opportunities.

National and EU policies serve as a roadmap for the transformation of Bulgarian agriculture, focusing on sustainability, resilience, and the integration of green and digital skills. However, closing the implementation gaps at the local level is crucial for the successful adoption of these strategies and for ensuring that VET effectively meets the evolving needs of the agricultural sector.

6.3.7. Best Practices and Success Stories

Successful vocational education and training (VET) programs and sustainable farming practices have been documented across both the EU and Latin America, offering valuable lessons for Bulgaria's agricultural transformation. By examining case studies from these regions, we can better understand how effective VET initiatives and innovative agricultural practices contribute to sustainability and productivity.

Conversion Support for Organic Farming - providing financial incentives and targeted support for farmers transitioning to organic production. These conversion subsidies reduced the financial risks for farmers adopting organic practices, thereby encouraging more conventional farmers to switch.

Promotion of Agroecological Methods - The eco-schemes emphasized agroecological approaches such as crop diversification, mixed farming systems, and natural pest management. This helped farmers improve the resilience of their agricultural systems while minimizing the use of chemical inputs.

Enhanced Biodiversity - Farmers were encouraged to implement measures that enhanced biodiversity, such as setting aside portions of their land for natural habitats, establishing flower strips, and protecting hedgerows. These initiatives improved the ecological health of farmland and supported a wide variety of plant and animal species.

Technical Guidance and Farmer Education - providing technical guidance to farmers, helping them adopt sustainable practices effectively. The government facilitated workshops and training sessions to educate farmers about organic farming techniques, soil health management, and biodiversity conservation.

Marketing and Certification Support - building a market for organic products through certifications and branding. Certified organic labels helped farmers access premium markets, thereby making organic farming more profitable and economically sustainable. Public awareness campaigns were also part of the strategy to increase consumer demand for organic products.

Data Collection and Monitoring - systematic data collection and monitoring to track the progress of organic farming and eco-scheme adoption. This monitoring helped evaluate the impact of the measures taken and provided valuable feedback for continuous improvement.

The Netherlands has emerged as a leader in integrating digital tools into agriculture, particularly through the adoption of precision farming technologies. Farmers utilize GPS-guided equipment and data analytics to optimize inputs and manage resources more effectively. This approach has led to increased efficiency and sustainability in agricultural production. (Wageningen University & Research, 2024)

The documented success stories from the EU and Latin America illustrate the positive impact that well-designed VET programs and sustainable practices can have on agriculture. In Germany and Argentina, farmers adopting eco-friendly methods have reported improved soil health and biodiversity, while in the Netherlands and Chile, the use of digital tools and capacity building has led to more efficient resource management and higher productivity.

By focusing on practical, hands-on training and integrating green and digital skills, Bulgaria's agricultural education can better prepare farmers to tackle current and future challenges. Community engagement, as seen in Mexico, could strengthen the local adoption of sustainable practices, ensuring that the benefits are widespread and deeply rooted in local contexts.

6.3.8. Challenges and Barriers

The path to implementing sustainable agricultural practices and Vocational Education and Training (VET) programs in agriculture often meet challenges and barriers ranging from financial and infrastructural limitations to cultural and policy-related hurdles. To successfully modernize agricultural practices in Bulgaria, it's crucial to understand these barriers and develop strategies to overcome them.

Common Barriers to Implementing Sustainable Practices and VET Programs

Financial Constraints - One of the most significant barriers is the cost associated with adopting sustainable practices and modernizing VET systems. Farmers, especially smallholders, often struggle with the high upfront investment needed for sustainable inputs, technology, and

infrastructure. Additionally, VET institutions require funding to update curricula, train educators, and acquire the necessary technology to effectively teach modern skills.

Limited Access to Technology and Infrastructure - In rural areas, access to the digital and technical infrastructure required for modern agriculture remains limited. Poor internet connectivity, insufficient access to precision tools, and outdated farming equipment hinder the adoption of sustainable practices and digital learning. This technology gap is a significant obstacle for implementing precision farming and other innovative methods.

Knowledge and Skill Gaps - Farmers and VET trainers may lack the knowledge and skills necessary for integrating sustainable practices into agriculture. This lack of capacity extends to educators within the VET system who may not be well-versed in modern, sustainable techniques or the use of digital tools. Without adequate training, both educators and students face challenges in understanding and applying sustainable farming concepts.

Cultural Resistance to Change - There is often cultural resistance to changing traditional farming practices. Many farmers prefer established methods that they are comfortable with, seeing new practices as risky or unproven. This hesitancy is particularly evident in older generations, who may be less inclined to adopt digital and green technologies without clear evidence of their benefits.

Policy and Institutional Barriers - Despite supportive national and EU policies, there are often gaps in implementation. Policies may lack practical mechanisms to ensure local adoption, such as inadequate financial support for farmers or the absence of incentives for VET institutions to modernize their programs. The fragmentation of responsibilities across different institutions can also lead to inefficiencies and delays in policy execution.

Sustainable practices, such as organic farming and conservation agriculture, are becoming more common, supported by both national policies and EU incentives. However, there is a need for broader implementation of green and digital skills within VET curricula to ensure that farmers can effectively transition to modern agricultural techniques. The focus on capacity building and community-led initiatives has shown promise, particularly in engaging farmers resistant to change.

The findings also highlight sufficient knowledge in some areas, such as the technical understanding of organic and conservation agriculture methods, thanks to well-established EU-funded initiatives. However, there are notable gaps in practical application, particularly in the integration of precision farming technologies and the adoption of digital tools. Moreover, cultural

barriers and limited infrastructure in rural areas continue to hinder the widespread adoption of these methods.

These findings will be used for the curriculum development for the FARM2LA project by emphasizing practical, hands-on learning, especially in areas where there is a current deficiency, such as digital literacy and precision agriculture. Incorporating case studies from successful EU and Latin American initiatives will provide concrete examples and motivate trainers and trainees to adopt these methods. By focusing on capacity building and overcoming the specific barriers identified, the FARM2LA curriculum can effectively address both the opportunities and challenges in sustainable agricultural development.

6.3.9. Implications for FARM2LA

The literature review findings provide valuable insights that will directly contribute to the goals of the FARM2LA project. The identification of gaps in current VET curricula, particularly in terms of green and digital skills, highlights where FARM2LA can make the most significant impact. By addressing these gaps, the project can empower trainers and trainees with the skills needed for a more sustainable and resilient agricultural sector.

Specifically, the findings indicate that the FARM2LA curriculum should prioritize the integration of precision farming technologies, digital literacy, and sustainable farming methods. Modules that focus on practical, hands-on training will be particularly beneficial in ensuring that learners are not only equipped with theoretical knowledge but also the skills to implement sustainable practices in real-world scenarios. The emphasis on community engagement and the use of demonstration projects can also be incorporated into the curriculum to help overcome cultural resistance and promote the adoption of new techniques.

Aligning the curriculum with EU policies such as the Green Deal and CAP will ensure that the training provided is relevant and forward-looking, preparing participants to meet both local and international sustainability standards. By incorporating successful strategies from other regions, such as work-based learning from France and agroecological practices from Argentina, FARM2LA can create a comprehensive and adaptable training program that addresses both current and future challenges in agricultural education.

6.4. Conclusion

In conclusion, the literature review has highlighted key strengths and gaps in the current landscape of agricultural VET systems and sustainable practices in Bulgaria. There is a clear need for broader implementation of green and digital skills in VET curricula, supported by targeted

financial incentives, infrastructure development, and policy alignment. By emphasizing hands-on learning, community engagement, and capacity building, Bulgaria can overcome existing barriers and promote a more sustainable agricultural sector.

The next steps for integrating these findings into the FARM2LA project involve refining the curriculum to address identified gaps, particularly in digital literacy and precision agriculture. Incorporating practical case studies and successful strategies from both Europe and Latin America will provide learners with the skills and confidence needed to adopt new, sustainable practices. Collaboration with local and international partners will also be crucial for ensuring the curriculum remains relevant and impactful, effectively equipping trainers and trainees to meet the evolving demands of sustainable agriculture.

7. Argentina

7.1. Introduction

The Argentine Republic is a federal state composed of 23 provinces and one Autonomous City. Located in the southern part of the American continent, comprises a vast territory of 3,761,274 km² that contains a variety of ecosystems, allowing it to be a leader in agriculture, rankink third in the world as a food-exporting country, and in the agricultural sector it contributes 15.7% to the Gross Domestic Product (GDP) and 10.6% of tax revenues (as of 2021). These characteristics and traditions in agriculture and livestock farming have made the country internationally known as the "Granary of the World."

It is a reality that year after year, climate change has become a setback for small and large-scale farmers, who increasingly suffer from the impacts of the El Niño and La Niña phenomena, leading the region to endure severe droughts and floods, causing significant damage at the population level and directly affecting all levels of agricultural production.

Beyond the extreme weather events and in contrast to their consequences, it should be noted that Argentina's fertile lands are the basis for the development of agriculture, both on a large and small scale, the latter aspect being the focus of this international project called “Farm2LA”.

The national institutes accompany with research and technology the large national cereal industry (wheat, corn, sorghum, barley, rice, rye, among others) with research and technology and also create information to support farmers from both rural areas and urban peripheries, with a special focus on agroecological production, prioritizing seasonal crops and the safeguarding and production of native seeds. The special attention on this type of production has been consolidating

over time and is a policy consistent with the 2030 Agenda. All these trends, which are growing year after year, point to a national policy that coincides with the 2030 Agenda in its objectives:

1. End Poverty:

End poverty in all its forms everywhere. By 2030, ensure that all men and women, particularly the poor and vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land, other forms of property, inheritance, natural resources, new technologies, and financial services, including microfinance.

2. Zero Hunger:

End hunger, achieve food security and improved nutrition, and promote sustainable agriculture: The goal is to end all forms of hunger and malnutrition by 2030 and ensure that all people, especially children, have sufficient and nutritious food year-round. This task involves promoting sustainable agricultural practices through support for small farmers and equal access to land, technology, and markets. Moreover, it requires promoting international cooperation to ensure investment in the infrastructure and technology necessary to improve agricultural productivity.

7.2. Methodology

Some of the texts consulted, in order to advance the project, are texts elaborated by the National Institute of Agricultural Technology (INTA) and academic material from different universities in the country. The extension and territorial diversity of Argentina allows us to approach different views related to the subject that concerns us. We have added texts that are easy to understand, easy to apply and with special attention to educational programs aimed at training young people in rural areas.

In Argentina, it is a priority for many researchers to take into account modern good agricultural practices with traditional knowledge, adding both techniques to achieve improvements not only in the crop but also in the quality of life of the families that live from it as food at home and for sale.

The compilation was based on the following keywords: sustainability, soil use, crop rotation, native seed bank, food sovereignty, family vegetable garden, urban agriculture, local consumption, agro-ecology, scale and seasonal crops.

7.3. Thematic Sections

7.3.1. Sustainable Agricultural Practices:

Sustainable agricultural practices are based on principles of environmental care, the prioritization of farmers' health and access to crops free of pesticides, with a detailed care of the land,

prioritizing crop rotation over monoculture, which will ensure the enrichment of the land in the long term. From a social perspective, it is a contribution to reduce rural poverty, whether by enabling the families to achieve Food Sovereignty or because they are able to sell their crops in the community and nearby areas.

One of the reasons for promoting sustainable agriculture is to minimize the pressure on natural resources, based on proper management and conservation of biodiversity; in Argentina, the practice of native seed banks and encouraging crop rotation is well known. Alongside these practices, environmental risks caused by climate change and increased resilience are taken into account, which are fundamental aspects for guaranteeing rural and urban livelihoods, especially in localities where urban agriculture is encouraged in peripheral lots.

7.3.2. VET systems in agriculture:

The Argentine Republic has a National Education System that starts at 5 years of age and is governed by national laws and regulations. Families can choose to enroll their children in the public or private school system. The public system has different learning categories and one of them is the Technical School within secondary education, where students can choose specific knowledge profiles that prepare them either for the labor market or for entry into higher education careers.

In Argentina, many students attend Technical School, where specialized contents are taught that are coherent with the local labor market so that when looking for a job, they can be hired in the production areas of the area. Students with technical education are also prepared to continue university studies with more expertise than the average.

Technical Vocational Education in Argentina is a type of education that offers general and vocationally oriented programs; some of the many options available are: chemistry, hygiene and safety, electronics, aeronautics, food technology, computer science and, in the case, agriculture.

Technical Vocational Education is divided into educational levels established by Law No. 26.058: Technical Secondary, Technical Higher Education (non-university) and Vocational Training. Technical Secondary Technical institutions within compulsory education have curricula with an additional year of studies, offering vocational training paths. The last year is intended to help students to do professional internships which prepares them to experience their first work environment and at the same time to get to know and establish professional links in their chosen field.

Tertiary institutions, also known as higher-level technical institutions, provide post-secondary training directly involved in the world of work, offering students a specialized technical program. These institutions offer diverse programs compared to the university system. The National Institute of Technical Education (INET) is the agency responsible for coordinating the implementation of public policies related to Technical Professional Education in collaboration with the provinces and the Autonomous City of Buenos Aires.

7.3.3. Green and digital skills:

The presence of courses and manual-like material provided by INTA is one of the official references to which the general population can have access.

National policies and frameworks:

National Law Nº 27118

Historical Reparation of Family Farming for the Construction of a New Rurality in Argentina".

It aims to promote, value and declare family, peasant and indigenous agriculture to be of public interest, strengthen production and food sovereignty, based on environmental, social and economic sustainability.

Some of the aspects addressed in the Law are gender equity, Land Bank for Family Farming, programs for production, financing and commercialization.

Article 24, which is of inherent interest to this project

a) To guarantee the preservation, promotion, validation and

dissemination of the practices and technologies of family, peasant and indigenous farming communities, in order to strengthen their cultural identity, the transmission of knowledge and recovery of good practices on production, attending to everything inherent to logistics and public services; communication; rural educational services; distributed renewable energies; water management, harvesting and recovery; bioarchitecture for housing and productive infrastructure;

added value at source; alternative certification

b) Preserve natural assets for future generations, promoting integral productive development for good living, in harmony with nature and preserving genetic diversity, respecting uses and customs, recognizing the family as the main nucleus of production and productive sustainability over time;

c) Promote healthy eating habits and their mass dissemination.

Likewise, Articles:

ARTICLE 27. - The NATIONAL INSTITUTE OF FAMILY, FARMING AND

INDIGENOUS AGRICULTURE shall prepare proposals to the Ministry of Education on topics related to rural education, at all levels that are mandatory, thus strengthening an education that revalues its immediate context, facilitating the construction of citizenship of children and young

people in rural areas; at the same time, it shall develop programs that allow the acquisition of values, skills and abilities typical of the family farming

sector. (Reference to the former MINISTRY OF AGRICULTURE, LIVESTOCK FARMING AND FISHERIES replaced by Section 13 of Decree No. 729/2022)

B.O. 4/11/2022. Effective as from its publication in the OFFICIAL BULLETIN). The National Executive Power shall promote higher technical education and training in the rural area, recognizing the sector's own forms of learning and knowledge transmission.

ARTICLE 28. - The Ministry of Education, in coordination with the Ministry of Health, shall incorporate in the curriculum of the Educational System, rural education, nutritional food education, the importance of the consumption of products of national origin, including those of family, peasant and indigenous agriculture, healthy, nutritious and culturally appropriate.

Municipal Ordinance 10.141 (Municipality of Rosario)

Sustainable food production program in the area of protection and promotion of food production.

Ordinance that accompanies the already existing programs both provincial and municipal and in line with the Sustainable Development Goals.

Some of the articles of interest for this research are:

Art. 2°.- OBJECTIVE. It will aim to implement policies for the promotion of sustainable primary food production, in coordination with the industries of its value chain, in its productive, social and environmental dimensions.

Art. 3- ACTION AXES. l. Advice and technical assistance to farmers in agro-ecological reconversion processes, which include good agricultural practices.

7.3.4. Best practices and success stories

National

Pro Huerta Program (1990-2024)

It was a public policy managed jointly with the National Institute of Agricultural Technology (INTA), which promoted Food Security and Food Sovereignty, through support for agroecological production and access to healthy products for adequate food. For more than 30 years, this program sought to produce the largest number of publications related to Food Sovereignty for the public, in addition to training and support in the territory with specialized technical personnel. It was the national program in charge of delivering seed kits and providing them to more than 600 thousand families throughout the national territory, certified and specific seeds for the season and region of the country. This program was known internationally by organizations such as FAO, as an aid for farmers. This program had international recognition and was a reference in Latin America; it was directly linked to the Environment Programme (UNEP) Food and Agriculture Organizations of United Nations (FAO), Economic Commission for Latin America and the Caribbean (CEPAL).

Some of the work strategies of the national program were:

● Promotion of agroecological gardens and farms (family, school and

community/institutional).

● Technical assistance and training.

● Food and environmental education.

● Strengthening of productive projects and access to water.

● Support for commercialization through local markets and popular fairs.

Although the program was recently closed, INTA maintains several of the policies, such as the delivery of seeds articulated with cities and provinces, since this program depended on this institute.

Province of Santa Fe:

“Cinturón Verde” Province of Santa Fe (2016-present).

It is a current project based on the concept of Food Sovereignty, extensive and sustainable and healthy fruit and vegetable production. Its objective is to strengthen and support local producers; achieve differentiated products for their quality and facilitate access to healthy and local food.

The program contemplates the ecosystemic functions of productive spaces for the city, by guaranteeing the conservation of the absorbent surface, CO2 capture, temperature moderation and nutrient recycling, among others. These contributions are of vital importance in climate crisis scenarios. Like Pro Huerta, the team visits, accompanies and technically advises farming families to ensure agrochemical-free crops and help them generate local marketing chains within a short distance.

Municipality of Rosario

Urban Agriculture Program (PAU) (2002- Present)

With similar characteristics to the *Cinturón Verde*, the PAU has been working for more than two decades. It was born in the early 2000s as a result of an economic crisis in the country that led the most vulnerable population to situations of extreme poverty. The Municipality of Rosario in the hands of the renowned Engineer Antonio Lattuca decided to bring agricultural knowledge to women in the periphery of the city due to the great need to generate food for their families. At that time Lattuca called this first experience “Emergency Vegetable Gardens”. As the country's situation improved, many of these farmers got more formal jobs and others continued in the activity as a permanent occupation.

Today, the Urban Agriculture Program (PAU) works together with the National University of Rosario (UNR), INTA accompanies social enterprises of food production and preparation using ecological techniques, intended for family, community consumption and the local market.

In June 2021, the PAU won first place in the international competition organized by the World Resources Institute's Ross Center for Sustainable Cities for its urban and peri-urban agriculture policies.

As part of this PAU project, an annual “Urban Agriculture Week” is organized in the city, during which workshops are held for the entire population on home gardens, aromatic plants, responsible consumption, medicinal plants, compost, among others. This proposal aimed at the general public seeks to publicize the urban agriculture program and raise awareness about the work done by urban farmers who sell in small fairs in the city.

7.3.5. Challenges and barriers:

We found it as a barrier to access to design, information and digital accessible technology for this compendium of farmers as a method of learning and as tools in the process of agricultural production.

There is a long tradition of family farming in the country due, in part, to the various economic crises the nation has gone through. In academic matters, traditional knowledge has space to contribute to academic research, which allows researchers and farmers to feedback knowledge.

At the same time, in large cities, access to agroecological products is not massive due to the population context and the lower-priced supply of fruits and vegetables produced on a large scale. It should be noted that within the programs mentioned as successful there is no fruit cultivation.

Another important finding is that we could not find accessible technology for farmers to help and accompany them in their planting process.

We consider that each country, with its context and history, could generate reports with different results among them, so the obstacles of each experience can be analyzed in a comparative process, which will allow us to know that the challenges of some will be the strengths of others. In conclusion, this joint work will make it possible to develop optimal and enriching results to cover the shortcomings of each region.

7.4. Conclusion

The literature review provides an overview of the country's situation, the legal framework and the existence of educational and technical programs and initiatives at the different levels of public administration in the country that deal with family farming and all its aspects.

It is a concern at the municipal and provincial levels how food reaches, or does not reach, the Argentine people's table, which is why programs of this kind predominate throughout the country and, as the project research progresses, we will be able to focus on the aspects that are of greatest interest.

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FIELD
RESEARCH

Field Research

1. Greece

1.1. Introduction

The FARM2LA project, funded under the Erasmus+ program aims to transform agricultural education by fostering sustainable farming practices across Europe and Latin America. The project's primary objective is to provide agricultural stakeholders with modern vocational education and training (VET) programs that promote sustainability. FARM2LA seeks to create a digital platform, develop educational materials, and establish "Farm Labs" to facilitate knowledge exchange. This initiative is focused on equipping farmers and trainers with the tools necessary to implement environmentally friendly farming methods, reduce their environmental impact, and promote collaboration between the EU and Latin America. The project also aims to address the challenges faced by small and medium-sized farms by offering innovative solutions for sustainable agriculture.

Purpose of the focus group is to gather direct feedback from farmers, VET trainers, and learners about the current state of agricultural education and sustainable practices. By engaging with stakeholders who are actively involved in farming and agricultural training, the focus group sought to identify key challenges, gaps in knowledge, and practical needs that exist within the sector. This feedback will play a crucial role in shaping the development of tailored VET programs that effectively meet the specific needs of farmers and help them transition to more sustainable methods.

The main objective of this report is to summarize the findings from the focus group discussions, highlighting the key practices, challenges, and opportunities identified by the participants. The report will provide actionable insights into how the FARM2LA project can enhance its educational programs to better support farmers in adopting sustainable practices. Furthermore, the report aims to outline recommendations for improving the current VET curriculum, ensuring it is aligned with the real-world needs of those involved in agriculture.

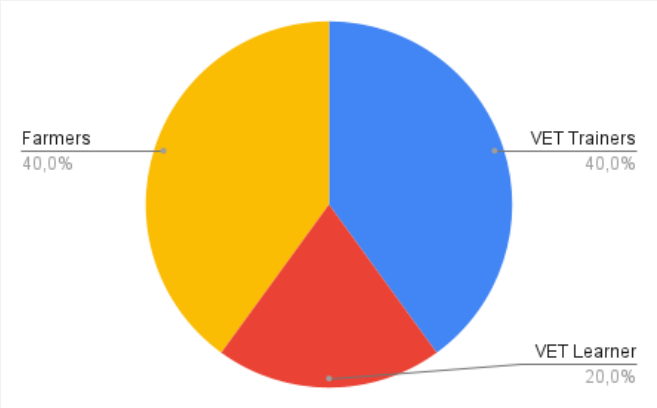
1.2. General Information about Participants

The focus group consisted of five participants, including two VET trainers, one VET learner, and two farmers. All participants are based in the agricultural region of **Veria**, located in the Imathia prefecture of northern Greece. Veria is a predominantly **rural area**, heavily reliant on agriculture, with the economy largely driven by the production of fruits such as peaches, apples, and cherries. This makes Veria a key area for exploring the implementation of sustainable agricultural practices and the role of vocational education and training (VET) in supporting farmers in this transition.

The two farmers who participated have been working in the agricultural sector for many years. They were keen to share their **experiences** and insights during the focus group, providing a

practical perspective on the **challenges** they face. They expressed a strong interest in contributing to the discussion about what is currently lacking in terms of educational resources and support for sustainable farming. Both farmers highlighted the gaps in the current VET offerings, pointing out that while there is growing awareness of sustainable practices, there is a lack of accessible, hands-on training that would allow them to integrate these practices more effectively into their daily work.

During the discussion, the farmers shared specific practices they have already implemented on their farms, such as rotating crops and using more organic methods to reduce their reliance on chemical fertilizers. They expressed a desire for more targeted educational programs that focus on practical, field-based learning, rather than theoretical approaches. They emphasized that training programs should be tailored to the real-world challenges farmers face and should provide clear guidance on how to balance productivity with sustainability. Additionally, the farmers discussed the need for ongoing support through workshops and peer learning opportunities, where they can exchange knowledge and experiences with other farmers facing similar challenges.



1.3. Current Practices and Experiences

From the focus group discussion, it became clear that the farmers who participated have been employing a mix of traditional and more sustainable practices on their farms. One of the primary methods they use is **crop rotation**, which they explained helps maintain soil health and reduce the need for chemical fertilizers. Additionally, they have started using **organic fertilizers**, such as compost, to minimize their environmental impact while improving crop yields. However, they acknowledged that they lack a formal, structured understanding of how to fully optimize these practices. The farmers also mentioned that while they have heard of more advanced techniques

like precision farming, they do not have access to the necessary training or resources to implement these methods effectively.

Another key practice shared by the participants, particularly the farmers, is their focus on **water management**. Given the water-intensive nature of agriculture in the Veria region, managing water resources efficiently is a significant concern. Some farmers have introduced **drip irrigation systems** to conserve water and reduce waste. While this practice has shown positive results, the farmers expressed a desire for more education and support to expand the use of water-saving technologies. They stressed that, without proper training and access to up-to-date techniques, it is difficult to scale these practices and ensure that they are applied consistently across different types of crops and fields.

The feedback highlighted several gaps in the current agricultural education system. Both the farmers and the VET trainers agreed that **practical, hands-on learning** is crucial for the effective adoption of sustainable farming practices. They noted that most of the available training programs are overly theoretical, focusing on broad concepts rather than the specific challenges that farmers face in their daily operations. According to the participants, future educational efforts should prioritize **field-based training**, where farmers can see sustainable practices in action and receive personalized guidance from experts. They also suggested that **continuous support**—such as workshops, on-site visits, and peer-to-peer learning—would be instrumental in helping farmers adopt and sustain new techniques. By addressing these educational needs, the agricultural sector could see a more widespread and effective implementation of sustainable practices.

1.4. Assessing Stakeholders' Understanding and Knowledge in Agriculture and Sustainability

It became evident that the participants primarily rely on self-directed learning and online research to gain knowledge about sustainable agricultural practices. Many stated that they regularly access information from the European Union, through newsletters or official websites, which provide updates on sustainability initiatives and guidelines. However, they expressed concern over the lack of an organized educational framework that could provide a structured approach to learning. Specifically, the farmers mentioned that while they have basic knowledge of sustainable practices like crop rotation or the use of organic fertilizers, they lack guidance on the precise quantities of materials to use, as well as the frequency and methods of application. Furthermore, they feel that there is insufficient support for learning about newer sustainable practices, such as precision

farming, which would help them optimize their production processes in an environmentally friendly way. Despite their motivation to adopt these practices, the absence of a clear, cohesive educational plan hinders their ability to implement them effectively.

The focus group participants identified several areas where they believe **agricultural education** and **training** need significant improvement. First, they pointed out the need for **more accessible, field-based training programs** that offer hands-on experience rather than just theoretical knowledge. They emphasized that **practical workshops** or **demonstration farms** would allow them to better understand how to apply sustainable practices in real-world scenarios. Additionally, the farmers highlighted the lack of **customized training** that addresses the specific needs of different types of crops or farming methods. They mentioned that many training materials are too generalized and do not take into account the unique challenges they face based on their crop types, soil conditions, or local climate. Lastly, the participants underscored the importance of **continuous learning opportunities**—such as regular workshops, online courses, and peer-to-peer exchanges—that would allow them to stay updated on the latest developments in sustainable agriculture and receive ongoing support as they implement these practices on their farms.

1.5. Identifying Barriers and Challenges Faced by Stakeholders in Agriculture

One of the key barriers highlighted by the participants during the focus group was **financial difficulty**. The farmers specifically mentioned that the high cost of adopting sustainable practices, such as purchasing organic fertilizers or installing advanced irrigation systems, presents a significant challenge. While they recognize the long-term benefits of these investments, the initial cost is often prohibitive, particularly for small and medium-sized farms. They also expressed frustration over the **limited financial support** available through local or national programs, noting that the subsidies and grants currently offered are not enough to cover the full expenses associated with transitioning to more sustainable farming techniques.

Additionally, the participants discussed **bureaucratic barriers**, particularly the complexity involved in applying for financial aid or grants. They stated that the process of applying for funding is often cumbersome and time-consuming, requiring extensive paperwork and knowledge of administrative procedures, which many farmers lack. This complexity discourages them from pursuing available support programs, leaving them to rely solely on their own financial resources to implement sustainable practices.

These financial and bureaucratic barriers have a direct impact on the effectiveness of agricultural training and education. The participants explained that because of the **limited financial resources**, many farmers cannot afford to participate in **advanced training programs** or attend workshops that focus on sustainable practices. This leads to a knowledge gap, as farmers are unable to access up-to-date information or receive training on the latest sustainable technologies and methods. Furthermore, the complexity of the funding application process means that even when educational programs are available, farmers may not be able to attend due to the associated costs. This situation creates a cycle where financial and bureaucratic challenges prevent farmers from gaining the necessary education, which in turn limits their ability to adopt more sustainable practices effectively.

1.6. Assessing the Efficacy of Current Support Systems for Implementing Sustainable Agriculture

Participants of the focus group discussed the efficacy of Current Support Systems for implementing sustainable agriculture, emphasizing on the significant assistance of the European Union on the topic. Evaluating government programs, financial incentives, educational initiatives, and community networks that promote sustainable practices among farmers constitute some of the main aspects of the potential support.

Educational initiatives are equally important. Training programs that focus on soil health, crop rotation, and integrated pest management empower farmers to adopt sustainable techniques. The success of these programs often depends on local conditions and the availability of skilled trainers, highlighting the need for customized curricula.

There is a **lack of educational staff**, which is highly important when referring to the implementation of sustainable agriculture. Trained staff are necessary to guide agriculturists, farmers, and other stakeholders, and ultimately, show them how they will utilize the given information and guidance effectively in their labor. While existing support systems show potential, a **comprehensive assessment** is essential to identify gaps and improve access, ensuring all farmers can effectively adopt sustainable practices.

1.7. Identifying Essential Skills for Training Programs Empowering Stakeholders in Agriculture

Participants highlighted several essential skills needed for sustainable agriculture, focusing on both traditional and modern farming techniques. One of the most critical areas mentioned was **technical skills** in **water management** and **precision farming**. Participants emphasized that managing water efficiently is essential for sustainability, especially in areas with limited water

resources. Furthermore, they recognized the growing importance of **digital literacy**, particularly for operating new technologies such as **drones** and automated **irrigation systems**. These tools help monitor crop growth, manage water distribution, and optimize overall farm productivity. The participants expressed a desire to learn more about how to effectively use these digital tools to reduce waste and improve efficiency. Additionally, **practical knowledge of sustainable farming practices**—like organic farming, crop rotation, and soil health management—were identified as fundamental skills needed to successfully implement sustainable agriculture.

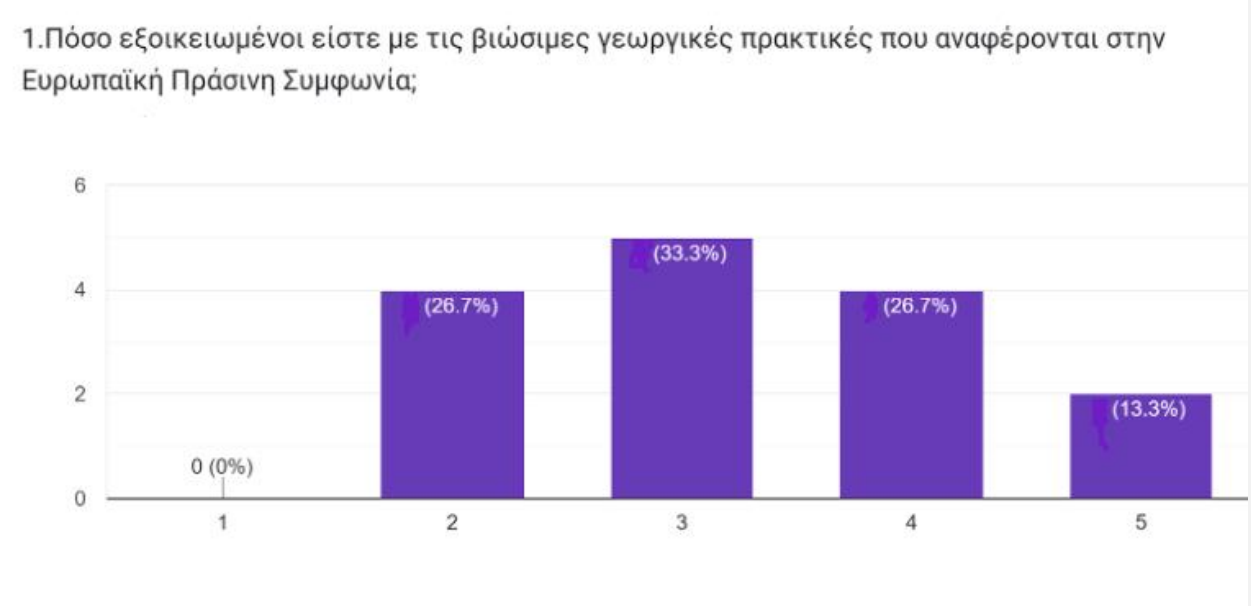
1.8. Comments

The focus group provided valuable insights into the current state of VET training for farmers, particularly in relation to sustainable practices. One of the main findings was that there is a clear lack of sufficient VET programs specifically designed to address the needs of farmers in adopting sustainable farming methods. The participants consistently highlighted that while some training is available, it is mostly theoretical and does not provide the practical, hands-on experience that is crucial for effectively implementing these practices. This gap in the educational offerings presents a significant challenge for farmers who wish to transition to more sustainable practices but lack the necessary resources and training to do so.

In response to these findings, our goal is to incorporate the lessons learned from the focus group into the development of our project's educational program. The participants confirmed that a combination of both theoretical knowledge and practical training is essential to the success of any sustainable agriculture program. As such, we aim to design a curriculum that not only covers the fundamental concepts of sustainability but also includes field-based training and real-world applications. By addressing these needs, we are confident that our project can offer more effective support to farmers, helping them to adopt and sustain environmentally friendly practices in their agricultural activities.

ONLINE QUESTIONNAIRES

1.How familiar are you with the sustainable agricultural practices outlined in the European Green Deal?

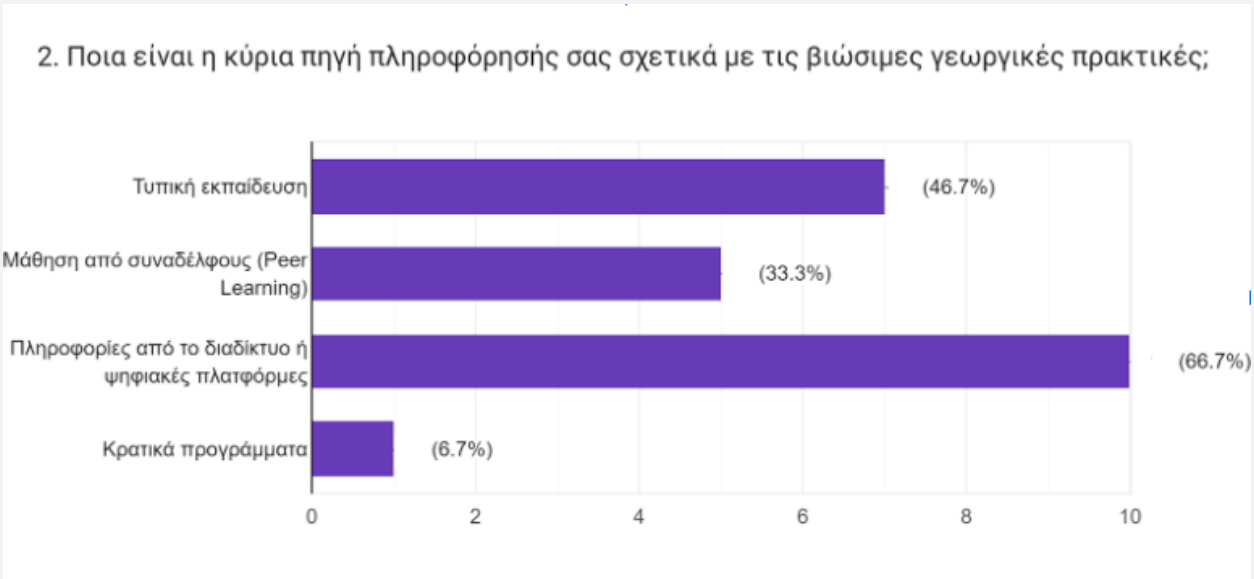


In the assessment of familiarity with sustainable agricultural practices from the European Green Deal (on a scale of 1 to 5), **31.3% of respondents fall into the low familiarity category** (rating 1 or 2). This represents almost one-third of the participants, highlighting a notable gap in awareness. The size of this group suggests an urgent need for enhanced communication and education efforts. It's possible that the European Green Deal's sustainable practices are not being effectively communicated to these farmers, or that they lack adequate access to information and resources that clearly explain these concepts.

Another **31.3% of respondents rated their familiarity as moderate (rating 3)**. This group likely has some knowledge of sustainable practices, but their understanding appears incomplete. These farmers could benefit from more targeted and in-depth training programs that build on their existing knowledge and provide practical, hands-on approaches to adopting sustainable techniques.

On a more positive note, **37.5% of respondents reported high familiarity (rating 4 or 5)**. This means over one-third of the surveyed farmers are well acquainted with the sustainable practices outlined in the European Green Deal. Many of them may already be applying these practices, indicating a promising level of engagement and preparedness for sustainable agriculture. This group could serve as valuable advocates or leaders in promoting sustainable practices among their peers.

2.What is your primary source of information on sustainable agricultural practices?



The data reveals that **68.8% of respondents** rely on **digital resources**—such as online platforms, websites, and digital learning tools—as their primary source of information on sustainable agricultural practices. This significant reliance on digital channels highlights the critical need to maintain and expand accessible, up-to-date online content. It suggests that farmers are increasingly embracing the internet as a learning tool. To leverage this trend, there's a strong opportunity to **strengthen online educational campaigns, webinars, interactive digital platforms, and mobile apps**. These digital tools can effectively deliver real-time, scalable learning to a broad audience, ensuring farmers can easily access the latest information on sustainable practices.

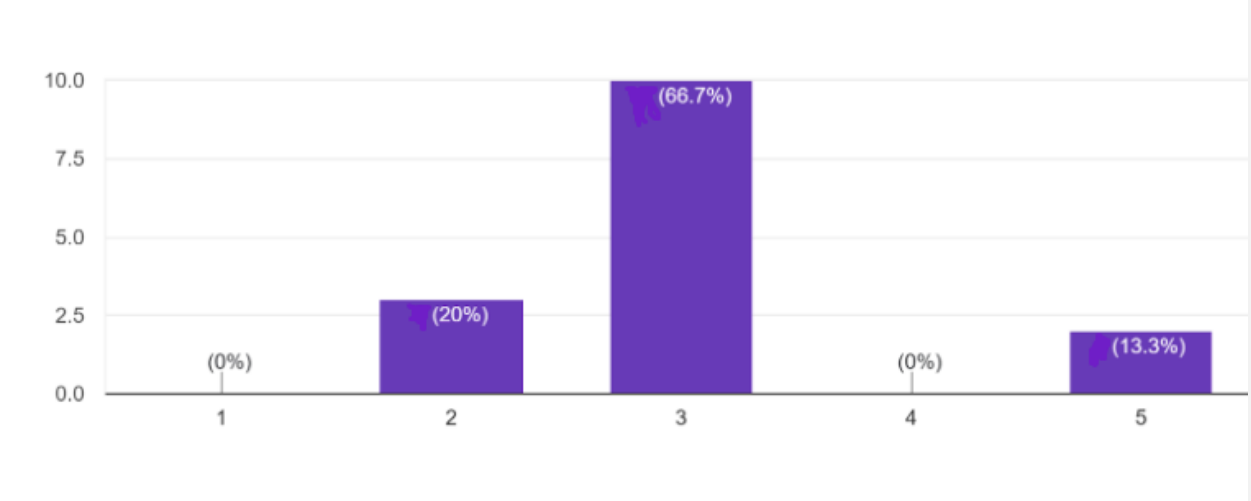
43.8% of respondents turn to **formal education**, such as vocational training, agricultural schools, and structured courses, as a key source of information. This underscores the continued importance of traditional educational systems in disseminating agricultural knowledge. Enhancing the integration of **sustainability-focused curriculum** within agricultural education can further solidify its role in equipping future farmers with the skills they need. **Collaborating with educational institutions** to embed sustainability topics into core subjects could drive long-term awareness and mastery of sustainable practices. Additionally, offering hybrid models that blend formal education with digital tools may further increase reach and engagement.

Meanwhile, **33.3% of respondents** depend on **peer learning**—the exchange of knowledge with fellow farmers and colleagues. This points to the value of **community-driven learning**, where practical, experience-based insights are shared among peers. Strengthening **farmer networks,**

cooperatives, and group discussion platforms can further enhance this form of learning. Encouraging collaboration through **local workshops, community-led initiatives, and farmer mentorship programs** could foster the peer-to-peer support necessary for widespread adoption of sustainable practices. Peer learning can complement other sources by providing farmers with relatable, firsthand experiences.

On the other hand, **only 6.3% of respondents** cite **government programs** as their primary source of information. This indicates that government efforts to promote sustainable agriculture may not be resonating with or reaching farmers effectively. The low reliance on government initiatives suggests the need to **increase the visibility and accessibility** of such programs. Governments could improve their impact by aligning their efforts with the information-seeking behavior of farmers, possibly by **integrating government resources into digital platforms** or partnering with educational institutions and farmer networks. Greater **proactive communication and user-friendly access to government support** could bridge the gap between policy and practice, ensuring farmers take full advantage of available resources.

3.How challenging is it for you to implement sustainable farming practices in your region?

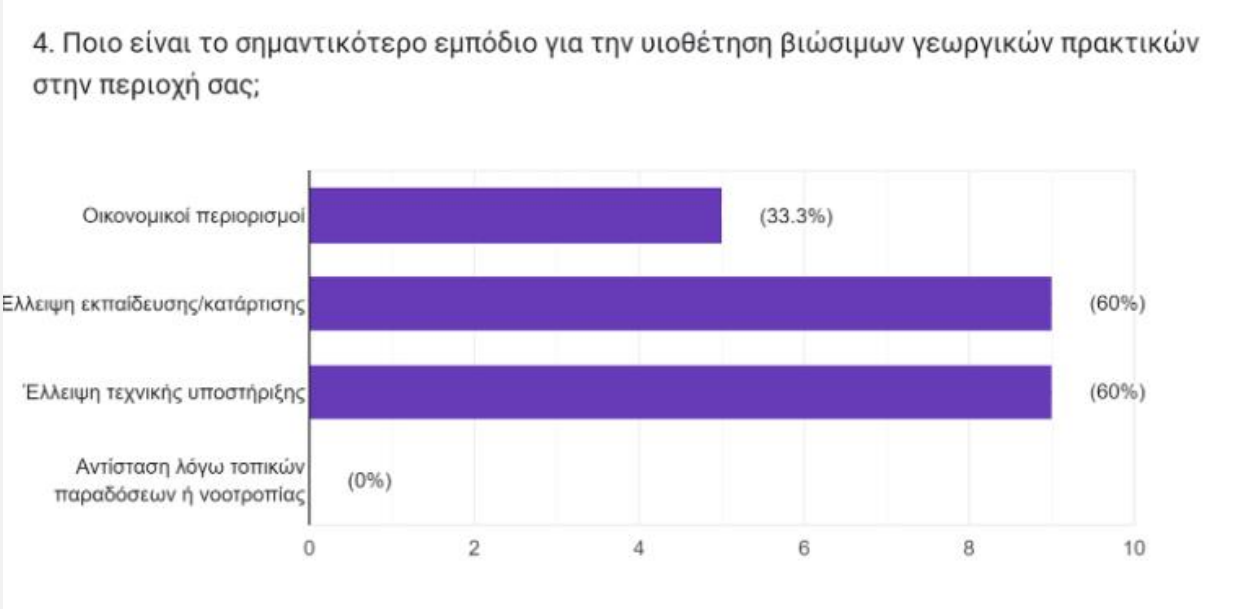


A quarter of the respondents reported facing relatively **low challenges** in implementing sustainable farming practices. This group likely possesses access to the essential resources and knowledge that facilitate the adoption of such practices. Although some challenges do exist, they appear to be manageable for these farmers. For this subset, ongoing support through minor interventions—such as refresher courses, technological updates, and peer learning opportunities—may be sufficient to maintain their progress toward sustainability.

In contrast, **a clear majority (over 60%)** rated their **challenge level at 3**, indicating that while they are making efforts to adopt sustainable practices, they encounter significant barriers. These challenges may arise from various factors, including financial constraints, limited access to suitable technology, and inadequate knowledge of sustainable techniques. This group would benefit most from targeted support. For example, providing financial assistance, facilitating access to technology, and offering educational programs focused on sustainable farming can help mitigate these obstacles. It is crucial to enhance the accessibility of sustainable practices through subsidies, government initiatives, or community-based programs.

A smaller but notable segment (12.5%) finds the implementation of sustainable farming practices **extremely challenging**. Respondents in this category may face severe obstacles, such as inadequate infrastructure, high costs, or regulatory limitations that hinder their ability to adopt these practices. To assist this group, more intensive interventions are required. Potential solutions could include tailored financial support packages, infrastructure development (such as irrigation systems or renewable energy solutions for farms), and customized training programs designed to address their specific challenges. Furthermore, creating collaborative networks for resource sharing and advocating for more supportive policies could significantly alleviate these barriers.

4.What is the most significant barrier to adopting sustainable farming practices in your area?



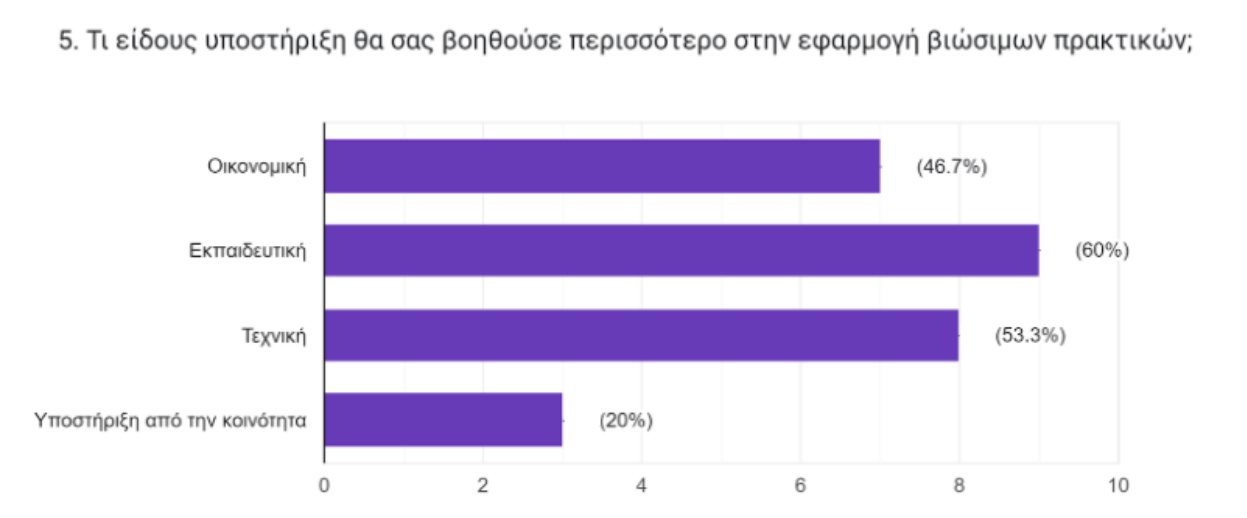
The results indicate that **lack of education/training (56.3%)** and **lack of technical support (also 56.3%)** are **the most significant barriers to adopting sustainable farming practices in the**

area. This suggests that farmers may not have the necessary knowledge or resources to implement these practices effectively. Without proper education and training, farmers may struggle to understand sustainable techniques and their benefits, leading to underutilization of available technologies. Similarly, insufficient technical support can hinder farmers' ability to apply what they learn, resulting in frustration and stagnation in their efforts to adopt sustainable methods.

Financial constraints (31.3%) are also a **notable barrier,** indicating that economic factors significantly impact farmers' ability to invest in sustainable practices. Limited financial resources can restrict access to necessary equipment, technologies, or inputs that are essential for transitioning to sustainable farming.

Lastly, **cultural resistance (6.3%)** appears to be a **minor barrier**, suggesting that while some traditional practices may be upheld, they do not pose a significant challenge to the broader adoption of sustainability initiatives in this area.

5.Which type of support would most help you in implementing sustainable practices?



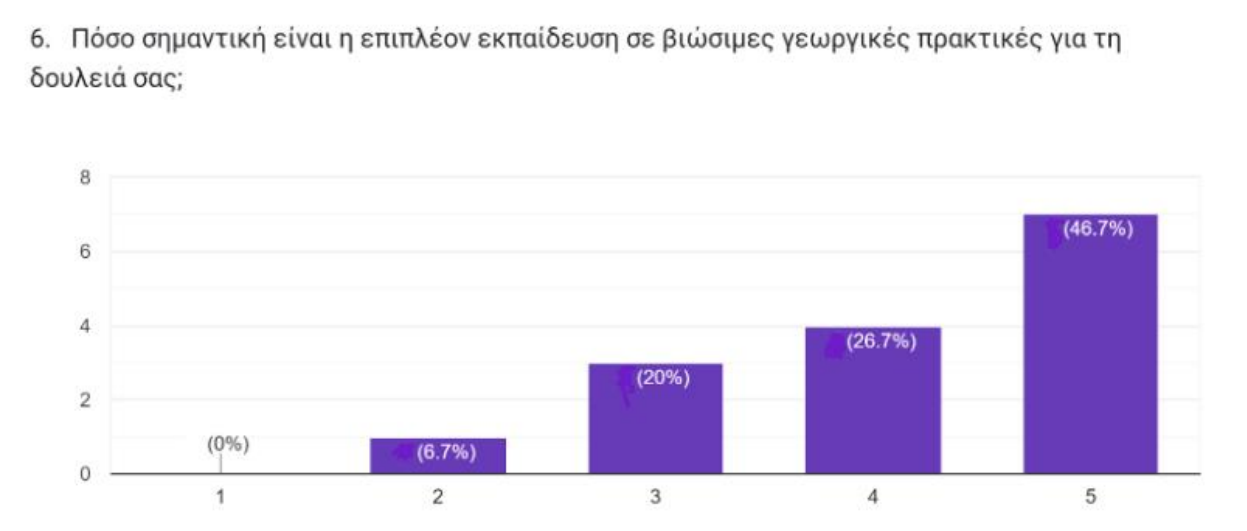
The results indicate that **educational support (56.3%)** is **the most crucial type of assistance needed** f**or farmers seeking to implement sustainable practices.** This highlights the importance of providing farmers with knowledge about sustainable techniques, best practices, and the benefits of adopting such methods. Educational initiatives, such as workshops, training sessions, and informational resources, can equip farmers with the skills and understanding necessary to make informed decisions about sustainable farming.

Following closely is **technical support (50%)**, which underscores **the need for practical assistance in applying sustainable practices.** This may include access to expert guidance,troubleshooting for technical issues, and resources that help farmers effectively implement new technologies and methods. A strong technical support system can significantly enhance the effectiveness of educational initiatives by ensuring that farmers can apply what they learn in real-world situations.

Financial support (43.8%) is also **essential**, reflecting the **need for economic assistance** to cover the c**osts associated with transitioning to sustainable practices.** This could involve grants, low-interest loans, or subsidies that make it more feasible for farmers to invest in sustainable technologies and practices.

Lastly, **community support (25%)** is recognized as a **valuable resource**, albeit to **a lesser extent than the other types of support.** Building a sense of community and collaboration among farmers can foster sharing of resources, experiences, and moral support, which can be beneficial in overcoming challenges.

6. How important is additional training in sustainable agricultural practices for your work?



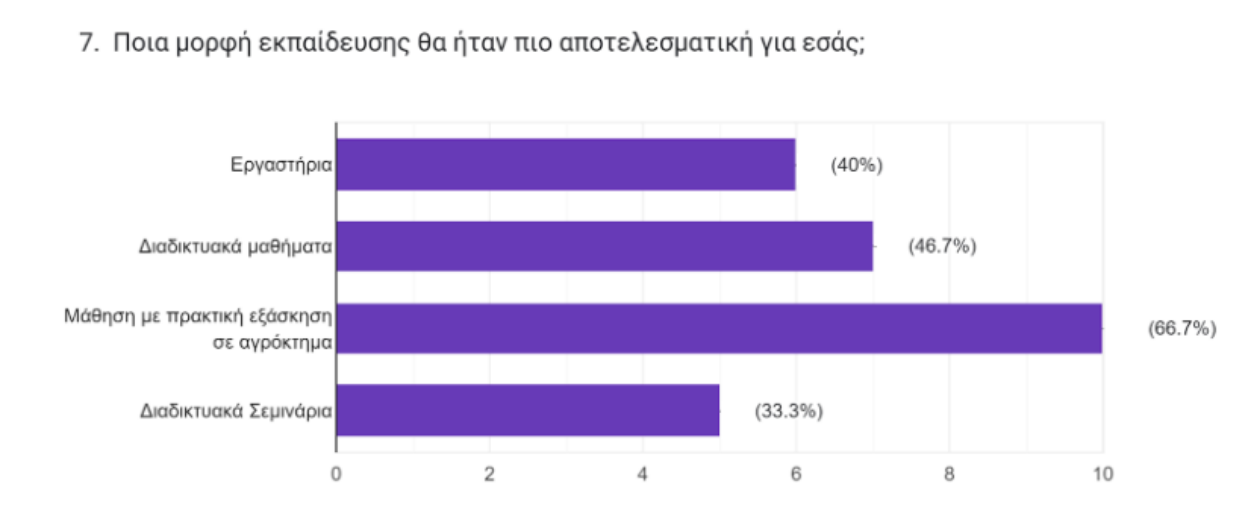
The results show that **50%** of respondents rated the importance of additional training in sustainable agricultural practices as **5 (Extremely important)**, indicating a strong recognition of the value of further education in this area. This majority reflects a significant commitment among farmers to enhance their knowledge and skills related to sustainable practices, suggesting a widespread understanding of the benefits these practices can bring to their operations.

Additionally, **25%** of respondents rated the importance as **4**, reinforcing the notion that a substantial portion of farmers sees considerable value in obtaining further training. Together, these two groups represent **75%** of respondents who regard additional training as highly important, emphasizing the critical role that education plays in facilitating the adoption of sustainable practices.

Conversely, **18.8%** rated the importance as **3**, indicating a moderate view on the necessity of training. This suggests that while these respondents acknowledge the benefits of training, they may not prioritize it as highly as others.

Finally, a small percentage of **6.3%** rated the importance as **2**, suggesting that a minority of farmers may not see additional training as a priority for their work. However, it is worth noting that no respondents rated the importance as 1 **(Not important at all)**, indicating a consensus that training holds at least some degree of value.

7. What type of training format would be most effective for you?



The results indicate that **farm-based learning** is the most favored training format, with **68.8%** of respondents identifying it as **the most effective method**. This preference suggests that hands-on, practical experiences on the farm are highly valued by farmers, as they provide direct exposure to sustainable practices in a real-world context. Such experiential learning allows participants to apply techniques immediately and fosters a deeper understanding of sustainable farming methods.

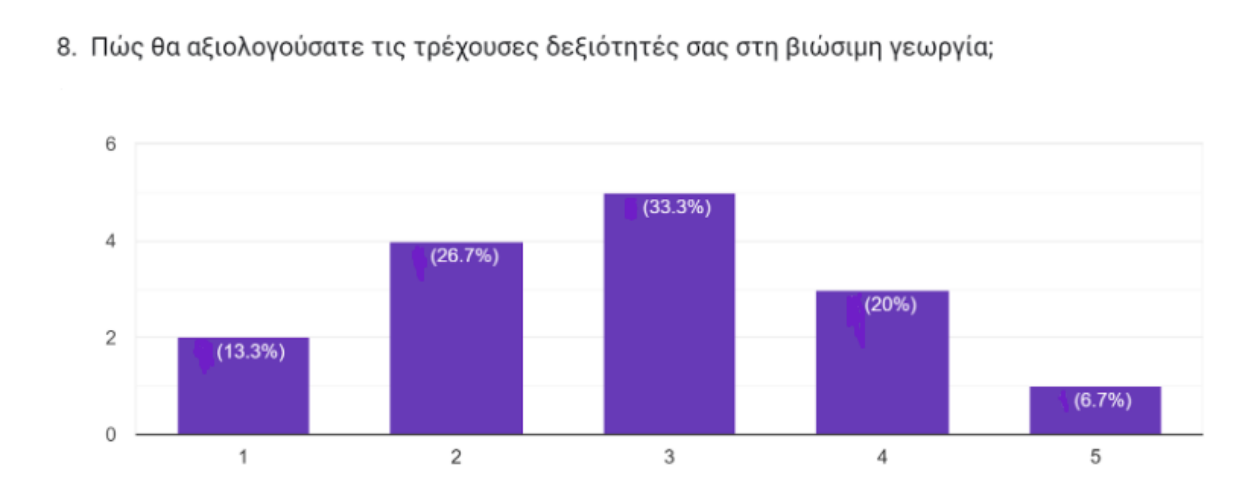
Following closely, **online courses** were chosen by **46.7%** of respondents, highlighting the increasing demand for flexible, accessible learning options. Online courses can accommodate

farmers' schedules and allow them to learn at their own pace, making them a practical choice for those balancing multiple responsibilities.

Workshops received **37.5%** support, indicating that structured, interactive group settings are also appreciated. Workshops often facilitate peer-to-peer learning and networking, which can enhance the learning experience by allowing participants to share insights and strategies.

Lastly, **webinars** were selected by **31.3%** of respondents, suggesting a moderate interest in this format. While webinars provide a convenient way to access information, they may not offer the same level of interaction and engagement as other formats, which could explain their lower preference compared to farm-based learning and online courses.

8. How would you rate your current skills in sustainable agriculture?



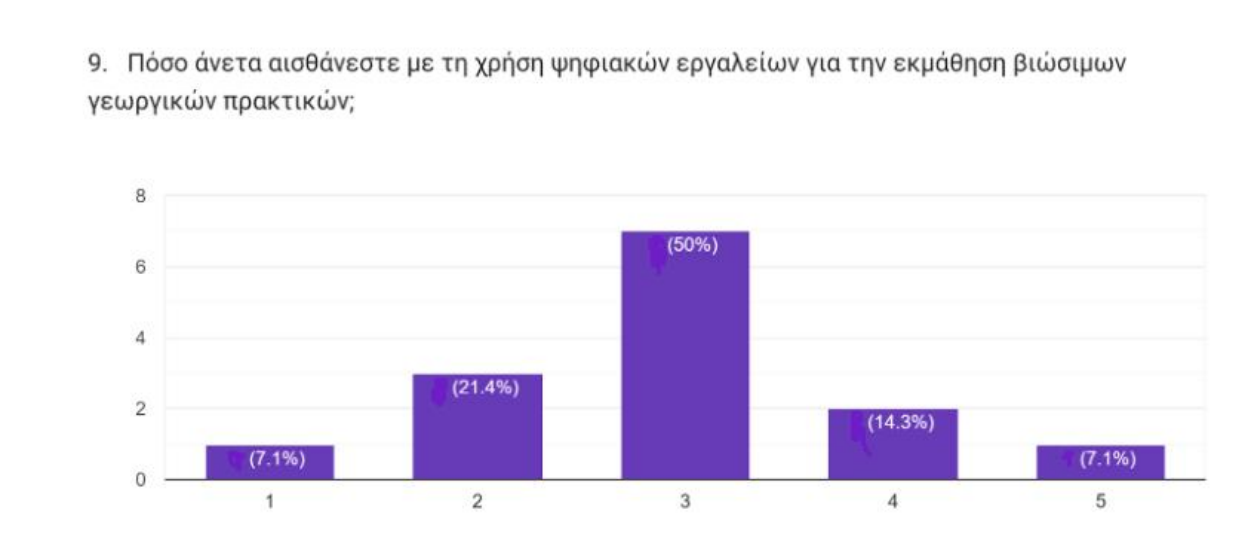
The survey results indicate a generally low self-assessment of skills in sustainable agriculture among respondents. **12.5%** rated their skills as **1 (Very poor**), while **25%** rated them as **2**. Together, these two categories represent **37.5%** of respondents who feel they possess limited skills in sustainable agriculture, highlighting a significant segment of the population that may require foundational training and support.

A further **37.5%** rated their skills as **3 (Average)**, suggesting that while they have some basic knowledge, there is considerable room for improvement. This middle ground indicates that many farmers recognize their skills are not fully developed and may be open to enhancing their expertise through training and resources.

Only **18.8%** rated their skills as **4**, and a mere 6.3% rated them as 5 (Excellent). This indicates that very few respondents feel confident in their sustainable agriculture skills. The low percentage

of those rating themselves as proficient or excellent suggests a need for targeted educational programs and training initiatives to elevate the skill levels across the farming community.

9. How comfortable are you with using digital tools for learning about sustainable agriculture?



The survey results reveal a mixed level of comfort among respondents regarding the use of digital tools for learning about sustainable agriculture. A notable **6.7%** rated their comfort level as **1 (very uncomfortable)**, while **20%** rated it as **2**. Together, these groups indicate that **26.7%** of respondents feel uncomfortable or very uncomfortable using digital tools, suggesting some apprehension or barriers to utilizing technology for learning.

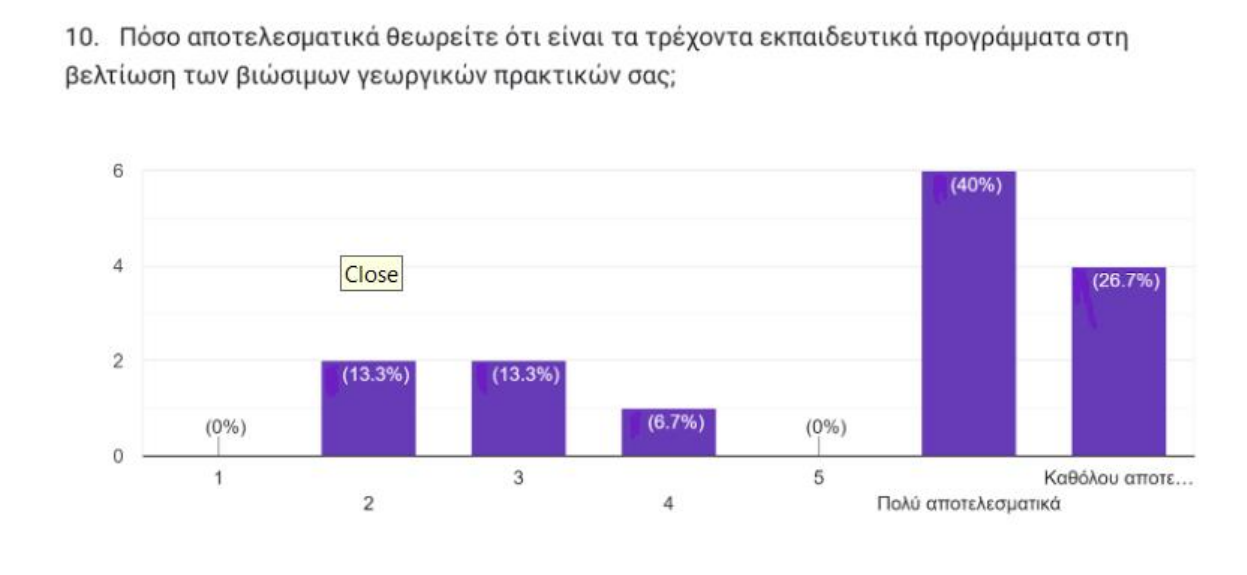
A significant portion of respondents, **46.7%**, rated their comfort level as **3 (neutral)**. This indicates that while they may not feel strongly either way, there is potential for growth in their comfort and proficiency with digital tools. This group may benefit from introductory training or support to enhance their confidence and ease with technology.

Conversely, **20%** rated their comfort level as **4**, and **6.7%** rated it as **5 (very comfortable)**. While these figures indicate a smaller segment of respondents are quite comfortable with digital tools, the combined **26.7%** who feel confident suggests that there is a foundation of digital literacy within the community.

Overall, the results highlight a significant opportunity for targeted training and support to improve comfort levels with digital tools. Providing resources such as workshops, tutorials, or hands-on sessions could help address the concerns of those who feel uncomfortable and elevate the skills

of those who are currently neutral or only moderately comfortable. Increasing digital proficiency will be essential for enabling broader access to information and resources on sustainable agriculture.

10. How effective do you think current training programs are in improving your sustainable agriculture practices?



In this chart, we initially used two broad categories—"Very effective" and "Not effective at all"—to assess how respondents view the current training programs for improving sustainable agricultural practices. However, as the survey progressed, we decided to introduce a wider range of rating scales to capture more nuanced opinions. This is why the chart reflects a distribution of responses across five different levels, showing a more detailed picture of the participants' perspectives.

The results indicate that a significant portion of respondents (40%) consider the current programs to be "Very effective," while 26.7% rated them as "Not effective at all." This split suggests that while some farmers are benefiting from these programs, others feel that more improvements or adjustments are needed. The middle categories (ratings 2, 3, and 4) show smaller percentages, indicating that a minority of participants view the programs as moderately effective.

11. In which area do you feel the greatest need for more knowledge or skills?

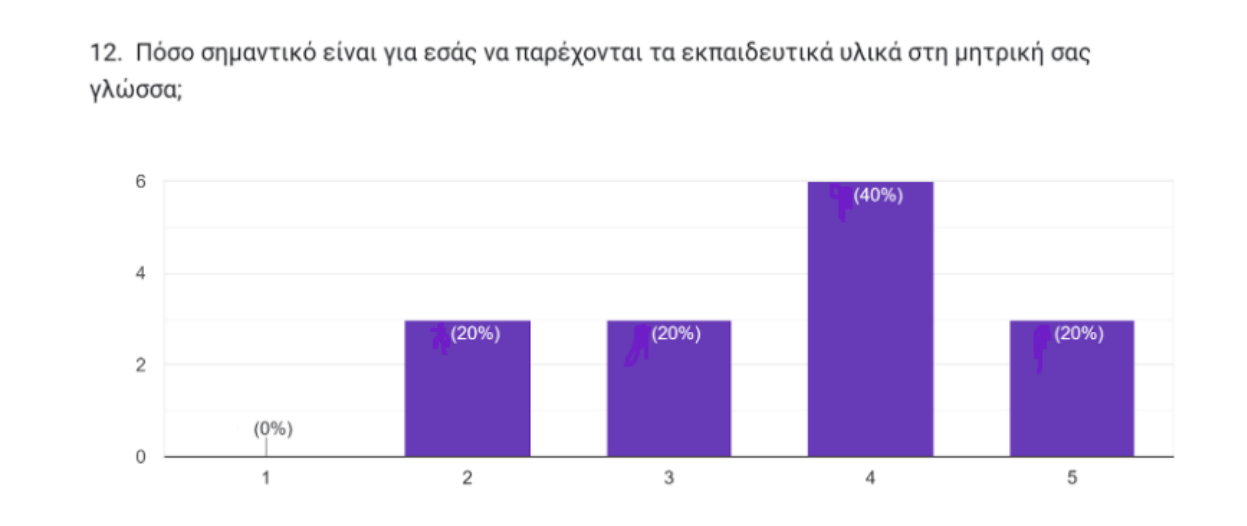
The survey results reveal that **climate change adaptation** is the area where respondents feel the greatest need for knowledge or skills, with **62.5%** expressing this need. This significant percentage highlights the increasing awareness among farmers about the impacts of climate change on agricultural practices and the urgency to develop strategies for resilience. As climate variability continues to pose challenges to farming, enhancing knowledge in this area is crucial for ensuring long-term sustainability and productivity.

Following closely, **soil health and management and crop diversification** each garnered **37.5%** of responses, indicating a strong desire for improvement in these fundamental aspects of sustainable agriculture. Healthy soil is essential for productive farming, and farmers may seek to deepen their understanding of soil management practices to enhance fertility and sustainability. Similarly, crop diversification is vital for reducing risk, improving biodiversity, and ensuring food security. The interest in these topics suggests a recognition of their importance in fostering resilient farming systems.

Water conservation techniques received **31.3%**, showing that while this is a recognized need, it is less emphasized compared to climate change adaptation and soil health. This reflects the ongoing challenges of water scarcity and the need for efficient water management strategies, especially in regions prone to drought.

Lastly, **pest management** also received **37.5%** of responses, indicating that farmers are keen to improve their skills in managing pests sustainably. This area is essential for maintaining crop health and reducing reliance on chemical inputs.

12. How important is it for educational materials to be provided in your native language?



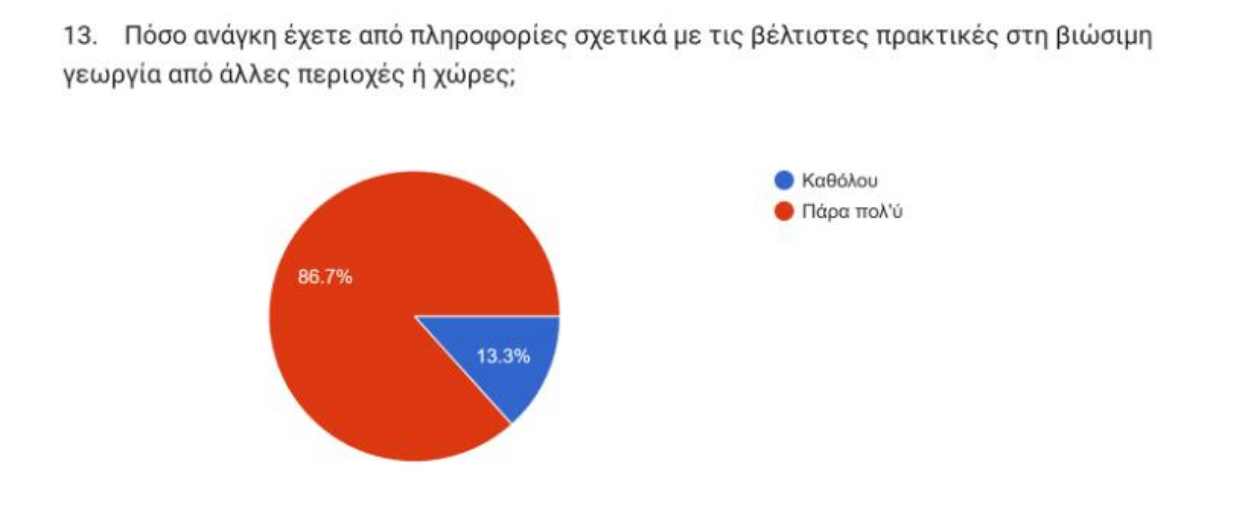
The survey results indicate a strong emphasis on the importance of educational materials being available in respondents' native language. **37.5%** rated the importance as **4 (important)**, while **18.8% rated it as 5 (extremely important)**. This combined total of **56.3%** underscores significant majority who recognize the critical role that language plays in understanding and effectively utilizing educational resources.

Conversely, **25%** of respondents rated the importance as **3 (neutral)**, suggesting that while they may not prioritize it as highly as others, they still acknowledge some level of importance. This group could benefit from materials available in both their native language and a secondary language, allowing for greater flexibility in learning.

On the other hand, **18.8%** rated the importance as **2**, indicating a smaller segment of respondents who feel that having educational materials in their native language is not as crucial. However, **the absence of any respondents rating it as 1 (not important at all)** suggests a consensus that language accessibility is at least somewhat important.

In summary, the results highlight a clear need for educational materials to be provided in respondents' native language to enhance comprehension and engagement. This is particularly important in the context of sustainable agriculture, where understanding complex concepts is essential for effective implementation. Ensuring that educational resources are linguistically accessible will likely contribute to better learning outcomes and foster greater adoption of sustainable practices among farmers.

13. How much do you need information on best practices in sustainable agriculture from other regions or countries?

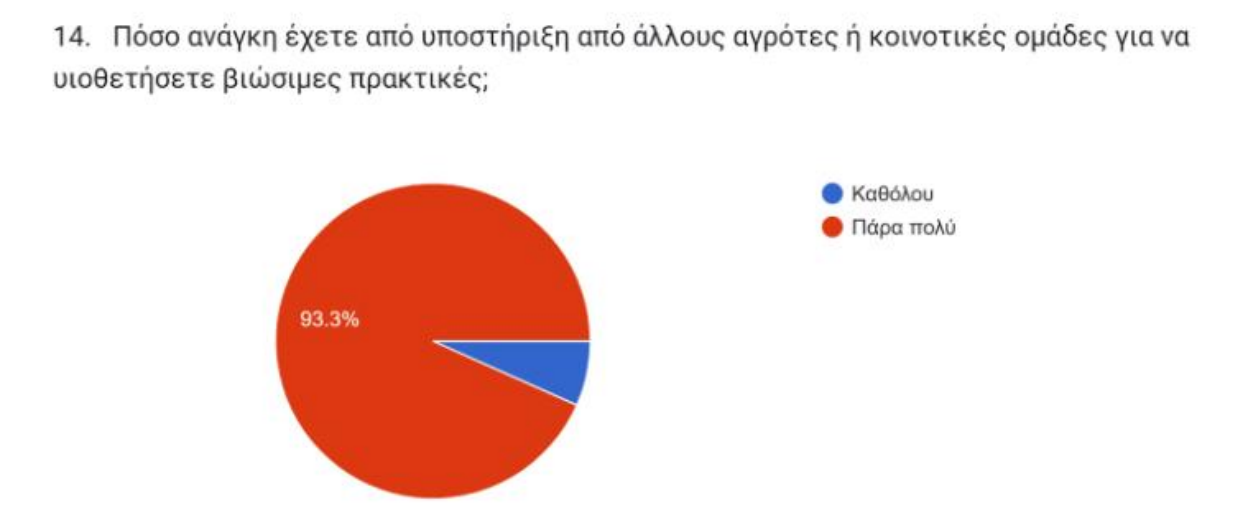


The survey results demonstrate a strong demand for information on best practices in sustainable agriculture from other regions or countries, with a remarkable 87.5% of respondents indicating that they need this information **a great deal**. This overwhelming majority highlights the recognition among farmers of the value that external insights and experiences can bring to their own practices. By learning from diverse agricultural systems and methods, farmers can adopt innovative solutions, adapt successful strategies to their local contexts, and improve their sustainability efforts.

Conversely, **12.5%** of respondents stated that they need **none at all** of this information. This small percentage may reflect a sense of confidence in their existing knowledge or a belief that local practices are sufficient for their needs. However, the minimal representation of this viewpoint suggests that the vast majority of farmers are eager to explore and integrate new ideas and practices from around the world.

In summary, the results indicate a significant opportunity for educational programs and resources that share successful sustainable agricultural practices from other regions and countries. Facilitating this exchange of knowledge can enhance local agricultural systems, promote innovation, and help farmers address challenges more effectively by learning from the experiences of their peers globally.

14. How much do you need support from other farmers or community groups to adopt sustainable practices?



The survey results reveal an overwhelming desire for support from fellow farmers and community groups in the adoption of sustainable practices, with *93.8%* of respondents indicating that they need **a great deal** of this support. This strong consensus underscores the importance of collaboration, shared experiences, and collective knowledge in fostering sustainable agriculture. It suggests that farmers recognize the benefits of learning from one another, sharing resources, and building a supportive network to navigate the challenges of implementing sustainable practices.

In contrast, only **6.2%** of respondents indicated that they need **none at all** of this support. This small minority may reflect individuals who feel confident in their ability to adopt sustainable practices independently or those who have sufficient resources and knowledge to do so.

However, the limited representation of this viewpoint highlights that the vast majority of farmers see significant value in community engagement and support.

In summary, the results highlight a critical opportunity for strengthening community networks and support systems to facilitate the adoption of sustainable practices. Initiatives such as farmer cooperatives, peer learning groups, and community workshops can play a vital role in empowering farmers, enhancing their skills, and promoting sustainable agricultural practices. Building a collaborative environment will be essential for encouraging knowledge sharing and fostering a sense of community among farmers dedicated to sustainability.

15. How likely are you to participate in a training program that addresses your specific needs in sustainable agriculture?

The survey results indicate a balanced interest in participating in a training program tailored to address specific needs in sustainable agriculture, with **33.3%** of respondents rating their likelihood as **3 (neutral)**, **33.3%** as **4 (likely)**, and **33.3%** as **5 (very likely)**. This equal distribution suggests a significant level of interest among farmers, indicating that a substantial portion sees value in targeted training, but there is also a segment that remains uncertain about their participation.

The **33.3%** rating of **4** signifies a strong willingness among these respondents to engage in training programs, reflecting a proactive attitude toward enhancing their skills and knowledge in sustainable agriculture. This group likely recognizes the potential benefits of such training in improving their farming practices and adapting to sustainability challenges.

Meanwhile, the **33.3%** rating of **5** indicates that another third of respondents are very enthusiastic about participating, which underscores the importance of developing targeted training programs that align with their specific needs. This enthusiasm is indicative of a readiness to learn and adopt new practices that could benefit their operations.

The **33.3%** rating of **3 (neutral)** suggests a need for further encouragement or clarification regarding the content and structure of the training programs. These respondents may require more information about the program's relevance, potential benefits, or the specific skills that will be addressed to convert their neutral stance into active participation.

In summary, the results demonstrate a favorable attitude toward training programs focused on sustainable agriculture, with a clear opportunity to engage farmers through targeted initiatives. To maximize participation, program developers should emphasize the practical benefits, relevance, and accessibility of training, ensuring that they meet the diverse needs of all potential participants.

4. Concluding remarks

The findings from both the focus group and the questionnaires reveal a significant gap in the current agricultural education system, particularly concerning sustainable practices. Farmers and VET trainers alike expressed that most training programs available to them are overly theoretical, lacking practical, hands-on experience. The questionnaires further emphasized that many respondents are either unfamiliar or only moderately familiar with sustainable agricultural practices, primarily relying on digital resources and informal peer learning. However, there is a clear desire for more structured educational programs that offer real-world applications and direct support for adopting sustainable farming methods.

The insights gathered underscore the need for tailored educational programs within the FARM2LA project, specifically designed to address the gaps identified in both knowledge and practice. The lack of accessible and practical training in sustainable agriculture suggests that our project must focus on creating a more comprehensive and hands-on VET curriculum. By incorporating field-based training and leveraging digital tools, FARM2LA can offer farmers the guidance and skills they need to effectively implement sustainable practices. This approach will directly address the challenges identified and ensure that the project supports farmers in both understanding and applying these methods.

Moving forward, the FARM2LA project will use the data collected from the focus group and questionnaires to refine its educational strategies. One key step will be expanding the VET programs to include more hands-on, field-based learning opportunities. Additionally, the development of digital platforms and resources will be crucial for reaching a broader audience and ensuring farmers have access to continuous learning. The insights from the focus group will also help inform the creation of "Farm Labs," which will serve as practical spaces for learning and collaboration. These next steps will be essential in ensuring the success of the FARM2LA project and its goal of promoting sustainable agricultural practices.

2. Germany

2.1. Introduction

The FARM2LA initiative, supported by the Erasmus+ program, seeks to bring transformative changes to agricultural education by embedding sustainable practices within vocational education and training (VET) programs. The main focus of the project is to empower agricultural professionals with up-to-date skills and knowledge essential for promoting sustainability. FARM2LA aims to achieve this by developing a digital platform, creating educational resources, and establishing collaborative “Farm Labs” where practical knowledge exchange can thrive.

Understanding the gap between traditional agricultural techniques and modern, sustainable practices is crucial for this project. As part of the field research, key agricultural stakeholders participated in a focus group to discuss the existing landscape of agricultural training and current sustainability practices. The discussions were centered around identifying common challenges, understanding the limitations of existing knowledge, and highlighting the practical skills necessary for effective transition to sustainable methods.

The primary objective of this report is to present a comprehensive overview of the feedback collected from the focus group, showcasing prevalent practices, key obstacles, and actionable suggestions for future training programs. These findings are instrumental in guiding FARM2LA’s efforts to provide stakeholders with effective, tailored VET programs that align with sustainable agricultural practices, ultimately fostering environmental responsibility and growth in the sector.

2.2. General Information about Participants

The focus group included five participants, comprising two VET trainers, one learner, and two farmers from rural areas surrounding Munich. These regions are central to agricultural activities in Bavaria, making them ideal locations for examining sustainable farming practices and vocational education and training (VET) needs.

The participating farmers brought considerable experience in agriculture, offering valuable insights into the challenges they face in their daily operations. While they had some understanding of sustainable practices, they expressed a strong need for more comprehensive, practical training to effectively integrate these methods into their farming routines. Both farmers emphasized the importance of structured programs that address real-world scenarios and provide actionable knowledge.

During the discussions, the farmers shared their experiences in adopting sustainable practices, such as rotating crops to maintain soil health and reducing reliance on chemical inputs by

introducing organic solutions. However, they highlighted the need for more ongoing, accessible learning opportunities, including workshops, on-site demonstrations, and peer exchange sessions, to better manage the balance between productivity and sustainability in their agricultural activities

2.3. Current Agricultural Methods and Experiences

During the focus group, the participants shared various farming practices they currently implement. The farmers discussed their efforts to incorporate more sustainable methods into their operations, including water conservation techniques such as drip irrigation systems, which help reduce water waste. They also highlighted their increasing use of cover crops, a practice aimed at improving soil health and preventing erosion during off-seasons.

One farmer explained how they had recently transitioned to using precision farming technology, which allows them to monitor soil conditions, crop growth, and irrigation needs more accurately. This approach has not only enhanced their productivity but also reduced the number of fertilizers and pesticides required, aligning their practices more closely with sustainability goals.

The VET trainers, on the other hand, discussed the current focus of agricultural education programs, noting that while theoretical knowledge about sustainability is being integrated into the curriculum, practical applications are still lacking. They emphasized the need to incorporate more hands-on training, such as field visits and workshops, to help learners better understand and apply sustainable methods in real-world contexts.

Both the farmers and trainers agreed that while there is progress in terms of awareness and adoption of sustainable practices, more comprehensive support, especially through accessible training programs, is necessary to address the unique challenges faced in agricultural production. They expressed a need for ongoing education that combines innovative techniques with traditional knowledge to create more resilient farming systems.

2.4. Evaluating Stakeholders' Awareness and Expertise in Agricultural Sustainability

The focus group revealed that most participants rely heavily on self-initiated research and online resources to expand their understanding of sustainable farming techniques. Many shared that they frequently consult information provided by European Union platforms, such as newsletters and official websites, to stay informed about the latest sustainability policies and initiatives. However, they voiced concerns over the absence of a comprehensive educational system that offers a more structured and thorough learning experience. For instance, while the farmers were

familiar with basic concepts such as crop rotation and the use of organic fertilizers, they expressed uncertainty about the specific amounts to apply and how frequently these methods should be employed. Additionally, they noted that newer technologies like precision agriculture are not adequately covered in available resources, which leaves them without sufficient guidance on how to integrate these advanced techniques into their operations effectively.

Moreover, participants pinpointed several areas where improvements are essential for agricultural training programs. They emphasized the need for more accessible, practical training opportunities that go beyond theory and focus on real-world application. Field-based programs, including live demonstrations on farms, were particularly highlighted as a way to bridge the gap between knowledge and practice. Many also stressed that current training offerings tend to be too broad and do not address the specific needs of different farming systems or crop varieties. They called for more specialized programs that take into account factors such as soil conditions, regional climates, and unique crop requirements. Lastly, participants underscored the importance of continuous learning through a combination of hands-on workshops, online courses, and peer collaboration, which would provide them with ongoing updates on sustainable practices and allow them to share insights with fellow farmers.

2.5. Exploring Challenges and Obstacles Encountered by Agricultural Stakeholders

Participants identified several key challenges that hinder the adoption of sustainable agricultural practices. A prominent obstacle mentioned was the financial burden associated with transitioning to more sustainable methods. Many farmers expressed concerns over the initial costs of purchasing equipment and technology, such as precision farming tools, which can be prohibitive for small to mid-sized operations. Moreover, while subsidies and grants are available through various EU programs, the participants noted that navigating these funding opportunities is often complicated and time-consuming. The administrative requirements and bureaucracy involved discourage many farmers from applying, leaving them without the financial support necessary to make significant changes to their farming practices.

Another major challenge is the lack of localized training and support systems tailored to the unique needs of specific regions. Farmers explained that most available educational resources are generalized and fail to account for regional variations in soil, climate, and crop types. This one-size-fits-all approach makes it difficult for them to implement practices that align with the specific conditions of their farms. Additionally, participants highlighted the insufficient availability of expert guidance and technical assistance, particularly for advanced sustainable methods like precision

farming or regenerative agriculture. Without direct access to experts who understand the challenges of their particular region, farmers feel isolated and uncertain about how to effectively implement new practices, creating a significant barrier to progress.

2.6. Reviewing the Effectiveness of Existing Support Mechanisms for Sustainable Farming

The focus group participants concluded that there are insufficient support mechanisms in place to aid the transition to sustainable farming practices. One of the primary concerns raised was the financial burden associated with adopting sustainable methods. Farmers expressed those sustainable techniques, such as precision agriculture or organic farming, often require significant upfront investments in equipment, technology, and resources. This creates a barrier for smaller farms that struggle with limited capital. As a result, participants emphasized the need for greater financial assistance from governing bodies or agricultural institutions. They suggested that subsidies, grants, or low-interest loans specifically targeted at sustainability initiatives would help farmers offset these initial costs and make the adoption of environmentally friendly practices more feasible.

In addition to financial challenges, participants pointed to a lack of educational support as a significant gap in the current system. Since much of what farmers know about sustainable practices comes from their own independent research—either through online resources or through informal discussions within their professional networks—they feel there is a pressing need for more structured and accessible educational programs. Farmers indicated that they often feel uncertain about which techniques are most suitable for their specific farm conditions and how to implement these practices correctly. Therefore, they believe that an effective support mechanism should include comprehensive training programs that provide clear, practical guidance on how to utilize modern techniques like regenerative agriculture or organic pest management. Such programs would not only bridge the knowledge gap but also give farmers the confidence to adopt these methods in a more structured and informed way.

2.7. Recognizing Key Competencies for Developing Training Programs in Agriculture

The focus group participants highlighted several essential competencies that should be integrated into future training programs for agricultural stakeholders. They emphasized the importance of combining both technical knowledge and practical skills, particularly in the areas of sustainable farming techniques and resource management. Participants agreed that understanding soil

health, water conservation, and biodiversity management are critical components for any training program aimed at fostering sustainable practices. Additionally, they stressed the need for digital literacy, given the increasing reliance on precision farming technologies that require a solid grasp of data analysis and technology-driven tools. Equally important, they mentioned soft skills such as problem-solving, adaptability, and collaboration, which are necessary to navigate the ever-evolving challenges of the agricultural sector. A well-rounded training program should thus equip participants with both the technical expertise and the flexibility to innovate and apply sustainable solutions effectively.

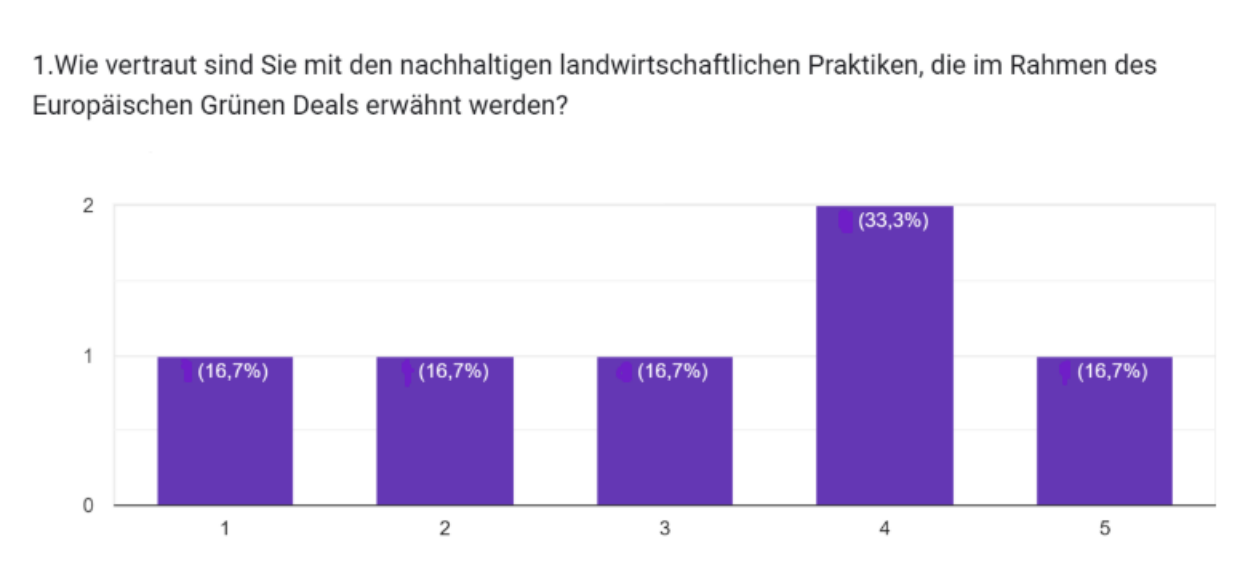
2.8. Feedback and Observations

The focus group discussions yielded important insights regarding the current landscape of vocational education and training (VET) for farmers, particularly in the realm of sustainability. One of the most prominent findings was the noticeable absence of well-rounded VET programs tailored specifically to the needs of farmers looking to adopt sustainable farming methods. Although some training options do exist, participants pointed out that these tend to focus heavily on theory and lack the hands-on experience necessary to apply sustainable practices effectively. This gap in practical training creates significant hurdles for farmers who are eager to shift toward more environmentally responsible practices but are held back by insufficient access to practical guidance and resources.

In light of this feedback, our project will incorporate these insights into the design and development of the educational program. The participants emphasized that a successful sustainable agriculture training program must strike a balance between theoretical knowledge and practical application. As such, we are committed to creating a curriculum that not only teaches the core principles of sustainability but also provides ample opportunities for field-based learning and real-life implementation. By addressing both the theoretical and practical needs, we believe our project will be better positioned to support farmers in their transition to sustainable farming, ensuring they have the tools and skills necessary to adopt and maintain environmentally friendly agricultural practices.

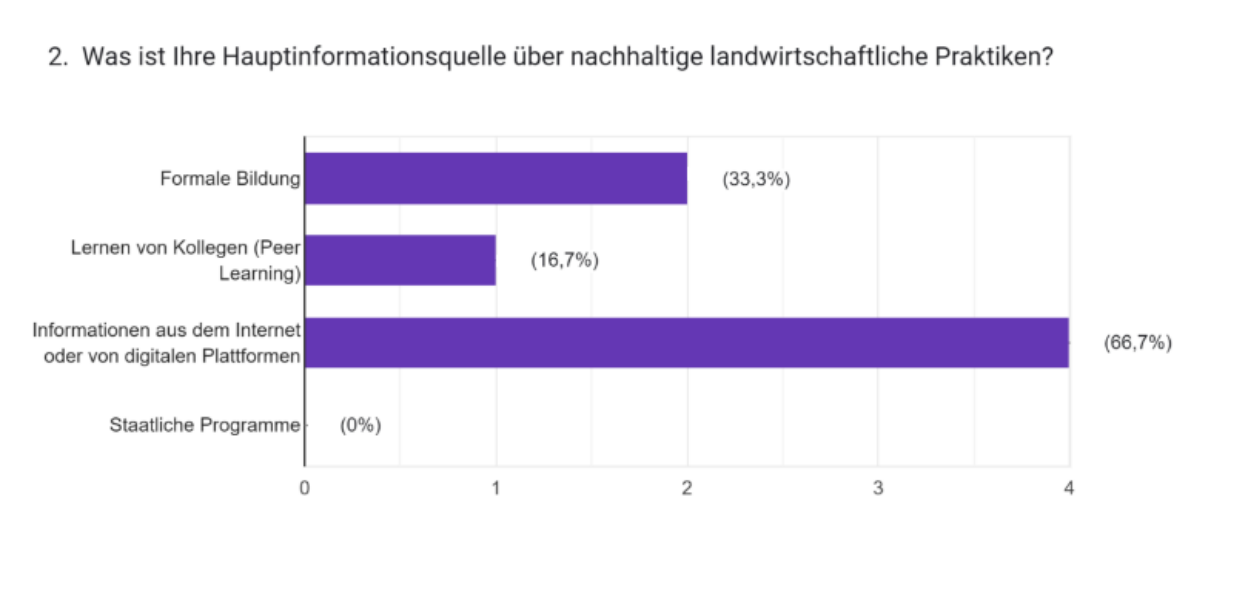
ONLINE QUESTIONNAIRES

1.How familiar are you with the sustainable agricultural practices outlined in the European Green Deal?



This chart illustrates participants' familiarity with sustainable agricultural practices mentioned in the context of the European Green Deal. Responses are distributed on a scale from 1 to 5, with 1 representing minimal familiarity and 5 representing maximum familiarity. The majority, at 33.3%, reported a familiarity level of 4, while the remaining responses were evenly distributed across the other levels of familiarity, each at 16.7%. This suggests that most participants have a solid understanding of sustainable practices, though some are less familiar with them.

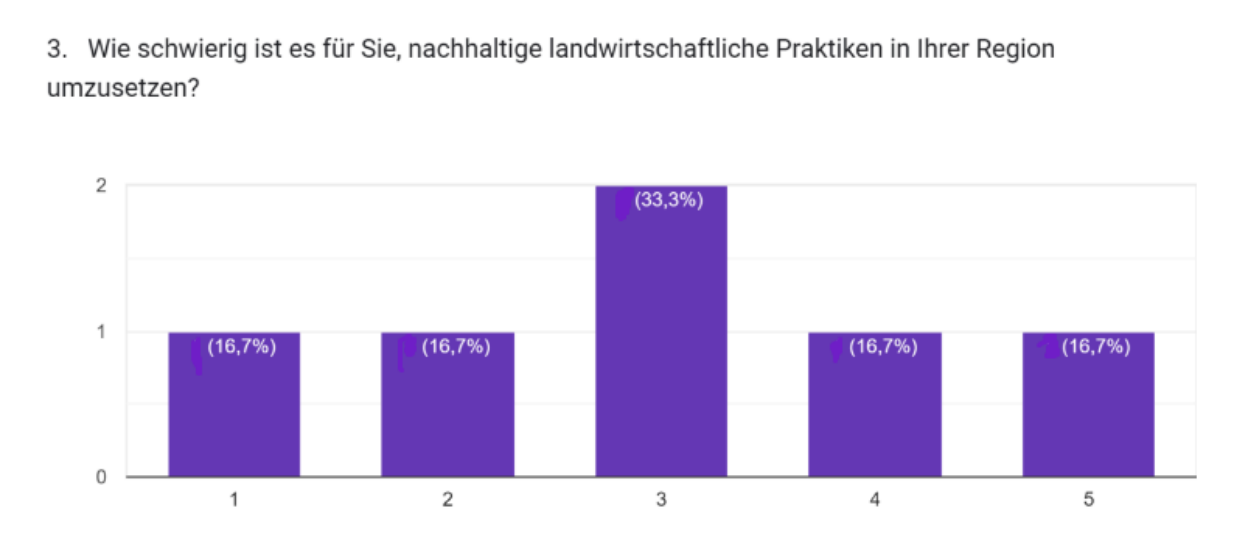
2.What is your primary source of information on sustainable agricultural practices?



The majority of respondents (66.7%) indicated that they rely on information from the internet or digital platforms for learning about sustainable agricultural practices. Formal education was

selected by 33.3%, while peer learning was the least chosen (16.7%). This highlights the growing role of digital sources in disseminating knowledge.

3.How challenging is it for you to implement sustainable farming practices in your region?



When asked about the difficulty of implementing sustainable agricultural practices, most participants rated the difficulty at level 3 (33.3%). The rest were evenly split across levels 1, 2, 4, and 5 (each with 16.7%), indicating that while some face challenges, others find it easier to adopt these practices.

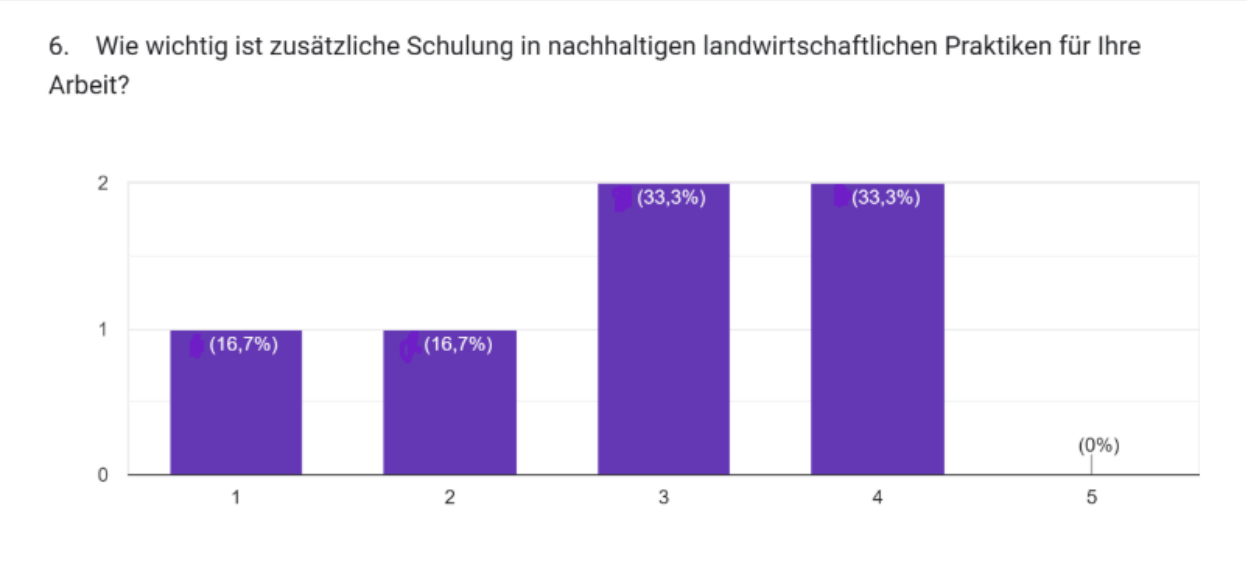
4.What is the most significant barrier to adopting sustainable farming practices in your area?

The largest barrier identified by participants (66.7%) was a lack of education or training, while financial and technical support limitations were also significant barriers, each cited by 50%. This emphasizes the need for more educational resources and better support systems to facilitate the adoption of sustainable practices.

5.Which type of support would most help you in implementing sustainable practices?

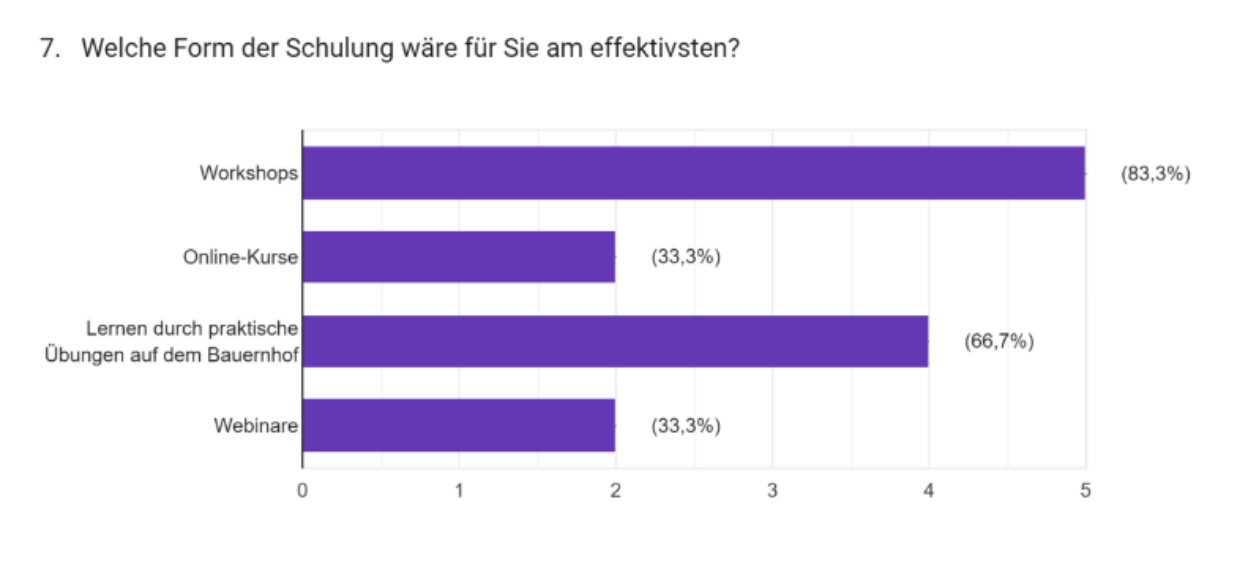
Most respondents (66.7%) expressed that financial and technical support would be the most helpful in implementing sustainable practices, while educational support was important for 33.3%. Community support was mentioned by a smaller portion (16.7%), suggesting that financial and technical assistance are the primary needs.

6. How important is additional training in sustainable agricultural practices for your work?



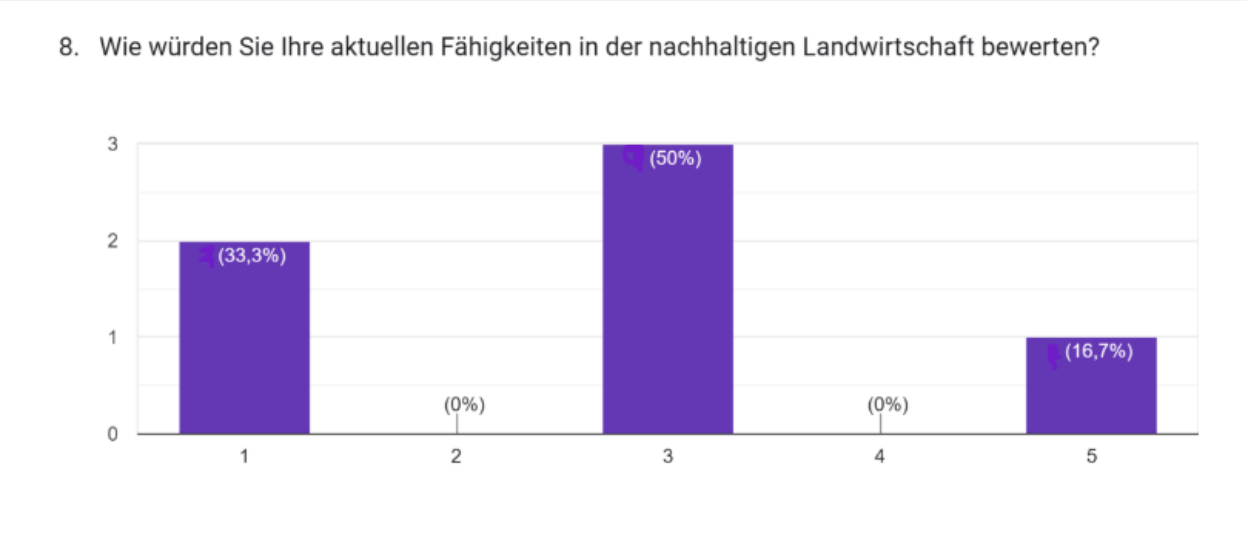
Responses to the importance of additional training in sustainable agricultural practices were divided, with 33.3% rating it as 3 or 4 on the importance scale. A smaller percentage (16.7%) rated it lower (1 or 2), indicating that many participants see value in further training, though the perceived importance varies.

7. What type of training format would be most effective for you?



Workshops were identified as the most effective training method by 83.3% of respondents. Practical learning on farms and online courses followed at 66.7% and 33.3%, respectively, while webinars were seen as less effective (33.3%). This suggests a preference for hands-on and interactive learning formats.

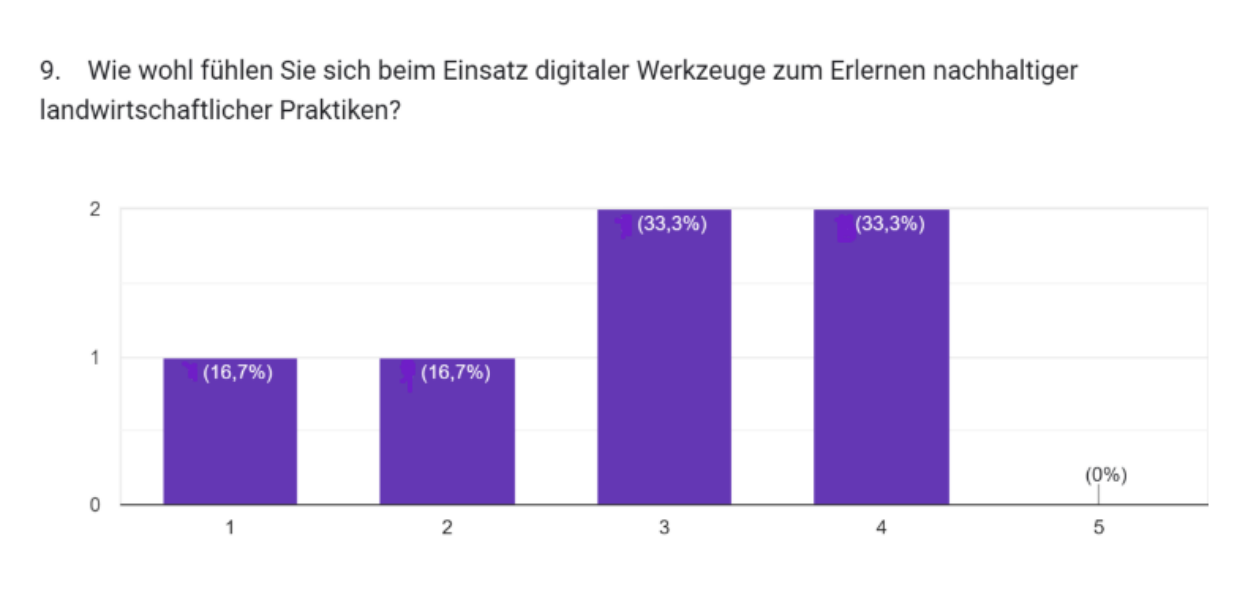
8. How would you rate your current skills in sustainable agriculture?



Half of the respondents (50%) rated their current skills in sustainable agriculture at a moderate level (3), while 33.3% rated themselves lower (1), and only 16.7% gave themselves a higher rating

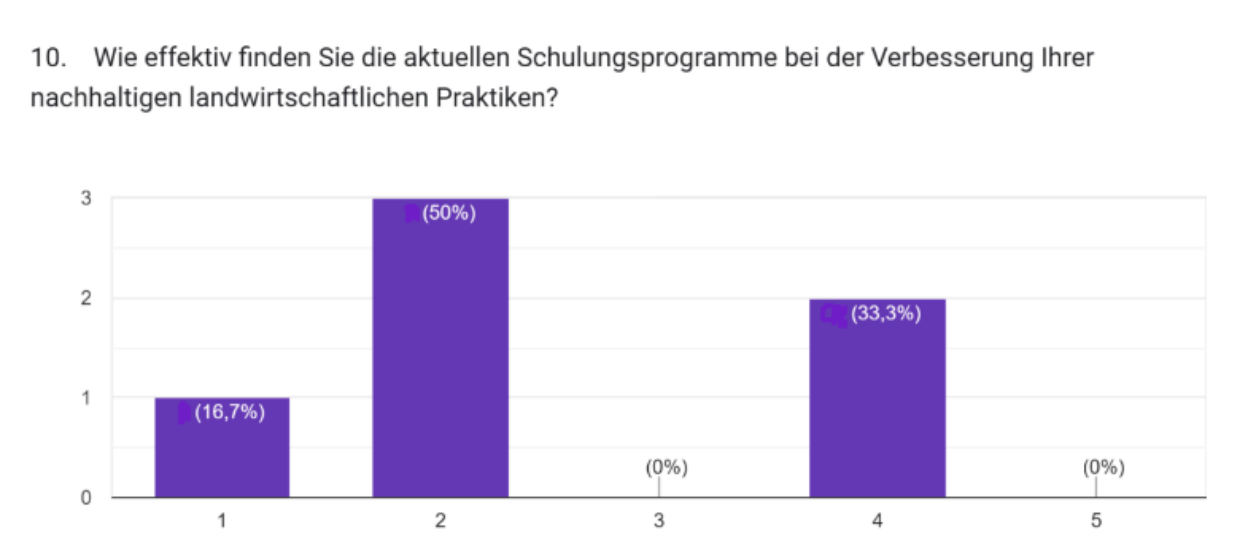
(5). This shows that there is room for improvement in sustainable agricultural skills among participants.

9. How comfortable are you with using digital tools for learning about sustainable agriculture?



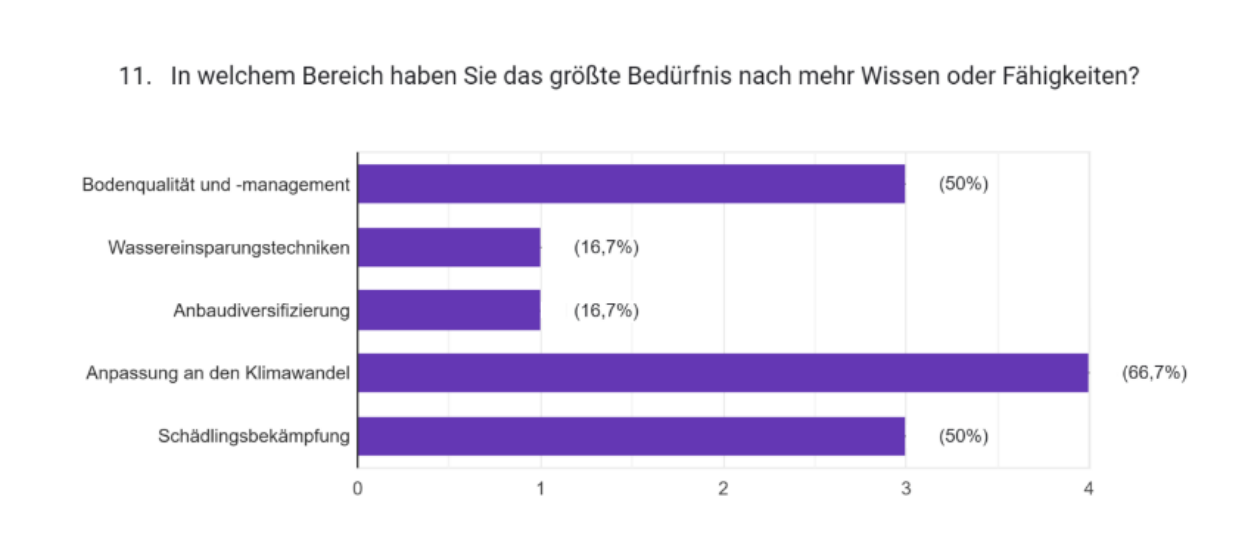
A significant number of respondents (33.3%) feel fairly comfortable using digital tools for learning sustainable agricultural practices, while smaller groups (16.7%) feel less comfortable. This suggests that while digital tools are embraced by many, there are still some participants who are less familiar or comfortable with them.

10. How effective do you think current training programs are in improving your sustainable agriculture practices?



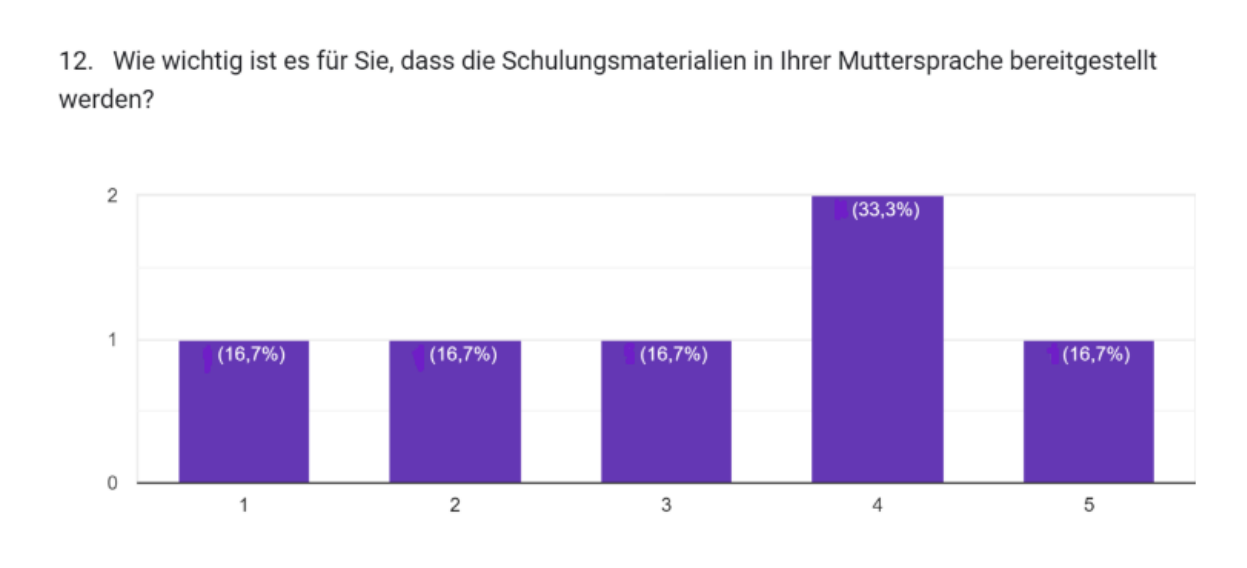
Most respondents (50%) rated current training programs for improving sustainable agricultural practices as moderately effective (2), while 33.3% found them more effective (4), and 16.7% rated them lower (1). This suggests there is room for improvement in the quality and effectiveness of existing training programs.

11. In which area do you feel the greatest need for more knowledge or skills?



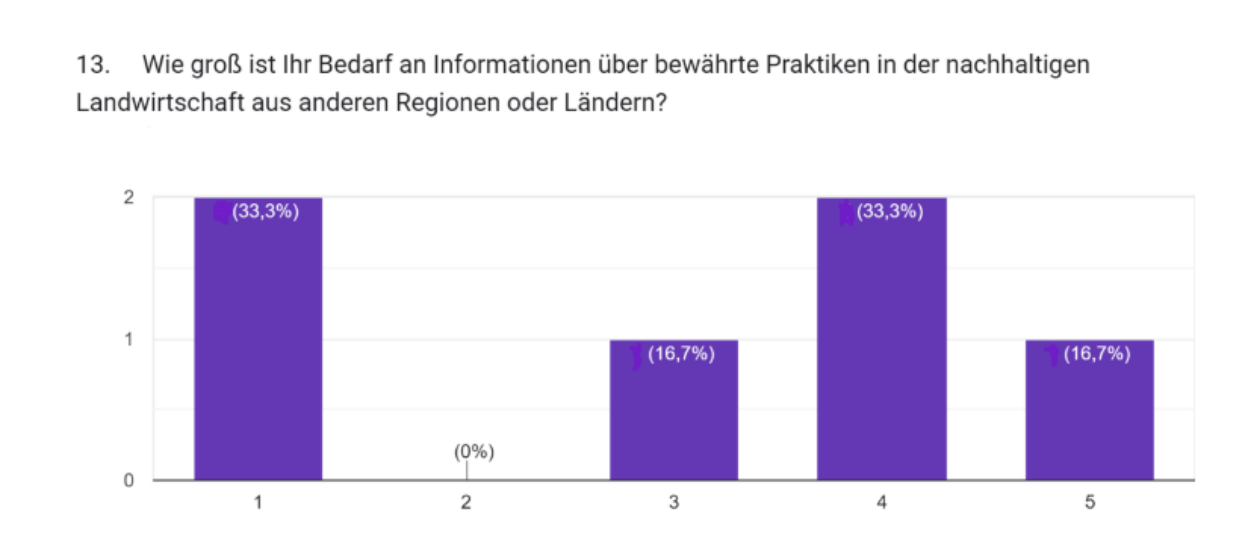
Respondents identified adaptation to climate change as the area where they have the greatest need for more knowledge or skills (66.7%). Soil management and pest control were also important, each cited by 50%, while water-saving techniques and crop diversification were of lesser importance. This highlights the importance of focusing on climate resilience in agricultural training.

12. How important is it for educational materials to be provided in your native language?



The majority of participants (33.3%) rated the importance of having training materials in their native language as a 4 on a scale of 1 to 5. Responses were evenly distributed across all levels, with 16.7% for each rating. This indicates that while many consider it important, the level of importance varies among participants.

13. How much do you need information on best practices in sustainable agriculture from other regions or countries?

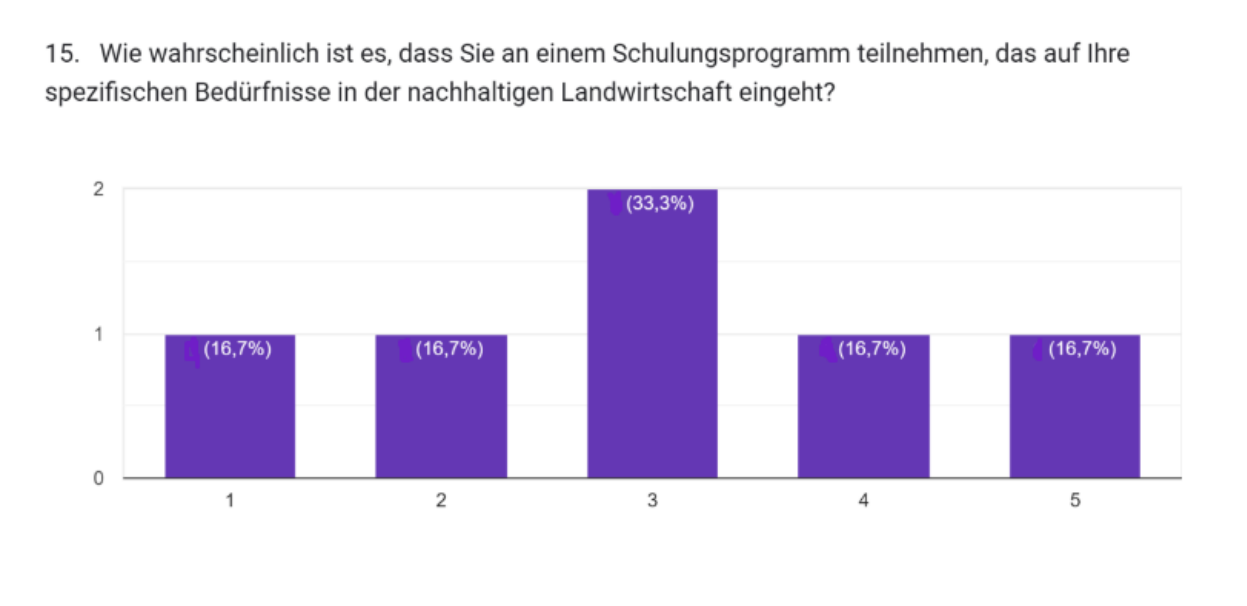


Participants expressed a divided need for information on sustainable agricultural practices from other regions or countries. The majority (33.3%) selected levels 1 and 4, showing some participants find it crucial, while others see it as less important. A smaller group (16.7%) rated their need at level 5, reflecting diverse levels of interest in external knowledge.

14. How much do you need support from other farmers or community groups to adopt sustainable practices?

A clear majority (66.7%) expressed a significant need for support from other farmers or community groups in adopting sustainable practices, while 33.3% felt they had no need for this kind of support. This underscores the importance of collaborative efforts in promoting sustainable agriculture.

15. How likely are you to participate in a training program that addresses your specific needs in sustainable agriculture?



Most participants (33.3%) indicated a moderate likelihood (3 on a scale of 1 to 5) of attending a training program that addresses their specific needs in sustainable agriculture. The rest of the responses were evenly spread across all other levels, indicating varying degrees of interest in further training.

4. Concluding remarks

The results of both the focus group and the questionnaires offer valuable insights that will guide the development of our educational program. Participants highlighted key challenges, including the need for more practical training and support tailored to their specific contexts, especially in sustainable agricultural practices. Many emphasized the importance of hands-on workshops, peer learning opportunities, and more region-specific content that addresses the unique environmental and farming conditions they face. This feedback underscores the necessity of incorporating not only theoretical knowledge but also practical applications into our curriculum to ensure that farmers are well-equipped to adopt sustainable methods effectively.

We will use these findings to shape the structure and content of the training programs under FARM2LA, ensuring they meet the diverse needs of agricultural stakeholders. By focusing on the areas identified—such as the importance of local support, tailored training, and access to new technologies—we aim to create a comprehensive educational platform that empowers farmers with the skills and confidence needed to implement sustainable agricultural practices. This will ultimately help bridge the gap between current farming techniques and the more environmentally sustainable approaches required for the future of agriculture.

3. Colombia

3.1. Introduction

Sustainable agriculture has emerged as a crucial approach to address current challenges related to food security, environmental degradation, and climate change. However, the adoption of sustainable agricultural practices is not free of barriers, especially in rural areas where farmers may face financial, technical, and educational constraints. In order to better understand these difficulties and the specific needs of farmers in implementing sustainable practices, a focus group and survey were conducted in the area, addressing aspects such as perceived barriers, preferred training formats, and interest in tailored educational programs.

These activities have been carried out in the municipality of Arjona, located in the department of Bolívar and classified in category 6 by the Comptroller General of the Nation, with a projected population of 75,995 inhabitants for 2024, according to the National Administrative Department of Statistics (DANE). This population, for the most part, works in Cartagena, taking advantage of the geographical proximity and the job opportunities offered by the city, which makes Arjona a “bedroom municipality”. Although this situation provides access to higher education, health services and an expanded market for primary products, the constant displacement to Cartagena limits the rural-urban development of Arjona.

In this context, a focus group was held in Arjona to understand the challenges and opportunities of the agricultural sector. The seventeen participants, including trainers and vocational training (FP) students and farmers from different districts of the municipality, identified a series of problems that affect local agricultural development. These include the lack of title to agricultural land, limited technical assistance, restrictions on artisanal fishing, low productive use of arable land, and restrictions on fish farming, as well as the limited possibility of creating a small irrigation district.

Representatives of the agricultural sector stated that official support is insufficient, and that municipal public policies for the agricultural sector are deficient or poorly defined, which negatively impacts the productivity and profitability of agricultural and fishing activities. This lack of support generates difficulties in accessing resources, technology and training for the sector, which leads to a low supply of agricultural products, a decrease in income and a reduction in the standard of living of local farmers and fishermen.

This report examines these challenges and highlights the need for effective public policies and stronger institutional support to boost the productivity of the agricultural sector in Arjona, strengthening its income-generating capacity and contributing to sustainable rural development.

Furthermore, the results of this survey offer a comprehensive view of farmers' main challenges and motivations towards sustainability, providing a basis for designing support programs that respond to their real needs. This introduction provides the necessary context to analyze the findings, which highlight key areas of training, as well as educational resources and methodologies that could be more effective in driving the adoption of sustainable practices in the region's agricultural sector.

3.2. General Information about Participants

The focus group was developed in the municipality of Arjona in the department of Bolívar. Arjona is a Category 6 municipality according to the Comptroller General of the Nation, of Intermediate growth. It has a municipal population in 2024 of 75,995 inhabitants, according to population projections of the National Administrative Department of Statistics – DANE.

The municipality is located in the sixth category, its location close to the city of Cartagena benefits it because the majority of the population has their source of employment in the city, which makes it a dormitory municipality, the possibilities of study are high allowing to take advantage of the offers of technical and higher education, and the services of Health and Public Services, even for the Agrarian sector being close to an expanded market for primary products enables its development. It is affected in a certain way by the migratory process that does not allow to consolidate processes of Rural Urban Development to the extent that a large part of daily life revolves around the displacement to the District of Cartagena.

The discussion group was made up of seventeen participants, including three vocational training instructors, four vocational training students and ten farmers. All of them were from the Municipality of Arjona but representing different districts of the municipality. They stated that in relation to the agricultural sector and rural development, the following problematic situations stand out:

- Limited proportion of land titled for agriculture

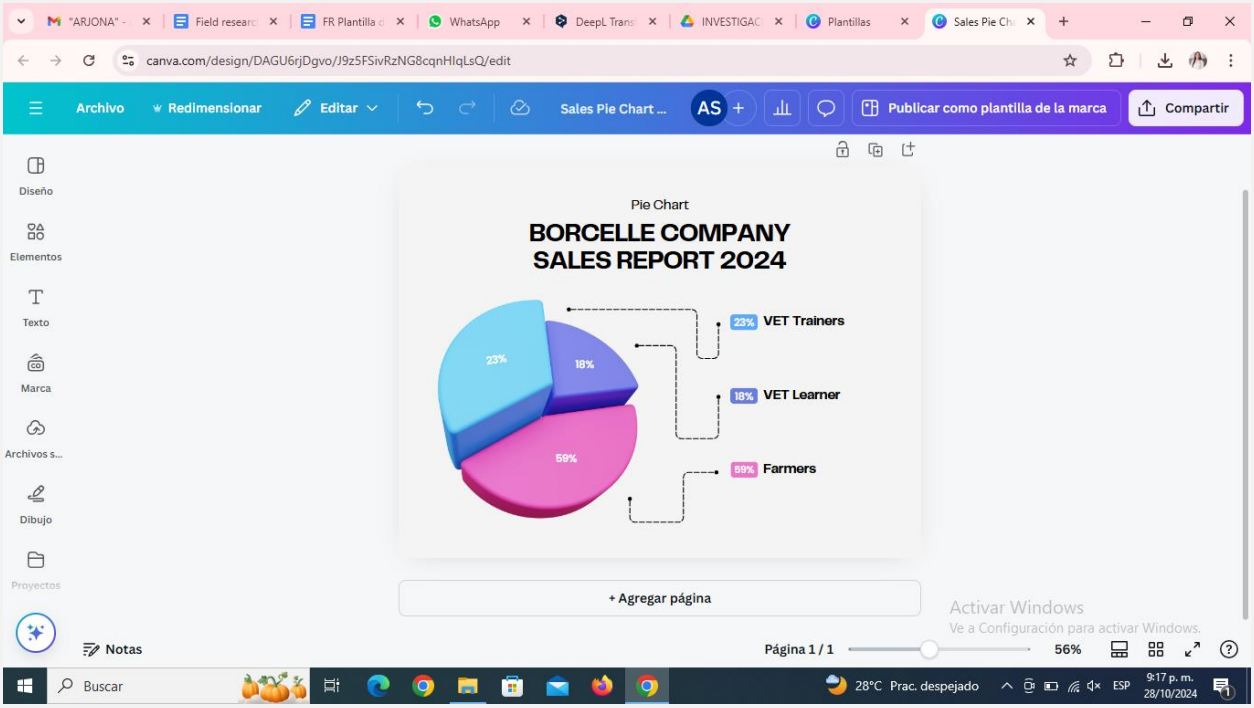
- Reduced municipal technical assistance

- Low productive use of arable land.

- Little possibility for the union to build a small irrigation district.

After what has been said, “there is little official support for the sector,” say representatives of the agricultural sector, as well as deficient or poorly defined municipal public policies for the sector, which translates into a low productive capacity and a relative tendency to abandon the countryside. In general, the productivity of the sector is low. And, as far as artisanal fishing is concerned, the trend of continental fishing production, that is, in freshwater bodies (Juan Gómez and Palotal swamps, for example, and the surrounding beaches within the 35 kilometers of the area of influence of the dam channel, in the case of Arjona), tends to decrease. This “scarce official support for the agricultural sector” makes it difficult for the sector to access appropriate means, resources and technologies, while leading to a low supply of products from the countryside, reduction of the level of income, and downward trends in the standard of living of the community of farmers, peasants and fishermen.

Participants **graph**



3.3. Exploring current practices and stakeholder experiences in agricultural education

The discussion group addressed issues such as Direct Rural Technical Assistance, where 700 farmers were trained in corn, cassava and milk courses, and training in the management of agrochemical waste. Formulation, management and support for productive projects for the benefit of producers and organizations in the municipality. The following projects have also been implemented: - Laying hens - Rams - Broiler chickens - Pigs - Seed banks - Home gardens -

Technical assistance - Rabbit breeding and exploitation - Piña Gold (executed and expanded by 3 hectares).

Farmers complain about the lack of titled land for agriculture and the lack of municipal technical assistance and claim that they do not have land for cultivation. Despite this, the group demands irrigation districts, which (even on a small scale) would generate an optimal use of the available arable land.

One argument that explains the dynamics of the sector is the low productivity of agricultural crops in the face of international competition, which is explained by factors that have had a negative impact on the growth of the sector, including high transportation costs, poor quality infrastructure, scarce and expensive labor, legal uncertainty, among other elements that have negative effects on the country's cost. Added to this list are some particular gaps in the sector, such as the lack of technical assistance to farmers, the low incorporation of technologies into production processes, the inadequate use of production inputs such as fertilizers and pesticides, among others.

Improving crop productivity should be the main priority of the agricultural sector, due to its potential for generating economic and social benefits, and due to the challenge facing the country and the world regarding food supply. The country must advance in its incorporation into this process of technological convergence, through comprehensive technology and knowledge transfer programs.

3.4. Assessing stakeholder understanding and knowledge of agriculture and sustainability

The municipality of Arjona does not have Sectoral and Territorial Plans for Adaptation to Climate Change as a strategy to reduce the risk of climate impacts on the urban and rural population, as well as on their ecosystems. It is evident that, as there are no Sectoral Plans, the necessary importance has not been given to the incorporation of considerations of climate behavior for the development and management of the territory. In this sense, there has been a lack of knowledge of how the climate affects the territory, as well as the identification of the responsible management of ecosystems.

Therefore, it is essential to generate spaces and programs aimed at promoting the increase of municipal fishing, agricultural and livestock production, so that municipal agricultural and fishing resources are taken advantage of, as well as its privileged position at the confluence site of the

Troncal de Occidente, Canal del Dique and Ramal El Viso - Coveñas, in a special way, and taking advantage of the municipal comparative advantages, it is important to promote and develop activities and programs of sustainable agricultural practices.

It is vital that through FP, training is aimed at the relationship between the incorporation of technologies for the defense and nutrition of crops, and their productivity, emphasizing protection against pests, diseases and weeds. Faced with the challenge of supplying healthy food to a growing population and the effects that agricultural production has on biodiversity, the main objective of this training should be to make a proposal aimed at the development of sustainable agriculture. Constituting a valid option to promote rural development and thus promote proposals that modify the present experience.

Farmers expressed Colombia's ability to become one of the world's food pantries and the fact that there will also be a greater need for supplies within the country. Colombia is part of the list of countries that are set to become global leaders in agricultural production, being the fourth country in Latin America with land available for agricultural production; it is also the third with the greatest water resources, climatic diversity and annual precipitation rates, in addition to a variety of attractive products in international markets.

3.5. Identification of barriers and challenges faced by stakeholders in agriculture

The agro-industrial sector faces several challenges in 2024. Focus group participants highlighted aspects such as climate change, high interest rates, difficulties in financing for the countryside and low productivity. In addition, security is a crucial challenge for sustainable rurality.

In consensus, farmers defined the following challenges:

1. **Limited access to finance:** Many farmers lack accessible credit, making it difficult to purchase inputs, machinery and technology.
2. **Climate and climate variability:** Adverse weather conditions such as droughts and floods affect agricultural production. Climate change is also exacerbating these problems.
3. **Poor infrastructure:** Lack of adequate roads and irrigation systems limits access to markets and production efficiency.
4. **Unstable markets:** Fluctuating commodity prices and lack of access to fair markets create uncertainty in farmers' incomes.
5. **Lack of training:** Many farmers lack training in modern cultivation techniques, sustainable management and marketing.
6. **Conflict and violence:** In some regions, violence and armed conflict negatively impact agriculture, displacing communities and affecting food security.
7. **Poverty and inequality:** Socioeconomic conditions limit farmers' opportunities, making it difficult to access basic services and markets.
8. **Diseases and pests**: The emergence of pests and diseases can devastate crops, and access to effective solutions is often limited.
9. **Regulations and bureaucracy**: The complexity of procedures and regulations can be an obstacle to accessing subsidies or international markets.
10. **Lack of innovation**: Resistance to change and lack of access to new agricultural technologies and practices limit growth and competitiveness.

These challenges require a comprehensive approach that includes public policies, investment in infrastructure and training, as well as the support of organizations and communities.

3.6. Evaluating the effectiveness of current support systems for the implementation of sustainable agriculture

The participating group considers it appropriate to analyze several key factors, such as government policies, access to financing, training and the availability of appropriate technology, which are listed below:

1. Policies and Regulatory Frameworks

- Policy Review: Examine current public policies that promote sustainable agriculture, such as tax incentives or subsidies.
- Implementation and Compliance: Assess whether these policies are being effectively implemented and whether farmers are aware of them.

2. Access to Financing

- Microcredits and subsidies: Analyze the availability of microcredits and specific subsidies for sustainable agricultural practices.
- Financial Institutions: Evaluate the role of cooperatives and banks in promoting sustainable agriculture projects.

3. Training and Education

- Training Programs: Investigate the existence of training programs on sustainable practices and their accessibility for farmers.
- Environmental Awareness: Measure the level of knowledge and awareness about sustainable agriculture among producers.

4. Technology and Resources

- Access to Technology: Assess access to sustainable agricultural technologies, such as efficient irrigation systems or organic farming techniques.
- Innovation and Development: Examine support for research and development of new technologies that benefit sustainability.

5. Socioeconomic Impact

- Economic Benefits: Evaluate whether the adoption of sustainable practices has led to improvements in farmers' incomes.
- Long-term sustainability: Analyze the ability of farmers to maintain sustainable practices over time.

6. Collaboration and Networks

- Local Associations and Networks: Evaluating the effectiveness of farmers' organizations and their role in promoting sustainability.
- Multi-Sector Collaboration: Analyze collaboration between government, NGOs and the private sector in sustainable agriculture initiatives.

7. Evaluation of Results

- Sustainability Indicators: Define and measure key indicators, such as improved biodiversity, soil quality and efficient water use.
- Case Studies: Conduct case studies of communities that have successfully implemented sustainable practices.

A comprehensive assessment must involve both quantitative and qualitative data, considering the diversity of agricultural realities in Colombia. The effectiveness of support systems depends on collaboration between all actors involved and an adaptive approach that responds to the changing needs of farmers and the environment.

3.7. Identifying core competencies for training programs that empower agricultural stakeholders

To develop training programs that empower farmers, it is essential to focus on essential competencies that enable them to improve their agricultural practices, increase their productivity and sustainability, and strengthen their ability to adapt to environmental changes. Therefore, participants described the competencies that need to be strengthened:

1. Agronomic Knowledge: Training in cultivation techniques, pest and disease management, fertilization and crop rotation.

2. Sustainable Resource Management : Training in sustainable agricultural practices, soil and water conservation, and efficient use of inputs.

3. Use of Technologies: Introduction to agricultural technologies, such as digital tools for crop monitoring, data management and access to market information.

4. Financial Management: Skills in resource management, budgeting, cost management and access to financing.

5. Marketing and Market Access: Strategies for marketing products, negotiating with buyers, and using online sales channels.

6. Strengthening Associations: Promoting cooperation between farmers, leadership training and management of community organizations.

7. Adaptation to Climate Change: Strategies to address the effects of climate change, including crop diversification and resilience practices.

8. Innovation and Entrepreneurship: Promotion of creativity and innovation in production and marketing, as well as entrepreneurial skills.

By implementing a program from the vocational training centers providing training that covers these skills, it is possible to contribute to the comprehensive development of farmers, improving their quality of life and promoting a more competitive and sustainable agricultural sector in Colombia.

3.8. Comments

The discussion group provided input from different points of view on agriculture and vocational training (FP) in Colombia that can address several key aspects, leaving key proposals on the table when designing a curriculum:

1. **Relevance of Vocational Training** : The need to align vocational training programs with the demands of the agricultural sector is highlighted, focusing on technical and practical skills that respond to market needs.
2. **Crop Diversification** : Training in agricultural diversification techniques can increase farmers' resilience to climate change and market fluctuations.
3. **Use of Technology** : The incorporation of technologies such as precision agriculture and the use of drones is crucial, and it is recommended to include these topics in VET curricula.
4. **Sustainability** : There is a strong interest in promoting sustainable agricultural practices. VET should include training in agroecology and environmental management.
5. **Access and Equity** : It is noted that it is essential to guarantee access to vocational training for all farmers, including rural communities and vulnerable populations.
6. **Interinstitutional Collaboration** : The importance of strengthening collaboration between educational institutions, governments, international cooperation, the European Union and the agricultural sector is highlighted to create more effective programs adapted to local realities.
7. **Continuing Education** : The need for continuing education is crucial, given that agricultural techniques and practices are constantly evolving.
8. **Social and Economic Impact** : It is recognized that better training can not only increase agricultural productivity, but also improve the quality of life of rural communities.

ONLINE QUESTIONNAIRES

1.How familiar are you with the sustainable agricultural practices outlined in the European Green Deal?

The answers are distributed from 1 to 5, where 1 indicates "not at all familiar" and 5 "very familiar". The results obtained allow us to know how familiar the respondents are with the sustainable agricultural practices described in the European Green Deal. That is why 20.6% are in an **intermediate point (3) Medium Familiarity,** which suggests that there is a group that has some knowledge, but it is not overwhelming.

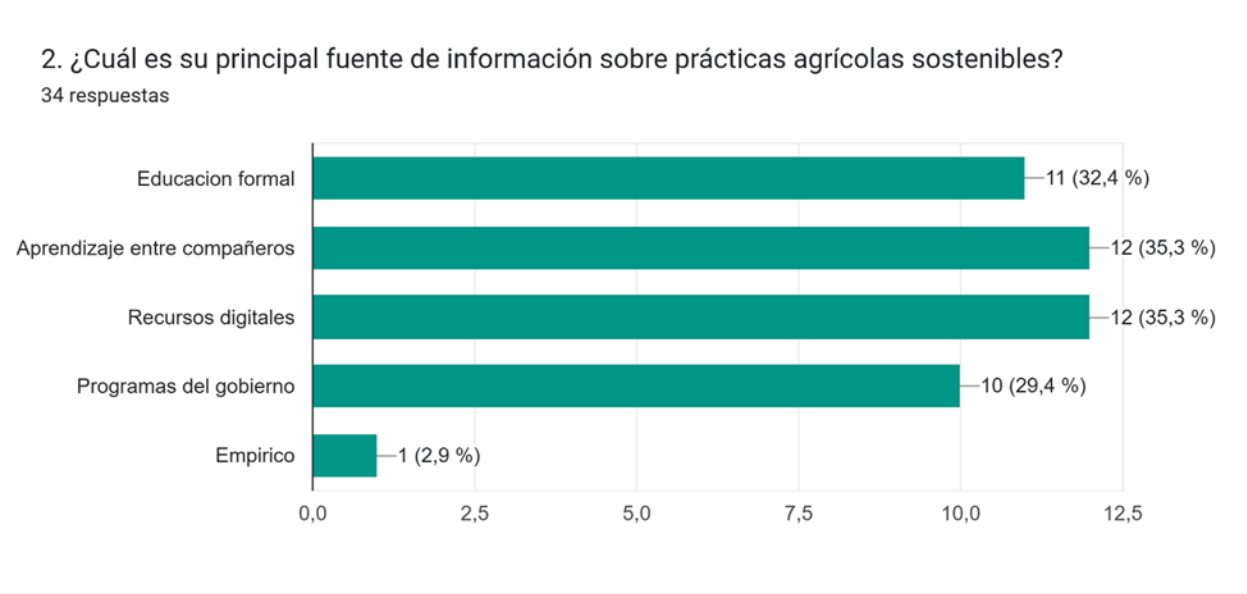
While around 41.2% (14.7% + 26.5%) consider themselves familiar or very familiar with the practices.

And finally, a significant portion (26.5% + 11.8% = 38.3%) of respondents consider themselves little or not at all familiar with sustainable agricultural practices.

Based on what all respondents answered, this question reflects that there is a clear division in familiarity; a considerable portion of respondents have little familiarity, while another significant portion feels more comfortable with the topic.

This could indicate a need for more education or outreach about the “European Green Deal” and its agricultural practices.

2.What is your primary source of information on sustainable agricultural practices?



A significant proportion of respondents, 32.4%, obtain their education through formal education. This could include schools, universities or specialized courses.

The highest percentage is peer learning at 35.3% indicating that many respondents gain information about sustainable agricultural practices through interaction and knowledge sharing with others, suggesting a collaborative approach.

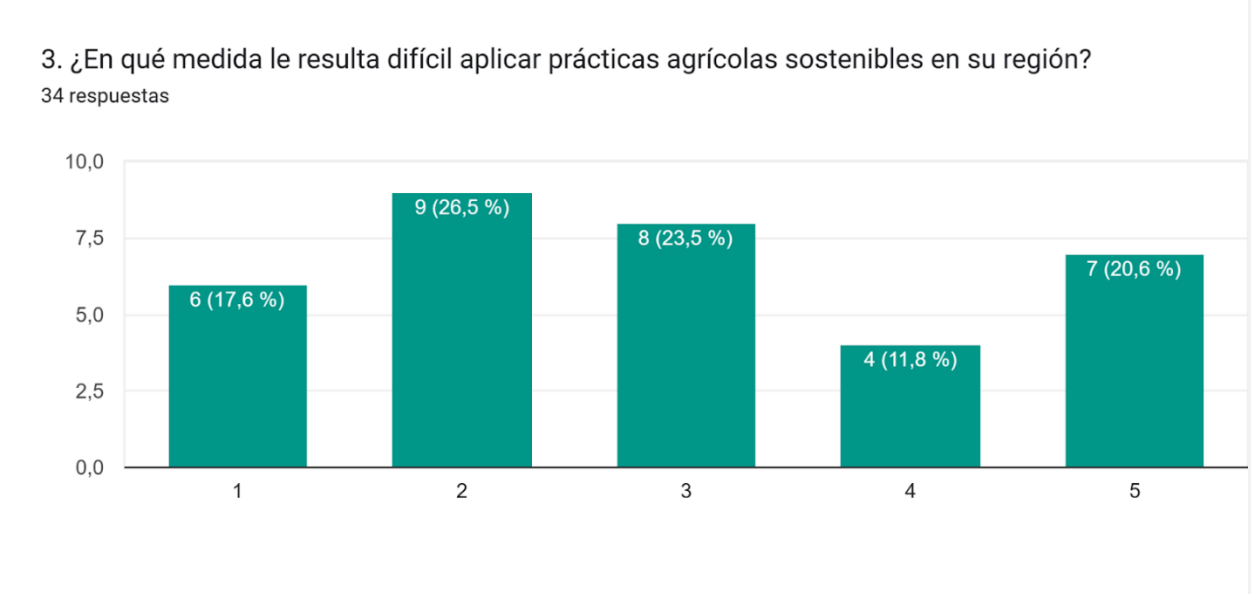
As with peer learning, this figure is notable. Digital resources, with a percentage of 35.3%, reflect the importance of technology and digital media as learning tools.

This percentage shows that government initiatives with 29.4% are also a relevant source of information, although less than direct interactions or digital resources.

Experiential learning at 2.9% is the lowest proportion, suggesting that learning based on personal experience is less common as a source of information on sustainable agricultural practices.

Taken together, these data show a preference for group learning, the use of digital tools, and formal education over experiential learning, suggesting that farmers find acquiring knowledge through collaborative networks and structured means more valuable. This also points to opportunities to strengthen programs that promote shared training and the use of technology, as well as reinforcing the involvement of government initiatives in the field of education for agricultural sustainability.

3.How challenging is it for you to implement sustainable farming practices in your region?



In this chart, respondents respond to the question about the level of difficulty they experience in implementing sustainable agricultural practices in their region, with response options ranging from 1 (very easy) to 5 (very difficult).

Moderate to high difficulty (levels 3, 4 and 5):

- 23.5% of respondents (8 people) consider the difficulty at level 3.
- 11.8% (4 people) are at level 4, indicating considerable difficulty.
- 20.6% (7 people) indicate a level 5, the highest difficulty.

Overall, nearly 56% of respondents perceive moderate to high difficulty (levels 3 to 5) when trying to implement sustainable practices in their region. This indicates that more than half find the implementation of these practices to be a significant challenge.

Low difficulty (levels 1 and 2):

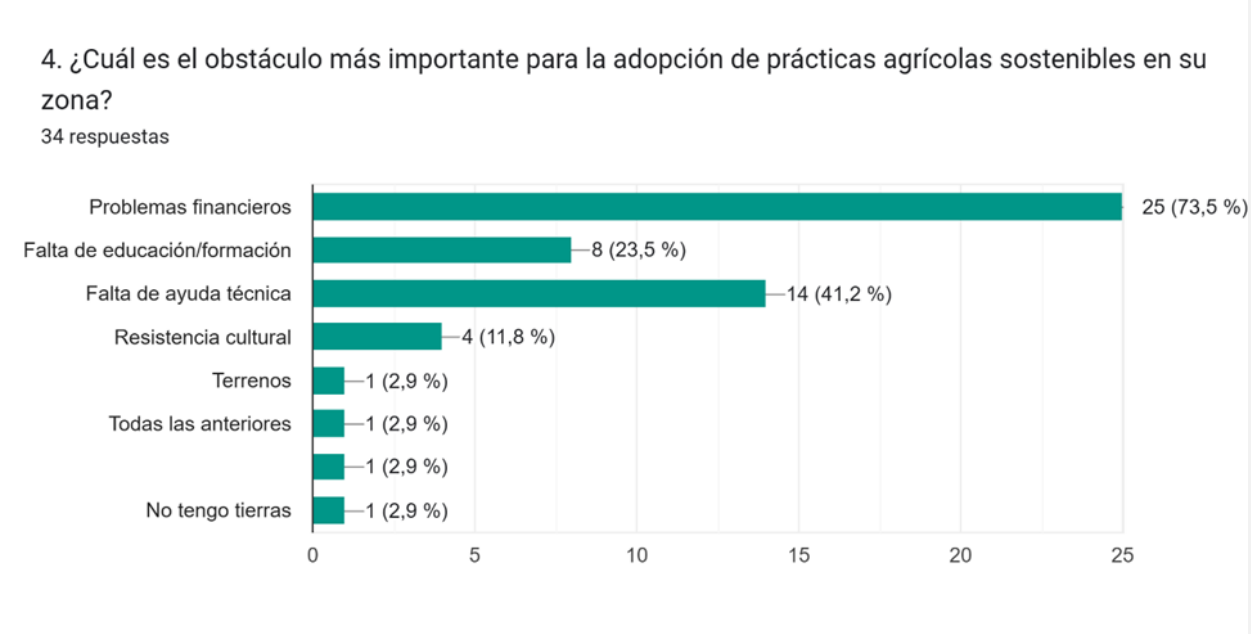
- 17.6% of respondents (6 people) rate the difficulty at level 1 (very easy).
- 26.5% (9 people) selected level 2, indicating some ease in application.

Overall, 44.1% of respondents perceived low difficulty (levels 1 and 2), reflecting that a significant portion finds it relatively easy to implement sustainable agricultural practices.

The overall interpretation suggests a split among respondents, with some finding few barriers (levels 1 and 2), while a larger proportion faced notable challenges (levels 3 to 5). This result

could indicate that certain factors, such as access to resources, training or technical assistance, affect the ease of implementing sustainable practices, varying depending on the circumstances of each farmer or community.

4.What is the most significant barrier to adopting sustainable farming practices in your area?



The survey results show that the main obstacle to the adoption of sustainable agricultural practices in the area is **financial problems,** with **73.5%.** This indicates that the lack of economic resources is a significant barrier for farmers, possibly because implementation sustainable practices requires an initial investment that not everyone can afford.

Next, **lack of technical assistance accounts for** 41.2 **%,** suggesting that in addition to financial issues, farmers also face challenges in accessing the technical assistance needed to implement these practices.

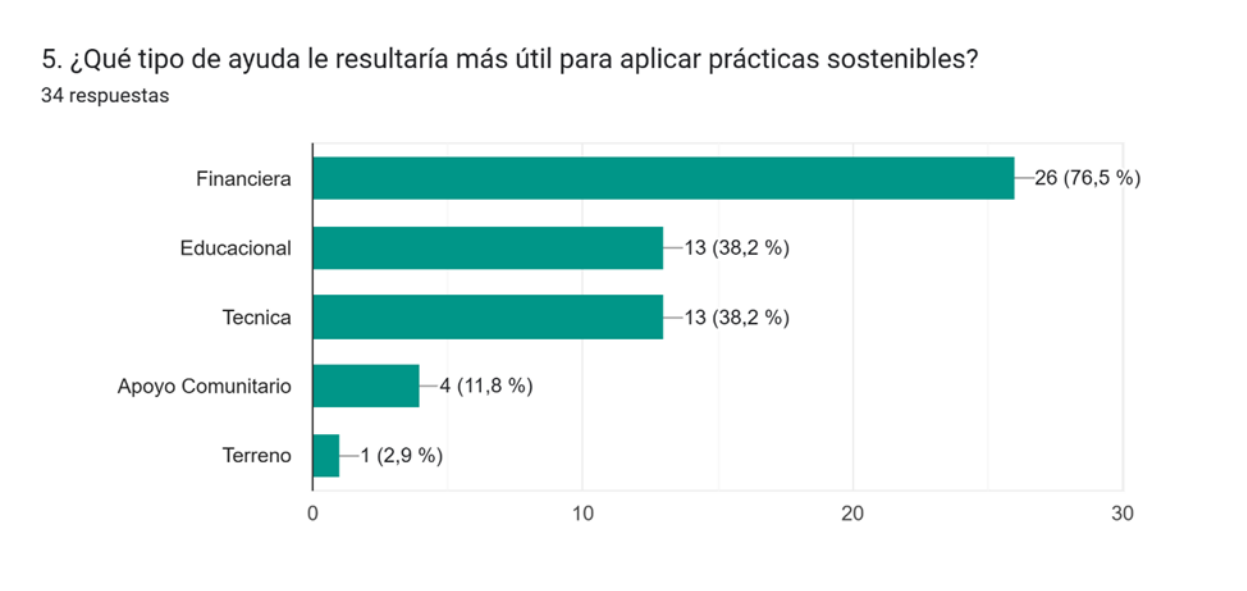
Lack of education or training is also a significant obstacle, cited by **23.5%** of respondents. This could mean that many farmers lack the necessary knowledge about sustainable techniques or the benefits of these practices.

Cultural resistance is at **11.8%,** indicating some reluctance to change traditional agricultural practices in favor of sustainable practices.

Finally, the terrain obstacles **(2.9%), All of the above (2.9%)** and **I have no land (2.9%)** are less significant compared to the above factors, suggesting that these factors affect a minority.

In summary, the analysis indicates that financial and technical support, as well as education, are the key areas to address in order to encourage the adoption of sustainable practices in the area.

5.Which type of support would most help you in implementing sustainable practices?



The data for this question reflect the priority needs of farmers to adopt sustainable practices:

Financial support at 76.5 **%** reflects that the majority of respondents indicate that financial support would be the most helpful, underlining that financial resources remain the main obstacle and a priority in implementing sustainable practices.

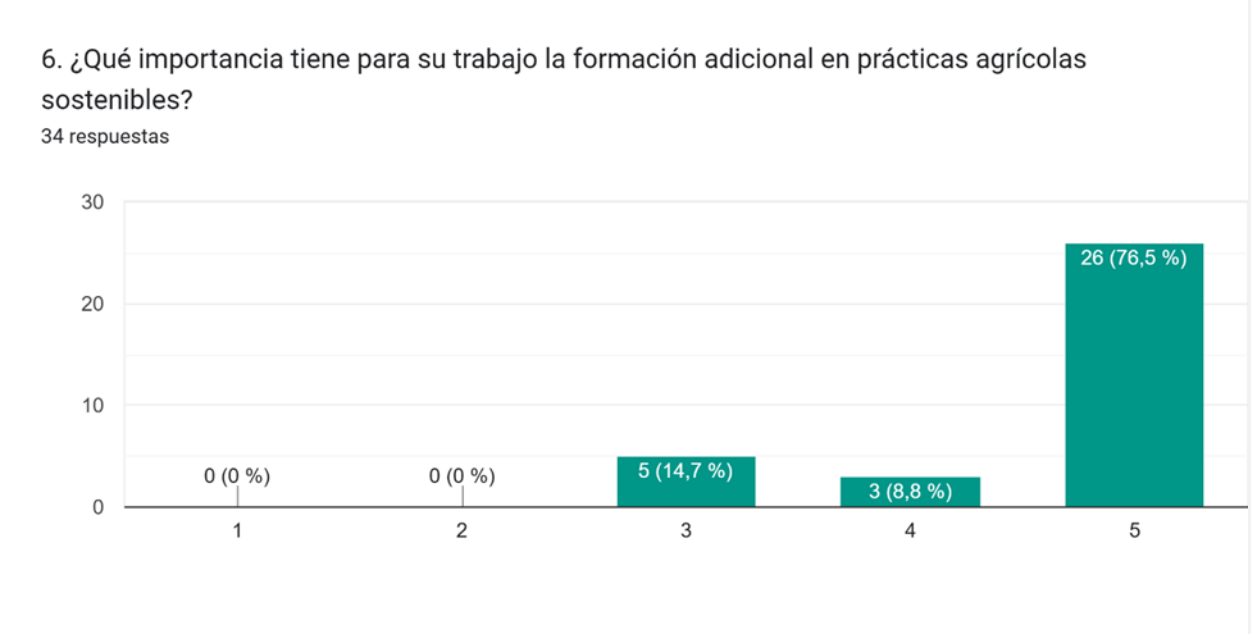
Regarding **educational and technical assistance** (both 38.2%) it indicates that farmers also consider training and technical assistance as valuable support. This suggests that many might be interested in adopting sustainable practices if they had the necessary knowledge and skills, as well as technical guidance to implement these changes effectively.

In the case of **community support** with **11.8%**, although less significant, this option indicates that some farmers would see additional benefits if there were collective or community support, such as collaboration programs between farmers or the strengthening of local networks that promote sustainable practices.

Land At **2.9%,** very few consider land availability as a necessary type of support, suggesting that most farmers already have land suitable for implementing sustainable practices.

Taken together, these results highlight the need for financial support, complemented by training and technical assistance, as the most important types of aid to facilitate the transition towards sustainable agricultural practices.

6. How important is additional training in sustainable agricultural practices for your work?

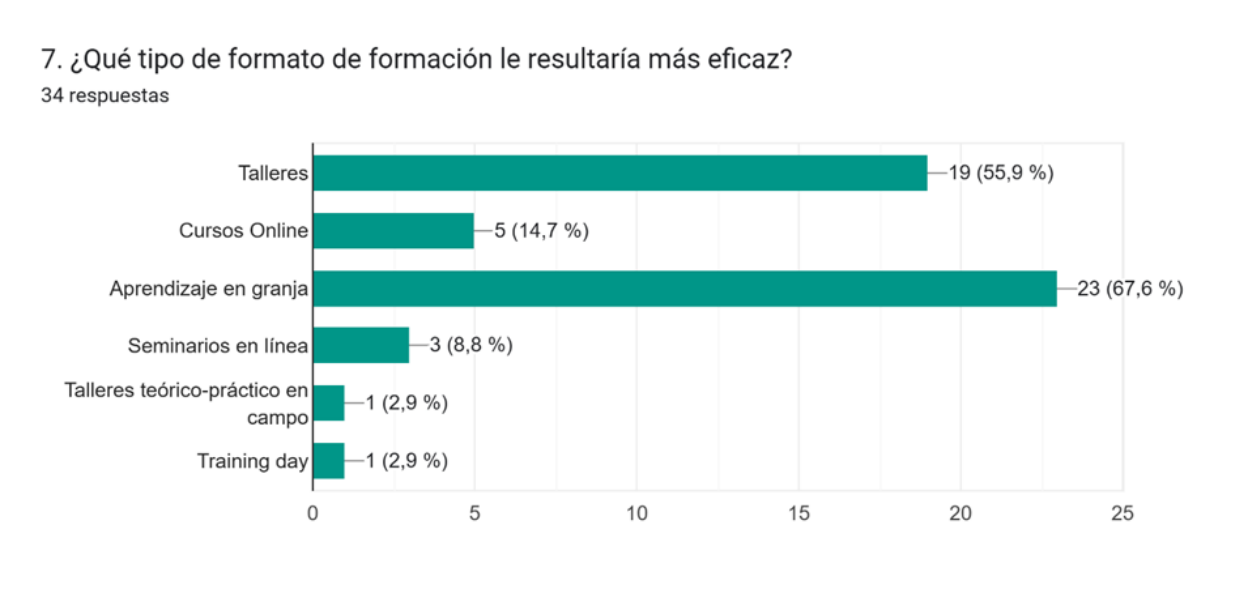


The results show that **additional training in sustainable agricultural practices** is highly valued by respondents, with **76.5%** of them rating its importance **as 5** (highest relevance). This indicates that the majority of farmers consider that acquiring knowledge and skills on sustainability would be essential to improve their work.

14.7 % rated this importance **with a 3,** suggesting that while some see it as relevant, they do not consider it as crucial as the previous group. Only **8.8%** gave a rating **of 4,** reaffirming that training is important, but perhaps not essential for all respondents.

In summary, these data reflect a clear interest and need on the part of most farmers to receive additional training in sustainable practices, which could be key to fostering an effective transition towards sustainability in the area.

7. What type of training format would be most effective for you?



The results indicate a clear preference for practical and face-to-face training formats for farmers:

On-farm learning with 67.6 **%** is the most valued format, suggesting that farmers prefer to learn directly in a real working environment, where they can see and apply sustainable practices in action. Practical experience in the field seems to be key for them.

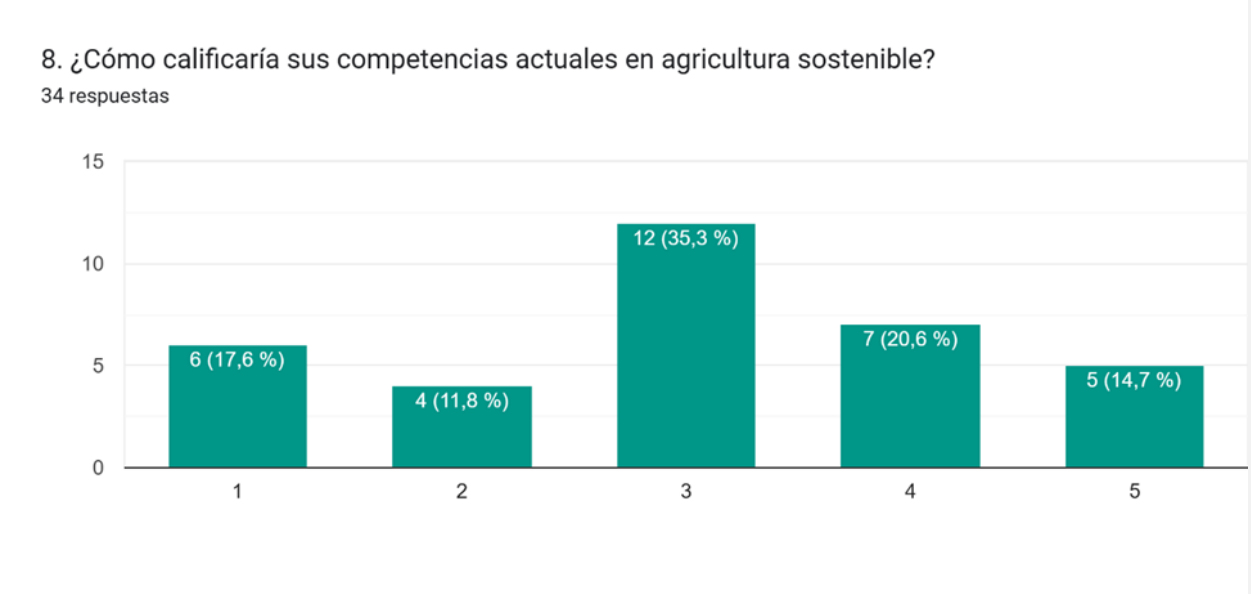
Regarding **Workshops,** with **55.9%,** it is also a popular format, highlighting the preference for interactive and practical activities that facilitate direct learning and the resolution of doubts in person.

In the case of **online courses,** which have a percentage of **14.7%** and **online seminars** with 8.8 **%** Although not the first choice, some farmers find online training useful, which could respond to the convenience and flexibility of this format, although without the practical component that seems to be preferred.

Training days and **theoretical-practical workshops (both 2.9%).** These formats are less popular, possibly because farmers value more continuous and practical training than occasional or theoretical training.

Taken together, these results indicate that farmers see greater value in practical training and real-world work contexts, such as on-farm and workshop training, which would allow them to immediately implement sustainable practices in their own environment.

8. How would you rate your current skills in sustainable agriculture?



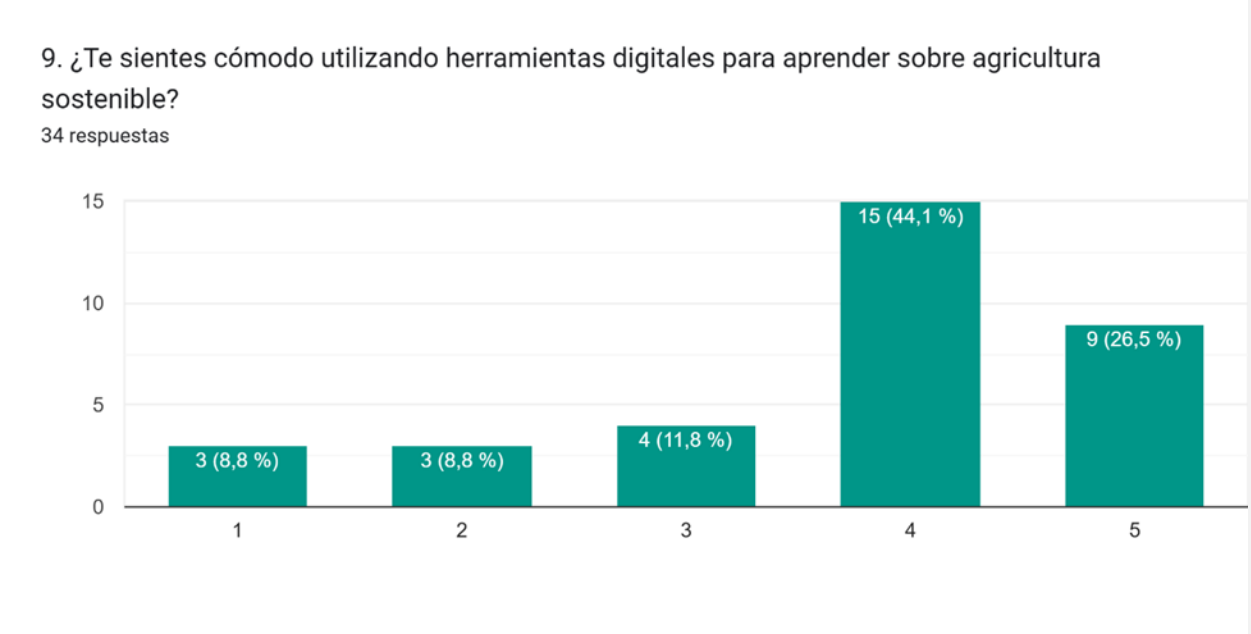
The analysis of this question reflects that the majority of respondents perceive their skills in sustainable agriculture as intermediate to low. The highest concentration of responses is in **range 3 (35.3%),** which suggests that a significant number of farmers consider their skills to be medium, probably with some basic knowledge, but insufficient to implement sustainable practices effectively.

Low grades (1 and 2) 17.6 **%** are rated at **level 1** and **11.8%** at **level 2. 2,** which means that almost **30%** of farmers have a perception of rather limited competences in sustainability. This confirms that a considerable part needs substantial training to improve their knowledge and skills in this area.

High ratings (4 and 5) correspond to **20.6%** who are rated with **a 4** and **14.7%** with **5** , indicating that approximately **35%** of farmers already have a high level of sustainability skills. These farmers could be well positioned to advance and/or support others in sustainable practices.

In conclusion, most farmers perceive that their sustainability skills are at levels that could be improved, which underlines the importance of offering training programs that strengthen this knowledge.

9. How comfortable are you with using digital tools for learning about sustainable agriculture?



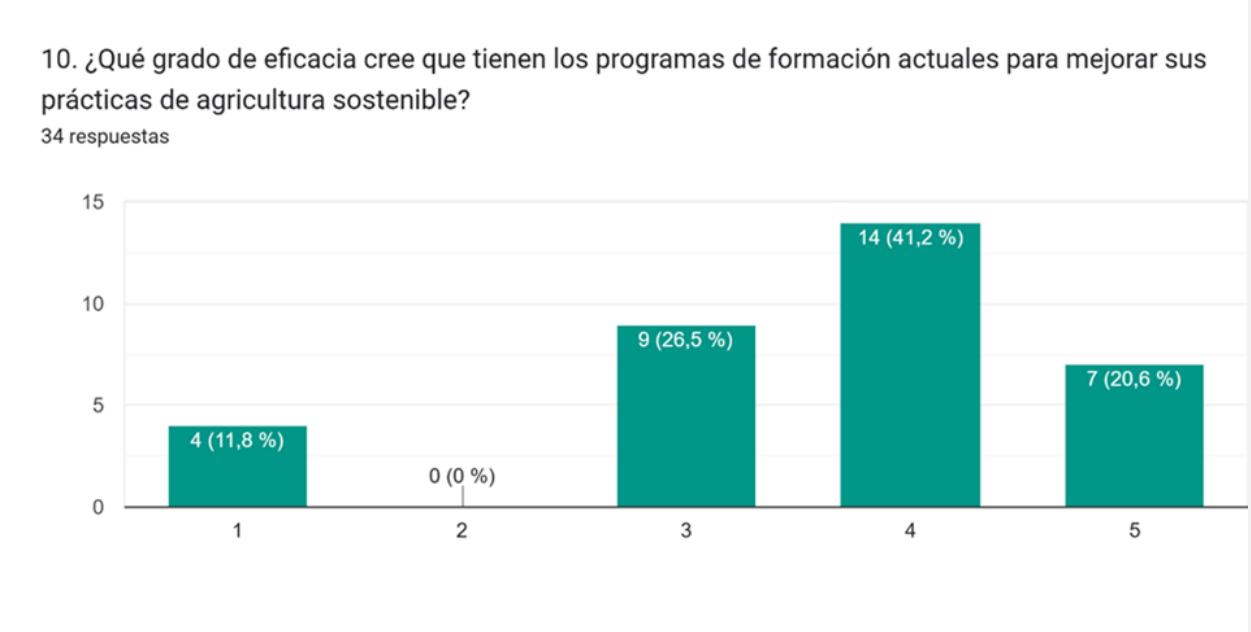
Respondents show a general positive disposition towards using digital tools to learn about sustainable agriculture, although with a variety of comfort levels. **High comfort levels (4 and 5)** are represented by **44.1%** of respondents **selecting 4** , and **26.5% selecting 5,** representing **70.6%** who are comfortable or very comfortable using digital tools. This suggests that most farmers are open to using digital technology as a learning medium, which is positive for the implementation of online courses or educational applications.

In the case of **intermediate level 3,** 11.8 **%** are at this level, which indicates that a minority is open to the use of digital tools, although with some uncertainty or less experience.

Low comfort levels **(1 and 2)** represented by **8.8%** in each of these levels shows that **around 17.6%** of respondents feel uncomfortable using digital tools, which could be due to lack of experience or preference for more traditional learning methods.

Overall, most farmers are fairly comfortable with digital tools, although some would require additional support to make the most of these resources. This suggests an opportunity to introduce digital learning platforms, as long as they include support for those with less technological familiarity.

10. How effective do you think current training programs are in improving your sustainable agriculture practices?



Of the 34 respondents who answered this question, they indicate a mostly positive opinion about the effectiveness of current training programs in sustainable agriculture, although there are also areas for improvement. High levels of effectiveness (4 and 5) where 41.2% rate the effectiveness of these programs with a 4 and 20.6% with a 5, which represents 61.8% of respondents who consider that current programs are quite effective. This suggests that a majority perceives that the programs help them improve their practices, although there is room to increase their impact.

Intermediate level 3, represented by 26.5%, indicates that although they find the programs somewhat useful, they could benefit from additional improvements in the content, teaching methods or resources offered.

Finally, the low levels of effectiveness (1 and 2) are represented by 11.8% who rate the programs with a 1, indicating that a small group of farmers consider these programs to be ineffective. The lack of ratings at level 2 suggests that the majority see some usefulness, although they do not always perceive the impact as significant.

These results show that, although training programs are highly valued, it could be useful to adjust certain aspects, such as including more practical components or adapting them more to the specific needs of farmers, in order to increase their effectiveness and the scope of their benefits.

11. In which area do you feel the greatest need for more knowledge or skills?

This question reflects the main areas in which farmers feel the need to acquire more knowledge or skills to advance sustainable practices. Thus, with soil health and management and crop diversification (both with 50%) these two areas are the most mentioned, indicating that half of the respondents consider it important to improve their skills in these practices. This suggests that many farmers recognize the importance of maintaining healthy soils and diversifying their crops, as both are essential for long-term sustainability.

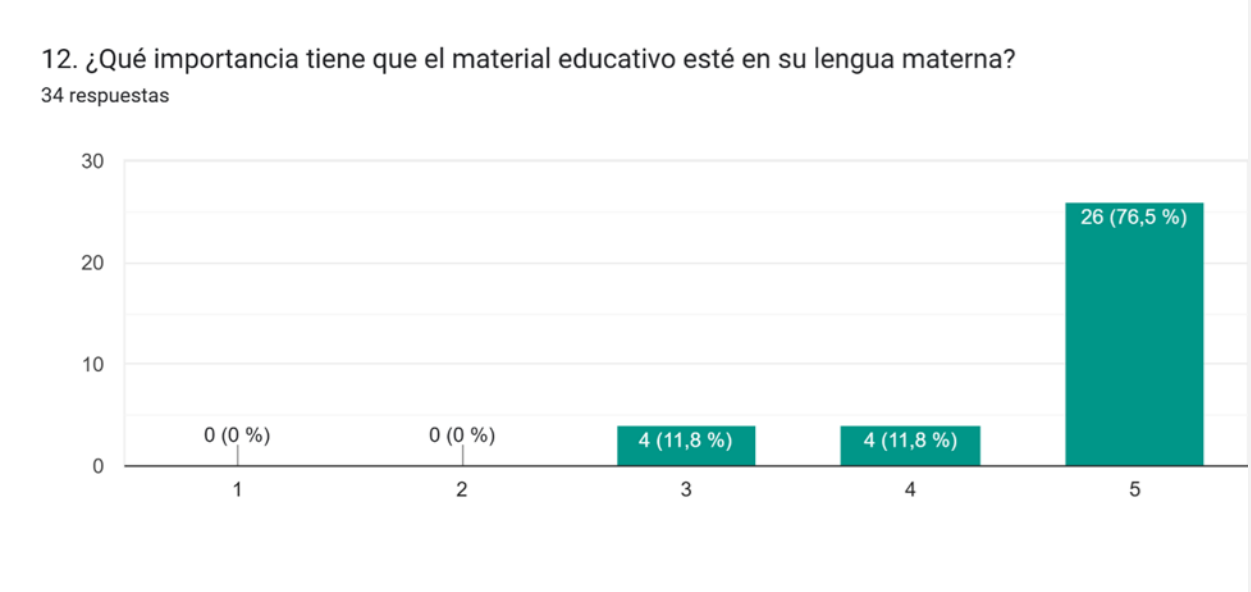
While climate change adaptation at 41.2% indicates that almost half of respondents also point to climate change adaptation as a critical competency. This reflects a concern about how climate changes are affecting agriculture and the need for tools and strategies to adapt.

Water conservation and pest management techniques (both 32.4%): These areas are also a priority for a third of farmers, indicating that managing water resources and controlling pests in a sustainable way are necessary skills to improve their current practices.

Safety in operation (2.9%): This aspect is mentioned by few respondents, suggesting that safety at work is not seen as a priority area of competence, at least compared to the others.

In relation to the above, farmers see soil management, crop diversification and climate change adaptation as key competencies, along with water conservation and pest management. These results can guide the provision of training programs in areas of greatest impact for agricultural sustainability in their area.

12. How important is it for educational materials to be provided in your native language?



Based on the analysis provided by question 12, it has been shown that the vast majority of respondents consider it very important that the educational material is in their mother tongue. Therefore, a higher percentage can be observed at the High Importance level with 76.5%. which rates this need with a 5, showing that most farmers highly value access to materials in their own language. This suggests that, for them, learning in their native language makes it easier to understand and apply the knowledge acquired. , thus increasing the effectiveness of training.

Regarding Medium-High Importance, 11.8% select level 4, indicating that they also see this feature as important, although with a little less emphasis. In addition, level 3 highlights medium importance with 11.8%, which represents a small proportion who might feel comfortable with material in other languages, although they prefer the material in their native language. No ratings are reported for levels 1 or 2, which means that no respondent considers it irrelevant that the material is in their native language.

To sum up, these data highlight the need to provide educational materials in the local language to ensure that farmers fully understand the content and can effectively implement sustainable practices.

13. How much do you need information on best practices in sustainable agriculture from other regions or countries?

By analyzing the information provided, 2.9% of respondents do not feel they need additional information on sustainable practices, suggesting that this group may be satisfied with their current knowledge or the practices they already follow.

Meanwhile, the high need at 97.1% reflects that the overwhelming majority considers obtaining information from other regions or countries to be a good option. This indicates that farmers are interested in learning from external experiences and applying practices that have proven effective in different contexts, which could help them improve their sustainability and adaptability.

These results highlight a strong interest on the part of farmers in accessing knowledge and innovations from other parts of the world, suggesting the possibility of developing information exchange or collaboration programs that enrich their agricultural practices.

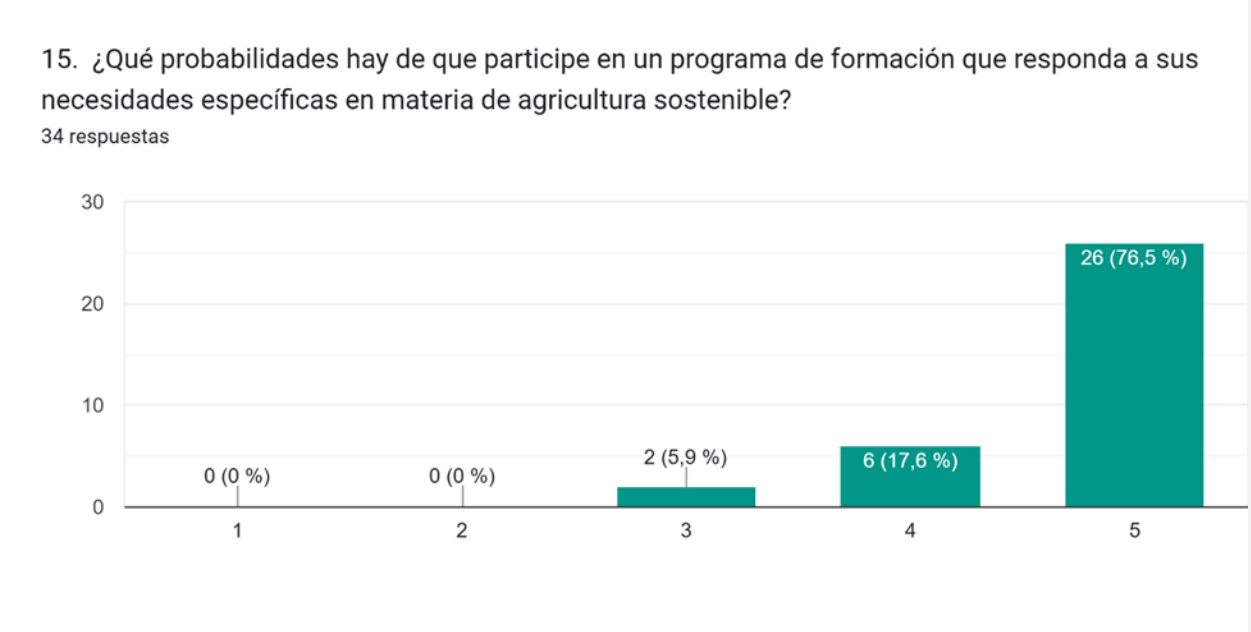
14. How much do you need support from other farmers or community groups to adopt sustainable practices?

As we can see, the results reflect that a **large majority of respondents (85.3%) consider the support of other farmers or community groups necessary** to adopt sustainable practices. This suggests that, for most, collaboration and knowledge sharing within the community play an important role in the implementation of these practices.

On the other hand, **14.7% indicate that they do not need much community support** , which could reflect confidence in their individual ability to adopt sustainable practices or an independent approach to their agricultural management.

Taken together, these data underline the **importance of community support and collaborative networks** for the adoption of sustainable practices, suggesting that promoting spaces for cooperation could facilitate the transition towards more sustainable agriculture in the region.

15. How likely are you to participate in a training program that addresses your specific needs in sustainable agriculture?



The results show a **high willingness to participate in a training program** that addresses the specific needs of farmers in sustainable agriculture.

- **High likelihood of participation:** 76.5 **%** of respondents rate this likelihood at 5, indicating that a large majority are very interested in participating in programs that are tailored to their needs. This suggests that there is a strong demand for customized training that can address their specific challenges and goals.
- **Considerable likelihood:** 17.6 **%** choose level 4, which also reflects a positive disposition towards participation in these programs, although with slightly less enthusiasm than the previous group.
- **Low probability** : Only **5.9%** rate it as 3, indicating that very few have a neutral perception about their participation, suggesting that most farmers have a clear interest in these programs.
- **No likelihood** : No responses are recorded at levels 1 and 2, meaning that no respondent believes that they will not participate in a training program.

These results highlight a **high motivation and willingness** on the part of farmers to get involved in training programs that respond to their specific needs, which is a positive indicator for the development of educational initiatives in the field of sustainable agriculture.

3.5. Final remarks

The analysis of the agricultural sector in the municipality of Arjona through the focus group exercise reveals a series of structural challenges that limit the productive and economic potential of the region. The difficulties pointed out by farmers and trainers, such as the lack of land titles, the scarce technical assistance and the restriction on key activities such as artisanal fishing and fish farming, expose the urgent need to strengthen institutional support and public policies for this sector. Despite having access to an expanded market in Cartagena and opportunities in education and health, Arjona's character as a "bedroom municipality" limits rural-urban development, displacing the economic and social life of the population towards the city and hindering the consolidation of a strong and autonomous agricultural sector.

Limited government intervention in the agricultural sector not only hinders access to adequate technologies, resources and means, but also affects the supply and quality of local products, reducing the income and standard of living of farmers and fishermen. To reverse this trend, it is essential that local policies be oriented towards the creation of infrastructure and the provision of technical assistance that strengthen the productive capacity of the municipality. In conclusion, the revitalization of the agricultural sector in Arjona depends on a comprehensive approach that combines public investment with the development of local capacities, thus promoting a sustainable improvement in the quality of life and economic activity of the region.

On the other hand, the survey results reveal that farmers in the area face mainly financial and technical barriers to adopting sustainable agricultural practices, these being determining factors for their implementation. Despite these difficulties, respondents show a high interest in receiving additional training in sustainable agriculture, especially in practical areas such as soil health, crop diversification and adaptation to climate change.

In terms of learning format, farmers prefer practical experiences such as on-farm learning and face-to-face workshops, suggesting that they value applicable and contextual approaches. There is also a positive willingness to use digital tools in learning, although some may need additional support.

The mother tongue plays a crucial role in the educational process, as most consider it essential to access material in their local language for an optimal and effective understanding of the content. In addition, there is a great interest in learning sustainable practices from other regions or countries, indicating an openness to innovations that can improve their own methods.

On the other hand, although most farmers feel self-sufficient to adopt these practices without relying on community support, they express a high willingness to participate in training programs tailored to their specific needs. This highlights the opportunity to develop personalized and practical programs that drive sustainability in the region.

In conclusion, farmers are motivated and willing to improve their sustainable practices, especially if they are provided with financial resources, technical support, practical training, and accessible content in their language. Future training programs can maximize their impact by aligning with these specific preferences and needs.

4. Chile

4.1. Introduction

The main objective of the FARM2LA project (Transforming Agricultural Education for Sustainable Development in Latin America) is to transform agricultural education in Latin America, promoting sustainable development through the integration of green practices and advanced technological tools. This project is intended to provide a solid foundation for education in sustainable agricultural practices, addressing both local needs and global trends in agriculture.

The focus group conducted in the context of FARM2LA aimed to explore and understand the perspectives of farmers and trainers on the adoption of sustainable technologies and green practices in the region. Through this process, the identification of barriers and challenges faced by key stakeholders was pursued, while assessing opportunity areas to strengthen agricultural education through the use of new technologies

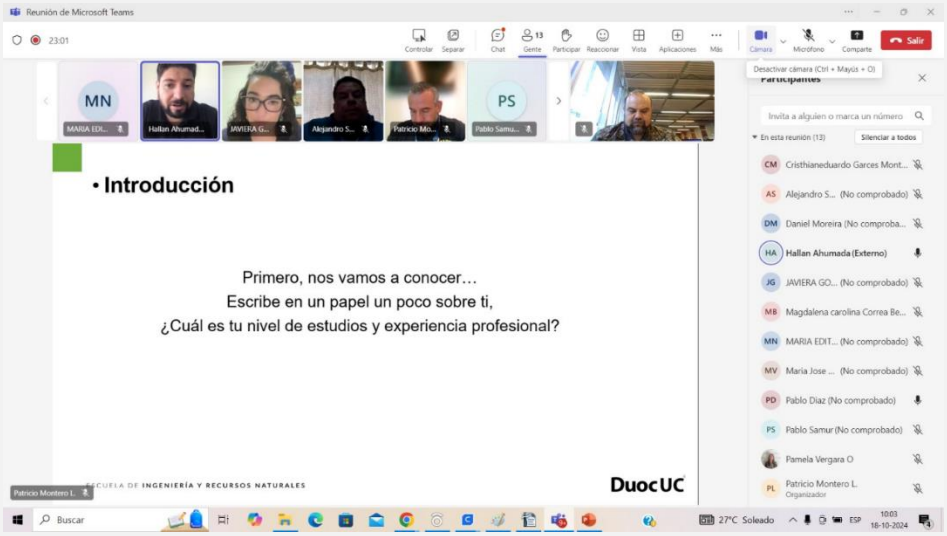
This report aims to analyze the results obtained from the focus group, identifying the essential skills needed for the training of stakeholders involved in agriculture, assessing their current level of knowledge and the barriers that limit the adoption of sustainable practices. Through this analysis, it is intended to provide recommendations to improve agricultural training and ensure greater integration of green practices in the region, in line with the objectives of the FARM2LA project.

4.2. General Information about Respondents

The focus group included nine professionals who brought different approaches and experiences within the field of agriculture and agricultural education. A detailed summary of the participants, with their respective roles and areas of expertise, is presented below:

- Mr. Hallan Ahumada: Agricultural engineer with specialization in the use of multispectral agricultural drones. He focuses on crop monitoring through multispectral images, which allows optimizing irrigation and managing water resources more efficiently. He has worked on projects that aim to use technology to maximize crop productivity with sustainable water use.
- Mrs. Javiera González: Manager of an agricultural foundation that promotes the adoption of sustainable agricultural practices. She is dedicated to the technification of irrigation and the implementation of agricultural solutions that minimize environmental impact. She has been part of educational projects that aim to train farmers in the efficient use of water and responsible agricultural practices.
- Mr. Alejandro Sánchez: Agricultural engineer with broad experience in rural development and the implementation of advanced technologies in small farms. He has led initiatives that introduce soil sensors and automated irrigation systems in rural communities to improve irrigation efficiency and increase production in a sustainable manner.
- Mr. Pablo Samur: Founder of a company dedicated to the distribution of agricultural inputs, especially focused on organic agriculture. His work focuses on promoting the use of natural fertilizers and reducing dependence on chemicals, contributing to the adoption of more environmentally friendly practices in agriculture.
- Mr. Daniel Moreira: Computer engineer who has applied his technological expertise in the agricultural sector. He works in a nursery that uses solar panels to generate clean and sustainable energy, integrating renewable energies with agricultural needs. His focus has been on reducing the use of non-renewable resources through energy optimization in the field.
- Mrs. María José Valladares: Agricultural engineer with experience in education and rural development. Her work focuses on training farming communities in the implementation of sustainable practices and creating farmer-to-farmer collaborative networks that help improve productivity and sustainability.
- Mr. Pablo Díaz: Agricultural engineer specialized in automated irrigation systems and the use of telemetry for crop management. He has developed projects that integrate climate monitoring to adjust irrigation and ensure a more efficient use of water, adapting to changing climatic conditions.

- Mr. Javier Muñoz: Agricultural engineer that focuses on soil management and the implementation of water conservation practices. He has worked on projects related to precision agriculture, seeking to optimize available resources through the use of technologies that increase soil sustainability.
- Mrs. Claudia Vega: Manager of an agricultural operation, specialized in the implementation of precision technologies. She has worked on optimizing production by using soil sensors and climate data to adjust irrigation and fertilization practices, ensuring more efficient and sustainable production.

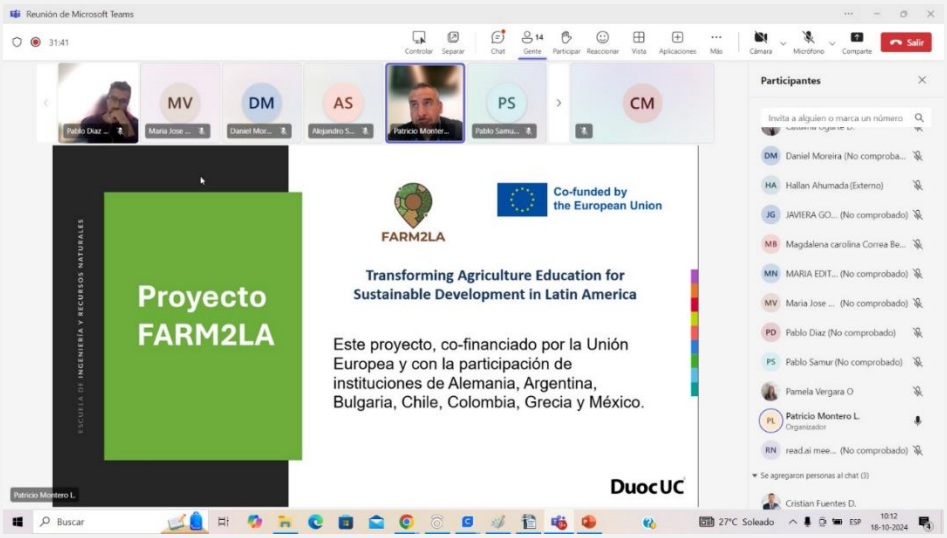


4.3. Exploring Current Practices and Stakeholder Experiences in Agricultural Education

During the focus group, participants emphasized the growing need to adopt cutting-edge technologies in agriculture to improve production efficiency and sustainability. Current practices reflect an evolution towards the integration of technological tools, such as multispectral drones, for monitoring crop health in real time. Drones have been used to capture images that help farmers identify areas with nutritional deficiencies or irrigation problems, which in turn facilitates more accurate resource management.

However, despite technological advances, some participants noted that adoption of these tools is still limited. Economic barriers and lack of appropriate training have prevented many small farmers from accessing technologies that could significantly increase their productivity. Automated irrigation systems based on telemetry were another recurring topic. Participants noted that these systems allow for more efficient irrigation control, automatically adjusting the amounts of water applied based on weather and soil moisture conditions.

In addition, the role of agricultural education in the adoption of these technologies was outlined. Although universities and training centers have begun to integrate technology into their programs, participants identified a gap between theory and practice. Many students acquire knowledge about emerging technologies, but lack the practical experience needed to apply them in real world settings.



4.4. Assessing Stakeholders' Understanding and Knowledge in Agriculture and Sustainability

The level of knowledge about sustainable agricultural practices varies among participants. Some participants show a strong familiarity with organic practices and the use of natural fertilizers, while others are more focused on incorporating cutting-edge technologies such as soil sensors and drones. Participants agreed that current technologies provide great potential to improve agricultural efficiency and reduce environmental impact, but also noted that training in data analytics is crucial to make the most of these tools.

Farmers still rely to a great extent on personal experience and intuition to make decisions, which can lead to inefficient use of resources. By integrating technologies such as drones and climate sensors, farmers could access accurate data that would allow them to adjust their operations more effectively. However, the lack of technical training in interpreting this data is a major barrier limiting the positive impact of technology in agriculture.

4.5. Identifying Barriers and Challenges Faced by Stakeholders in Agriculture

Participants noted several barriers that are holding back the adoption of green technologies in agriculture. Resistance to change was one of the main barriers mentioned. Although new technologies have proven to be effective in increasing productivity and reducing costs, many

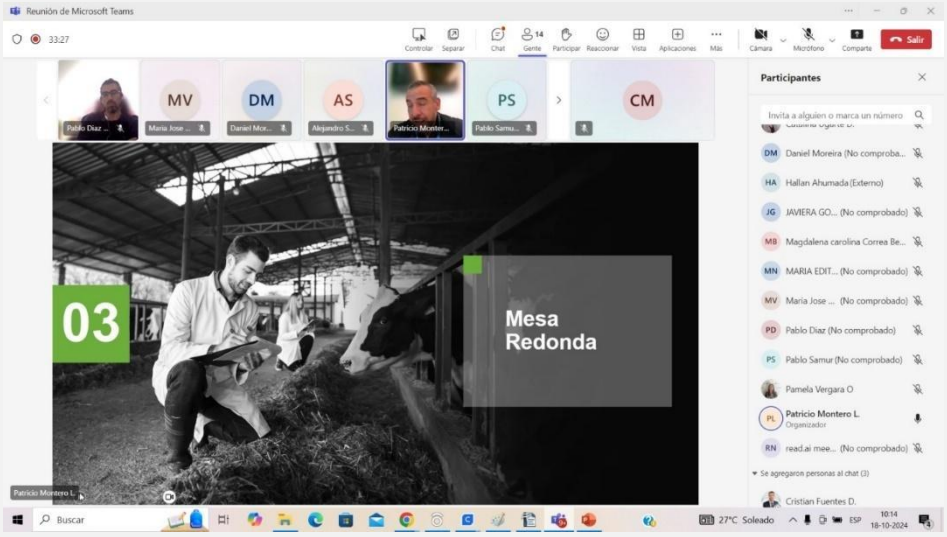
farmers still prefer to use traditional methods that have worked for generations. This is not only due to lack of knowledge about the technology, but also to the perception that the initial cost of these tools is too high, especially for small farmers.

Another important barrier is the lack of technological infrastructure in rural areas. Some farmers do not have access to reliable data networks, making it difficult to implement technologies that depend on connectivity, such as automated irrigation systems and climate sensors. Government subsidies and financial incentives were mentioned as useful tools to encourage the adoption of green technologies, but participants agreed that these programs are not always sufficient to cover the costs associated with the acquisition and maintenance of advanced equipment.

4.6. Assessing the Efficacy of Current Support Systems for Implementing Sustainable Agriculture

The existing support systems for the implementation of sustainable technologies in agriculture were assessed by the participants. Some noted that, although there are government programs designed to encourage the adoption of sustainable practices, these are not always targeted to the farmers who need them most. In many cases, small farmers do not receive sufficient technical or financial aid to implement available technologies.

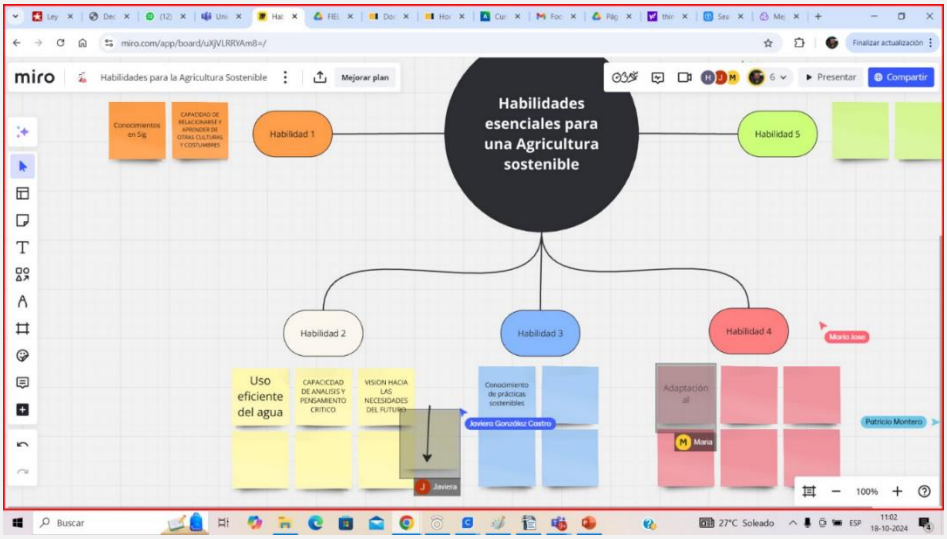
It was mentioned that the lack of ongoing technical advice is a major obstacle for the adoption of new technologies. While there are programs that provide subsidies for the purchase of equipment, farmers often do not receive the necessary training to use them effectively. Participants suggested that a more comprehensive support system should include both financial incentives and ongoing technical training to ensure that technologies can be used efficiently and sustainably.



4.7. Identifying Essential Skills for Training Programs Empowering Stakeholders in Agriculture

Essential skills for the adoption of green technologies in agriculture were a key topic during the focus group. Participants agreed that farmers need to acquire skills in the use of drones, telemetry, and climate data management to make well-informed decisions about the management of their crops. In addition, the need for training programs to include practical modules where students can experiment with these technologies in a controlled environment was outlined.

It was proposed that educational programs should focus on teaching farmers how to interpret the data generated by these tools, since the ability to analyze accurate information is essential to optimize farming practices. It was also suggested that courses should include the management of soil sensors and other monitoring devices, which allow farmers to adjust their practices based on actual conditions of their fields.

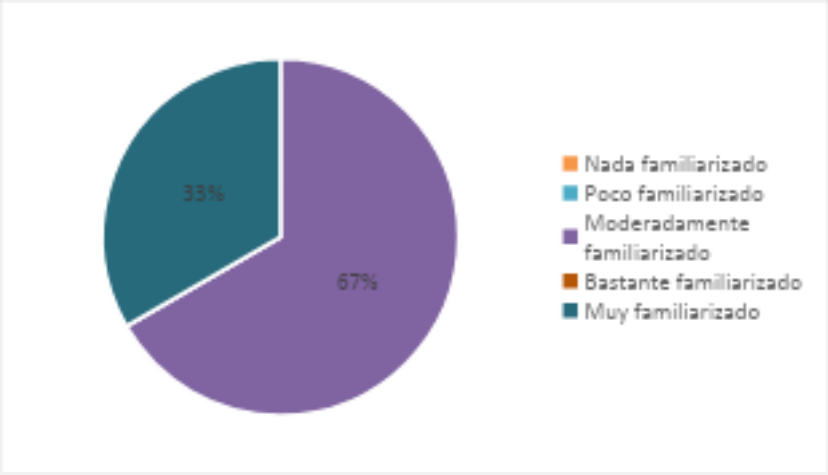


4.8. Comments

Additional comments outlined the need to create a knowledge exchange platform where farmers can share their experiences with the use of green technologies. Participants suggested that the FARM2LA project could play a key role in creating this platform by providing a support network for farmers seeking to implement sustainable practices but lacking adequate technical training.

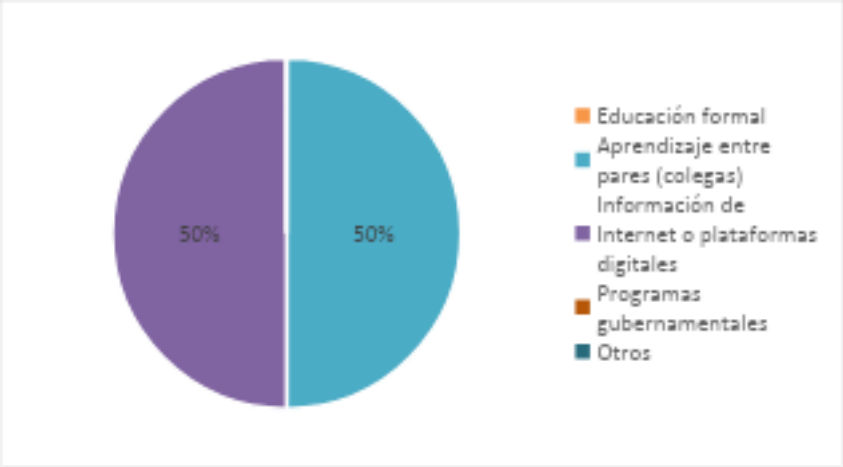
ONLINE QUESTIONNAIRES

1. How familiar are you with the sustainable agricultural practices mentioned in the European Green Pact?



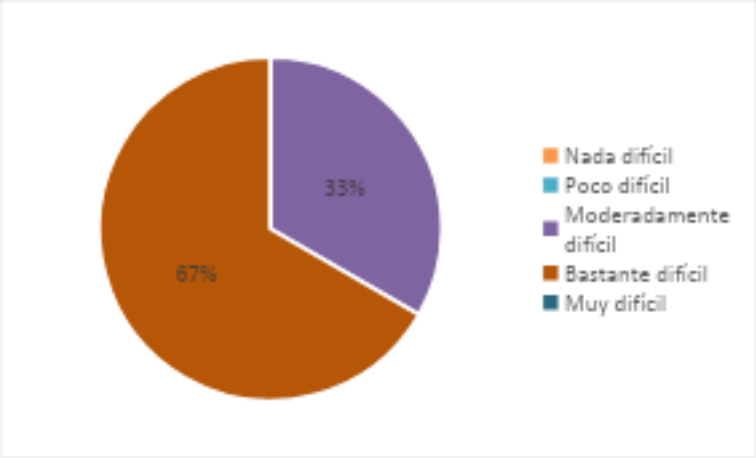
66.67% of the participants described themselves as moderately familiar, while 33.33% indicated being very familiar. This level of knowledge comes mostly from secondary sources such as colleagues or online readings. Although they understand the basic concepts, some indicated that they find it difficult to make a connection of these practices to local conditions, thus underscoring the importance of adapting strategies to their specific contexts.

2. What is your main source of information on sustainable agricultural practices?



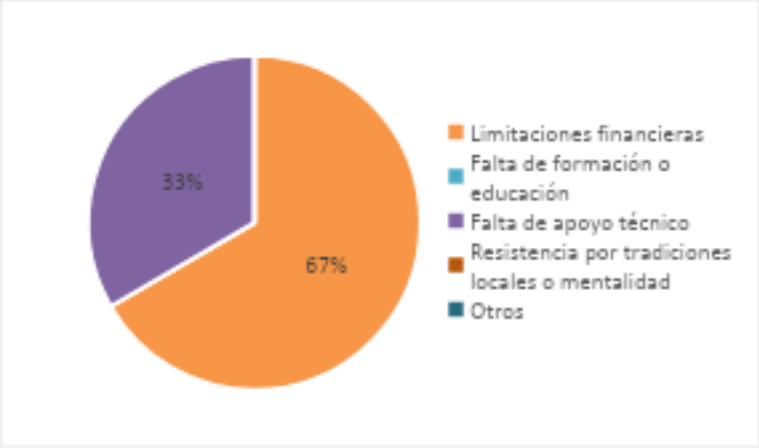
50% of the participants indicated that their main source of learning comes from colleagues in the sector, while the other 50% access information through digital platforms. While they highly value peer-to-peer exchange, they also mentioned that digital information is more up to date, although sometimes fragmented. Participants stated that they would like to see more online resources that are easy to understand and adapted to their local realities, since many contents are oriented to developed countries.

How difficult is it for you to implement sustainable agricultural practices in your region?



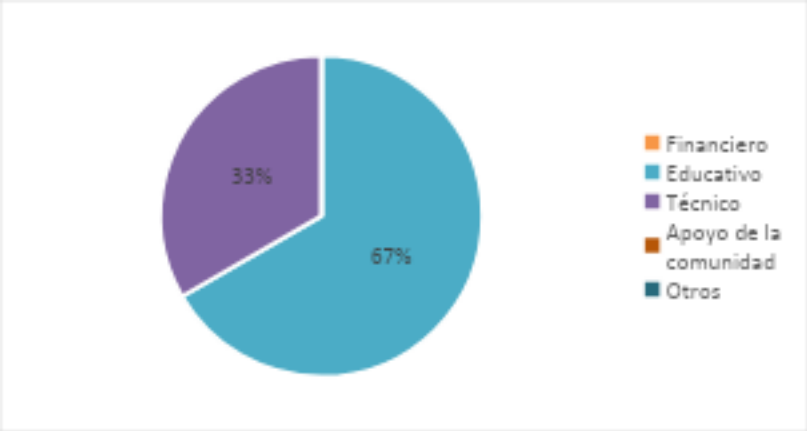
66.67% of the respondents mentioned that it is quite difficult to implement these practices, while 33.33% considered it moderately difficult. Some of the main obstacles identified include lack of access to financing and technical constraints, especially in rural areas. In addition, it was noted that the lack of infrastructure, such as irrigation systems or advanced technology, hinders the efficient implementation of sustainable practices, especially for small farmers.

4. What is the biggest obstacle to adopting sustainable agricultural practices in your region?



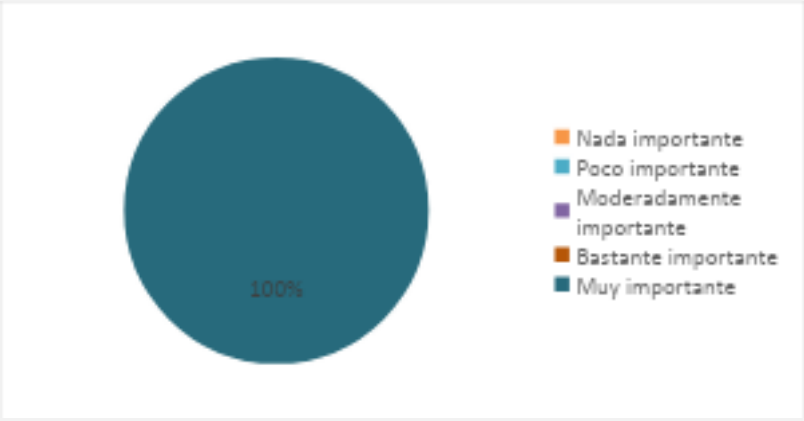
66.67% of the participants identified financial constraints as the main obstacle, followed by 33.33% who mentioned lack of technical support. Although many are interested in adopting sustainable practices, the initial costs of acquiring technologies, such as soil sensors or automated irrigation systems, are too high. In addition, the lack of trained technicians in the region prevents them from receiving the necessary advice to implement these changes effectively.

5. What type of support would be most helpful in implementing sustainable practices?



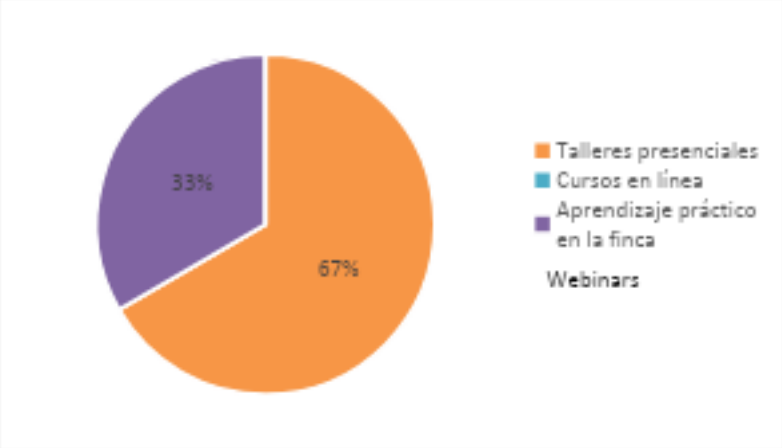
66.67% of the participants considered that educational support would be most important, while 33.33% mentioned technical support as equally valuable. Many stressed the importance of educational programs that not only provide theoretical knowledge, but also include on-site practices. The need for technicians to visit the site to guide farmers in adopting these practices was also pointed out.

6. How important is additional training in sustainable agricultural practices to your work?



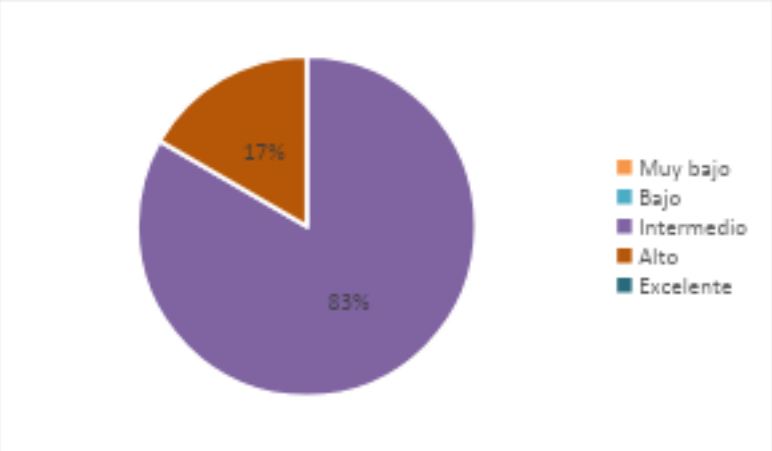
100% of respondents agreed that additional training is very important. It was emphasized that the lack of practical training is one of the biggest barriers to successfully implement these practices. Although there is access to educational materials, these are often general information and not adapted to local needs. Therefore, the importance of receiving continuous and contextualized training was outlined, in order to effectively apply what has been learned.

What form of training would be most effective for you?



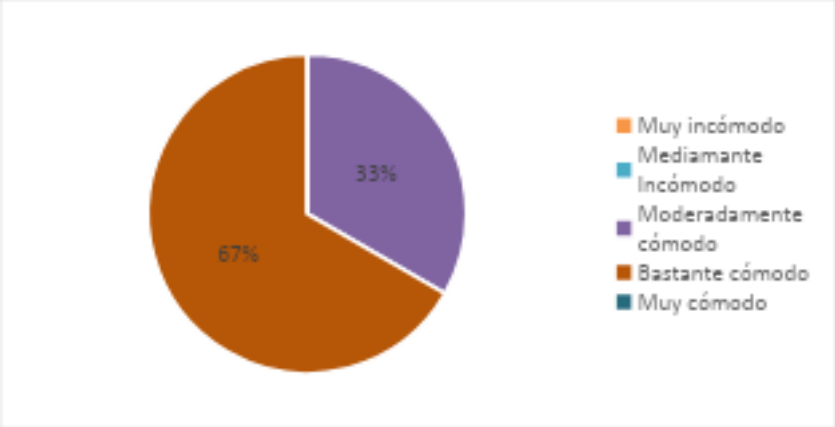
66.67% of the participants preferred face-to-face workshops, while 33.33% preferred practical learning on the farm. Face-to-face workshops allow interaction with experts and the resolution of doubts in real time, which is highly valued. However, some noted that practical training in the field is essential to see the direct application of the technologies and techniques learned, especially in local contexts where conditions can vary considerably.

0. How would you assess your current level of skills in sustainable agriculture?



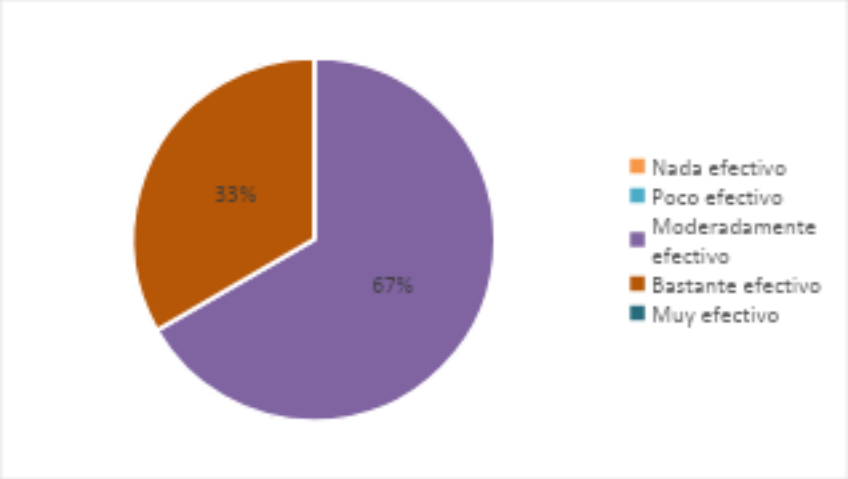
83.33% of the participants considered themselves at an intermediate level, while 16.67% rated themselves at a high level. Although they have adopted some sustainable practices, their knowledge is limited in key areas such as advanced water management and the use of organic fertilizers. Participants expressed a willingness to improve their skills but stressed the need for more specific training resources on these topics.

How comfortable are you using digital tools to learn sustainable farming practices?



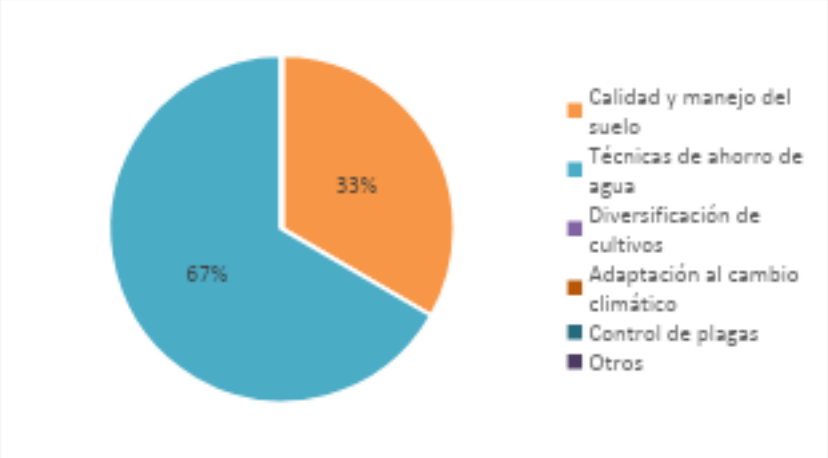
66.67% of the respondents described themselves as quite comfortable using digital tools, while 33.33% considered themselves moderately comfortable. Although many use devices such as smartphones and online platforms, some face difficulties in accessing the internet in rural areas. It was also mentioned that some educational platforms are not appropriately adapted to local technological capabilities, which can make digital learning more complicated.

How effective do you consider current training programs are for improving your sustainable farming practices?



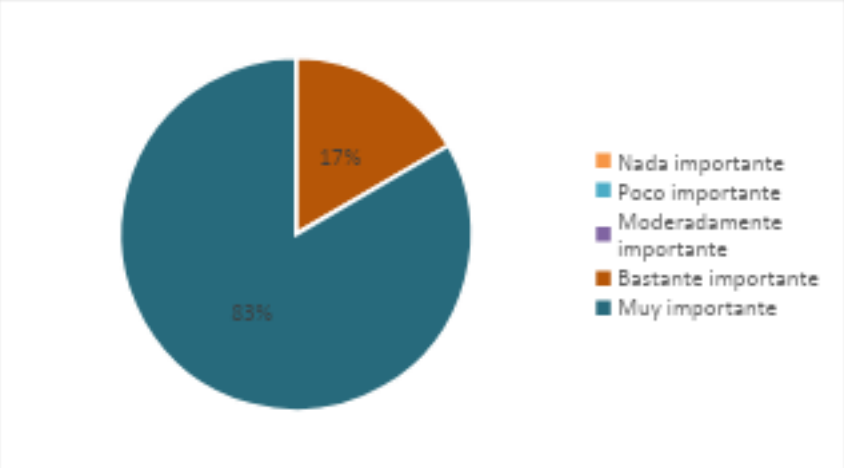
66.67% of respondents rated the current programs as moderately effective, while 33.33% considered them quite effective. While these programs provide a good theoretical basis, it was suggested that they should include more practical elements and be better adapted to local realities. Participants expressed that training programs should include more practical examples and field visits.

In what area do you think you need further knowledge or skills?



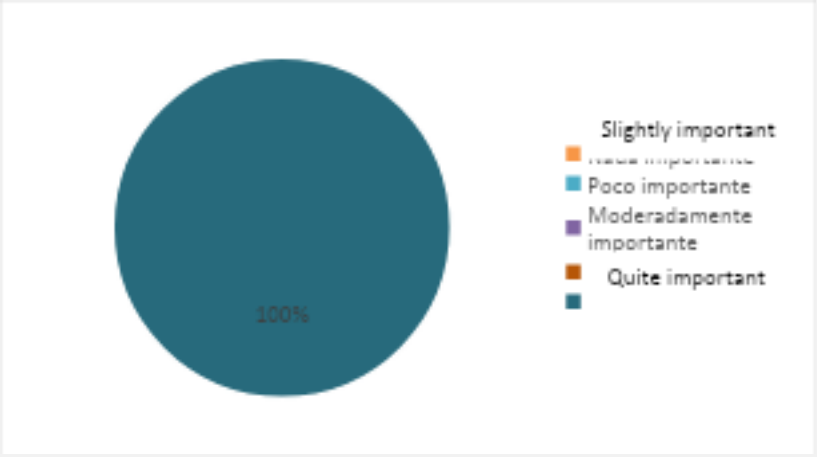
66.67% of the participants said they would like to learn more about water saving techniques, while 33.33% were interested in improving their knowledge on soil quality and management. The importance of water management in regions affected by drought, such as the central area of Chile, was outlined. Farmers also indicated that a better understanding of soil management would help them maximize productivity without depleting natural resources.

How important is that training materials are available in your native language?



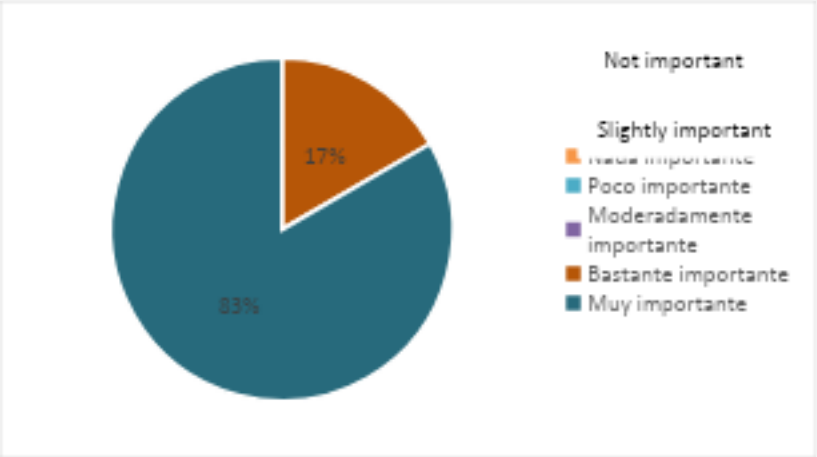
83.33% of the participants considered very important that educational materials be available in their native language, while 16.67% indicated that it is quite important. Although resources are available in other languages, such as English, farmers prefer that the materials be translated and contextualized for their own agricultural conditions, simplifying their implementation.

How significant is your need to receive information on good practices in sustainable agriculture from other regions or countries?



100% of the respondents considered this need to be very important. Farmers expressed interest in learning from other regions that have already successfully implemented sustainable practices. They also noted that access to case studies and examples from other regions would help them to adapt these practices to their own fields, thus improving the sustainability of their crops.

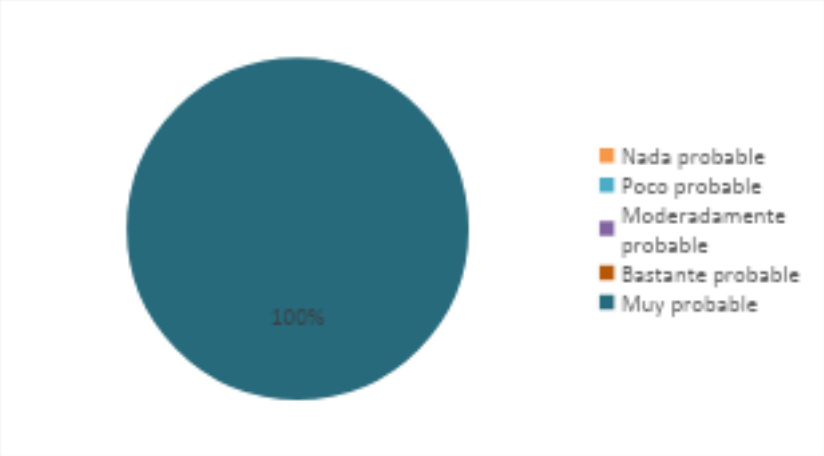
14. How important is to receive support from other farmers or community groups to adopt sustainable practices?



83.33% of respondents considered farmer-to-farmer and community group support to be very important, while 16.67% rated it as quite important. The value of collaborative networks for sharing knowledge and resources, as well as for facilitating the adoption of new technologies and

practices, was outlined. Farmers pointed out that these networks could help them overcome some of the technical and financial obstacles they face.

15. How likely are you to participate in a training program designed specifically for your needs in sustainable agriculture?



100% of respondents indicated that they would very likely participate in a training program tailored to their needs. Farmers expressed enthusiasm for training programs that are designed with their local conditions in mind and that provide them with practical and specific tools to improve productivity in a sustainable way.

4.8. Concluding remarks

Focus group results have shown the growing need to incorporate cutting-edge technologies in agriculture to improve both productivity and sustainability. Although many farmers are already familiar with some sustainable practices, such as the use of drones and soil sensors, there remains a significant gap in the technical training needed to maximize the use of these tools. Among the main barriers identified were financial constraints and lack of access to technological infrastructure in rural areas. Most farmers agreed on the importance of receiving additional training and ongoing technical support to be able to implement these technologies efficiently.

4.9. Implications for the FARM2LA project

For the FARM2LA project, these results emphasize the need to design training programs that focus not only on theory, but also on practice. Farmers require practical skills to apply technologies such as drones, sensors, and automated irrigation systems in their fields. In addition, it is crucial that programs are tailored to local realities, both in terms of agricultural needs and the technological and economic barriers faced by small farmers. FARM2LA has the opportunity to fill

this gap by providing quality technical training and facilitating access to technological and financial resources.

4.10. Next steps for the Project

As a next step, the FARM2LA project should focus on developing training modules that include field practices and the use of advanced technologies. It is also essential to create partnerships with local institutions and governments to offer subsidies and financial support to farmers, thus facilitating the acquisition of sustainable technologies. It is also suggested that a collaborative platform be created where farmers can exchange experiences on the use of green technologies, promoting a network of support to foster the adoption of sustainable practices throughout the region.

5. Bulgaria

5.1. Introduction

The FARM2LA project, "Transforming Agriculture Education for Sustainable Development in Latin America," is an Erasmus+ funded initiative aimed at bridging the educational divide between the European Union (EU) and Latin America. The project focuses on modernizing Vocational Education and Training (VET) systems by equipping trainers with essential green and digital skills needed for sustainable agricultural practices. By fostering collaborative networks between VET institutions, FARM2LA works to support the capacity-building of educators and agricultural professionals in Argentina, Paraguay, Mexico, and Chile.

The project aims to align VET programs with global sustainability goals, integrating innovative farming techniques and technological advancements. Through practical, hands-on training, capacity-building workshops, and community engagement, FARM2LA seeks to promote environmentally friendly and technologically advanced agriculture that not only enhances productivity but also contributes to environmental conservation and economic resilience in the agricultural sectors of both Europe and Latin America.

The focus group aimed to gather diverse insights on transforming agricultural education for sustainable development in Latin America, as part of the FARM2LA project. The participants, representing educators, farmers, administrators, local officials, and community activists, discussed challenges, opportunities, and actionable strategies for integrating green and digital skills into agricultural vocational education and training (VET).

The session included 15 participants from various sectors, allowing for a balanced representation of expertise and experience:

Mediators - Boyan Kelchev and Elitsa Kostova guided the discussion, fostering meaningful exchanges.

Educators and Activists - Local educators such as Reneta Georgieva, along with local activists like Vasia Vasileva, contributed insights on community education and training challenges.

Local Administration and Officials - Representatives like Rositsa Milcheva (Municipal Counsel) and Marin Bonchovski (Mayor of Vrachesh Village) provided a policy perspective.

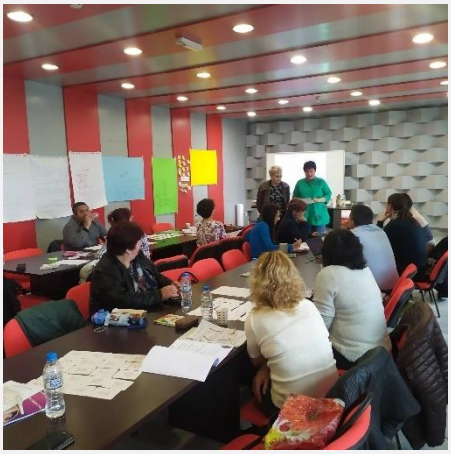
Farmers - Marin Bonchovski (farmer, Vrachen Village) and Adrian Angelov brought practical insights into the challenges faced in adopting sustainable agricultural practices.

Local Initiative Committees - Members such as Nikoleta Ivanova and Silvia Marinova shared grassroots perspectives on addressing regional needs.

Agro-Experts - Milena Hristova offered technical expertise on sustainable agriculture.

Participants list	**Role**	**Comments**
Boyan Kelchev	Mediator	EduAge
Elitsa Kostova	Educator	EduAge
Vania Ivanova	Administrator	Lipnitsa cooperative
Marin Bonchovski	farmer	Botevgrad, Vrachen village
Vasia Vasileva	Educator, local activist	
Rositsa Milcheva	Municipality counsel	Botevgrad
Marin Bonchovski	Mayor, Vrachesh village	
Milena Hristova	Agro expert, local activist	Botevgrad
Desislava Yotova	Local educator	Botevgrad

Nikoleta Ivanova	Local initiative committee	Botevgrad
Vasia Vassileva	Local initiative committee	Botevgrad
Adrian Angelov	farmer	
Silvia Marinova	Local initiative committee	
Reneta Georgieva	Local educator	
Inna Vassileva	Adult training center	Botevgrad



The focus group highlighted the importance of addressing economic, educational, and cultural barriers to sustainable farming. The participants emphasized collaboration among farmers, educators, and policymakers to design impactful training programs. Their insights will guide the FARM2LA project in creating practical, scalable solutions to transform agricultural education and promote sustainable development across Latin America.

5.2. Focus Topics and Key Insights

Current Practices and Experiences

Participants shared their experiences in implementing sustainable farming methods, such as composting and crop rotation. Educators discussed the lack of updated teaching methodologies for imparting green skills.

Key Challenges Identified

- Limited infrastructure and resources in rural areas to adopt eco-friendly techniques.
- Farmers' resistance to adopting digital tools due to unfamiliarity or lack of training.

Barriers to Sustainable Practices

Economic Barriers

- Farmers noted the financial risks of transitioning to sustainable methods without initial support.
- Agro-experts highlighted the high costs of technology and tools.

Educational Gaps

Educators emphasized the need for VET curriculum updates to include practical training on sustainability.

Policy and Governance

Local officials stressed the need for stronger policy alignment to encourage sustainable practices through incentives and funding.

Training and Support Systems

Proposed Solutions

- Develop blended learning programs combining online modules and practical fieldwork.
- Leverage local initiative committees to mobilize communities and provide peer-to-peer learning opportunities.
- Create training programs tailored to different groups, such as farmers, educators, and young people entering the agricultural workforce.

Innovative Suggestions

- Use digital tools like apps for soil analysis or crop monitoring.
- Engage the youth through gamification of learning materials to make agricultural education appealing.

Digital and Green Skill Mapping

Participants mapped essential skills

- Technical Skills - water conservation, pest management, and soil health monitoring.
- Soft Skills - leadership, communication, and adaptability to new technologies.
- Digital Skills - use of precision agriculture tools, data analysis for crop planning, and digital literacy for accessing online resources.

5.3. Outcomes, Recommendations and Comments

Participants concluded that the educational frameworks should be enhanced to include modules on sustainable agriculture in VET curricula, co-designed by educators, farmers, and agro-experts. It is also recommended to introduce mobile learning platforms to bridge gaps in remote areas.

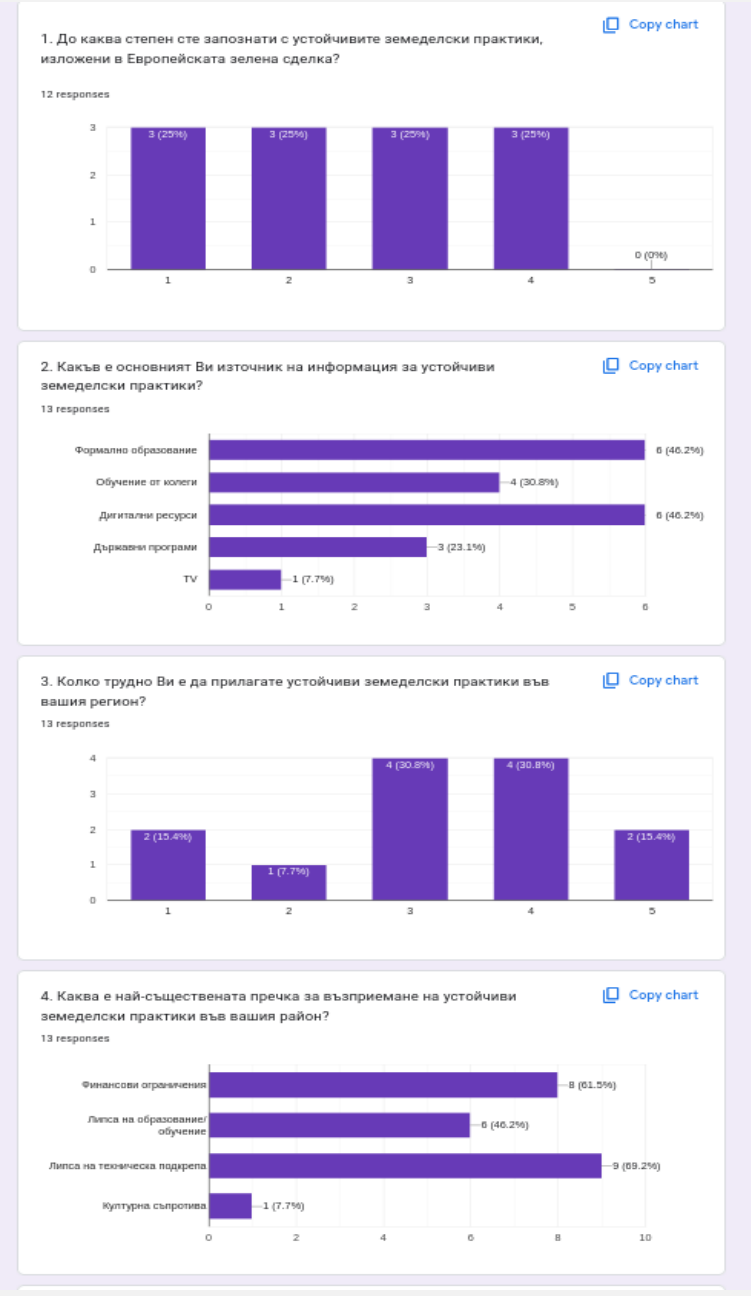
An important element in VET training was pointed out to be community engagement. By leveraging local initiatives, the FARM2LA project will drive awareness better and may provide low-cost training solutions. It can promote the initiative to cooperatives for knowledge-sharing and collective problem-solving.

On the local policy and advocacy, participants agreed that subsidies or grants are needed to encourage the adoption of sustainable practices. It is pivotal to integrate FARM2LA goals into local and national agricultural policies for a cohesive approach. This also corresponds with the need for local infrastructure development. The investment in connectivity and digital tools for rural areas will support further e-learning and smart farming technologies.

ONLINE QUESTIONNAIRES

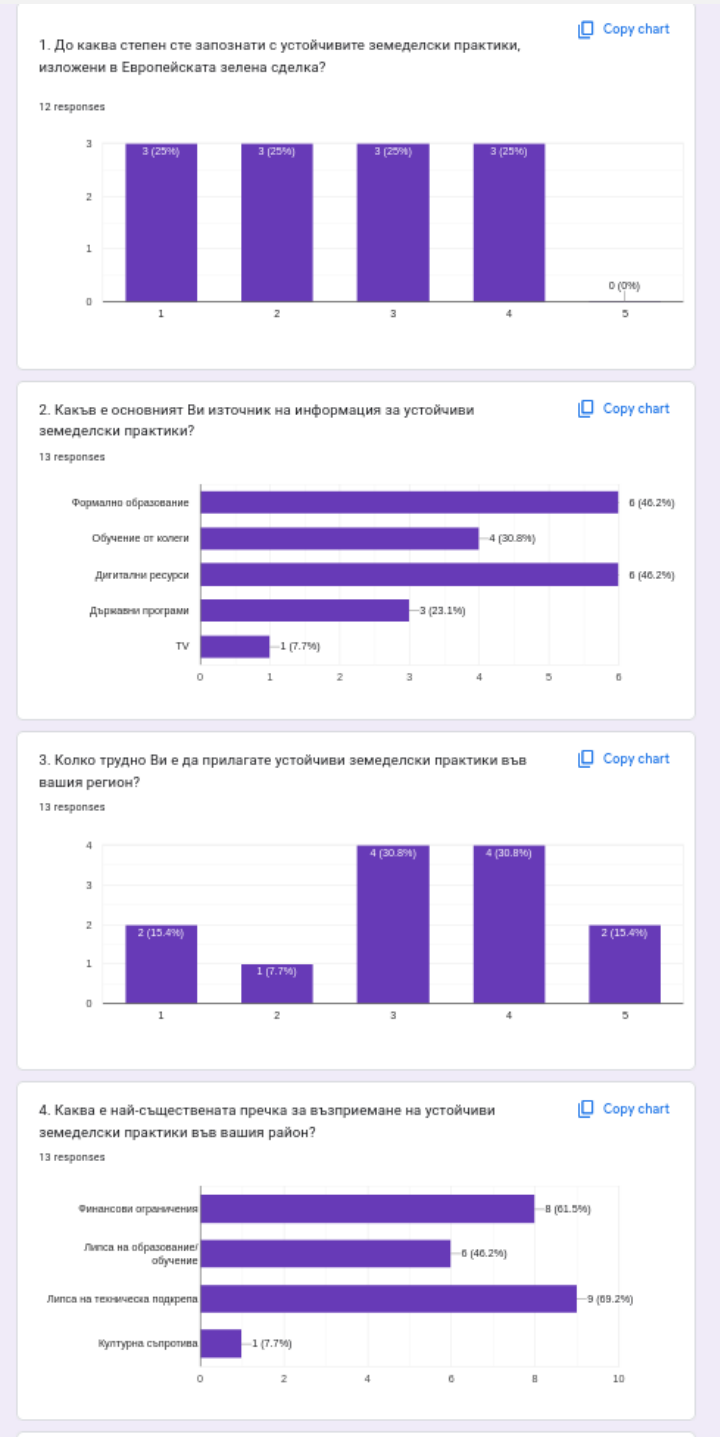
The insights from the online questionnaire provide a roadmap for designing impactful programs under the FARM2LA project, focusing on practical, inclusive, and collaborative solutions for sustainable agriculture.

1. How familiar are you with the sustainable agricultural practices outlined in the Europea Green



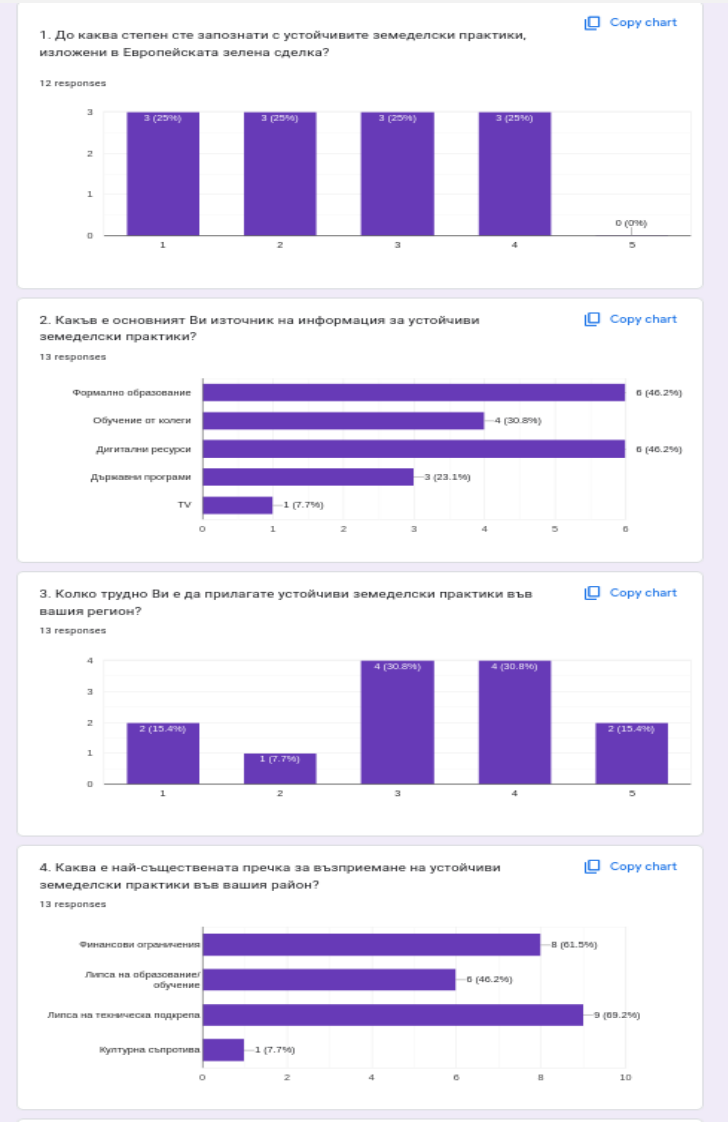
Responses showed a balanced distribution, indicating that participants have varying levels of familiarity. This suggests a need for foundational education tailored to their starting knowledge.

2. What is your primary source of information on sustainable agricultural practices?



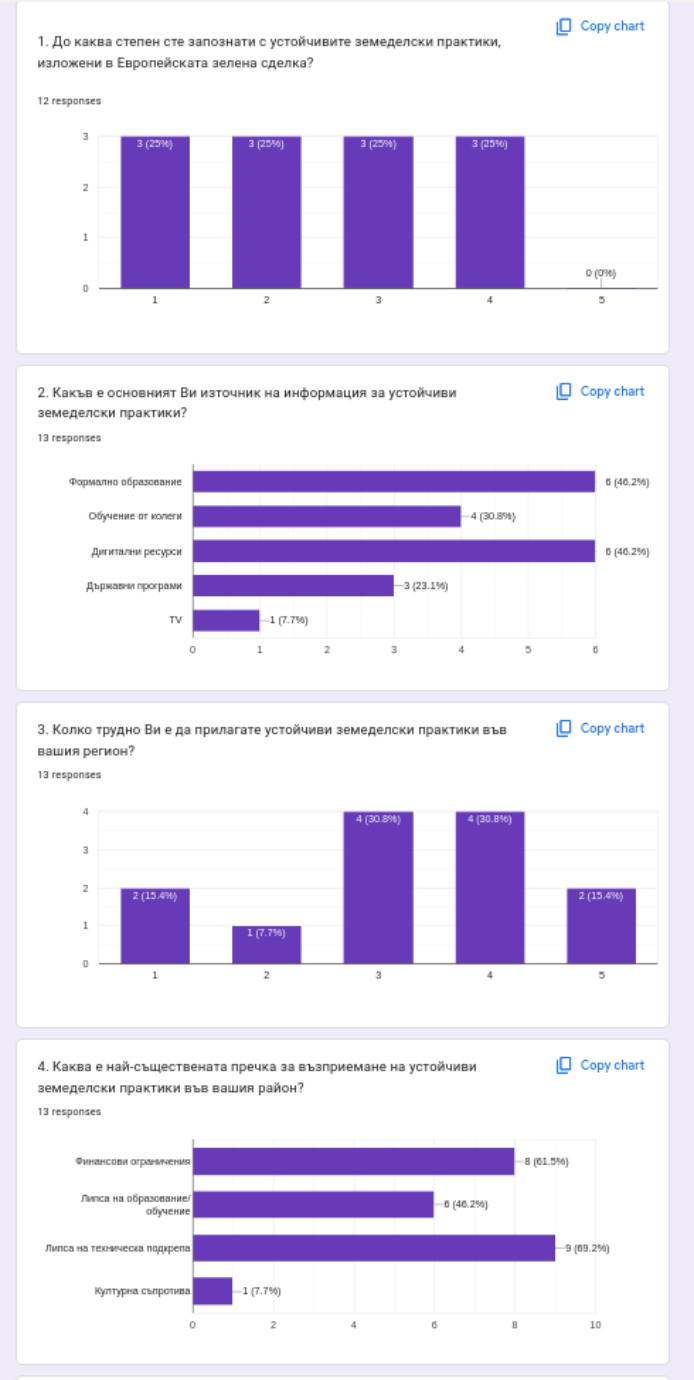
Formal education and digital resources ranked the highest, emphasizing the importance of structured and accessible learning platforms.

3. How challenging is it for you to implement sustainable farming practices in your region



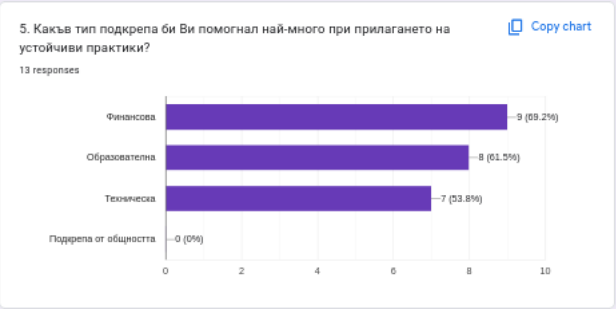
Most participants indicated significant difficulty, pointing to systemic issues such as resource availability or training gaps.

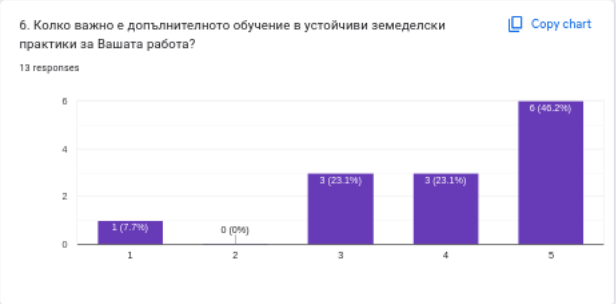
4. What is the most significant barrier to adopting sustainable farming practices in your region?

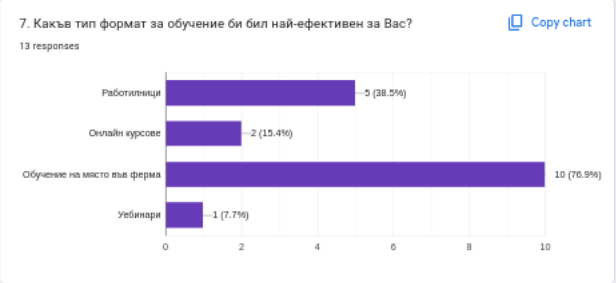


Financial constraints were the top issue (81.5%), followed by lack of training and technical support. This highlights the need for funding and practical assistance programs.

5. Which type of support would most help you in implementing sustainable practices?

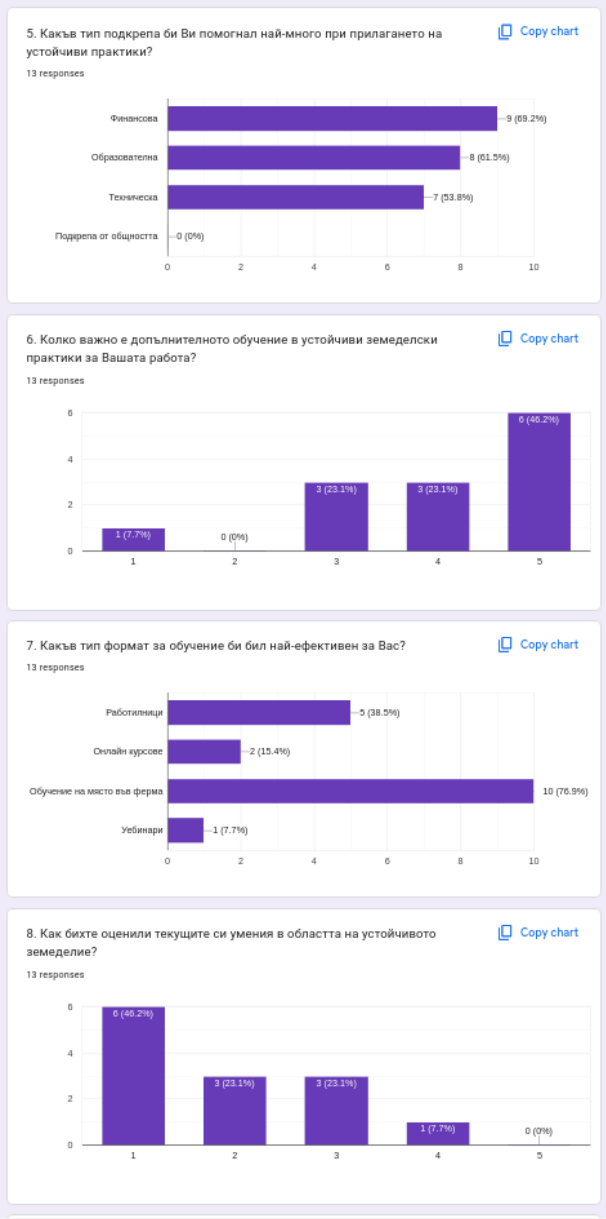






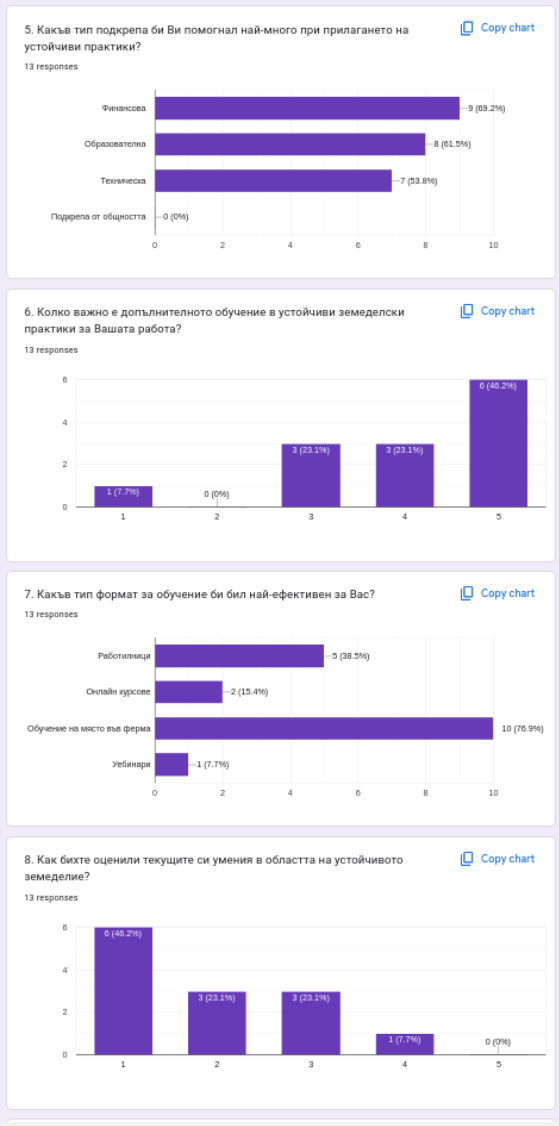
Financial support (92.3%) and educational programs (81.5%) were deemed essential, underscoring the importance of addressing economic and knowledge gaps.

6. How important is additional training in sustainable agricultural practices for your work?



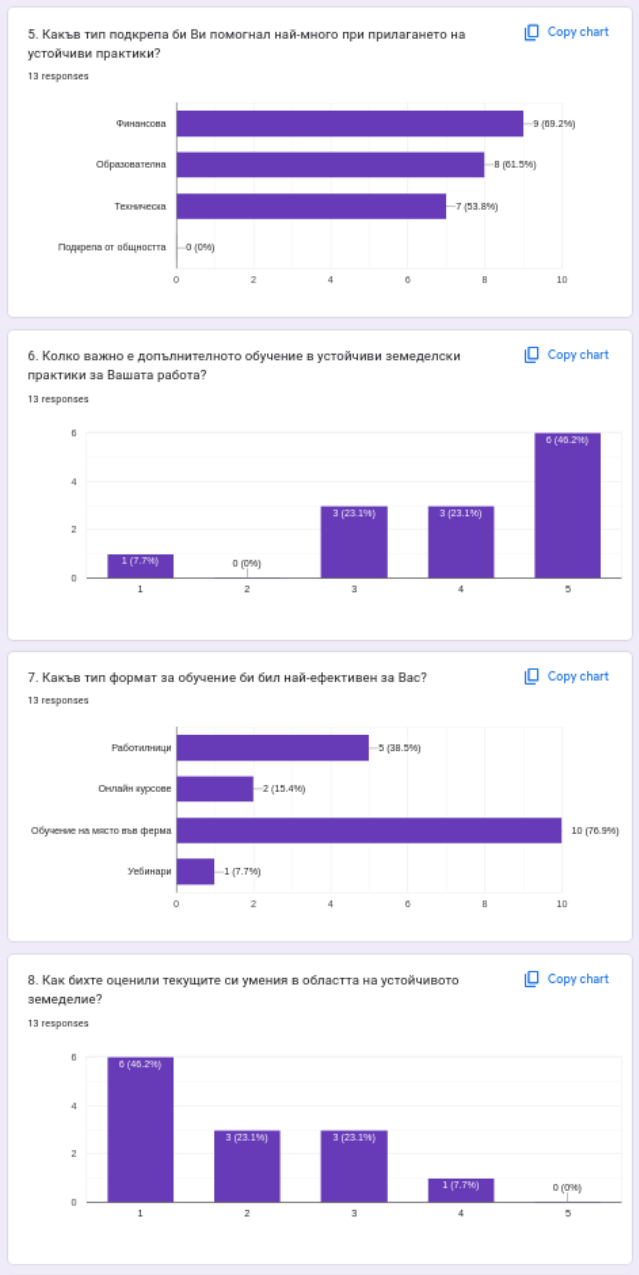
A majority rated it as very important, reinforcing the need for accessible and targeted training initiatives.

7. What type of training format would be most effective for you?



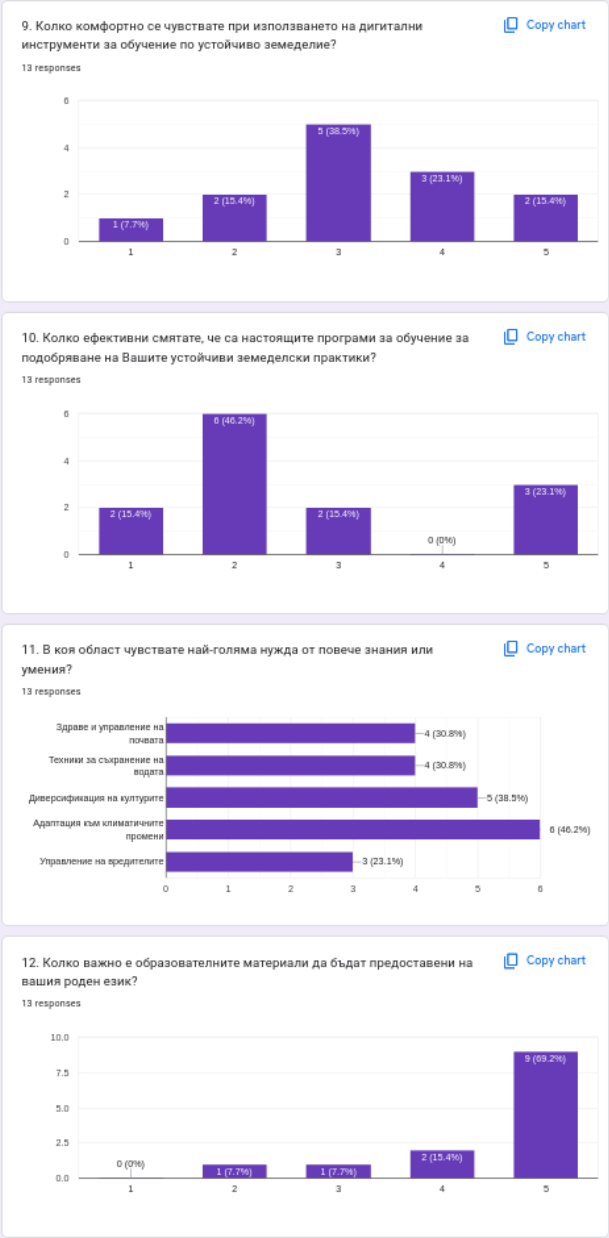
On-site farm training was overwhelmingly preferred, indicating that hands-on approaches are most effective.

8. How would you rate your current skills in sustainable agriculture?



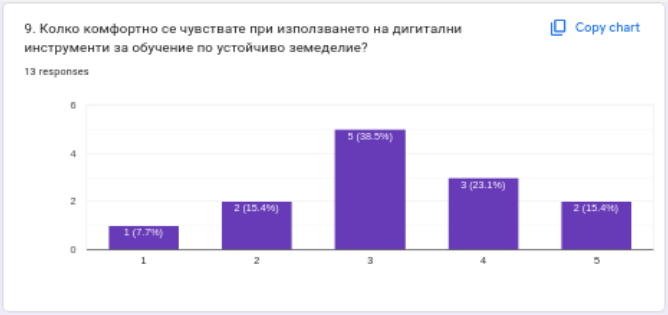
Most rated their skills as moderate, suggesting room for improvement but also a foundation to build upon.

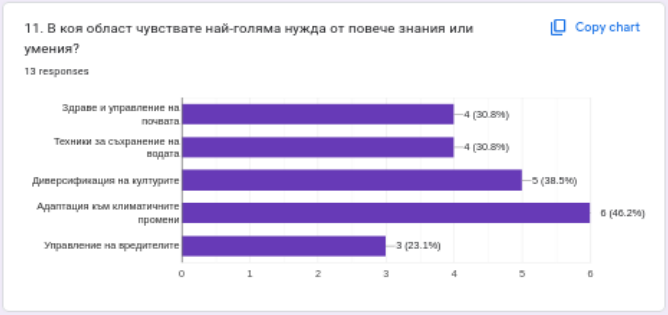
9. How comfortable are you with using digital tools for learning about sustainable agriculture?



Comfort levels were moderate, suggesting that while digital tools are an option, additional support may be needed to enhance usability.

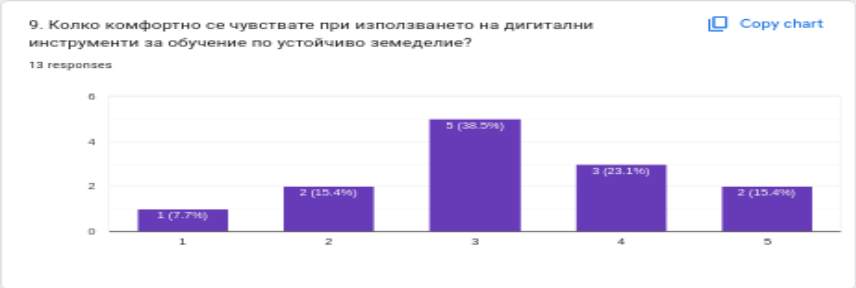
10. How effective do you think current training programs are in improving your sustainable

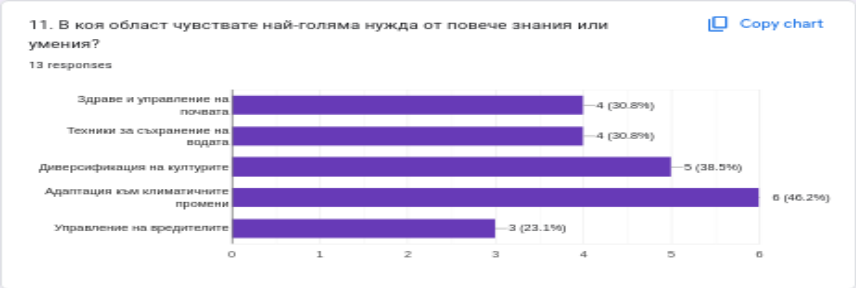




Effectiveness was rated as moderate, indicating room for improvement in content and delivery methods.

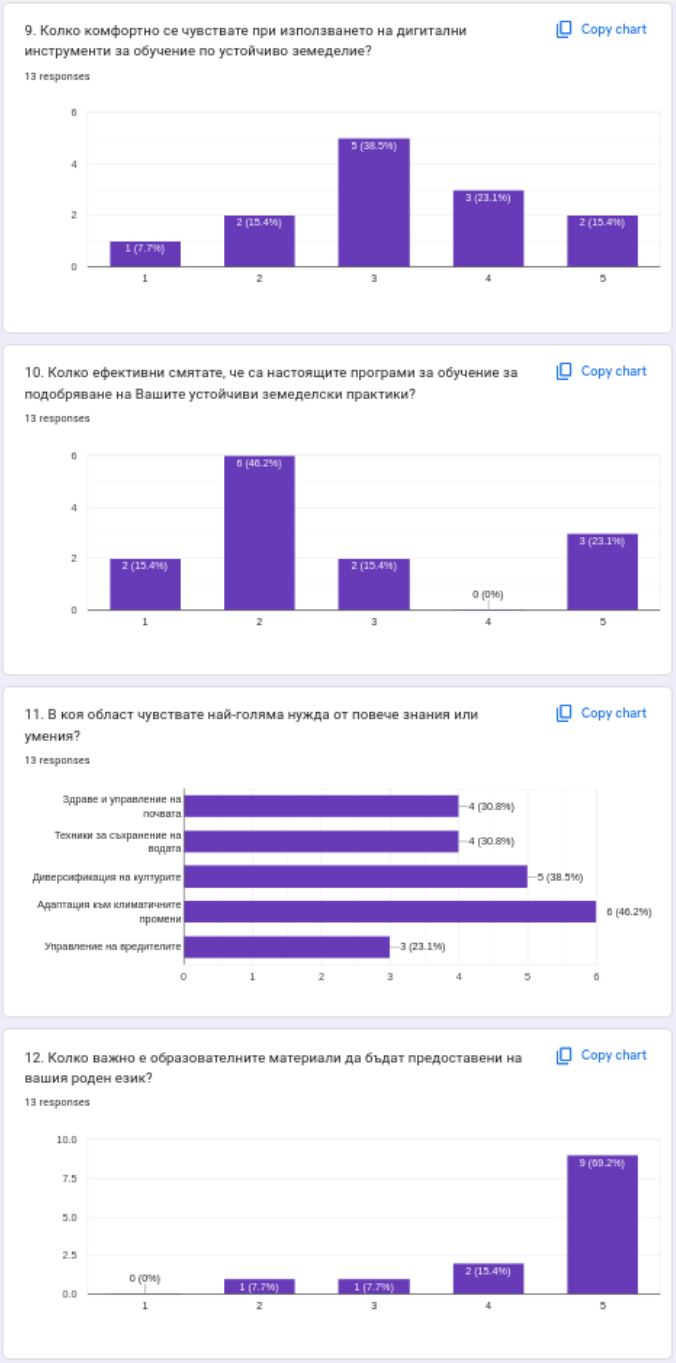
11. In which area do you feel the greatest need for more knowledge or skills?





Climate adaptation and soil health management were the most cited needs, reflecting urgent environmental challenges.

12. How important is it for educational materials to be provided in your native language?

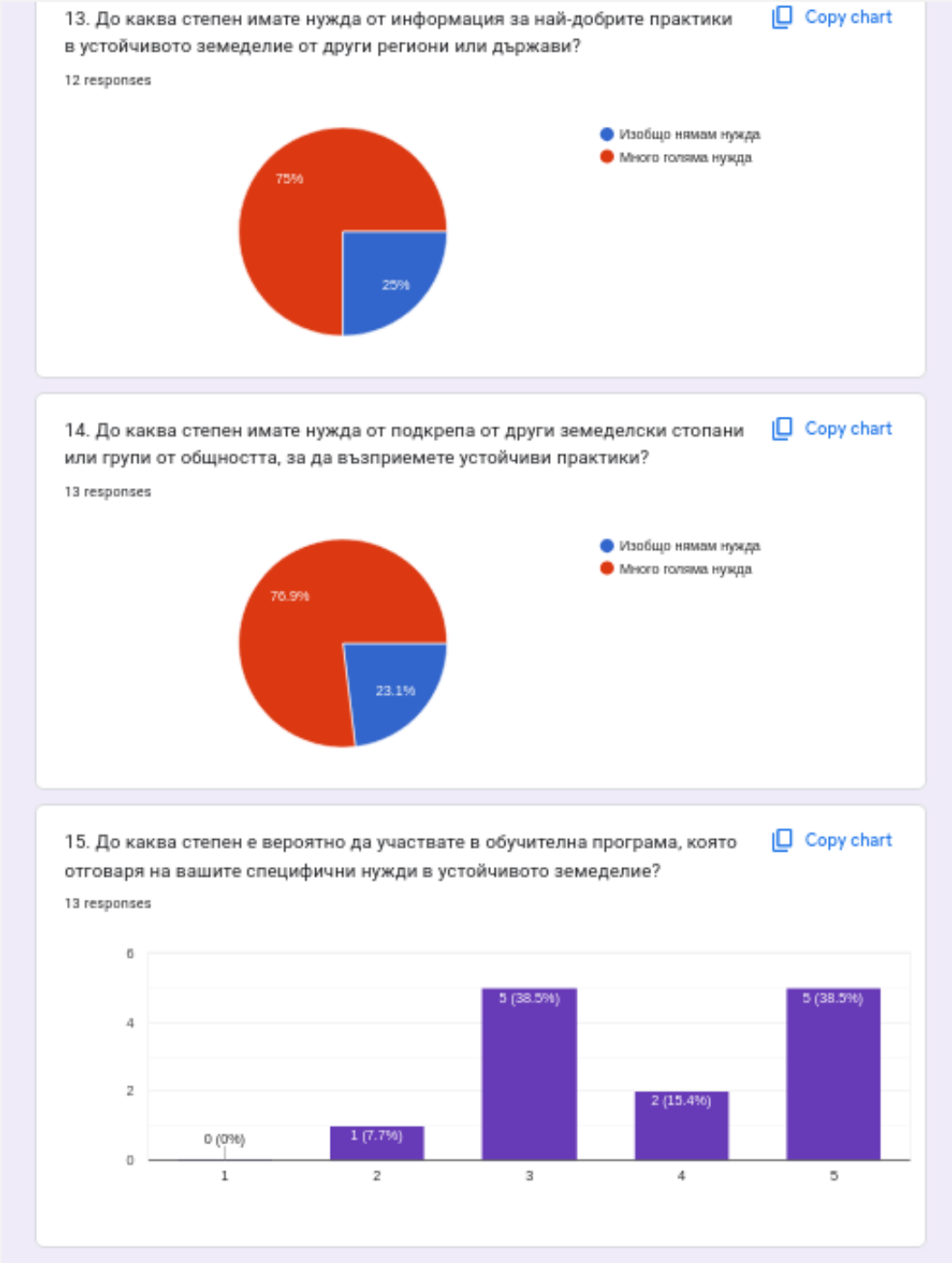


Most participants considered native-language materials critical, emphasizing the importance of localization in educational content.

13. How much do you need information on best practices in sustainable agriculture from other regions

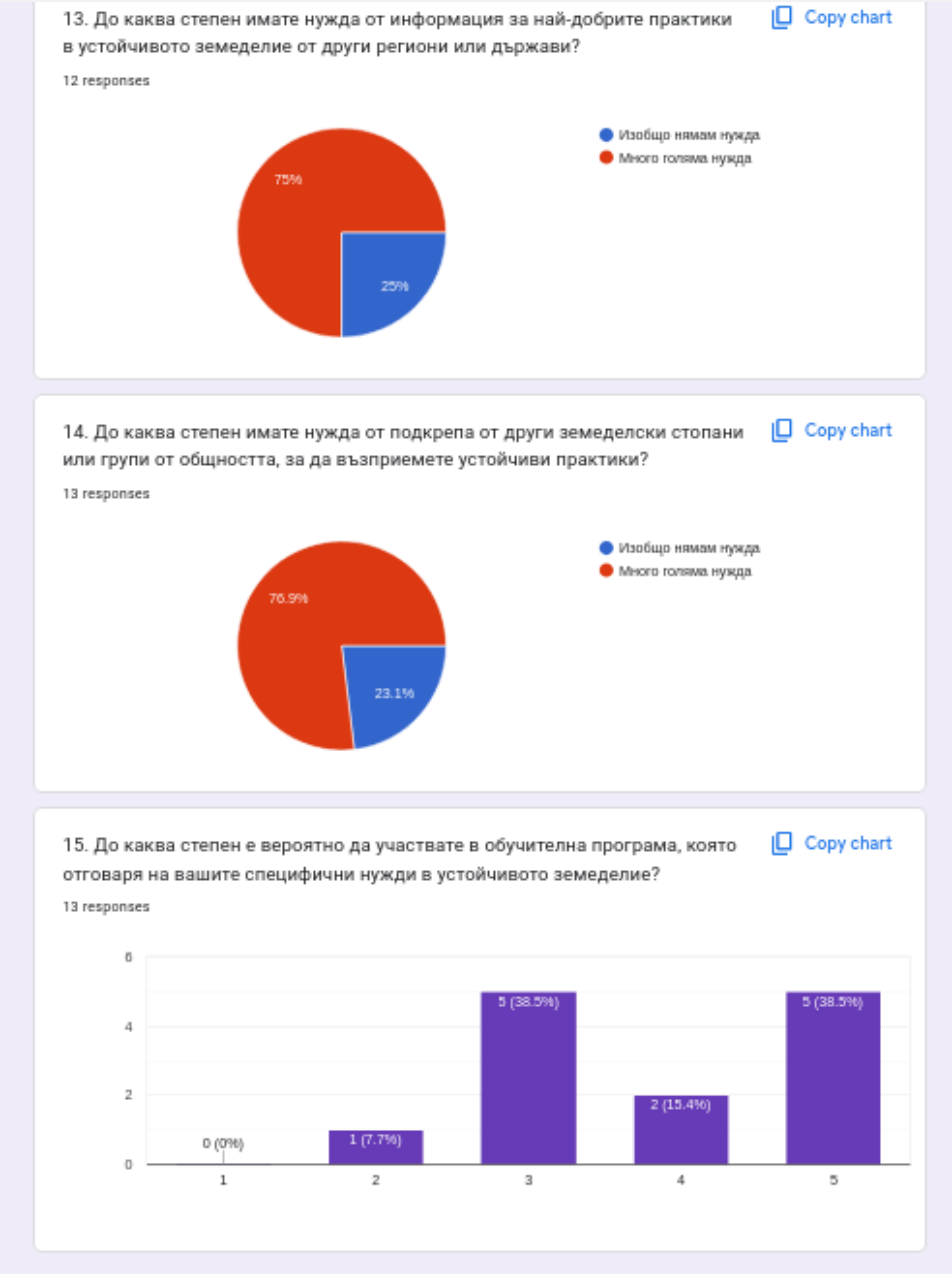
A significant majority expressed a strong need for external best practices, highlighting the importance of cross-regional collaboration.

14. How much do you need support from other farmers or community groups to adopt sustainable practices?



Most participants indicated a strong need for community-based support systems, suggesting the importance of cooperative models.

15. How likely are you to participate in a training program that addresses your specific needs in



High willingness was noted, underscoring enthusiasm for customized training solutions.

Summary of Key Findings

The survey results reveal a strong demand for financial and educational support, hands-on, localized training, collaborative knowledge sharing, and addressing climate-specific challenges.

- Participants need resources to overcome barriers to sustainable practices.
- On-site farm training and native-language materials are preferred for effective learning.
- There is significant interest in learning from other regions and leveraging community networks.
- Training programs should prioritize areas such as climate adaptation and soil management.

5.4. Concluding remarks

- **Summary of Findings**

The field research revealed significant barriers to the adoption of sustainable agricultural practices, including financial constraints, lack of training, and limited access to technical support. While many participants have moderate familiarity with sustainable farming methods, there is a clear demand for practical, hands-on training tailored to specific regional needs. Key areas identified for improvement include climate adaptation, soil health management, and diversification of crops. Additionally, participants emphasized the importance of localized resources, such as native-language materials and peer-to-peer learning networks, to make training programs more accessible and impactful.

- **Implications for the FARM2LA Project**

The findings underscore the need for FARM2LA to prioritize inclusive and regionally relevant solutions for sustainable agriculture education. The project must address economic barriers by integrating financial incentives and resources into its framework while emphasizing community-based and on-site training formats. Furthermore, leveraging digital tools and fostering cross-regional knowledge sharing can enhance accessibility and provide scalable solutions. The project should also ensure that training content focuses on climate-specific challenges while incorporating participants' feedback to ensure relevance and impact.

- **Next Steps for the Project**

To build on these insights, the FARM2LA project should first develop a training curriculum that addresses the specific needs identified, such as climate adaptation and digital literacy. Collaboration with local farming communities and stakeholders is crucial to co-design and pilot these training modules. Additionally, the project should establish partnerships with local governments and organizations to secure funding and policy support. Finally, FARM2LA should

implement a robust monitoring and evaluation framework to assess the effectiveness of its training programs and continuously refine its approach based on participant feedback and evolving challenges.

6. Argentina

6.1. Introduction

Rosario, one of Argentina's principal cities, stands out for its rich agricultural history and significant role in national food production. This city has established itself as an economic and logistical hub where agriculture plays a fundamental role.

While the region is renowned for its production of grains such as soybeans, corn, and wheat, it also boasts substantial horticultural, fruit, and livestock production. Large agribusinesses coexist with small family-run farms, each with its own characteristics and challenges. The agricultural expansion in the region has exerted pressure on natural resources such as water and soil, contributing to climate change. Rosario's urbanization has created a growing demand for fresh and healthy food, presenting an opportunity for urban and peri-urban agriculture.

Sustainable agriculture in Rosario has been a highly relevant topic, particularly with initiatives such as the Green Belt and the Urban Agriculture Program (PAU). These initiatives not only promote sustainable food production but also aim to enhance the city's climate resilience and food security.

According to FAO, here are some statistics about the city of Rosario:

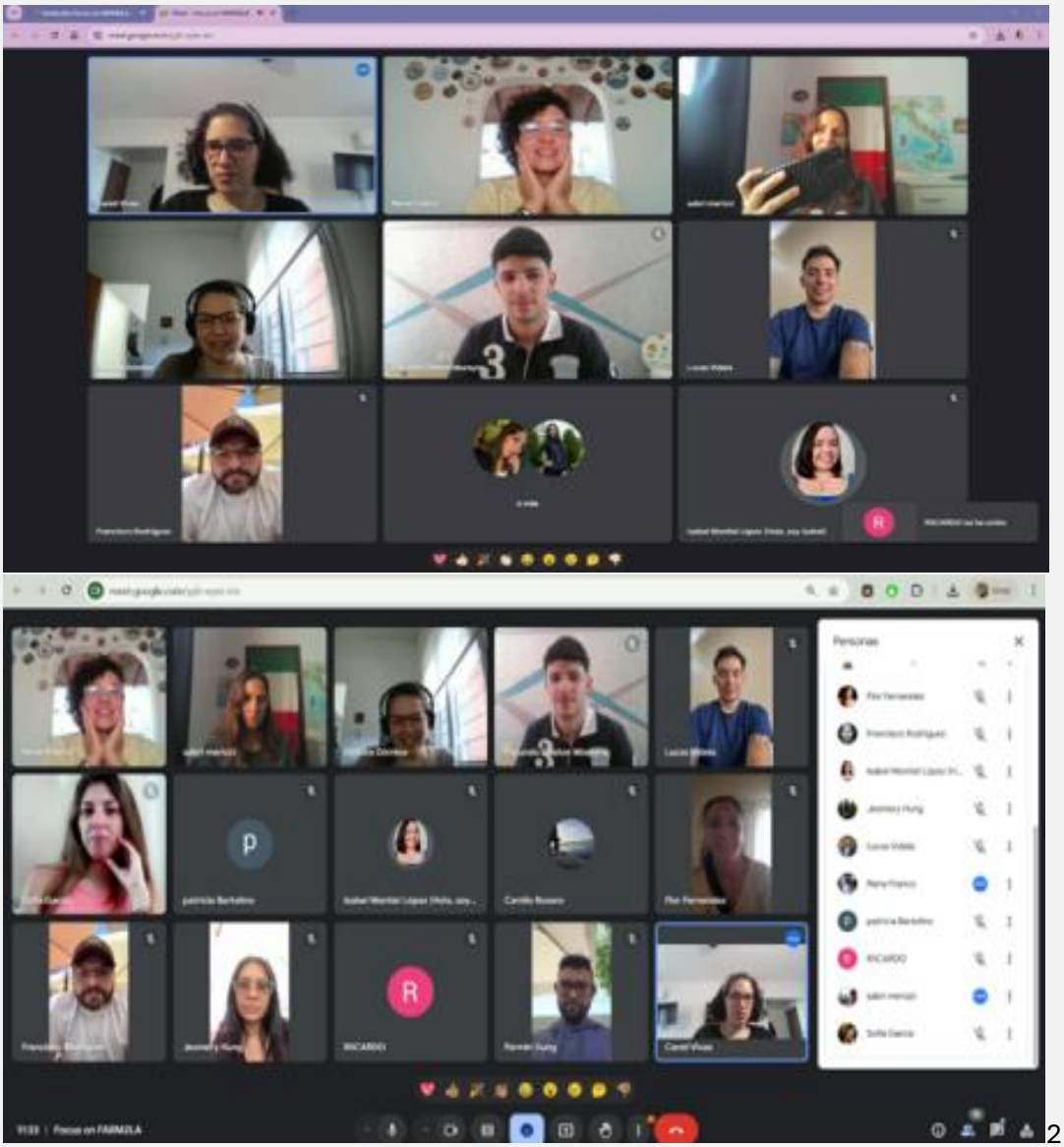
● Agricultural area: 25 hectares dedicated to urban agriculture.

● Annual production: Approximately 2,500 tons of agroecologically produced vegetables.

● Families involved: More than 2,400 families have their own gardens and practice environmentally sustainable agriculture.

Sustainable agriculture is essential for ensuring food security, preserving natural resources, and promoting Rosario's economic development. This report analyzes the obstacles local producers face in adopting more sustainable practices and proposes strategies to overcome these challenges.

6.2. General information about participants



The results of the consultation indicate the need for a comprehensive approach that combines training, access to financing, and the promotion of markets for agroecological products. Additionally, it is crucial to strengthen the coordination among the various stakeholders involved in the sector, such as producers, research institutions, governments, and civil society organizations.

Given RAMCC's status as a national organization, virtual meetings and exchanges are frequent due to the extensive geographic distribution of member municipalities.

On this occasion, the focus group comprised fifteen participants, including six professional training (FP) instructors, three FP students, and six farmers, all from different areas of Rosario.

Participant list	Role Observations
Careli Vivas	Instructor
Débora Dómina	Instructor
Facundo Moreyra	Instructor
Sabrina Merizzi	Student
Carmen Franco	Local Producer Subsistence Family Agriculture
Lucas Videla	Instructor
Sofía García Patricia Bertolino	Local Producer Commercial Agriculture Instructor
Isabel Montiel López Camilo Rosero	Student Student
Florencia Fernández	Instructor
Francisco Rodriguez Jermery Rosales Hung	Local Producer Subsistence Family Agriculture Local Producer Commercial Agriculture
Fermín Hung	Local Producer Commercial Agriculture

Ricardo Paez	Local Producer Subsistence Family Agriculture

It is noteworthy that among those engaged in agricultural production, some practice for food sovereignty and subsistence, while others focus on agricultural practices for commercialization in the local city's circuits.

Located in the province of Santa Fe, Rosario is an intermediate growth city with a projected population of approximately 1,319,000 by 2024, according to the National Institute of Statistics and Censuses (INDEC).

As a major urban and commercial center, Rosario offers ample employment and educational opportunities, benefiting its inhabitants. However, this situation also generates a constant migratory flow that limits rural-urban development, as a significant portion of the population commutes to Rosario in search of better employment and educational opportunities, making it a dormitory city for many nearby rural communities.

The meeting to gather local producers' perspectives took place on November 9, 2024. Volunteers, instructors, and farmers who have directly or indirectly worked with RAMCC were invited.

The consultation with participants from Rosario, a city with significant agricultural activity, revealed a series of challenges faced by local producers. The participants emphasized the need for greater government support and clearer, more effective public policies to strengthen the agricultural sector and promote sustainable practices. Notably, the importance of fostering family agriculture and promoting the commercialization of local products was highlighted.

6.3. Current practices and experiences

In Rosario, producers have shown a growing interest in diversifying their crops and adding value to their products. Programs such as seed banks, home gardens, and green households highlight this interest. However, challenges such as limited technical assistance and restricted market access persist. It is essential to strengthen these initiatives and promote the production of healthy and quality foods, leveraging the region's competitive advantages, such as its proximity to urban centers and availability of water resources.

Sustainable agriculture is a fundamental path to ensuring food security and protecting natural resources in Rosario. Local producers focused on commercialization have shown interest in practices such as crop rotation and the use of organic fertilizers. However, the lack of access to

credit, water scarcity, and soil degradation are challenges that must be addressed. It is necessary to promote public policies that incentivize the adoption of sustainable practices and the conservation of ecosystems.

6.4. Assessing stakeholders' understanding and knowledge in agriculture and sustainability

Rosario, a city with a rich agricultural history and a present marked by urban growth, faces a crucial challenge: reconciling economic development with environmental sustainability. Agriculture, traditionally a driver of the local economy, faces new challenges such as climate change, water scarcity, and the loss of fertile soil.

Urban agriculture in Rosario has gained prominence in recent years, driven by community initiatives and public policies that promote the production of fresh and healthy food in urban and peri-urban spaces. Family gardens, vertical gardens, and hydroponic systems are some expressions of this trend, which not only contributes to improving the inhabitants' quality of life but also fosters a connection with nature and healthy eating.

The concept of "green households" has gained traction in Rosario, promoting food self-sufficiency and reducing the carbon footprint at the domestic level. Initiatives such as the installation of rooftop and balcony gardens, composting of organic waste, and rainwater harvesting are becoming increasingly common. Rosario has implemented programs like Green Households and the Green Belt. Green Households aim to educate families about sustainable practices in their homes, while the Green Belt promotes agroecological production in peri-urban areas. These programs are fundamental in educating the community and promoting sustainable agriculture.

The municipality also supports the creation of local producer markets and fairs, where farmers can sell their products directly to consumers. These initiatives not only improve access to fresh and local food but also strengthen the local economy and reduce greenhouse gas emissions associated with food transportation. Rosario's Green Belt, a wide strip of land surrounding the city, represents a unique opportunity to develop large-scale sustainable agriculture. However, urban expansion and pressure on natural resources threaten this valuable ecosystem. It is essential to implement land-use planning policies that ensure the protection of the Green Belt and promote its use for producing healthy and quality food.

The National Institute of Agricultural Technology (INTA) is also a key player, providing research and technology to improve agricultural practices and encourage the adoption of sustainable techniques. Through its experimental stations and extension programs, INTA provides technical

assistance to producers, disseminates innovative technologies, and promotes research in agroecology.

In this context, it is essential to analyze the current practices and experiences of stakeholders in agricultural education in Rosario. Through focus groups and surveys, we aim to identify the needs and expectations of producers, technicians, and other key actors, as well as the opportunities and challenges for developing sustainable agriculture in the region.

6.5. Identifying barriers and challenges faced by stakeholders in agriculture

The participants in the focus group highlighted the following current and future challenges impacting their practices:

● Debt and financial risk: Difficulty in accessing affordable credit and market volatility expose farmers to high financial risk.

● Impact on production: Extreme weather conditions, pests, and diseases significantly reduce agricultural yields and cause economic losses.

● Isolation and marginality: Lack of infrastructure and rural insecurity isolate producers and limit their marketing opportunities.

● Inequality in access to resources: Disparities in access to land, water, technology, and information exacerbate inequalities among producers.

● Barriers to innovation: Lack of training and the complexity of bureaucratic procedures hinder the adoption of new technologies and agricultural practices.

However, several opportunities were also shared:

● Potential for sustainable agriculture: Rosario has great potential to develop more sustainable and climate-resilient agriculture.

● Market opportunities: The growing demand for healthy and organic food represents an opportunity for local producers. There is an increasing demand for organic and biodynamic products, presenting an opportunity for producers who adopt these practices.

● Agricultural production and rural tourism: Combining agricultural production with rural tourism can generate new sources of income and promote local development.

These challenges require a comprehensive approach that includes public policies, investment in infrastructure and training, as well as support from organizations and communities.

6.6. Assessing the Efficacy of Current Support Systems for Implementing Sustainable Agriculture

Rosario faces multiple challenges in 2024. During the focus group, participants highlighted several issues such as climate change, high interest rates, difficulties in financing for the agricultural sector, and low productivity. Additionally, security is a crucial challenge for rural sustainability. However, possible solutions for each situation were also identified and evaluated.

A. Limited access to financing:

● Promote the creation of producer cooperatives to access group credits and negotiate better conditions with financial entities.

● Seek funds for climate change adaptation and sustainable agriculture projects.

● Implement state guarantee programs to reduce the risk for financial entities when granting credits to small producers.

B. Climate vulnerability:

● Encourage the adoption of agricultural insurance to protect farmers against extreme weather events.

● Implement early warning systems so that producers can take preventive measures against adverse weather conditions.

● Promote the adoption of agroecological practices that increase the resilience of production systems.

C. Market instability:

● Strengthen producer organizations to negotiate better prices and access new markets.

● Promote the signing of production contracts with buyers to ensure fair and stable prices.

● Encourage crop diversification to reduce dependence on a single product and minimize economic risk.

D. Knowledge deficit:

● Strengthen rural extension services to provide technical assistance and training to producers.

● Promote the creation of field schools where producers can share knowledge and experiences.

● Develop virtual platforms to facilitate access to courses and educational materials.

E. Rural insecurity:

● Strengthen coordination between producers and security forces to ensure safety in rural areas.

● Implement community development programs that promote social cohesion and citizen participation.

F. Inequality and poverty:

● Implement programs that address the multiple dimensions of poverty, such as access to land, health, education, and infrastructure.

● Prioritize support for family farming, which is the foundation of food production in many regions.

G. Phytosanitary threats:

● Strengthen pest and disease surveillance and control systems.

● Promote research and development of pest and disease-resistant crop varieties.

H. Bureaucratic barriers:

● Simplify administrative procedures and reduce the bureaucratic burden on producers.

● Implement single-window service points to streamline procedures and reduce costs for producers.

I. Promotion of innovation:

● Support the creation of innovative companies in the agri-food sector.

6.7. Identifying essential skills for training programs empowering stakeholders in agriculture

Based on the consultation conducted with participants from the city of Rosario, the following training areas have been identified as priorities:

● Training in new cultivation techniques: Pest and disease management adapted to local conditions, organic fertilization, and crop rotation to improve soil health.

● Sustainable natural resource management: Strengthening capacities for efficient water management, soil conservation, biodiversity, and adaptation to extreme climatic events such as droughts and floods.

● Business management: Developing skills in cost management, budgeting, digital marketing, and access to financing.

● Associativism and commercialization: Promoting the creation of cooperatives and producer associations to improve negotiations with buyers, access new markets, and obtain better prices.

Coordination between schools and local producers:

To consolidate practices related to agriculture, it is essential to coordinate the efforts of schools, professional training programs, and research institutions. Through educational programs that link theory with practice, the interest of young people in agriculture can be fostered, preparing them to face the sector's challenges.

Specific proposals for Rosario:

Implementation of educational programs combining theoretical and practical knowledge, with an emphasis on agroecological production and innovation. Development of educational projects linking schools with agriculture, fostering interest and participation of young people in the agricultural sector.

Implementation of school gardens and agroecology programs in educational curricula. Establishment of alliances with producers, cooperatives, and companies to offer professional practices and employment opportunities to young people.

Encouraging student participation in projects related to agriculture, such as the creation of school gardens and research on solutions to local problems.

Additional considerations:

It is important to design training programs that include a gender perspective, recognizing the fundamental role of women in family agriculture. Women's participation in agricultural activities provides them with economic autonomy and enables them to make decisions about managing family resources. Many women stand out as leaders in their communities, organizing gardening groups, participating in exchange networks, and promoting agroecology.

6.8. Comments

The focus group on agriculture and professional training in Rosario has revealed a series of challenges and opportunities that must be considered to design effective and relevant training programs.

Challenges identified:

● **Insecurity and violence:** Growing insecurity in some areas of Rosario has fostered distrust and hindered the development of productive activities in rural areas.

● **Inflation and economic crisis:** Economic instability has affected production costs, making it difficult to access agricultural inputs and machinery.

● **Climate change:** Extreme climatic events such as droughts and floods have impacted agricultural production, demanding new adaptation strategies.

● **Urban development:** Urban expansion has reduced arable land and generated conflicts over land use.

● **Social inequality:** Significant gaps exist in access to land, technology, and information among producers, limiting their development opportunities.

Opportunities and Proposals:

● Urban and peri-urban agriculture: Promote training in agroecological production techniques in urban and peri-urban spaces, such as family, community, and school gardens.

● Sustainability and resilience: Strengthen producers' capacities to adapt to climate change by implementing sustainable practices such as crop rotation, soil conservation, and efficient water use.

● Technology and digitalization: Incorporate technologies such as precision agriculture, remote monitoring, and data analysis to improve productive efficiency and decision-making.

● Circular economy and added value: Encourage the generation of added value through the production of processed foods, direct marketing, and the development of short marketing circuits.

● Gender and equity: Promote women's participation in agriculture by providing specific training in leadership, business management, and access to financing.

● Public-private coordination: Strengthen collaboration between the public sector, educational institutions, producer organizations, and the private sector to design more effective and relevant training programs.

● Continuous education: Implement continuous training programs that allow producers to update their knowledge and skills throughout their productive lives.

Professional training in agriculture in Rosario must be a dynamic and flexible process, capable of adapting to the changing needs of the sector and the demands of producers. By strengthening the capacities of farmers, it is possible to contribute to improving food security, promoting rural development, and strengthening the local economy.

ONLINE QUESTIONNAIRES

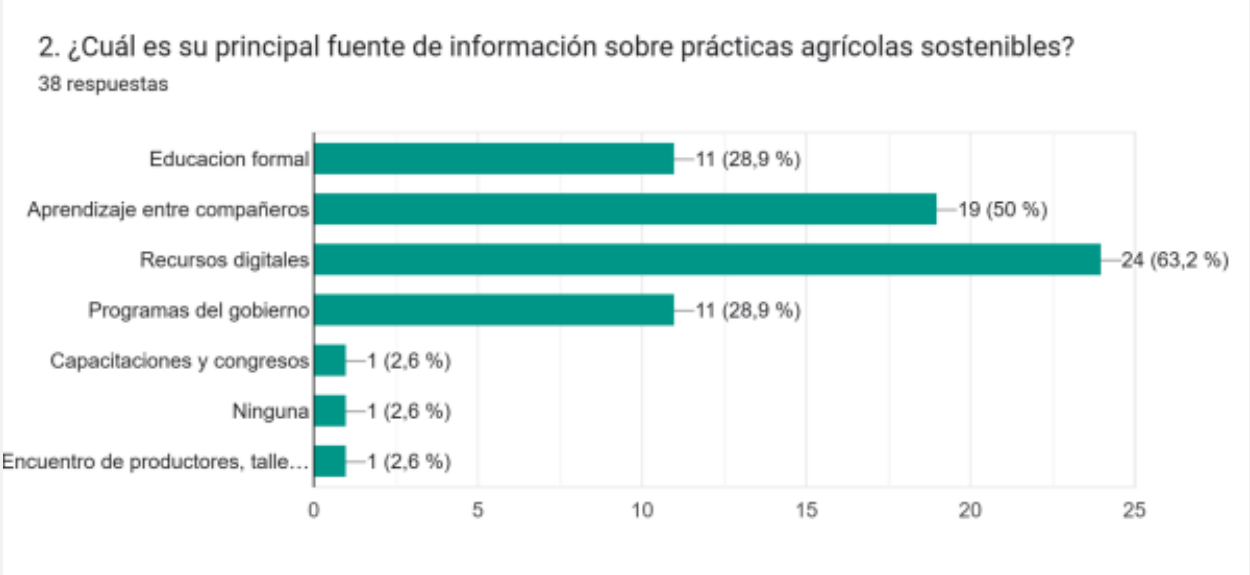
This form was completed by 38 people, the following is the analysis of the bar graph and pie charts provided by the google form

1. Do you have knowledge of the sustainable agricultural practices described in the "European Green Pact"?

In relation to the first question of the survey, 68.4% of the people surveyed had no knowledge of the European Green Pact, a response that can be considered coherent, since, as stated in the general report, in Argentina there is a more endogenous and informative approach to sustainable agriculture in neighboring countries. This result is accompanied by option 2, answered by 7.9% of those surveyed.

The next statistic to be surveyed is in second place, with 15.8%, option 3, which could be interpreted as those people who possibly heard mention of the Green Pact. Of all respondents, only 3 people were aware (option 4 and 5) of this document.

2. What is your main source of information on sustainable agricultural practices?



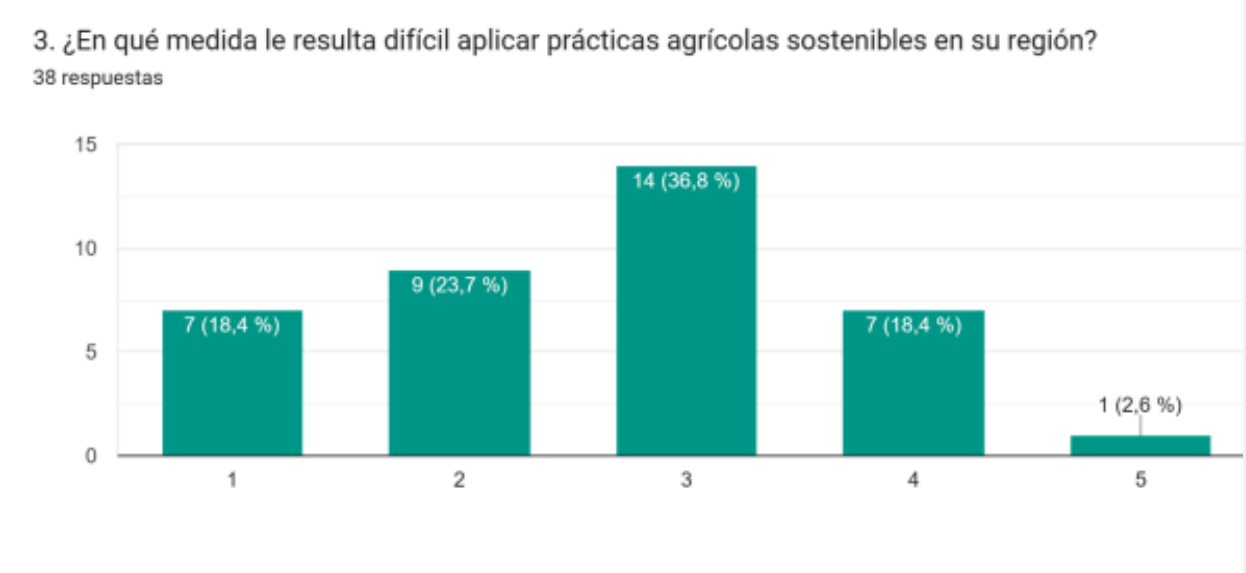
Question 2 shows that the majority of respondents, with 24 answers (63.2%), consider the use of **digital resources** to be of great importance as a suitable source of information for learning new sustainable agricultural practices.

Another important fact is the 57.8% obtained between the option **Formal Education and Government Programs**, both options in Argentina can be coupled, because in agriculture, formal education is organized, regulated and offered free of charge by the State, so that access to information, either through formal education systems or programs, will come mostly from the Government (at its different levels of management).

The third item to analyze is the **Peer Learning** option, answered by 19 respondents, which refers to the interaction between people who share the practice of agriculture.

This question yielded a low result for the **Training and Meetings** options, which can be considered a shortcoming that in turn can be an opportunity to develop face-to-face formats at the local or regional level, providing attendees with meetings and communication support based on social dynamics.

3. How difficult is it for you to implement sustainable agricultural practices in your region?



In general terms, the respondents consider the applicability of sustainable agricultural techniques **Difficult** in their daily dynamics, which reflects a challenge that may have different edges to be investigated in the development of the research, for example, to know which of the aspects of sustainable planting cause more difficulties: pest management, application of natural fertilizers or herbicides, soil care, water shortage, among others.

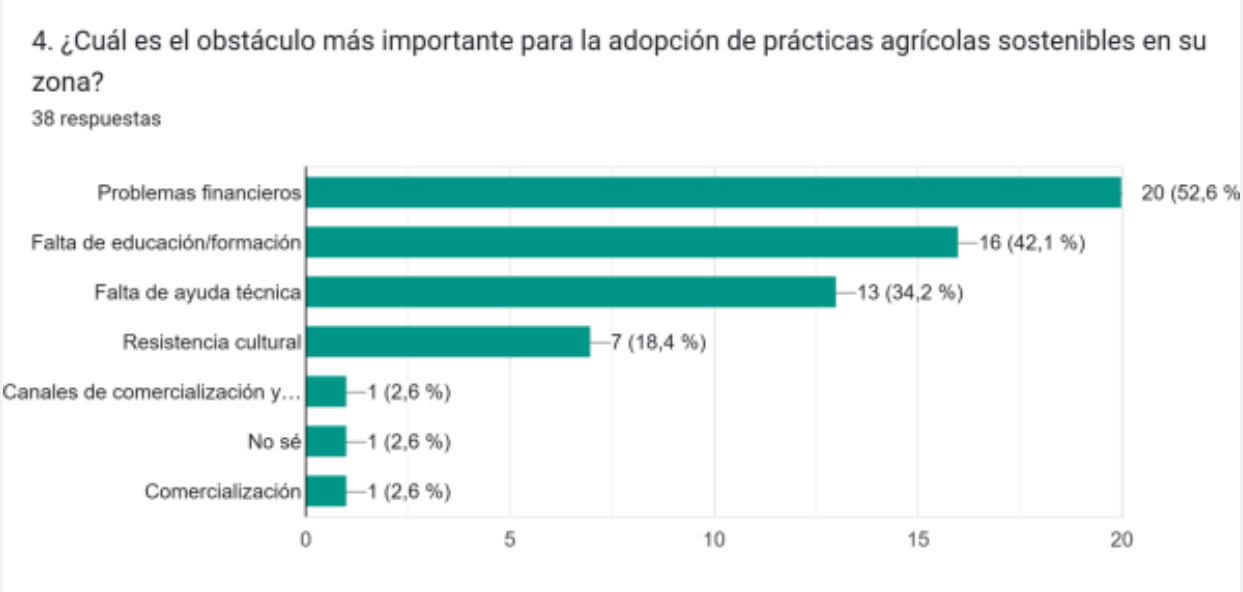
More than a third of the respondents (36.8%) consider that it is **Moderately difficult** to apply these practices in their locality, which indicates that the respondents have knowledge and know about techniques and methods but, in spite of this, it is difficult to fully consolidate sustainable agriculture.

Seven of the respondents (18.4%) voted for option 4 which expresses that the applicability of the practices **is Easy** and option 5 with (2.6%) who consider that it is **Very Easy**. Overall it can be concluded that 21% of the respondents have knowledge about sustainable agriculture and at the same time implement it on their farm.

In a less favorable way we find 23.7% corresponding to nine of the respondents who chose **option 2** and are those who say that there are some difficulties but it can be concluded that the knowledge exists but that it is not easy for them to apply it in the territory.

Finally, 18.4% considered it **Very difficult to** implement sustainable agriculture methods, which invites us to investigate the difficulties they are experiencing and to accompany them in the incorporation of knowledge and theoretical and practical techniques.

4. What is the most important barrier to the adoption of sustainable agricultural practices in your area?



52.6%, equivalent to 20 people surveyed, agree that the greatest problem related to the migration of agriculture towards sustainable practices is associated with the difficulty in accessing **Financing.**

In second place, 42.1% perceive the lack of access to **Education and Training** as relevant obstacles from their point of view. In third place is the lack of **Technical** assistance, with 13 people considering it as one of the fundamental obstacles. The fact that people know and share knowledge about sustainable agriculture is no guarantee that when they apply alternative methods to their crops, the results will be optimal. Therefore, it is relevant that they consider that access to specialists to guide them is important.

In fourth place as a notorious response is **Cultural Resistance** with 18.4% referring to paradigm changes regarding the use of organic fertilizers, crop rotation, soil care, among

others. This is a fairly low percentage, which indicates that the vast majority of respondents are aware of the benefits of sustainable planting.

The minority responses were in the options **Marketing Channels** (2.6%); **Don't know** (2.6%) and **Marketing** (2.6%).

5. What type of support would be most helpful in implementing sustainable practices?

The **Educationa**l factor has been the most chosen by the respondents, with 71.1%, so they consider that knowledge is an essential aspect so that sustainable practices can be implemented and sustained in the long term. It is important to highlight that in agriculture there is an investment in the time that a farmer dedicates and also an economic capital on planting, harvesting and selling, i.e. the more knowledge the farmer has, the more successful the harvest will be.

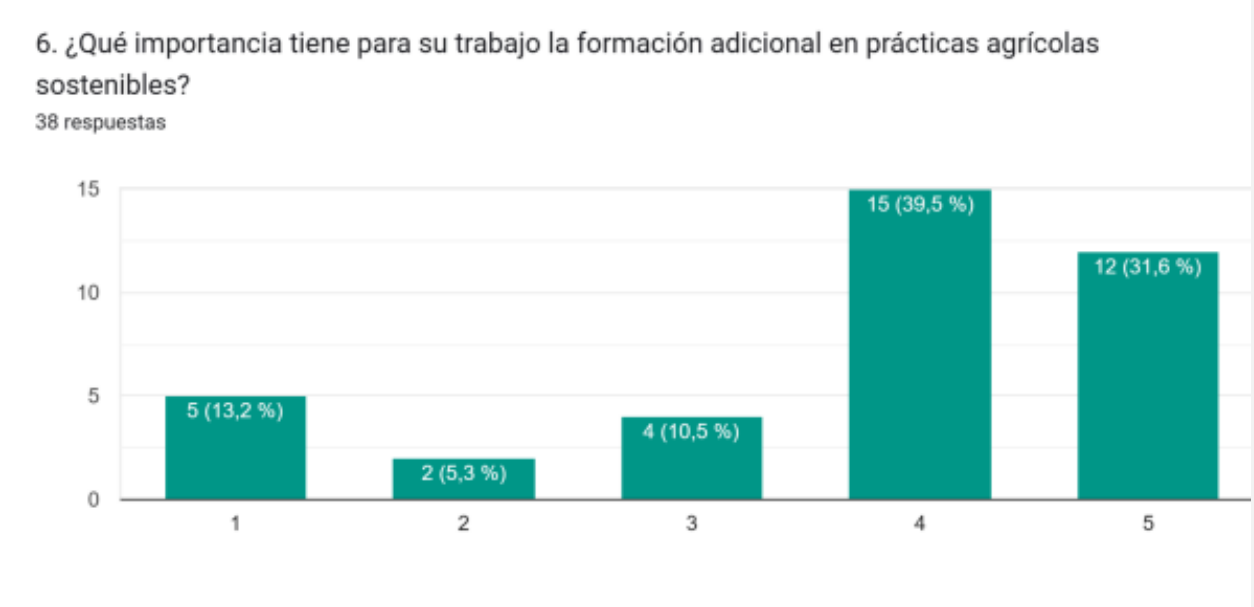
The second most voted aspect is the **Financial** aspect, 52.6% of the responses indicate that economic assistance would facilitate the consolidation or adaptation of crop planting towards sustainable models, in addition to the support it would give them in times of extreme drought or extreme rain, both common climatic phenomena known as El Niño and La Niña, which cause crop losses.

In third place, **Technical Support** is another of the crucial factors for supporting sustainable agriculture, chosen with 47.37%, beyond territorial knowledge and knowledge passed on from generation to generation, the graph shows that there is interest in specialized and scientific support.

In next place is **Community Support** with 23.7%. It is a reality that encouraging local or online meetings between farmers from the same locality and other regions promotes exchanges of experiences and knowledge, which helps in the discussion for the resolution of problems and agricultural strategies that benefit them mutually.

Among the options provided by the respondents in the **Other** option are **Technical support** (which was added to the percentage of the Technical option offered in the question) and with 2.6% the possibility of **conducting Pilot Tests** of planting with sustainable models.

6. How important is it to be able to access additional training in sustainable agricultural practices?



Of the responses given, **Important** (39.5%) and **Very Important** (31.6%) comprised 63.1% of the responses, thus indicating a great interest in learning to improve their own sustainable agricultural practices.

Only 10.5%, four of the respondents, expressed themselves in a more neutral way, which could be interpreted as not very important because they already have knowledge about it. In last place we can appreciate options 1 and 2 with a low percentage of respondents who chose them, and do not aspire to add more training on the subject, this response can be considered an opportunity to generate attractive content and awareness not only on the basics of sustainable agriculture but also on how important it is to keep updated information to have planting cycles increasingly efficient and friendly to the environment.

7. **Which training model would be most effective for you?**

In this multiple-choice question we grouped one of the results from the responses to the Other option, as it coincides with an option already offered previously. 24 of the answers pointed to **Territorial Learning** as an ideal format for the acquisition of knowledge. The *in situ* learning method has great advantages, among them being able to interact with the facilitator about possible inconveniences in the territory and at the same time being able to explain solutions or techniques in a suitable and real environment.

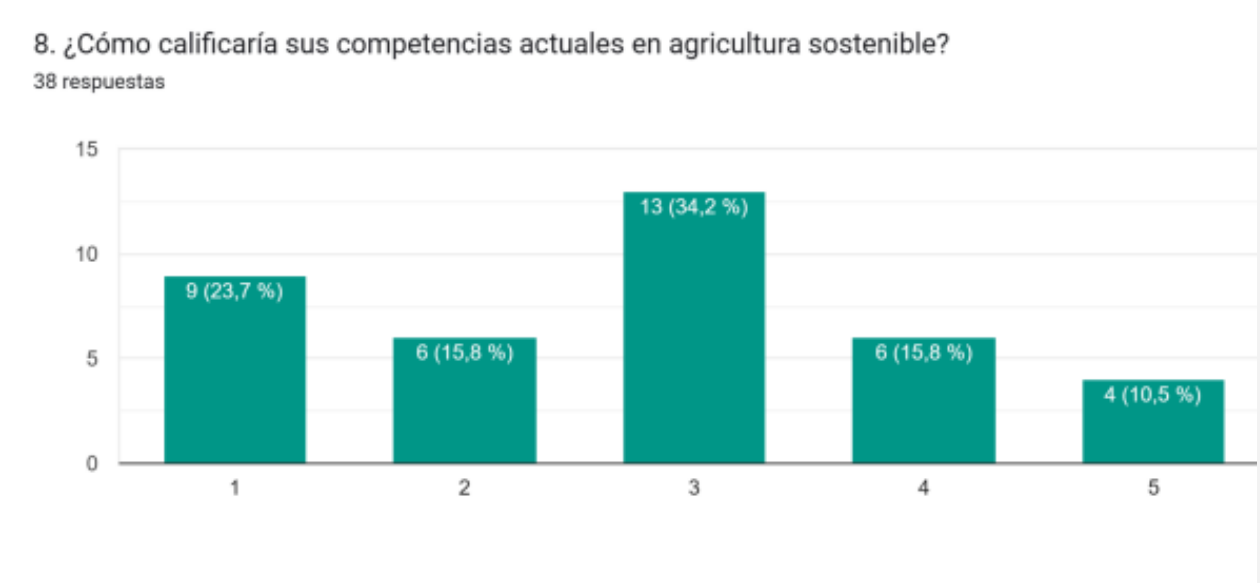
In second and third position with 20 responses each are the **Online Courses** and **Workshops,** so respondents are familiar with these formats and feel comfortable with participating in them. Offering online courses has the advantage of being able to develop them in asynchronous mode, which is an advantage for farmers to move to other places in case they

do not have access to the Internet and to be able to organize their study and learning hours according to their time.

As for the **Workshops** option, it is a format that will always bring the benefit of face-to-face interaction and because it is more structured, this dynamic promotes contacts between participants and subsequent meeting spaces.

The fourth choice with the highest number of responses is the option **Online Seminars (** 13 responses), with which we can deduce an interest in this type of format that is characterized by more formal and pedagogical structures and contents typical of classroom teaching. Finally, to a lesser extent in the **Others** option are the **Face-to-Face Seminars,** which would have the same benefits of social interaction as the **Workshops.**

8. How would you rate your current skills in sustainable agriculture?



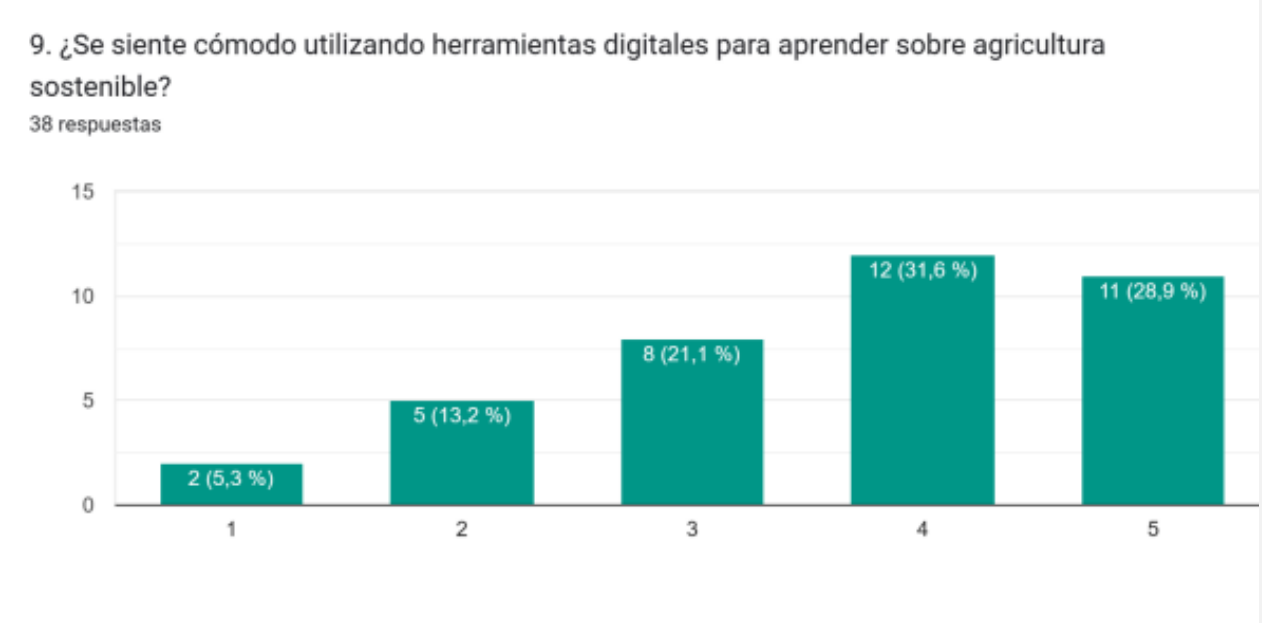
The rating given by each of the respondents was fairly even in general terms, leaning towards a medium to low level. A total of 34.2% (13 people) consider their skills to be **moderately sufficient**, while those who chose options 1 (23.7%) and 2 (15.8%) rate their skills as **Low to Very Low**, which amounts to 39.5%, more than one third of the respondents.

A total of 26.8% encompassing options 4 and 5 consider their skills **High and Very High**, which represents, positively, almost a third of the group surveyed. This percentage is

consistent with the local policies being implemented in the city in relation to urban agriculture, including those who self-assessed themselves in option 3, it can be inferred that **they have knowledge** of the subject but not sufficient skills for applicability.

9. Are you comfortable using digital tools to learn about sustainable

agriculture?

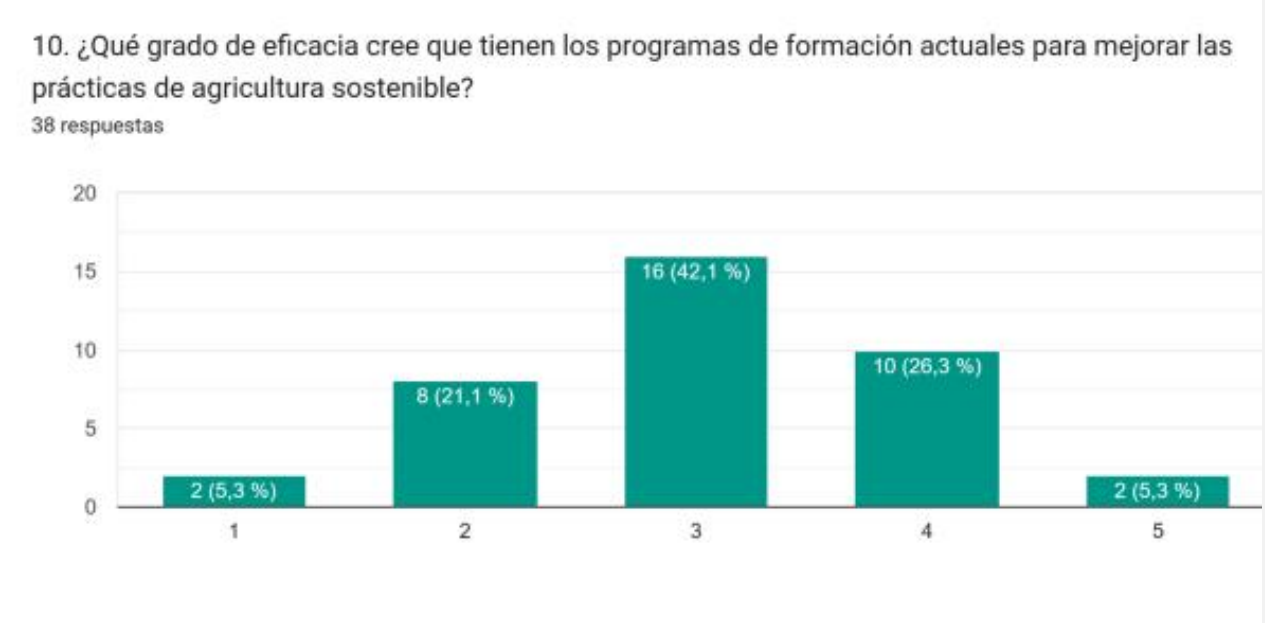


The responses obtained are favorable for advancing the development of **digital tools** focused on sustainable agriculture learning. Thanks to globalization, the accessibility of intuitively manageable electronic devices, and the presence of social networks as information and recreation channels, it is becoming a reality that more and more people can access a variety of content through a mobile phone.

This makes the **digital format an attractive option** for learning and an effective alternative even in rural or urban fringe areas. Therefore, the result of this question validates the possibility of working on the development of digital tools to provide educational information related to sustainable agriculture.

Options 4 and 5 encompass 60.5% of the respondents, which strongly supports the idea of developing digital content. Option 3 can be interpreted as a **medium receptivity** with 21.1%, while options 2 and 1 account for only 13.2% and 5.3% respectively, representing 7 out of 38 people surveyed.

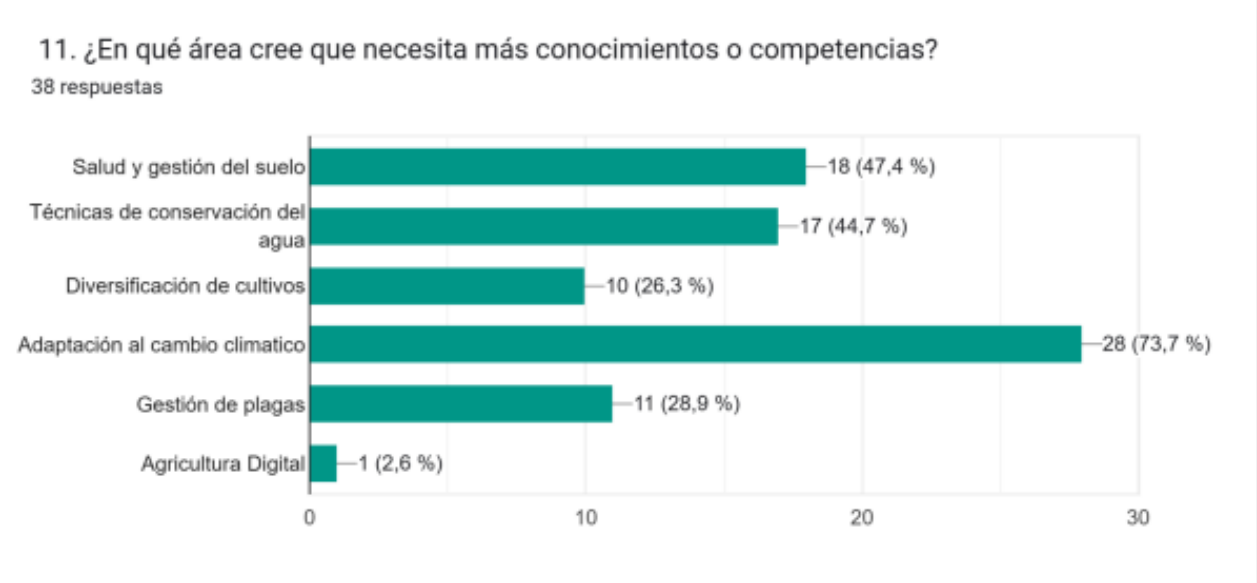
10.How effective do you think current training programs are in improving sustainable agriculture practices?



Evaluating the effectiveness of the programs that respondents have accessed is a positive parameter for addressing training tools. In the case of the 38 surveys conducted, slightly less than half choose a midpoint with option 3 (42.1%), which can be interpreted as having seen enriching aspects in the training previously received in one way or another.

Options 4 **Effective** and 5 **Very effective** together cover 31.6%, representing about a third of the respondents. In much smaller percentages, options 1 and 2 following a descending order with 21.1% considering that it is not very effective and therefore last, and finally, with 5.3%, equivalent to two surveyed individuals who assert that it is not effective at all. In these cases, it is possible that they either have not received quality training or have not had access to any in recent times.

11. In which area do you think you need more knowledge or skills?



In this multiple-choice question, 28 of the responses point to the relevance of knowing and deepening content related to **climate change.** It is worth noting that the weather's harshness, soil degradation for farmers and adjacent lands, obstacles to accessing water, or groundwater contamination are realities that farmers are very familiar with. The respondents' answers clearly indicate the need for more official, simple, and concrete information to address climate change in the short, medium, and long term.

Secondly, the option of **Soil Health and Management** ranks second with 18 responses, both aspects associated in the region with the use of agrochemicals and monocultures. Therefore, it is coherent that this is the second factor of interest to be further explored by the respondents, either due to the direct repercussions on the population in areas affected by herbicides or due to soil fatigue that decreases land productivity.

In third place, with 17 responses, were the **Water conservation techniques**, coinciding with one of the major concerns in recent years in the Pampas region of Argentina, which includes the provinces of Buenos Aires, La Pampa, Entre Ríos, Santa Fe, and Córdoba. These areas have suffered prominent droughts in recent years, leading to economic impacts at all scales due to crop losses. In some cases, farmers border their lands with feedlots, making groundwater contamination likely.

Pest management, with 11 supportive responses demonstrates a concern that aligns with the **Health** item; It should be noted that one of the main characteristics of sustainable agriculture is

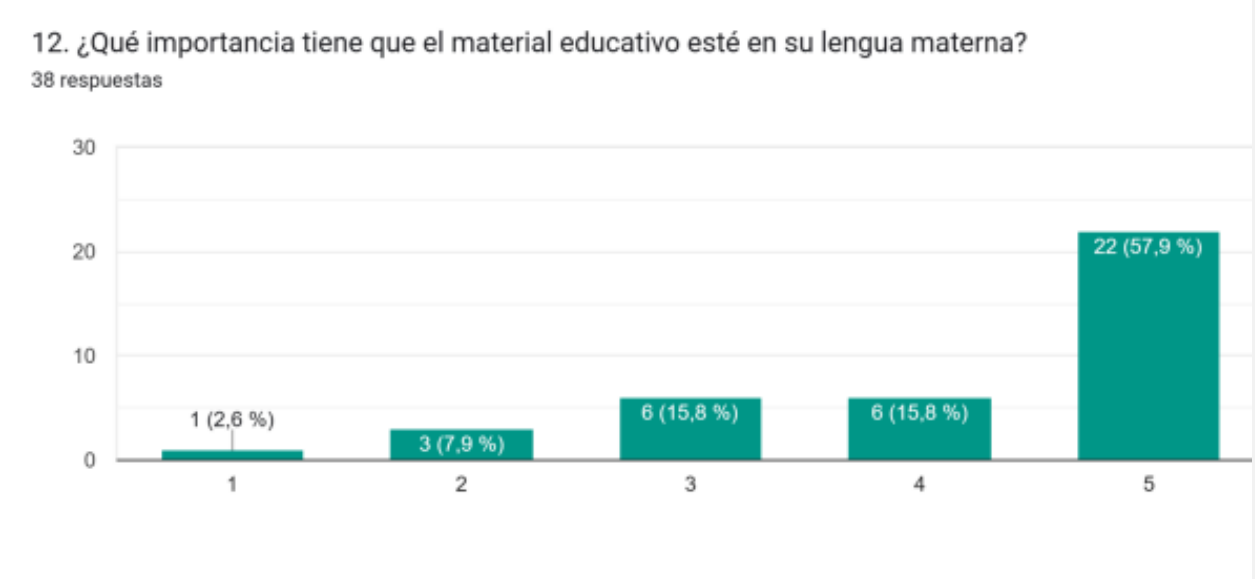
working with agrochemical-free methods, using natural products to combat pests and vectors, which not only protect the crop but also the families who work in them.

Following this option is crop diversification with 26.3%, which is connected to **Soil Management.** In Argentina, the widespread practice of large-scale monoculture is a well-known issue, and in some cases, in small productions, who, due to ignorance, use this method that quickly impoverishes the soil.

This option is followed by **Crop Diversification** with 26.3%, an item that is connected to Soil Management, in Argentina a problem of public knowledge, the widespread practice of large-scale monoculture and in some cases Lastly and with less relevance, one of the respondents provides the option of Digital Agriculture, we can interpret the interest in knowing technological methods that accompany the development and production of the land (for example, soil monitoring, exact weather forecasts, satellite images , among others)

Lastly, with less relevance, one respondent mentioned **Digital Agriculture**, which indicates an interest in learning about technological methods that support land development and production (e.g., soil monitoring, accurate weather forecasts, satellite imagery, among others).

12.How important is it that the educational material is in the native language?



Between options 5 **(Very important)** and 4 **(Important)**, a clear 78.7% of the responses can be counted, which shows the importance of providing farmers with educational materials that are easy to understand in their native language.

Option 3 includes 6 responses (15.8%) that reveal that these people **do not consider the language of the information to be relevant for their reception.**

In options 1 and 2, which group only 10.5% of the respondents, they cover **Low Importance** and **Very Low Importance,** which can be interpreted as individuals who may have knowledge of more than one language or who are familiar with translation tools.

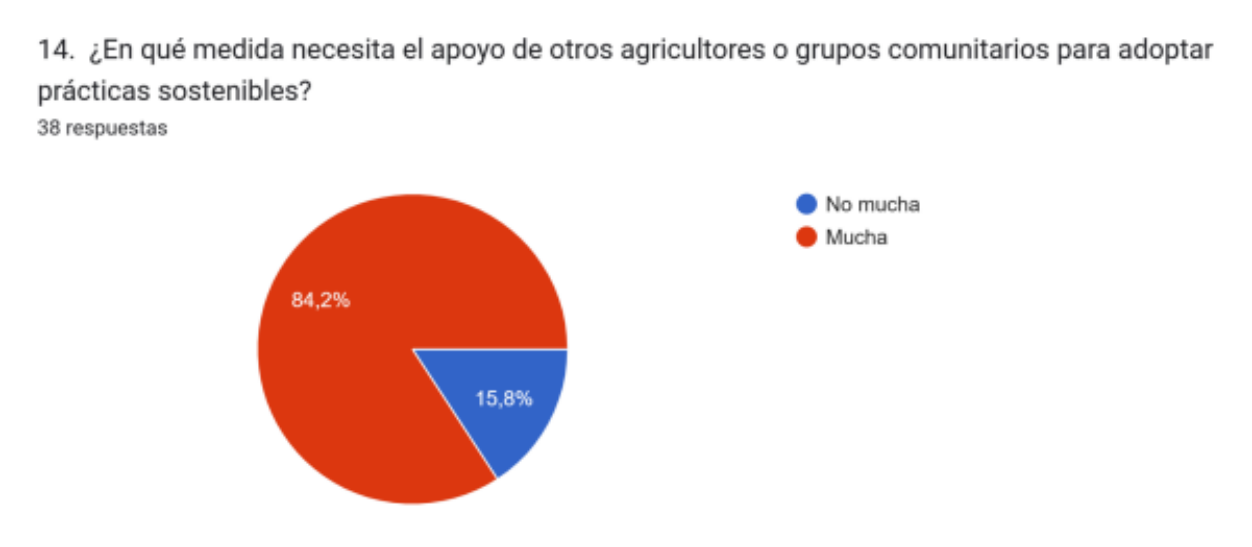
13. How much information do you need on good sustainable agriculture practices from other regions or countries?

The pie chart clearly shows that more than 80% of those surveyed are **interested in accessing more information related to good practices in sustainable agriculture,** as opposed to a small 15.8% who feel they do not need additional information on the subject.

This assessment is a motivation to develop materials according to the needs of small farmers, either because they know sustainable practices or because of the desire to make the transition to them.

The 15.8% who consider they do not need information is not a minor issue, since when investigating it can be divided into individuals with sufficient knowledge and practice and others with little information, which would be an audience to whom attractive content could be presented to consider the possibility of testing practices in their plots and thus discover the benefits.

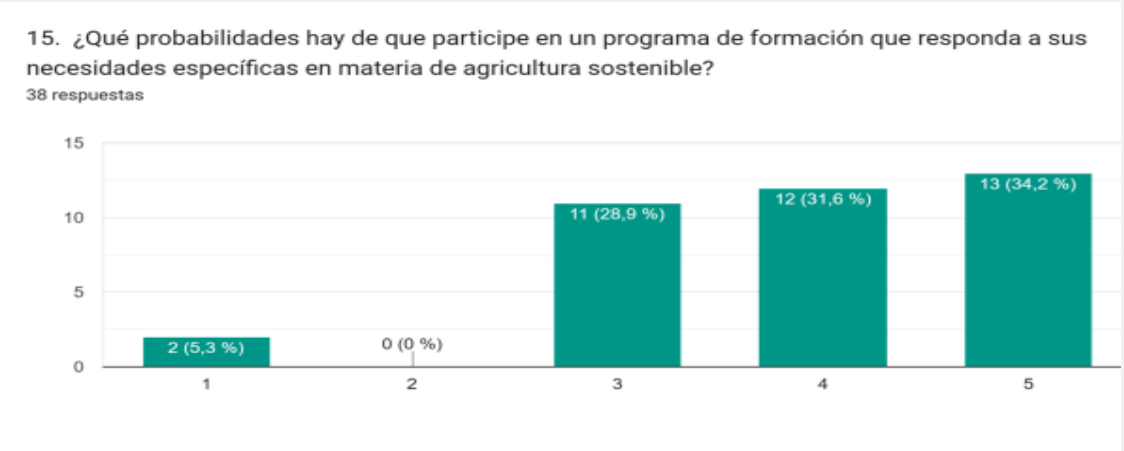
14. How much support do you need from other farmers or community groups to adopt sustainable practices?



This response makes evident the **absence of community work,** mentioned in other stages of this research; This 84.2% demonstrates the importance of generating learning formats that allow farmers to connect with each other and share knowledge and techniques. Such support is a way of recognizing that applying new methods can be a source of clarifying doubts within the community, promoting creation of support networks.

As a minor but equally important fact, 15.8% of respondents consider that they do not need support from other farmers, that is, **they feel more comfortable working on their own.**

15. How likely are you to participate in a training program that meets your specific needs in sustainable agriculture?



The graph reflects a good receptivity, specifically with options 4 and 5, which sum up to 65.8%, corresponding to **Agree** (31.6%) and **Strongly Agree** (34.2%) in participating in training programs with content on sustainable agriculture.

This will allow them to acquire new skills and knowledge beneficial for their economy and the environment. These two options encompass a little over two-thirds of the respondents, indicating that the vast majority would be willing to receive knowledge about agricultural practices.

In a second instance, a 28.9% shows a **moderate possibility of participation**, and a **minimal** 5.3% (2 people) expressed no interest in any instance of participation.

6.9. Final remarks

Reviewing the results of the survey, it is advisable to highlight that from the surveyed universe (38 people), there is a solid theoretical and practical knowledge of sustainable agriculture. It is also worth noting the willingness to acquire more and better knowledge about sustainable agriculture methods, not only because the surveyed audience is knowledgeable about the subject but also because they put it into practice with a clear understanding that sustainability is the right path for the well-being of their crops and the food sovereignty of their families and the community.

It is important to reiterate, for the interest of this project, that more than a third of the respondents have no knowledge of the European Green Deal, reflecting a preference for processes and techniques that are more culturally and geographically familiar, focusing on more local and regional practices. Only 15.8% seem to have heard about the deal, while only 3 people (options 4 and 5) were well-informed about it.

Regarding the advancement of the project, the Digital Format stood out with 63.2% of the surveys, which allows for the development of non-printed materials. In the case of Argentina, educational support is quite consolidated and led by the State, with 28.9% of the respondents affirming this, which is evident in the receptivity towards the subject and the knowledge of the surveyed individuals about sustainable agriculture. It should be mentioned that this type of government program is available at various levels of education (secondary, university, rural, among others) and all are free of charge.

It is noteworthy that at different stages of the survey there is a need for in-person or online meetings; respondents positively value social interaction, and the circulation of knowledge acquired in networks, in community.

Regarding the project, there is an evident opportunity to generate digital materials or asynchronous courses as these are friendly formats for study and training, allowing participants to organize their learning hours according to their schedules and internet access.

In the case of the group surveyed in Argentina, it is clear the general knowledge they have and the concerns for problems they experience daily, such as soil degradation, monocultures, the origin of climate change, extreme rains and droughts; All of these are contents that must be taken into account when developing the contents of the project.

6.10. Conclusion

The consolidated findings from the FARM2LA partner countries underscore the pivotal role of modernizing agricultural education in addressing global challenges such as climate change, food security, and rural development. The project highlights the necessity of integrating green and digital skills into VET systems to foster a resilient, innovative, and sustainable agricultural sector. While each partner brought unique insights, the shared commitment to sustainability and educational advancement forms a strong foundation for collaborative progress.

Best practices such as Germany's dual training model, which seamlessly combines theoretical learning with practical applications, and Greece's emphasis on precision farming technologies, offer scalable and impactful solutions for modernizing agricultural education. Equally significant are the grassroots innovations and community-focused training initiatives exemplified by Mexico and Colombia, which demonstrate the transformative potential of local empowerment and culturally adapted practices. These diverse approaches provide a rich repository of strategies to inform and inspire agricultural education reform across Latin America.

This report not only consolidates the shared expertise of the participating nations but also serves as a strategic guide for collaborative efforts. By addressing the barriers identified—such as resource disparities, policy misalignments, and technological gaps—FARM2LA can drive meaningful advancements in agricultural education and sustainability. The next phase of the project will focus on translating these insights into actionable strategies, fostering cross-regional learning, and strengthening international cooperation. Together, these efforts will contribute to a more sustainable, inclusive, and equitable future for agricultural communities in Latin America and beyond.

FARM2LA

Transforming Agriculture Education for Sustainable Development in Latin America

ERASMUS-EDU-2023-CB-VET
Project Number: 101129446

FARM2LA Need Research Report

Co-funded by the European Union