PRUDENT

WP3: BUSINESS MODELS, SOCIAL INNOVATION AND COOPERATION FOR MORE SUSTAINABLE FARMING AND FORESTRY SYSTEMS

D3.7: Good practices for more sustainable business models, social innovations and cooperation modes in agriculture and forestry

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List of abbreviations

AI - Artificial Intelligence

BM – Business Model

CAGR – Compound Annual Growth Rate

CAP – Common Agricultural Policy

CSA – Community Supported Agriculture

D - Deliverable

DaaS – Data-as-a-Service

DSS – decision support system

EAFRD – European Agricultural Fund for Rural DevelopmentEB – Executive Board

EC – European Commission

ESPR – Ecodesign for Sustainable Products Regulation

ETS – Emissions Trading System

GA – Grant Agreement

GDPR – General Data Protection Regulation

HaaS – Hardware as a Service

IoT – Internet of Things

IPM – Integrated Pest Management

SI – Social Innovation

T – Task

UC – Use Case

VLM – Flemish Land Agency

WP – Working Package

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Executive summary

The document at hand investigates good practices of existing business models (BMs), including social innovations (SIs) and alternative models of cooperation, with the potential to enable more sustainable farming and forestry systems in Europe. The good practices suggest changes that farmers, foresters, private forest owners and other stakeholders can make to optimise key activities and production processes through improved material and energy efficiency, the use of renewables, and vertical integration. They also propose developing new products and services by repurposing businesses for societal or environmental benefit and creating value from waste. Expanding into new markets by focusing on specific customer segments is another key aspect, alongside enhancing distribution and sales channels through face-to-face interactions, online trade, and improved logistics. Additionally, the good practices emphasise fostering collaborations through producer organizations and intermediary models, as well as investing in key resources by developing scalable solutions that enhance operational capacity and sustainability.

Table 1: Titles and shortcuts for the 20 Good Practices presented in this report

	Title	Section
1	Dairy farm with carbon farming, micro-algae cultivation and direct sales	Good Practice 1
2	Seedling planting for the creation of carbon sinks	Good Practice 2
3	Carbon credits through hedgerow carbon sequestration	Good Practice 3
4	Sustainable permaculture farming and agri-tourism	Good Practice 4
5	Sustainable organic farming with direct and online sales	Good Practice 5
6	Precision and technology driven sustainable agriculture for high-value crops	Good Practice 6
7	Firm offering precision agriculture tools and consultancy	Good Practice 7
8	Cooperative for grain management with Pay-for-Data solutions	Good Practice 8
9	Data-as-a-Service for precision agriculture	Good Practice 9
10	Hardware as a Service for precision agriculture	Good Practice 10
11	Sustainable winemaking incorporating circular procedures	Good Practice 11
12	Eco-Viticulture Network offering certifications and digital services	Good Practice 12
13	A Cooperative of farmers and foresters creating pellets from biomass waste	Good Practice 13
14	Responsible forest management (common forests and ecosystem services)	Good Practice 14
15	Community Organic Co-op for affordable and sustainable food	Good Practice 15
16	Cooperative model for mowing buffer strips with removal of the grass	Good Practice 16
17	Forest grazing sheep-based land management	Good Practice 17
18	Mutual Eco-Protection Fund	Good Practice 18
19	Agroecology partnerships of farmers and companies for sustainable growth	Good Practice 19
20	Cultivation of medicinal mushrooms in birch forests	Good Practice 20

Each good practice in this document follows a structured format that provides an overview of the suggested change. It begins by describing a sustainable BM, its core activities, innovative approaches, and sustainability aspects. The environmental and social impacts are then explored, highlighting benefits such as resource efficiency and contributions to the local community. The report also identifies potential adopters by specifying by whom, when, and where the practice can be implemented, considering market conditions and investment requirements. A real-life example of a firm or SI initiative is included to demonstrate practical application and success, offering insights into how the good practice has been implemented before. Furthermore, the promising potential of the practice is assessed by discussing market opportunities, consumer trends, and growth prospects. Finally, potential limitations are addressed, focusing on challenges such as technological complexity and regulatory barriers, to provide a balanced perspective on the feasibility of adoption.

1. Introduction

PRUDENT is a four-year Horizon Europe project that aspires to change how agriculture and forestry systems currently operate and accelerate the transition to sustainable agriculture, forestry practices, and smart farming technologies. It aims to identify and evaluate the most effective green nudges in the context of appropriate behavioural and experimental settings that can enable behavioural change towards more sustainable agriculture and forestry. The project focuses on four use cases (UCs) representing a range of EU agriculture and forestry systems and conditions. In particular, these are (i) Lithuania, focusing on arable crops; (ii) Italy, focusing on perennial crops; (iii) Belgium, focusing on livestock; and (iv) Finland, focusing on forestry.

Figure 1: PRUDENT's Use Cases

The document at hand investigates good practices of existing business models (BMs), including social innovations (SIs) and alternative models of cooperation, with the potential to enable more sustainable farming and forestry systems in Europe. In brief, our work began with desk research to define key terms, followed by mapping 34 real-life examples of firms and SI initiatives, which were then shortlisted to 20 based on their relevance and adoption potential. Targeted interviews with stakeholders explored their innovative aspects, benefits, and challenges. Further desk research analysed market and framework conditions at the EU level to provide contextual insights. An online survey gathered perceptions from 168 stakeholders, including advisors, industry professionals, and consumers. Finally, insights from all steps were combined to develop 20 detailed good practices.

Why is the focus on good practices?

The insights generated through our research have been synthesised into 20 good practices of existing business models, social innovations, and cooperation models. This approach facilitates the uptake of business models by farmers and private forest owners, as it shifts the focus from extensive technical detail to core, decision-relevant elements. In particular, the good-practice format highlights the potential of each model, its social impacts, and the realism of the solution, supported by real-life examples, thereby better capturing the attention of decision-makers.

The remaining part of the document consists of the following chapters:

- **Chapter 2** articulates the key steps, and overall approach followed to create the 20 good practices, spanning from creating a typology to doing an online survey.
- **Chapter 3** illustrates the 20 good practices, focusing on the innovative aspects of each selected practice, its expected impact, and future potential.
- **Chapter 4** provides some concluding remarks and guides the project's next steps.

The **Annexes** include the typology of the changes to a farm's BM and the template we used for mapping real-life examples of firms and SI initiatives. Also, the reader may find the list of real-life examples that were not shortlisted (and thus not provided in Chapter 3). Finally, Annexes include the interview questionnaire, the survey questionnaire and the survey results in an aggregated form.

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2. Overall Approach

2.1. Summary of our Approach

Our overall approach is summarised in the figure below.

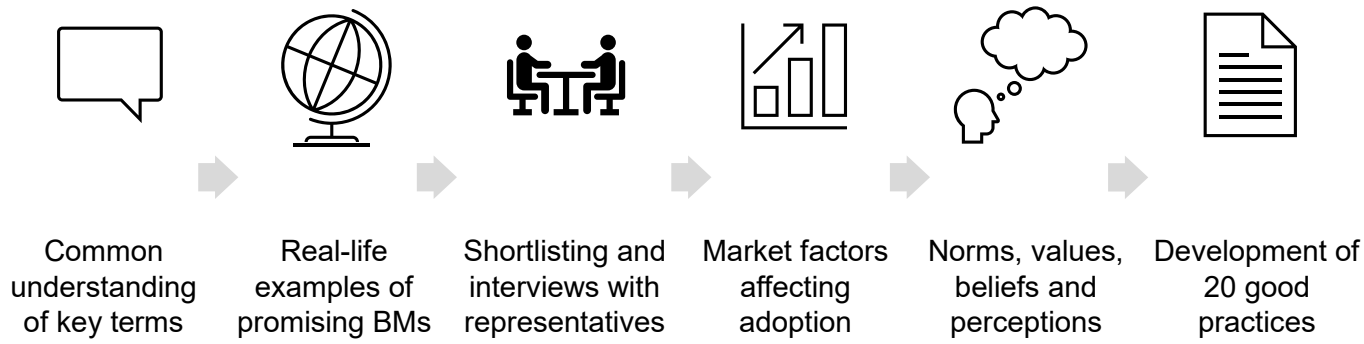

Figure 2: Overall approach

Step 1 – Common understanding of key terms. Our work began with defining key terms and concepts to ensure a common understanding among the authors' team. In particular, we performed desk research to define BMs, SIs, cooperation models, etc.

Step 2 – Real-life examples of promising BMs. We identified 34 real-life examples of firms and SI initiatives to uncover promising BMs, including SIs and cooperation models. The examples identified come from all over Europe, with an emphasis placed on the UC areas. Also, we aimed to analyse examples that adhere to various types of BMs and for this, we defined a typology of the core types and subtypes of BMs in the farming and forestry fields (see Annex 1: Typology of BMs).

Step 3 – Shortlisting and interviews with representatives. We shortlisted the above real-life examples based on their relevance for the UCs and their potential for adoption. The result was a list of 20 cases of BMs showcasing a variety of practices for sustainability in farming and forestry. Then, we approached a representative from each case and conducted 20 interviews to understand each case's innovative aspects, the societal, environmental, and economic factors that make them good examples, their potential adopters and the benefits deriving from their adoption, and weaknesses and limitations to consider.

Step 4 – Factors affecting BMs' adoption. We performed desk research to shed further light on the market and other framework conditions that may affect each of the selected 20 cases. In particular, we investigated the political, economic, social, and technological contexts in which farmers and foresters (and/or private forest owners) operate and the opportunities and threats they might encounter.

Step 5 – Norms, values, beliefs and perceptions. Building on the interview results and based on the specificities of the 20 shortlisted cases, we designed an online survey, which we distributed among a broader group of stakeholders, including farmers, foresters and private forest owners, other industry professionals and advisors, as well as consumers. The survey captured norms, values, beliefs, and perceptions of people towards each of the selected cases. Apart from participants' own perceptions, many questions aimed to identify their perceived knowledge about their sector/field in their region.**Step 6 – Development of 20 good practices.** We integrated all the information collected about the selected cases to develop 20 good practices. Each good

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practice is a text with key information about a promising BM, to help other stakeholders who may wish to adopt them.

2.2. Definitions of Key Terms

The following paragraphs contain definitions of key terms the reader will encounter within the current document.

Business model

"A BM describes the rationale of how an organisation creates, delivers, and captures value"[1]. A common way of describing BMs is in a one-page document (the so-called BM Canvas) that provides concise information on products or services, target markets and customers, marketing strategy, a description of the competition, and projections of revenues and expenses.[2] A few key facts about BMs from Investopedia are the following:

- The BM may not tell you everything about a firm, but it helps you understand how a firm does business.
- There are dozens of types of BMs. Actually, one could tell that there are as many types of BMs as there are types of business. Also, one can find various BMs within the same firm.
- A primary component of the BM is the value proposition. A value proposition describes the products and services offered to generate economic returns and why they are desirable to customers and different from competitors' products or services.[3]
- While traditionally associated with for-profit entities, non-profits also use business models to outline how they sustain their operations, fund their activities, and achieve their mission.[4]

Social Innovation

SI is "a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals" (Phills et al., 2008).[5] SI can take diverse forms. SI may come from both the public and the private sector. Indicatively, it can be:

1. product or production process,
2. technology (much like innovation in general),
3. a principle or an idea,
4. a piece of legislation or an intervention and policy,
5. a social movement,
6. market mechanisms (e.g. social finance instruments),
7. role and behavioural practices (e.g. peer-to-peer services),
8. or some combination of the above.[6, 7]

According to EC (2013), a few key features of SI are as follows. It must:

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[1] Osterwalder, A., & Pigneur, Y. (2010). Business model generation. John Wiley & Sons.
[2] Kopp, C. M. (2024, November 1). *13 Business Models: Definition and Examples*. Investopedia. https://www.investopedia.com/terms/b/businessmodel.asp
[3] Kopp, C. M. (2024, November 1). *13 Business Models: Definition and Examples*. Investopedia. https://www.investopedia.com/terms/b/businessmodel.asp
[4] Perić, J., Delić, A., & Stanić, M. (2020). Exploring business models of nonprofit organizations. Management: Journal of Contemporary Management Issues, 25(2), 181-194.
[5] Phills Jr., J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering Social Innovation. Stanford Social Innovation Review, 6(4), 34–43. https://doi.org/10.48558/GBJY-GJ47
[6] What is social innovation in health by the Social Innovation in Health Initiativw.
[7] Phills Jr., J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering Social Innovation. Stanford Social Innovation Review, 6(4), 34–43. https://doi.org/10.48558/GBJY-GJ47

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1. have as a primary goal the creation of social change, meaning to address a specific social need or problem rather than to benefit private individuals. In other words, not all innovations are SIs;
2. be innovative, meaning novel or significantly different from existing solutions. For instance, not all social enterprises are innovative;
3. be more effective than existing solutions in achieving the intended social outcomes or fill a gap where no known solutions exist (e.g., not addressed by the market or public authorities); and
4. often involve collaboration across different sectors or engage multiple stakeholders to promote inclusivity and equity.[8]

The mechanisms driving the diffusion of a SI differ from those influencing the adoption of business models.

Models of cooperation

In PRUDENT, we refer to models of cooperation as the ways that various stakeholders in the value chain cooperate. Changes in the models of cooperation would mean changes in the distribution of products/services (e.g., fewer intermediaries between the farmer and the consumer) and changes in the channels for getting raw materials such as fertilisers, among others. The list can be long, and the models of cooperation may easily change when a firm transforms how its BM operates.

Sustainable BMs

Transforming a BM to make it more sustainable can influence the firm internally (e.g., more efficient operations) or externally (e.g., positive environmental effect) in the short or long run. In practice, this means that a firm transforms its activities by integrating environmental, social, and economic dimensions into its performance.[9] In the agrifood domain, transforming a BM may include, among other things, new visions of customer-supplier relationships, new forms of organisation, and marketing strategies at the crossroads of various value chains.[10]

SI in farming and forestry

SIs in farming and forestry aim to address social, economic, and environmental challenges while fostering collaboration and knowledge sharing. More specifically, SI in the context of:

- sustainable and/or green farming involves the development and implementation of new ideas, practices, and strategies that enhance agricultural sustainability and resilience, foster positive environmental and economic outcomes while also addressing social needs and challenges[11].
- sustainable and/or green forestry involves rethinking traditional forestry methods and integrating social, economic, and environmental considerations through initiatives that develop and apply new social practices, ideas, and structures aimed at enhancing the

[8] European Commission (2013) Guide to Social Innovation, available here https://ec.europa.eu/regional_policy/en/information/publications/guides/2013/guide-to-social-innovation
[9] Sadovska, V., Fernqvist, F., & Barth, H. (2023). We do it our way – small scale farms in business model transformation for sustainability. Journal of Rural Studies, 102, Article 103090. https://doi.org/10.1016/j.jrurstud.2023.103090
[10] Donner M., Gohier R., de Vries H. (2020) A new circular business model typology for creating value from agro-waste, Science of The Total Environment, Volume 716, https://doi.org/10.1016/j.scitotenv.2020.137065
[11] (i) What Is Sustainable Agriculture? by the The Union of Concerned Scientists (2017) and (ii) How farming innovations can feed the world and protect the planet by the World Economic Forum (2022)

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sustainability of forestry operations, adapting forests to climate change, enhancing biodiversity, and supporting rural livelihoods while benefiting local communities and fostering collaboration among various stakeholders[12].

2.3. Real-life Examples

During this stage, we performed a mapping exercise to identify BMs with the potential to enable more sustainable farming and forestry systems. These BMs were identified in real-life examples (firms or SI initiatives), and some of them also introduced alternative models of cooperation within the value chain. The mapping consisted of two steps:

1. first, we identified the core types and subtypes of BMs (i.e. a typology of BMs) in the farming and forestry fields.
2. then, considering that typology, we mapped 34 real-life examples of such BMs (firms and SIs initiatives).

Typology of BMs. Our work started with desk research, focusing on innovative BMs suggested by previous projects (e.g., Agrobridges[13], MainstreamBIO[14]), reports from organisations such as the FAO of the United Nations[15], and related literature, such as the Donner and Vries (2023)[16] and the Bocken et al. (2014)[17]. Following Sadovska et al. (2023)[18], we grouped the BMs into 7 types according to the changes required to achieve a more sustainable BM. We also included their subtypes. More specifically, following Bocken et al. (2014)[19], we used the following table as a template to describe the key features of each BM, aiming to have a homogeneous approach across all BMs.

Table 2: Template for describing the key elements of a BM

Value proposition	Value creation & delivery	Value capture
Innovative elements of this BM regarding any of the following: (i) Product/ service and why it is better, (ii) customer segments, and (iii) customer relations	Innovative elements of this BM regarding any of the following: (i) key activities, (ii) resources and partners, (iii) distribution channels, and (iv) technology	Innovative elements of this BM regarding any of the following: (i) cost structure and (ii) revenue streams (e.g., pricing strategy)

[12] (i) European Commission, European Green Deal, (ii) European Commission, EU Forest Strategy for 2030 and (iii) Ludvig, A.; Rogelja, T.; Asamer-Handler, M.; Weiss, G.; Wilding, M.; Zivojinovic, I.(2020) Governance of Social Innovation in Forestry. Sustainability, 12, 1065, https://doi.org/10.3390/su12031065
[13] Agrobridges project (2021) D1.4: SFSCs current status regional assessment
[14] MainstreamBIO project (2023) D2.1 Catalogues of technologies, business models and social innovations for small-scale biobased solutions
[15] FAO of the United Nations (2008) Business Models for Small Farmers and SME's
[16] Donner M. and de Vries H. (2023) Business models for sustainable food systems: a typology based on a literature review. Front. Sustain. Food Syst. 7:1160097. https://doi.org/10.3389/fsufs.2023.1160097
[17] Bocken N.M.P., Short S.W., Rana P., Evans S. (2014) A literature and practice review to develop sustainable business model archetypes, Journal of Cleaner Production, Volume 65, Pages 42-56, https://doi.org/10.1016/j.jclepro.2013.11.039
[18] Sadovska, V., Fernqvist, F., & Barth, H. (2023). We do it our way – small scale farms in business model transformation for sustainability. Journal of Rural Studies, 102, Article 103090. https://doi.org/10.1016/j.jrurstud.2023.103090
[19] Bocken N.M.P., Short S.W., Rana P., Evans S. (2014) A literature and practice review to develop sustainable business model archetypes, Journal of Cleaner Production, Volume 65, Pages 42-56, https://doi.org/10.1016/j.jclepro.2013.11.039

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Following is the list of Types and Sub-types. You may find the full text about the typology of BMs at the Annex 1: Typology of BMs.

- Type 1: New products and services
  - Sub-type #1. Creating value from waste
  - Sub-type #2. Repurposing the business for society/ the environment
- Type 2: New markets and customers
  - Sub-type #1. Focus on a specific customer segment
- Type 3: Changes in key activities and production
  - Sub-type #1. Maximising material and energy productivity and efficiency
  - Sub-type #2. Substituting with renewables and natural processes
  - Sub-type #3. Vertical Integration and Ownership
- Type 4: Changes in customer relations and communication
  - Sub-type #1. Encouraging sufficiency
  - Sub-type #2. Adopting a stewardship role
  - Sub-type #3. Community Supported Agriculture
- Type 5: Changes in distribution and sales channels
  - Sub-type #1. Reusable or sustainable packaging
  - Sub-type #2. Online trade
  - Sub-type #3. Retail trade
  - Sub-type #4. Face to face
  - Sub-type #5. Improved logistics
- Type 6: Changes in key resources and investments in assets
  - Sub-type #1. Developing scale-up solutions
- Type 7: Changes in key partners and forms of collaborations
  - Sub-type #1. Producer organisation models
  - Sub-type #2. Buyer driven models
  - Sub-type #3. Intermediary models
  - Sub-type #4. Public institutional procurement models

Mapping real-life examples of BMs. Considering the above typology, we identified cases of firms and SI initiatives using a template available in Annex 2: Template for Real-life Examples. The mapping was finalised by the middle of July 2024, with the **identification of 34 BMs** offering greener and more sustainable perspectives in various aspects of farming and forestry.

Criteria considered in mapping
All cases mapped held promising potential, were perceived as successful, and would be useful as good practices to be adopted by farmers, foresters and private forest owners in the UC areas. Where possible, we opted for examples that fit the UC's expertise (farming or forestry) and that are related to their local farming or forestry products (boreal forests, bovines, wheat, grapevines).

2.1. Shortlisting and Interviews

Shortlisting. Following the identification of the 34 BMs, we moved forward with assessing the each case's potential. Our assessment led to the selection of the 20 most promising real-life examples to investigate further through interviews.

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Criteria considered in shortlisting

The selection criteria dictated that the cases incorporate innovative features, yield positive outcomes for both the environment and society (beyond just economic benefits), are adaptable and replicable by other organisations or initiatives and include various sustainable and eco-friendly components and processes that enhance their overall performance (aligning with the definition of a Good Practice offered in Section 2.7). We also aimed for cases that (i) were relevant to the field of focus of the UCs; (ii) held promising potential to be adopted by farmers and private forest owners in the UCs; and (iii) provided a variety of solutions and examples for sustainability in farming and forestry.

Interviews. The interviews aimed to gather information that would enhance the current understanding of the shortlisted cases. Thus, we developed a questionnaire to extract detailed information about each case's origins, innovative aspects, contributions to society and the environment, successes, challenges, and future goals (see Annex 4: Interviews Questionnaire).

Process-wise, we first crafted a cold invitational email to invite potential interviewees to participate in the interviews and introduce the project's purpose. To ensure ethical standards and transparency, we developed a custom consent form. The authors of the current document approached their interviewees (one representative from each selected case) and scheduled a meeting with them. The interviews took place both in person and virtually, mainly between July and September 2024 (with a couple taking place later in November). The insights and other information we gathered were used as input for elaborating the final good practices available in Chapter 3. Information about the cases not shortlisted (and thus not available in Chapter 3) is provided in Annex 3: Other Real-life Examples (not Shortlisted).

2.2. Market Factors

During this step, we searched online sources for information and data about the market and framework conditions (contextual, institutional, etc.) in which the farmers and private forest owners of our selected cases operate. For example, we drew insights from various sources, including market reports, publications, specialised journals, and reports of the European Commission. In doing so, we shed further light on factors that may affect the emergence and adoption of our selected cases by other farmers or foresters and private forest owners. Our research of relevant web sources was facilitated by using common Artificial Intelligence (AI) tools, considering their merits and limitations. In response to the limitation of AI tools, we performed quality assurance of the outcomes, cross-checked the information and added elements where needed. All our findings have been incorporated into the Good Practices text available in Chapter 3.

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2.3. Survey to Capture Norms, Values, Beliefs and Perceptions

Survey preparation. The survey aimed to capture stakeholders' norms, values, beliefs, and perceptions towards the selected cases, which would, in sequence, help us better understand the future potential of each case. Thus, building on the results of the interviews with stakeholders, we prepared an online survey with relevant questions for each case (see Annex 5: Survey Questionnaire). The survey featured primarily closed-ended questions, with responses captured through multiple-choice and Likert scale formats. The survey was created in English and launched using the Microsoft Forms platform, with translations available in Finnish, Italian, Lithuanian, and Dutch to accommodate non-native English speakers. Data collection started in mid-November 2024 and ran until the end of December. Moreover, we offered the participants the possibility to check the aggregated responses of their peers in real-time after they had submitted their responses, adding value for them.

Figure 3: Preview of social media post for the survey distribution

Most questions place respondents in the role of "local ambassadors" and ask them to estimate the norms, values, beliefs, and perceptions prevalent among their peers, rather than reporting solely on their own views or practices. This methodological choice was made strategically in order to obtain a more representative overview of the sector. Asking respondents to report exclusively on their own perceptions, implementation choices, or practices would likely introduce significant selection bias, as farms and private forest owners willing to participate in the survey are more likely to be open to innovation and outward engagement. As a result, the findings would risk being overly positive. While this approach has acknowledged limitations—such as the possibility that some respondents may have difficulty making accurate estimations—it is well established in the literature (e.g. see the Delphi method). In the context of this study, it is therefore expected to better serve the research objectives than alternative approaches.

Also, as many of the products and services examined in this research are highly innovative and not yet widely available on the market, it was believed that only a small proportion of consumers would have had access to them and could report actual purchasing behaviour. Relying solely on observed behaviour would therefore exclude a large share of potential users. For this reason, we focused on purchase intention rather than actual purchasing behaviour. This approach captures both consumers who already purchase these products or services and those who would be willing to do so if they became accessible to them. In the context of this study, measuring purchase intention is therefore better aligned with the research objectives than alternative approaches.

Survey distribution. First, we identified potential respondents and shared the survey directly with them. Additionally, we developed a social media post, including relevant text and hashtags, which was shared on PRUDENT's LinkedIn and Facebook channels in November and December 2024 to engage the appropriate stakeholder groups. Overall, UC pilots were instrumental in reaching potential participants directly through their networks. Various methods and strategies were employed to engage participants in each country. We leveraged established connections within the local agriculture and forestry sectors of the UCs (farmers, foresters, private forest owners, advisors, agricultural/farmer associations, and other relevant stakeholders such as technology

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providers, financial institutions, researchers, and policymakers) and partners shared the survey with their networks, through emails, social media and direct communications.

Survey demographics. The online survey was completed by 168 respondents, out of which half were female and half male. The sample was drawn from a population consisting of individuals aged 18 years and above, residing mostly in Belgium (29%), Greece (23%), Finland (18%), Lithuania (15%) and Italy (12%). The respondents were mainly young people between 25 to 44 years old (65%). Out of all, 50% were consumers, 29% were farmers, farm managers and stakeholders working with farmers, and 21% were forest owners, forest managers and stakeholders working with forest owners.

Figure 4: Survey respondents' stakeholder type

Among all the farmers who responded, 27% worked with wheat, 25% with grapevine, and 12,5% with bovines. Many replied, "other products", such as olive trees, forage, peaches, citrus trees, potatoes, etc. Most of the farmer respondents own farms of a size perceived to be average compared to their peers (48%) or smaller (27%). Among all the private forest owners who responded, 39% owned small forests, 25% owned forests of a size perceived to be average compared to their peers and 16,7% owned large forest areas (see more in Annex 6: Survey Results in section "Demographics").

Which countries were examined and why

The main objective of the survey was to capture stakeholder perceptions in order to assess the potential and limitations of each good practice. For this reason, data collection focused primarily on farmers and private forest owners in the designated UC countries, namely Belgium, Italy, Lithuania, and Finland. In contrast, when it comes to consumers, insights from other EU countries were also considered valuable, as products originating from the UC regions are marketed and consumed beyond national borders. Consumer perceptions from these additional countries (e.g., Greece), therefore, constitute a relevant variable in the analysis. In the Annexes, we provide survey results both aggregated and disaggregated at the country level, allowing readers to examine findings by country and to more clearly interpret which results apply to each national context.

2.4. Development of Good Practices

Good practice structure. For each of the selected cases, we analysed and integrated all the information collected to develop one good practice. Each good practice is a text with key information about a promising BM (for a business, SI initiative and/or cooperation model) to help other stakeholders who may wish to adopt them. In particular, each good practice provides the following information:

1. Description: A concise description of the BM, focusing on its most important and unique, innovative and green aspects. It also explains how the Good Practice contributes to sustainability in farming or forestry.
2. Societal Impacts: An explanation of the rationale behind why the practice is considered beneficial. This includes its most prominent positive impacts on society, the environment, and the economy.

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3. Who, When and Where Can Adopt it: Information about the target audience of the good practice (farmers, foresters) and the specific contexts in which it can be applied. This text helps the reader understand the relevance and adaptability of the practice to their unique circumstances and operational environments.
4. Real-life Example: This part links the good practice with a real-life example (one of 20 cases shortlisted), making it more tangible and elaborating on actual outcomes, as well as its effectiveness and achievements.
5. Promising potential: This part explores the incentives, strengths, and opportunities associated with adopting or extending the good practice (including the potential benefits such as increased efficiency, cost savings, and alignment with regulatory requirements). It also considers the political, economic, social, and technological (PEST) factors that may favour the adoption of the particular good practice.
6. Limitations to Consider: Finally, this part addresses potential weaknesses and limitations related to the good practice, acknowledging the challenges (including the political, economic, social, and technological factors) that might hinder the good practice's implementation or scaling potential.

Good Practice elaboration. Process-wise, each good practice is the aggregation of the information collected from real-life examples, interviews with representatives, desk research on market factors, and online surveys of norms, values, beliefs, and perceptions. Our work to combine the above information was facilitated by using common AI tools, considering their merits and limitations. AI was used cautiously and with appropriate quality-control measures to minimise the risk of errors. AI was not employed to conduct any part of the research or analysis. Its use was limited exclusively to supporting the drafting process, specifically by helping to summarise longer texts into more concise descriptions of the good practices.

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3. Good Practices

In this chapter, you may find the 20 good practices of sustainable BMs that can be adopted by farmers, private forest owners and other stakeholders running a farm or an SI initiative or those who wish to establish alternative cooperation models across the value chain.[20] The presented good practices have the potential to enable more sustainable farming and forestry systems in Europe. The table below summarises our work.

Table 3: List of the 20 good practices

	Title	About
1	Dairy farm with carbon farming, micro-algae cultivation and direct sales	Combines dairy and algae farming to reduce methane emissions, generate green energy, and produce sustainable products
2	Seedling planting for the creation of carbon sinks	Involves youth into planting of seedlings on wastelands, creating carbon offsets and expanding forest areas.
3	Carbon credits through hedgerow carbon sequestration	Enables farmers to generate income by managing hedgerows sustainably and selling carbon credits
4	Sustainable permaculture farming and agri-tourism	Integrates regenerative farming practices with eco-tourism and educational workshops to promote sustainable land use
5	Sustainable organic farming with direct and online sales	Combines organic farming with direct and online sales, while engaging vulnerable groups and closing nutrient cycles.
6	Precision and technology driven sustainable agriculture for high-value crops	Utilises smart farming technologies to optimise production and minimise environmental impact.
7	Firm offering precision agriculture tools and consultancy	Provides farmers with precision agriculture tools, training, and consultancy to optimise farming practices and improve soil health.
8	Cooperative for grain management with Pay-for-Data solutions	Offers grain handling services and real-time data analytics, reducing costs and environmental impact for local farmers.
9	Data-as-a-Service for precision agriculture	Delivers precision agriculture solutions through a flexible pay-per-use model, enabling farmers to adopt advanced technologies affordably.
10	Hardware as a Service for precision agriculture	Provides agricultural machinery and data services on a rental basis, supporting sustainable practices through cost-effective access to technology.
11	Sustainable winemaking incorporating circular procedures	Produces wine using renewable energy, organic farming, and circular economy principles to reduce waste and environmental impact.
12	Eco-Viticulture Network offering certifications and digital services	Supports sustainable viticulture through certifications, digital platforms, and streamlined logistics, enhancing environmental outcomes.
13	Cooperative of farmers and foresters creating pellets from biomass waste	Transforms agricultural and forestry residues into biomass pellets, offering additional revenue streams and reducing waste.
14	Responsible forest management through common forests and ecosystem services	Combines small forest plots into larger units for efficient management, generating revenue from timber and ecosystem services.
15	Community Organic Co-op for affordable and sustainable food	Operates a cooperative organic food shop, prioritising fair farmer compensation, social inclusion, and waste reduction.

[20] Definitions of a business model and social innovation are provided in Chapter 2.

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	Title	About
16	Cooperative model for mowing buffer strips with removal of the grass	Collaborates with farmers, advisors, and governments to manage buffer strips efficiently, valorising the grass removed.
17	Forest grazing sheep-based land management	Uses sheep grazing for sustainable forest management, promoting biodiversity, reducing costs, and enhancing rural landscapes.
18	Mutual Eco-Protection Fund	Farmers' association that provides financial protection against crop losses due to pests, encouraging sustainable practices like Integrated Pest Management (IPM).
19	Agroecology partnerships of farmers and companies for sustainable growth	Facilitates funding for farmers transitioning to agroecological practices by matching them with corporate sponsors.
20	Cultivation of medicinal mushrooms in birch forests	Enables forest owners to cultivate chaga mushrooms sustainably, enhancing biodiversity and generating additional income.

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3.1. Good Practice 1

Dairy farm with carbon farming, micro-algae cultivation and direct sales

Keywords: Dairy farm, dairy products, algae, agroforestry, direct sales	*Type of good practice:* Changes in key activities and production (Maximising material and energy productivity and efficiency, Substituting with renewables and natural processes, Vertical Integration and Ownership)

Description

A dairy farm with cows that utilises carbon farming, cultivate micro-algae and has a shop selling farm ice cream, dairy products and desserts. It focuses on producing sustainable food through a combination of dairy and algae farming, appealing to both local consumers and environmentally conscious, technology-driven customers. The firm's model integrates livestock production with algae cultivation to reduce methane emissions and improve environmental sustainability. Additionally, the company employs carbon farming and agroforestry practices by planting trees and cultivating grass and herbs on arable land, and it generates green electricity through a bioreactor that ferments cow manure. This circular approach seeks to make use of farming by-products to support energy production and animal welfare. Also, it resembles a short and integrated supply chain that internalises energy, feed, and waste flows while connecting producers directly with local consumers.

Figure 5: Dairy farm with carbon farming, micro-algae cultivation and direct sales (Source: ChatGPT)

Societal Impacts

1. It creates environmental and economic impacts by promoting a sustainable approach to agriculture. Through the integration of algae production with livestock farming, methane emissions are reduced, and the cultivation process minimises water waste, contributing to resource conservation.
2. The use of a bioreactor to generate green electricity from cow manure further enhances energy efficiency and reduces the carbon footprint.
3. Socially, it supports the local community by providing locally sourced, sustainable food products and fostering consumer awareness of environmentally friendly farming practices. Additionally, it offers potential economic benefits by reducing energy costs and creating niche market opportunities through algae-based products. However, reliance on specialised technologies and production methods may limit access for smaller farms and widen the economic gap

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between small-scale producers and larger investors.

Who, When and Where Can Adopt it

Livestock farmers in eco-conscious markets (especially those with moderate to high levels of income, given the initial technological investments required) that want to (i) reduce methane emissions; (ii) meet environmental regulations; (iii) create additional revenue streams; (iv) have long-term operational efficiency and sustainability.

Private forest ownersusing agroforestry practices that look to (i) combine environmental restoration with sustainable agriculture; (ii) enhance carbon sequestration (iii) improve land productivity; (iv) benefit from additional income streams (sale of algae for various uses, e.g., dietary supplements, cosmetics, or animal fee).

A real-life example

A farm[21] that is located in north Belgium. This firm originated from a long-established dairy farming operation that evolved toward a more sustainable business model after recognising the limitations of traditional milk production. The shift was driven by a desire to embrace a circular approach and local supply chains. Over time, the company innovated by integrating livestock farming with microalgae production, utilising a closed system to minimise water waste and CO_2 emissions. A bioreactor was installed to generate green electricity from cow manure, further reducing environmental impact. Currently, the company operates on a small scale, with algae being cultivated on a 200 m² area across 26 layers of serpentine pipes. It is one of Belgium's largest microalgae producers, marking a notable achievement in sustainable farming.

Figure 6: Farm in north Belgium (Source: ChatGPT)

Promising potential

The closed-loop system that combines livestock farming with algae production reduces environmental impacts, particularly through methane reduction and water conservation, which makes the firm attractive to consumers interested in sustainable food production[22]. The rising global demand for plant-based proteins, particularly algae-based products, enhances growth prospects[23]. Algae is increasingly recognised for its nutritional value, including high levels of proteins, antioxidants, and essential minerals, making it a valuable ingredient in food and personal care products[24]. The European Union's focus on developing a bio-based economy

[21] The farm owner did not provide permission to mention the farm's name, so it will not be mentioned in the report.
[22] Farm Owner of farm in north Belgium, personal communication, September 2024
[23] *Algae Market Size, share, growth, Price, analysis 2024-2032*. (n.d.). https://www.expertmarketresearch.com/reports/algae-market
[24] *Algae Market Size, share, growth, Price, analysis 2024-2032*. (n.d.). https://www.expertmarketresearch.com/reports/algae-market

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further supports the algae market's growth, offering policy-driven incentives and support[25]. Finally, consumers see value in dairy products from brands that contribute to the earth's climate and would be willing to pay a little more (31%) or quite more (9,5%) to buy them[26].

Limitations to Consider

The complexity of algae production - requiring sophisticated technology such as bioreactors - can increase operational costs and demand specific expertise, which may not be readily available[27]. Furthermore, the scale-up process from small to industrial production is often accompanied by technological and logistical difficulties, which can slow profitability[28]. The algae market is still emerging in Europe, and the regulatory landscape can be cumbersome, particularly regarding bio-safety and food classification[29] [30]. Moreover, competition from cheaper alternatives, such as soy protein, and consumer hesitation, especially in long supply chains, can limit the adoption and market penetration of algae-based products[31]. Finally, several consumers are sceptical towards substituting dairy with algae-based alternatives even when knowing their merits: 41,6% wouldn't choose them in any case, while 31% would decide based on the quality and convenience[32].

Dictionary

- Carbon Farming: Based on the Carbon Cycle Institute[33], carbon farming is a way of managing land to help capture and store more carbon in plants and soil. By using eco-friendly practices, farmers can pull CO_2 from the air and lock it in the soil, improving its quality and making farms more productive. This approach helps fight climate change and boosts the overall health of the land.
- Micro-algae: As described by Dolganyuk, et al.[34], micro-algae are tiny, photosynthetic organisms that thrive in water and soil environments. They efficiently convert carbon dioxide and sunlight into energy, producing valuable substances like proteins, lipids, and vitamins. Due to their rapid growth and ability to adapt to various conditions, micro-algae are used in a range of applications, from nutrition to renewable energy. Their cultivation supports sustainable practices by capturing CO_2 and requiring minimal resources.

[25] Bioeconomy. (n.d.). *Algae production industry in Europe | Knowledge for policy*. https://knowledge4policy.ec.europa.eu/bioeconomy/algae-production-industry-europe_en
[26] Online Survey results, December 2024, find out more in Annex 6
[27] Farm Owner of farm in north Belgium, personal communication, September 2024
[28] Farm Owner of farm in north Belgium, personal communication, September 2024
[29] Bioeconomy. (n.d.). *Algae production industry in Europe | Knowledge for policy*. https://knowledge4policy.ec.europa.eu/bioeconomy/algae-production-industry-europe_en
[30] *Algae Market Size, share, growth, Price, analysis 2024-2032*. (n.d.). https://www.expertmarketresearch.com/reports/algae-market
[31] *Algae Market Size, share, growth, Price, analysis 2024-2032*. (n.d.). https://www.expertmarketresearch.com/reports/algae-market
[32] Online Survey results, December 2024, find out more in Annex 6
[33] Carbon Cycle Institute. (2021, June 4). *What is Carbon Farming? | Carbon Cycle Institute*. https://www.carboncycle.org/what-is-carbon-farming/
[34] Dolganyuk, V., Belova, D., Babich, O., Prosekov, A., Ivanova, S., Katserov, D., Patyukov, N., & Sukhikh, S. (2020). Microalgae: a promising source of valuable bioproducts. *Biomolecules*, *10*(8), 1153. https://doi.org/10.3390/biom10081153

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3.2. Good Practice 2

Seedling planting for the creation of carbon sinks

Keywords: Afforestation, seedling planting, creation of carbon sinks, young people

Type of good practice: New products and services (Repurposing the business for society/ the environment)

Description

The social innovation initiative provides carbon offsetting services through afforestation by planting tree seedlings for organisations and individuals seeking to offset part of their carbon emissions. .The initiative employs young people, including teenagers (who are often environmentally conscious), by offering them summer jobs to plant tree seedlings on wasteland, which includes areas not actively used for forestry or agriculture. By planting new seedlings, the initiative contributes to the expansion of forest areas and the creation of carbon sinks. A distinctive aspect of this initiative is its focus on social sustainability, combining paid youth employment with basic training in tree planting and forest management practices. Additionally, the initiative differentiates itself from other approaches by planting forests on wasteland rather than extending forestry rotation cycles or focusing solely on restoration projects.

Figure 7: Seedling planting for the creation of carbon sinks (Source: ChatGPT)

Societal Impacts

1. Environmentally, it enhances carbon sequestration by planting new forests on previously unused land, helping to increase carbon sinks. However, the environmental benefits depend on site-specific conditions, as unused land may present challenges such as poor soil quality, limited water availability, or low seedling survival rates, which can reduce the effectiveness of afforestation efforts.

2. Socially, the initiative provides job opportunities for teenagers, particularly those who have not yet entered the labour market, giving them valuable experience in forest-related work and contributing to their environmental awareness. On the other hand, participation in such an initiative may be more accessible to youth from certain social or economic backgrounds, potentially reinforcing inequalities in access to training opportunities.

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Who, When and Where Can Adopt it

Farmers and private forest owners with underutilised land in rural areas who want to generate an additional revenue stream by planting trees on unused land while contributing to climate change.

Foresters and Forestry agencies (especially in countries committed to carbon neutrality goals) who are looking (i) to rehabilitate the land; (ii) to raise awareness in the local community (especially targeting young people) and fight against climate change; (iii) to participate in carbon markets (catering to organisations looking to offset emissions); and (iv) for new restorative land management practices.

A real-life example

A real-life example is the Taimiteko – Seedling action by 4H Finland, a leading youth organisation supporting children's and young people's life skills. The initiative takes action throughout Finland and is a carbon sequestration project, aimed at planting 10,000 hectares of new forest by 2030, equating to 20 million trees. It focuses on afforestation and youth employment as part of its mission to combat climate change. It began in 2018 when a company approached the organisation to compensate for its emissions, leading to the development of a model where businesses and individuals can offset their carbon footprint by funding the planting of tree seedlings. The initiative hires teenagers, often for their first summer jobs, to carry out the planting. So far, over 450 hectares of new forests have been planted across 21 locations, employing approximately 850 teenagers. The initiative has also faced challenges in finding suitable wasteland for planting, but it continues to grow by acquiring and managing land for afforestation.

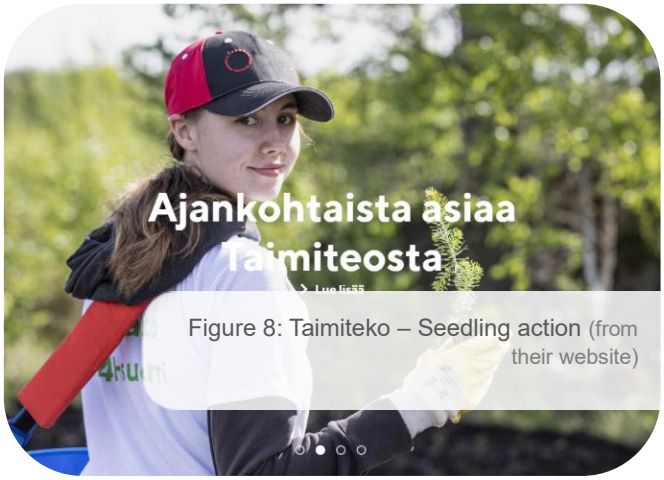

Figure 8: Taimiteko – Seedling action (from their website)

Promising potential

The initiative aligns with carbon neutrality goals and has a dual focus on carbon offsetting and youth employment[35]. The increasing demand for carbon sequestration solutions (e.g., due to the commitment of EU countries to becoming carbon neutral by 2050[36]), offers opportunities for such initiatives to arise. The EU carbon price is projected to be around 149€ per ton in 2030, providing financial incentives for afforestation and carbon sequestration projects[37]. Additionally, EU support through mechanisms like the European Green Deal and funding for carbon farming enhances the profitability of such ventures[38]. Initiatives like this could flourish in countries with robust policy frameworks, including subsidies and incentives for carbon sequestration and renewable energy

[35] Organisation manager of Taimiteko – Seedling action, personal communication, September 2024
[36] *2050 long-term strategy*. (n.d.). Climate Action. https://tinyurl.com/482af4sd
[37] BloombergNEF. (2024, February 22). *Global Carbon Market Outlook 2024 | BloombergNEF*. BloombergNEF. https://about.bnef.com/blog/global-carbon-market-outlook-2024/
[38] *Carbon removals and carbon farming*. (n.d.). Climate Action.https://tinyurl.com/yeym5z38

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projects (such as Finland[39] [40]). Finally, private forest owners and consumers appreciate the initiative's focus on afforestation and would be positive about allowing their children to join[41].

Limitations to Consider

The reliance on finding suitable wasteland for planting is challenging, as competition for land from other sectors, such as renewable energy (wind and solar projects), is increasing[42]. The EU carbon market is experiencing price volatility, with lower emissions from sectors like energy that could lead to an oversupply of carbon allowances, affecting the stability of carbon credit revenues[43].

Dictionary

- Carbon offsets: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Often used interchangeably with "carbon credits", (although "credits" do not necessarily have to be used to make claims or carbon neutrality or "offsetting" emissions).*"[44]
- Carbon sink: "*A carbon sink is anything that absorbs more carbon from the atmosphere than it releases – for example, plants, the ocean and soil*".[45]
- Carbon credits: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Used interchangeably with "carbon offsets", (although, in theory, a credit could be purchased by an entity wanting to contribute to climate action, but without claiming it has "offset" its own emissions).*"[46]
- *Carbon Farming: Based on the Carbon Cycle Institute[47], carbon farming is a way of managing land to help capture and store more carbon in plants and soil. By using eco-friendly practices, farmers can pull CO_2 from the air and lock it in the soil, improving its quality and making farms more productive. This approach helps fight climate change and boosts the overall health of the land.*

Read more

Information on Taimiteko – Seedling action is on their website, https://tinyurl.com/muyndy9w, and on their Facebook, Instagram and X (Twitter).

[39] *Finland is on track to meet some of the world's most ambitious carbon neutrality targets. This is how it has done it*. (2024, September 10). World Economic Forum. https://www.weforum.org/agenda/2023/06/finland-carbon-neutral-2035-goals/
[40] *Finland 2023 – Analysis - IEA*. (2023, May 1). IEA. https://www.iea.org/reports/finland-2023
[41] Online Survey results, December 2024, find out more in Annex 6
[42] Organisation manager of Taimiteko – Seedling action, personal communication, September 2024
[43] *EU Carbon Market Report: driving emission reductions and enabling climate and energy investment*. (2022, December 14). Climate Action. https://tinyurl.com/3n4suuay
[44] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[45] *What is a carbon sink?* (2020, December 22). ClientEarth. Retrieved November 7, 2024, from https://www.clientearth.org/latest/news/what-is-a-carbon-sink/
[46] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[47] Carbon Cycle Institute. (2021, June 4). *What is Carbon Farming? | Carbon Cycle Institute*. https://www.carboncycle.org/what-is-carbon-farming/

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3.3. Good Practice 3

Carbon credits through hedgerow carbon sequestration

Keywords: Hedgerows, carbon credits, farmers' association, voluntary carbon markets

Type of good practice: New products and services (Repurposing the business for society/ the environment)

Description

The initiative introduces a potential new revenue stream for farmers by selling carbon credits from hedgerows. This initiative is managed by a farmers' association, whose objective is to develop environmental services projects together with their farmer members. Farmers manage hedgerows sustainably, which can enhance biodiversity, improve crop yields, and sequester carbon, which is sold as carbon credits to companies seeking to offset their greenhouse gas emissions. The target clients are companies, particularly local firms and authorities, participating in voluntary carbon markets. A key innovation in this initiative is the certification of hedgerows for traceable carbon storage, helping to prevent double counting of credits. Additionally, the initiative encourages direct partnerships between farmers and local companies, potentially strengthening regional ties. Through this association, farmers may receive an additional yearly income coming from corporate sponsorships (corporate social responsibility) equivalent to the CO2 emissions that their projects manage to substitute for.

Figure 9: Carbon credits through hedgerow carbon sequestration (Source: ChatGPT and edited by the author)

Societal Impacts

1. Environmentally, the initiative may enhance biodiversity, reduce greenhouse gas emissions, and contribute to climate change mitigation by sequestering carbon in hedgerows.
2. Economically, the initiative could provide farmers with additional income through the sale of carbon credits, encouraging sustainable land management practices while supporting the local economy. On the other hand, uncertainty and low prices in the voluntary carbon market may make income for farmers less reliable.
3. Socially, it strengthens local communities by fostering collaborations between farmers, companies, and local authorities, creating a direct link between carbon offset efforts and regional stakeholders.

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Who, When and Where Can Adopt it

Small to medium-sized farmers in rural areas looking to (i) generate an additional revenue stream by selling carbon credits; (ii) maintain biodiversity and improve soil health; (iii) utilise traditional farming techniques; (iv) attract foreign investment for carbon offsets.

Farmers and private forest owners in countries with growing carbon markets: who (i) want to align with regulatory incentives and private-sector demand for carbon credits; (ii) seek to diversify their income through environmental services and capitalise on the financial incentives of carbon credit sales.

A real-life example

A real-life example is Solenat, a farmers' association created by farmers from Pays de la Loire region of France that supports farmers in carbon sequestration and biodiversity enhancement, primarily through sustainable hedgerow management. It was established in 2020 by the regional agricultural consular chamber and agricultural unions, and it develops environmental services projects with farmers, focusing on carbon sequestration and biodiversity enhancement. One of their main projects revolves around sustainable management of hedgerows, allowing farmers to sell carbon credits to companies seeking to offset their greenhouse gas emissions. They connect farmers with companies looking to offset carbon emissions, prioritising local partnerships and connecting farmers directly with regional companies, which prefer to invest locally rather than in foreign carbon markets. Since its founding, the initiative has involved over 280 farms in the carbon credits scheme, demonstrating considerable growth within four years, and it continues to expand its projects and partnerships.

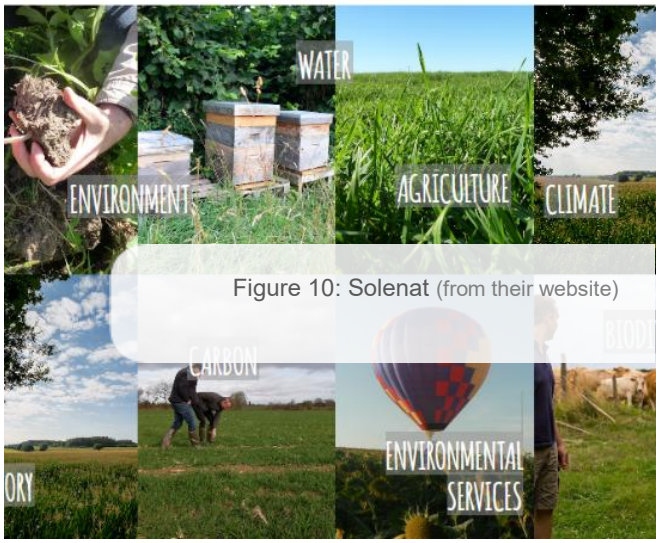

Figure 10: Solenat (from their website)

Promising potential

The initiative's strength lies in providing farmers with new revenue streams through sustainable practices that improve biodiversity, sequester carbon, and enhance crop productivity[48]. The voluntary carbon credit market is a promising external factor, particularly as companies increasingly prioritise local carbon offset projects to align with their corporate social responsibility and sustainability goals[49]. Additionally, as many countries are beginning to establish policy frameworks for carbon markets, the corporate demand for high-quality carbon credits is likely to rise, providing opportunities for further market expansion[50]. Finally, in areas where farms have

[48] Coordinator of Solenat, farmers' association, personal communication, October 2024
[49] Coordinator of Solenat, farmers' association, personal communication, October 2024
[50] The World Bank. 2024. "State and Trends of Carbon Pricing: International Carbon Markets," Washington, DC. https://openknowledge.worldbank.org/server/api/core/bitstreams/b98160d9-ca19-4a75-ad69-4b1d9e9319e3/content

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hedgerows (like in Belgium or Italy), most farmers would be interested in participating in an association that could certify and manage the hedgerows sustainably and sell carbon credits, allowing farmers to generate additional revenue streams[51].

Limitations to Consider

The relatively high cost of managing smaller agricultural projects compared to larger forest-based carbon projects can make these initiatives less competitive in the voluntary carbon market[52]. The carbon credits market suffers from low trading volume, limited financing (sellers deal with uncertain demand and often can't get good prices), few options for managing risks, and a lack of available data[53]. Moreover, other limitations include regulatory uncertainties, such as evolving standards for carbon credit verification and potential public scrutiny of greenwashing accusations, which could reduce demand or delay corporate investment[54]. Additionally, the recent volatility and slowdown in the global voluntary carbon market, caused by concerns about credit integrity and oversupply, may pose risks to revenue generation[55].

Dictionary

- Carbon credits: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Used interchangeably with "carbon offsets", (although, in theory, a credit could be purchased by an entity wanting to contribute to climate action, but without claiming it has "offset" its own emissions).*"[56]
- Carbon markets: "*Trading systems in which carbon credits can be bought and sold.*"[57]
- Carbon offsets: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Often used interchangeably with "carbon credits", (although "credits" do not necessarily have to be used to make claims or carbon neutrality or "offsetting" emissions).*"[58]

Read more

Information on Solenat is on their website, https://solenat.fr/, and on their Facebook, YouTube and X (Twitter).

[51] Online Survey results, December 2024, find out more in Annex 6
[52] Coordinator of Solenat, farmers' association, personal communication, October 2024
[53] Blaufelder, C., Levy, C., Mannion, P., & Pinner, D. (2021). A blueprint for scaling voluntary carbon markets to meet the climate challenge. In *McKinsey & Company*. https://www.mckinsey.com/capabilities/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge
[54] *Voluntary carbon markets in 2023: A bumpy road behind, crossroads ahead*. (2024, June 28). Bain. https://www.bain.com/insights/voluntary-carbon-markets-in-2023-a-bumpy-road-behind-crossroads-ahead/#
[55] Han, N. (2024, January 23). *Carbon markets: 5 things to look for in 2024 | Wood Mackenzie*. Wood Mackenzie. https://www.woodmac.com/news/opinion/carbon-markets-2024-outlook/
[56] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[57] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[58] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html

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3.4. Good Practice 4

Sustainable permaculture farming and agri-tourism

Keywords: permaculture, agri-tourism, regenerative agriculture, biodiversity,

Type of good practice: New markets and customers (Focus on a specific customer segment)

Description

A farm that offers sustainably produced farming products, such as olives, olive oil and vegetables combined with agri-tourism rental houses and educational workshops, targeting environmentally conscious consumers, volunteers, and digital nomads. It centres around cultivating olive trees and vegetables using permaculture principles, which can help restore soil health and enhance biodiversity. The model provides farm stays, organic product sales, and educational workshops, providing a combined eco-friendly experience. A key innovation lies in collaborating with local farmers to exchange resources and implement regenerative techniques, as well as involving volunteers for labour, reducing costs while providing them with accommodation and hands-on experience in regenerative agriculture. Additionally, the farm adopts circular economy practices, repurposing agricultural waste to help reduce environmental impact. The model is supported by a hybrid supply chain combining on-farm production, local input exchanges, and direct-to-consumer tourism and food sales.

Figure 11: Sustainable permaculture farming and agri-tourism (Source: ChatGPT)

Societal Impacts

1. Environmentally, the farm promotes soil regeneration, biodiversity, and sustainable land use through permaculture and circular economy practices.
2. Economically, it could provide income stability by diversifying revenue streams through agri-tourism, organic product sales, and reducing costs via volunteer contributions, all while encouraging local farmers to adopt more sustainable practices. However, relying on unpaid volunteers, even if compensated in other ways, could create a problematic example of work without pay (particularly in volatile economies like Greece's.).
3. Socially, it builds a strong community by engaging volunteers and local farmers, creating a network that shares knowledge and resources while fostering inclusivity and environmental awareness through educational workshops.

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Who, When and Where Can Adopt it

Small and medium-sized farmers that want to (i) receive an additional (or diversified) income, (ii) face soil degradation or biodiversity loss; (iii) capitalise on government incentives (e.g., subsidies for eco—certifications).

Tourism operators looking to (i) go beyond traditional sightseeing and provide customers with a unique experience; (ii) expand (or diversify) their activities to eco- or agro-tourism, especially in areas with rich cultural heritage or unique biodiversity.

A real-life example

A real-life example is the farm Dio Pigadia, based in Mesochori, Messinia, Greece. It was founded by two individuals concerned about the future of the environment, who desired to produce food sustainably. Initially focused on sustainable food production, the farm's business model evolved as a community of volunteers formed around it, prompting a shift towards agri-tourism and educational workshops. The model now integrates regenerative agricultural practices, eco-tourism, and hands-on educational experiences. Over the past six years, the farm has achieved financial sustainability through diverse revenue streams, including agri-tourism, organic product sales, and EU/private funding. Its achievements include fostering biodiversity, building strong community ties with local farmers, and receiving positive feedback from volunteers and visitors.

Figure 12: Dio Pigadia (from their website)

Promising potential

The firm's diversified revenue streams—such as direct sales of organic produce, farm stays, and educational workshops—enhance financial stability by tapping into various markets[59]. The use of regenerative agriculture also reduces input costs by restoring soil health and using natural resources efficiently, making the business less dependent on external inputs like fertilisers[60]. At the same time, regulatory frameworks, such as the EU's Common Agricultural Policy (CAP) and Farm to Fork strategy, provide incentives for sustainable practices[61,62]. Companies adopting this model can capitalize on a shift toward environmentally conscious consumers (as retail sales for

[59] Manager of the Dio Pigadia project, personal communication, July 2024
[60] Manager of the Dio Pigadia project, personal communication, July 2024
[61] BCG (2022) Agribusiness Can Lead the Shift to Sustainable Farming
[62] *Sustainable agricultural practices and methods*. (accessed 2024, September 13). Agriculture and Rural Development. https://agriculture.ec.europa.eu/sustainability/environmental-sustainability/sustainable-agricultural-practices-and-methods_en

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organic products have increased by over 128% between 2009 and 2019[63]) and the growth in the farming and tourism sectors[64,65]. Finally, 25% of consumers would choose sustainable tourism if the price was not too high, and most consumers (56%) would be willing to sometimes give up the convenience of a nearby supermarket for a smaller, more distant one that sells agricultural products from a local farm that uses regenerative farming practices[66].

Limitations to Consider

It can be labour-intensive (permaculture operations) and complex in terms of the management of multiple revenue streams (e.g., regenerative farming, tourism, educational services, and community engagement)[67]. The reliance on volunteers and community input could lead to operational instability if these resources become less available[68]. At the same time, rising costs for organic certification and regulatory compliance (especially regarding pesticide-free and regenerative claims) pose significant challenges[69]. Furthermore, the agri- and eco-tourist market may face fluctuations due to economic conditions or global events (such as pandemics). Additionally, rising global input costs, particularly for energy and water management, could further affect the profitability of such an endeavour[70].

Dictionary

- Permaculture: *"Permaculture is an approach to land management that creates high-yielding, low-energy, self-perpetuating systems by which the functions of animals, plants, humans, and earth are integrated to maximise their value and create sustainable human habitats. Permaculture brings together disciplines relating to food, shelter, energy, water, waste management, economics, and social sciences. It aims to maximise a site's productivity while maintaining ecosystems and restoring damaged land to a healthy, life-promoting state."*[71] The term was first introduced by Bill Mollison.
- Biodiversity: *"Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter."*[72]
- *Regenerative agriculture: Regenerative agriculture is an advanced approach to farming that prioritises restoring soil health, promoting biodiversity, and improving the ecosystem's*

[63] *Organic action plan*. (accessed 2024, September 17). Agriculture and Rural Development. https://agriculture.ec.europa.eu/farming/organic-farming/organic-action-plan_en
[64] Malorgio, G., & Marangon, F. (2021). Agricultural business economics: the challenge of sustainability. *Agricultural and Food Economics*, *9*(1). https://doi.org/10.1186/s40100-021-00179-3
[65] Klein, O., Nier, S., & Tamásy, C. (2022). Circular agri-food economies: business models and practices in the potato industry. *Sustainability Science*, *17*(6), 2237–2252. https://doi.org/10.1007/s11625-022-01106-1
[66] Online Survey results, December 2024, find out more in Annex 6
[67] Manager of the Dio Pigadia project, personal communication, July 2024
[68] Manager of the Dio Pigadia project, personal communication, July 2024
[69] Brennan, T., Bryan, S., Byrne, S., & Rogers, C. (2023). *Building food and agriculture businesses for a green future*. McKinsey & Company. https://www.mckinsey.com/industries/agriculture/our-insights/building-food-and-agriculture-businesses-for-a-green-future
[70] The European Business Review. (2023). *Sustainable Agriculture: Balancing Profitability and Environmental Responsibility - The European Business Review*. https://www.europeanbusinessreview.com/sustainable-agriculture-balancing-profitability-and-environmental-responsibility/
[71] *Permaculture | Encyclopedia.com*. (n.d.). https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/permaculture
[72] WWF. (n.d.). *What is biodiversity? why it's under threat and why it matters*. WWF. Retrieved November 5, 2024, from https://www.worldwildlife.org/pages/what-is-biodiversity

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natural functions which shifts the focus from merely reducing harm to actively revitalising the land and environment [73] [74].

- *Agri-tourism: Agri-tourism (also agro-tourism) is a type of tourism where visitors experience life on a farm or other agricultural setting, blending agricultural production with recreational or educational activities (such as farm tours, seasonal events like apple picking, workshops on cheese-making, or staying at rural bed-and-breakfasts)[75].*

Read more

Information on Dio Pigadia is on their website, https://dio-pigadia.com/, and on their LinkedIn and Instagram: @diopigadia.

[73] Sustainable Harvest International. (2024, October 2). *What is Regenerative Agriculture, and Why Does It Matter? — Sustainable Harvest International: Regenerative Agriculture for People + the Planet*. Sustainable Harvest International: Regenerative Agriculture for People + the Planet. https://www.sustainableharvest.org/blog/what-is-regenerative-agriculture-2024

[74] *What is regenerative agriculture?* (2024, September 10). World Economic Forum. https://www.weforum.org/stories/2022/10/what-is-regenerative-agriculture/

[75] IICA Agritourism. (2023, August 16). *What is Agritourism? - IICA Agritourism*. https://agritourism.iica.int/what-is-agritourism/

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3.5. Good Practice 5

Sustainable organic farming with direct and online sales

Keywords: Organic farming, direct sales, online sales, vulnerable groups	*Type of good practice:* New markets and customers & Changes in distribution and sales channels (Focus on a specific customer segment, Face to face, Online trade)

Description

A farm producing and selling organic agricultural products at slower paces while closing nutrient cycles and utilising direct and online sales. Its products include crops like spring barley, triticale, and potatoes, along with vegetables and animal products like beef and eggs. The initiative primarily targets consumers through direct sales in short supply chains, using an online shop and a local farm shop, with sales mainly coming from the web shop. It has a cooperative form and offers employee farmers the possibility of becoming a member. Key innovative aspects of the initiative include its combination of organic farming with "green care," integrating vulnerable groups in society and pursuing environmental sustainability through agricultural nature management and closing nutrient cycles. The value proposition is that the farm offers high-quality, ethically produced local food tailored to a specific segment of environmentally and socially conscious consumers, selling products both directly through farm shops and online, thereby combining convenience, sustainability, and direct engagement between producers and customers.

Figure 13: Sustainable organic farming with direct and online sales (Source: ChatGPT)

Societal Impacts

1. On the environmental side, the initiative emphasises organic farming practices, including maintaining buffer strips and wooded edges, which enhance biodiversity and contribute to sustainable land management. Additionally, it supports nutrient cycling by using livestock to convert agricultural waste into manure, which is then applied to crops, minimising waste and enhancing soil health.

2. Economically, the initiative promotes direct sales through short supply chains, fostering local economic resilience and autonomy. Nonetheless, transitioning to organic farming requires significant upfront investments and certification-related administrative work, which can be especially challenging for small farms.

3. The initiative creates social impact by involving vulnerable groups, such as individuals with disabilities or mental health issues, in farm activities through a "green care" initiative. This provides these individuals with a therapeutic environment and meaningful day-time activities.

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Who, When and Where Can Adopt it

Small or Medium-Sized Farmers in regions with strong consumer demand for organic and sustainable products who want to (i) sell products at a premium price; (ii) reduce dependency on large buyers, ensuring more autonomy by selling directly to consumers via farm shops and web shops; (iii) attract additional government subsidies and community support (by combining organic production with social care initiatives).

Farmers in degraded land areas: who want to regenerate the soil health by integrating organic farming with livestock to close nutrient cycles; (ii) attract subsidies for sustainable practices.

A real-life example

A real-life example is a farm[76], located in north-eastern Belgium. The initiative started as a traditional dairy farm in the 1950s and underwent several transitions, shifting from dairy to beef cattle in the 1990s due to declining milk prices. In 2008 it embraced organic farming and direct consumer sales, transforming from a family business into a cooperative venture involving independent farmers. The farm now focuses on organic agriculture, producing vegetables, grains, and beef while selling primarily through direct channels such as a local farm shop and online store (with two-thirds of sales made through the online store). It also integrates social initiatives, providing work opportunities for vulnerable groups ("green care" initiative). The farm operates on 30 hectares, producing over 50 types of vegetables annually.

Figure 14: Farm, located in north-eastern Belgium (Source: ChatGPT)

Promising potential

The initiative's focus on organic production and short supply chains, such as direct sales via a web shop and local farm store, enables it to maintain high product quality and customer loyalty[77]. The integration of "green care" initiatives, where vulnerable groups are involved in farm activities, adds a unique social dimension, further enhancing community support and brand differentiation[78]. The organic farming sector is growing steadily, supported by increasing consumer demand for healthier and more sustainable food options[79]. In Europe, the organic farming market is projected to grow at a robust CAGR of 9.8% until 2034, driven by strong consumer preferences and supportive government policies, such as the European Union's Green Deal and Farm to Fork

[76] The farm owner did not provide permission to mention the farm's name, so it will not be mentioned in the report.
[77] Owner of the farm located in north-eastern Belgium, personal communication, October 2024
[78] Owner of the farm located in north-eastern Belgium, personal communication, October 2024
[79] Prophecy Market Insights. (2024, June 1). *Europe Organic Farming Market Size, Share, By Farming Type (Pure Organic Farming and Integrated Organic Farming), By Method (Crop Diversity, Weed Management, soil management and Controlling Other Organisms) and By Country (UK, Germany, France, Russia, Italy and Rest of Europe) - Trends, Analysis and Forecast till 2034*. https://www.prophecymarketinsights.com/market_insight/europe-organic-farming-market-5385

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strategies[80]. Finally, most consumers would be willing to pay a little more (51,2% of respondents) or quite more (16,7%) to buy organic agricultural products grown in small local farms[81]. The possibility of supporting a farm that provides work opportunities to vulnerable groups also seems to be perceived positively by consumers[82].

Limitations to Consider

The high labour intensity of organic farming, especially without the use of herbicides, and the need for continuous manual work (e.g., weed control) can increase operational costs and strain profitability[83]. Moreover, the emphasis on direct sales demands significant time and resources for communication, order processing, and delivery, reducing the time available for core farming activities[84]. Transitioning to organic farming comes with significant upfront investments and administrative challenges related to certification, which can be particularly burdensome for small farms[85] [86] [87]. Furthermore, organic farms typically yield 5-30% less than conventional ones, creating a reliance on higher prices and subsidies to remain profitable[88]. While the EU's Green Deal and Farm to Fork strategy aim to expand organic farming to 25% of agricultural land by 2030, this ambitious target brings challenges[89]. Consumer purchasing power, especially during periods of economic instability or inflation, could affect the demand for premium-priced organic products, limiting growth[90] [91]. Furthermore, the EU's new organic regulations tighten requirements and restrict certain practices, adding complexity for farmers looking to convert[92]. Climate change also remains a critical threat, with increased unpredictability in weather patterns affecting yields, particularly in regions heavily reliant on organic practices[93] [94] [95].

[80] Prophecy Market Insights. (2024, June 1). *Europe Organic Farming Market Size, Share, By Farming Type (Pure Organic Farming and Integrated Organic Farming), By Method (Crop Diversity, Weed Management, soil management and Controlling Other Organisms) and By Country (UK, Germany, France, Russia, Italy and Rest of Europe) - Trends, Analysis and Forecast till 2034*. https://www.prophecymarketinsights.com/market_insight/europe-organic-farming-market-5385
[81] Online Survey results, December 2024, find out more in Annex 6
[82] Online Survey results, December 2024, find out more in Annex 6
[83] Owner of the farm located in north-eastern Belgium, personal communication, October 2024
[84] Owner of the farm located in north-eastern Belgium, personal communication, October 2024
[85] European Court of Auditors (2024). *Special report "Organic farming in the EU - Gaps and inconsistencies hamper the success of the policy"*. Luxembrurg: European Union. https://www.eca.europa.eu/ECAPublications/SR-2024-19/SR-2024-19_EN.pdf
[86] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
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[88] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
[89] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
[90] European Court of Auditors (2024). *Special report "Organic farming in the EU - Gaps and inconsistencies hamper the success of the policy"*. Luxembrurg: European Union. https://www.eca.europa.eu/ECAPublications/SR-2024-19/SR-2024-19_EN.pdf
[91] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
[92] foodnavigator.com. (2021, March 2). *The future of organic farming in Europe: How the new Regulation tightens the rules*. https://www.foodnavigator.com/Article/2021/03/02/The-future-of-organic-farming-in-Europe-How-the-new-Regulation-tightens-the-rules
[93] European Court of Auditors (2024). *Special report "Organic farming in the EU - Gaps and inconsistencies hamper the success of the policy"*. Luxembrurg: European Union. https://www.eca.europa.eu/ECAPublications/SR-2024-19/SR-2024-19_EN.pdf
[94] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
[95] EC (2023), Organic farming in the EU – A decade of organic growth, January 2023. European Commission, DG Agriculture and Rural Development, Brussels. https://agriculture.ec.europa.eu/system/files/2023-04/agri-market-brief-20-organic-farming-eu_en.pdf

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3.6. Good Practice 6

Precision and technology-driven sustainable agriculture for high-value crops

Keywords: precision agriculture, sustainable agriculture, high value crops, decision support system, Integrated Pest Management	*Type of good practice:* Changes in key activities and production (Maximising material and energy productivity and efficiency)

Description

A farm utilising contemporary and smart technologies for viticulture and aiming to provide high-quality agricultural products. The target market includes mid-to-high-end customers such as wine shops, restaurants, and local stores. The firm's model emphasises the use of precision agriculture and cutting-edge technology, such as satellite-guided tractors and automated irrigation systems, which can reduce the need for chemical inputs and pesticides (enabling integrated pest management) and allow real-time adaptation to environmental conditions. A notable innovation is the farm's integration with a decision support system (DSS) to support cultivation decisions and help minimise environmental impact. This approach seeks to improve product quality while maintaining sustainability in production.

Figure 15: Precision and technology driven sustainable agriculture for high-value crops (Source: ChatGPT)

Societal Impacts

1. Environmental impact by reducing the use of chemical inputs and minimising their spreading in the environment through the adoption of precision agriculture technologies. This approach lowers carbon emissions by using modern, efficient machinery and rationalises water usage, addressing the risk of drought and enhancing resource efficiency.

2. Economically, it optimises production costs without compromising yields, supporting the farm's resilience. On the other hand, the high costs of precision equipment may make it difficult for smaller farms to participate, increasing economic gaps in the sector.

3. Socially, it contributes to the local community by promoting sustainable farming practices.

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Who, When and Where Can Adopt it

Farmers specialising in high-value crops who want to (i) deliver consistent, high-quality output; (ii) meet increasing consumer demand for sustainable, high-end products; (iii) reduce production costs; (iv) have competitive advantages in niche markets where premium products are valued.

Foresters and private forest owners in regions affected by climate change: looking to (i) monitor and mitigate the impact of adverse events such as fires or drought; (ii) maintain productivity while protecting natural resources.

A real-life example

A real-life example is a farm in Amelia, Umbria, Italy, which operates approximately 200 hectares of land. Originally a family-run business, it has expanded through the acquisition of both owned and leased land. Over time, the company has shaped its BM around sustainability and innovation, adopting precision agriculture tools and integrating advanced technologies such as satellite-guided machinery and decision support systems. These innovations have allowed the company to reduce chemical use and increase efficiency. Notably, the farm applies Integrated Pest Management (IPM) and utilizes real-time monitoring systems for irrigation and climate adaptation. It has also expanded into direct sales of high-quality wine, produced with environmentally friendly methods, and has achieved success with customer loyalty from wine shops and restaurants due to its quality and price balance.

Promising potential

Precision tools such as automated machinery, satellite-guided systems, and real-time data platforms help reduce water use, fertilisers, and chemicals, lowering costs while boosting productivity and environmental sustainability[96]. These innovations appeal to eco-conscious consumers and premium markets, enhancing profitability[97]. Moreover, growing regulatory support and financial incentives from programs like the European Agricultural Fund for Rural Development (EAFRD) promote the adoption of such technologies[98]. Increasing consumer demand for sustainable and high-quality products, coupled with the resilience these technologies provide against climate change, sets up the firm for more growth[99] [100]. Finally, many farmers see the further adoption of precision agriculture and cutting-edge technologies as crucial to their long-term sustainability and would like to increase their use[101], indicating a positive attitude towards precision agriculture.

[96] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[97] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[98] *European Agricultural Fund for Rural Development (EAFRD)*. (n.d.). European Commission. https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/european-agricultural-fund-rural-development-eafrd_en
[99] Blasch, J., Van Der Kroon, B., Van Beukering, P., Munster, R., Fabiani, S., Nino, P., & Vanino, S. (2020). Farmer preferences for adopting precision farming technologies: a case study from Italy. *European Review of Agricultural Economics*, *49*(1), 33–81. https://doi.org/10.1093/erae/jbaa031
[100] Digest, A. (n.d.). *Precision Agriculture: Navigating the present and future of farming*. AgTech Digest. https://agtechdigest.com/p/precision-agriculture-navigating
[101] Online Survey results, December 2024, find out more in Annex 6

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Limitations to Consider

The high upfront costs of acquiring precision agriculture technologies, along with the need for ongoing maintenance, training, and technical expertise, can limit adoption, especially for smaller farms[102]. The complexity of integrating various technologies and managing vast amounts of data may pose additional hurdles[103] [104]. Regulatory barriers, such as restrictive regional legislation around water usage and reservoir creation, can hinder the full potential of these innovations[105] [106] [107]. Additionally, market volatility, including low compensation for primary agricultural products, presents a threat to profitability[108].

Dictionary

Precision Agriculture: Precision agriculture, based on the work of Shafi et al. [109], involves using technology like sensors, drones, and Internet of Things (IoT) devices to collect real-time data on soil conditions, crop health, and environmental factors. This data helps farmers optimise their farming practices, applying resources such as water and fertilisers precisely where needed. The goal is to maximise crop yields, minimise waste, and enhance sustainability. This modern approach allows more efficient and informed farm management, reducing environmental impact and improving productivity.

[102] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[103] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[104] Digest, A. (n.d.). *Precision Agriculture: Navigating the present and future of farming*. AgTech Digest. https://agtechdigest.com/p/precision-agriculture-navigating
[105] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[106] Blasch, J., Van Der Kroon, B., Van Beukering, P., Munster, R., Fabiani, S., Nino, P., & Vanino, S. (2020). Farmer preferences for adopting precision farming technologies: a case study from Italy. *European Review of Agricultural Economics*, *49*(1), 33–81. https://doi.org/10.1093/erae/jbaa031
[107] *Precision Agriculture: Benefits and Challenges for technology adoption and use*. (2024, January 31). U.S. GAO. https://www.gao.gov/products/gao-24-105962
[108] Advisor manager in Albano Agabiti's farm, personal communication, September 2024
[109] Shafi, U., Mumtaz, R., García-Nieto, J., Hassan, S. A., Zaidi, S. a. R., & Iqbal, N. (2019). Precision Agriculture Techniques and Practices: From Considerations to applications. *Sensors*, *19*(17), 3796. https://doi.org/10.3390/s19173796

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3.7. Good Practice 7

Firm offering precision agriculture tools and consultancy

Keywords: precision agriculture, consultancy, Carbon Farming, agricultural machinery, training, certification	*Type of good practice:* Changes in key activities and production (Maximising material and energy productivity and efficiency)

Description

A firm that provides precision agriculture tools, training and consultancy services to farmers (and private forest owners), with a focus on sustainability and innovation. It offers a variety of products, including the sale, service, and rental of agricultural machinery, spare parts, and used equipment. The firm also provides specialized training and certification, empowering farmers to maximise the benefits of precision agriculture. A key innovative aspect of this firm's model is its promotion of carbon farming, using data-driven methods to improve farming practices and soil health, and to reduce environmental impact, contributing to modern sustainability goals.

Figure 16: Firm offering precision agriculture tools and consultancy (Source: ChatGPT)

Societal Impacts

1. From an environmental point of view, through the promotion of carbon farming and precision agriculture, the firm helps their clients reduce fuel consumption and greenhouse gas emissions, contributing to climate change mitigation.
2. Economically, it helps farmers optimise their operations, reducing costs and increasing efficiency, particularly through data-driven methods and innovations that enable better resource management and productivity on farms. However, the financial benefits of carbon farming depend on the unstable carbon credit market, which can make farmers' income uncertain.
3. Socially, the firm emphasises education, offering training to farmers and engaging with schools to raise awareness about sustainable farming practices.

Who, When and Where Can Adopt it[110]

Groups of professionals **who could benefit from buying services and machinery by a firm like** this, to shift towards precision agriculture combined with carbon farming, could be:

[110] The text included here explains who could benefit from buying services and machinery from a firm like this, to shift towards precision agriculture combined with carbon farming in order to examine the potential for farmers and foresters.

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Entrepreneurs or cooperatives managing farms in emerging markets who want to (i) be able to afford the upfront costs of precision agriculture tools by collectively investing in common resources; (ii) become sustainable; (iii) take advantage of carbon credits; and (iv) adopt more efficient land management practices.

Farmers in areas with strong regulatory support for carbon farming who want to (i) gain financial benefits (additional income) from carbon credit; (ii) meet new legal standards; (iii) reduce their environmental impact; all while (iv) maintaining or improving productivity.

A real-life example

A real-life example is Dojus Agro, a firm based in Vilnius, Lithuania, that has over 30 years of experience in the agricultural sector, offering precision agriculture solutions, machinery sales, rentals, and services. Initially focused on addressing labor shortages through advanced agricultural machinery, it has evolved by incorporating precision agriculture and sustainable practices such as carbon farming. The company has grown significantly, expanding into Latvia and employing innovative approaches like remote machine programming and soil testing. The firm has achieved growth, with its precision agriculture division expanding by about 30% annually over the past 11 years. It now employs a team of around 25 experts across Lithuania and Latvia.

Figure 17: Dojus Agro (from their website)

Promising potential[111]

The use of advanced technology—such as remote machine programming and precision tools—enables efficiency gains for farmers, reducing costs and improving productivity[112]. The firm's offering of training removes one of the most crucial barriers to adopting precision agriculture and cutting-edge technologies: the lack of technical expertise to use the equipment effectively[113]. Moreover, carbon farming practices enable farmers and land managers to generate carbon credits and open up new revenue streams by participating in carbon markets[114]. Growing demand for carbon credits, driven by regulatory initiatives (such as the EU's "Fit for 55" climate package or the EU Carbon Removals and Carbon Farming Certification Regulation, etc.) and increasing corporate commitments to carbon neutrality, can provide an additional revenue stream for

[111] The text included here explains the promising potential of adopting precision agriculture and carbon farming practices in order to examine the potential for farmers and foresters.
[112] Head of precision agriculture in Dojus agro, personal communication, September 2024
[113] Online Survey results, December 2024, find out more in Annex 6
[114] *Carbon Farming: Opportunities for agriculture and farmers to gain from decarbonization*. (n.d.). S&P Global. https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization

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farmers[115] [116] [117]. The carbon farming market is projected to grow as more companies seek offsets, and carbon prices rise to incentivize sustainable farming practices[118] [119]. Companies following this direction can leverage the trend toward sustainable agriculture while capitalizing on government support and private sector investment in carbon credits[120] [121] [122].

Limitations to Consider[123]

The long-term commitment required to data collection and analysis before substantial benefits can be realized may deter farmers seeking immediate returns[124]. Even though carbon farming opens up a door for carbon credits for the farmers, the regulatory landscape, while supportive of carbon reduction, is complex and inconsistent across regions, leading to uncertainties in carbon credit pricing and market access[125] [126]. Additionally, the economic success of carbon farming initiatives depends on the market price of carbon credits, which remains volatile and can vary widely based on geographic and market conditions[127].

Dictionary

- Precision agriculture: *"Precision agriculture is an umbrella term for using modern data-driven technologies for growing crops. [..] It provides an improved understanding of the spatial demands of a particular agricultural area, which can be coupled with highly accurate decision support tools and early warning systems. Application of these tools prevents wasteful actions, and provides information for timely management. [..] This allows farmers to control important processes remotely, saving time, energy and resources. The technologies used in precision agriculture are constantly evolving. The Internet of Things (IoT), Big Data analysis, artificial intelligence (AI), and machine learning could all be used, optimised and combined to make informed management decisions."*[128]

[115] *Carbon Farming: Opportunities for agriculture and farmers to gain from decarbonization*. (n.d.). S&P Global. https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization
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[117] *Carbon removals and carbon farming*. (n.d.-c). Climate Action. https://climate.ec.europa.eu/eu-action/carbon-removals-and-carbon-farming_en
[118] *Carbon Farming: Opportunities for agriculture and farmers to gain from decarbonization*. (n.d.). S&P Global. https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization
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[120] *Carbon Farming: Opportunities for agriculture and farmers to gain from decarbonization*. (n.d.). S&P Global. https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization
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[122] Lorenzetti, L. A., & Fiorini, A. (2023). Conservation agriculture impacts on economic profitability and environmental performance of agroecosystems. *Environmental Management*, *73*(3), 532–545. https://doi.org/10.1007/s00267-023-01874-1
[123] The text included here explains the limitations of adopting precision agriculture and carbon farming practices in order to examine the limitations farmers and foresters might face.
[124] Lorenzetti, L. A., & Fiorini, A. (2023). Conservation agriculture impacts on economic profitability and environmental performance of agroecosystems. *Environmental Management*, *73*(3), 532–545. https://doi.org/10.1007/s00267-023-01874-1
[125] *Carbon Farming: Opportunities for agriculture and farmers to gain from decarbonization*. (n.d.). S&P Global. https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization
[126] *Carbon farming: A transition path for agriculture & forestry* (February 10, 2022) Allianz. https://www.allianz.com/en/economic_research/insights/publications/specials_fmo/2022_02_10_Forestry_Agriculture_Pathway.html
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[128] European Climate Adaptation Platform Climate-ADAPT (2023). *Precision agriculture*. https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/precision-agriculture

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- *Carbon Farming: Based on the Carbon Cycle Institute[129], carbon farming is a way of managing land to help capture and store more carbon in plants and soil. By using eco-friendly practices, farmers can pull CO_2 from the air and lock it in the soil, improving its quality and making farms more productive. This approach helps fight climate change and boosts the overall health of the land.*
- Carbon credits: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Used interchangeably with "carbon offsets", (although, in theory, a credit could be purchased by an entity wanting to contribute to climate action, but without claiming it has "offset" its own emissions).*"[130]
- Carbon markets: "*Trading systems in which carbon credits can be bought and sold.*"[131]
- Carbon offsets: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Often used interchangeably with "carbon credits", (although "credits" do not necessarily have to be used to make claims or carbon neutrality or "offsetting" emissions).*"[132]

Read more

Information on Dojus Agro is on their website, https://www.dojusagro.lt/, and on their Facebook, YouTube, Instagram and LinkedIn.

[129] Carbon Cycle Institute. (2021, June 4). *What is Carbon Farming? | Carbon Cycle Institute*. https://www.carboncycle.org/what-is-carbon-farming/
[130] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[131] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[132] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html

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3.8. Good Practice 8

Cooperative for grain management with Pay-for-Data solutions

Keywords: Grain management, agricultural cooperative, "Pay for Data", real-time data management and analytics	*Type of good practice*: Changes in key partners and forms of collaborations & Changes in key resources and investments in assets (Producer organisation models, Developing scale-up solutions)

Description

A cooperative of farmers that offers a grain handling service for small-scale farmers, utilizing a "Pay for Data" model that leverages real-time data management and analytics. The cooperative reduces the burden of grain handling from farmers who now don't need to do this individually. At the same time, it gathers data through a data analytics model and performs high-quality data analysis in the areas of logistics and energy required for grain drying and cleaning. This helps them reduce logistics and energy costs as they avoid unnecessary movements and cut energy consumption, leading to reduced operational costs and precise energy and resource management for their members. The cooperative's main activities include trading grain, storing grain (grain elevator services) and providing fertilisers and pesticides to members. Their members are primarily local farmers seeking cost-efficient grain drying, cleaning, and logistics. One of the key aspects of the cooperative is the precise energy management in grain processing, reducing environmental impact.

Figure 18: Cooperative for grain management with Pay-for-Data solutions (Source: ChatGPT)

Another innovative element is that the cooperative members only pay for the specific data they need, which minimises costs and improves decision-making.

Societal Impacts

1. The initiative impacts society through its focus on sustainability and economic empowerment for small-scale farmers. By optimising energy use in grain drying and cleaning, it reduces environmental impact, contributing to more

2. Economically, the model enhances profitability for farmers by lowering operational costs and improving efficiency, allowing them to save resources and increase their income through better market timing and reduced reliance on intermediaries. However, the benefits of the cooperative may be limited by the costs and

3. Socially, the model strengthens community ties by fostering trust and collaboration among cooperative members, encouraging them to actively manage their grain flows and make

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sustainable farming practices.	technical skills required to use data-driven systems, which could restrict participation for some small-scale farmers.	better-informed decisions.

Who, When and Where Can Adopt it

Small to medium-scale grain farmers with limited capital who through a cooperative structure want to (i) take advantage of EU regulations promoting sustainability; (ii) access advanced technologies; (iii) optimise costs; (iv) overcome market barriers; (v) have more efficient logistics; (vi) better manage resources.

Foresters, private forest owners or agroforestry entrepreneurs who want to (i) use real-time data to optimise energy consumption and resource management in timber drying and transport; (ii) reduce operational costs; (iii) ensure compliance with environmental standards (especially appealing if they are involved in sustainable forestry certification programs).

A real-life example

A real-life example is the Joniškis aruodas agricultural cooperative located in the Joniškis district of Lithuania, formed by local farmers in response to a lack of strong cooperation models before the 2000s. It was founded in 2007 by 54 farmers managing 10,000 hectares of land and has since grown to 84 members managing 15,000 hectares of land. Supported by EU initiatives, the cooperative was created to address logistical challenges in grain handling and energy management. Over time, it adopted the innovative "Pay for Data" model, which leverages real-time data management to optimise grain drying, cleaning, and logistics (members of the cooperative pay for the specific data they need to optimise e.g., their logistical efficiency, energy usage for grain drying and cleaning and grain handling). The cooperative manages a modern grain elevator with a 50,000-ton capacity and has improved operational efficiency and sustainability. It offers grain trading, storage services, and the supply of fertilisers and pesticides.

Figure 19: Joniškis aruodas (from their website)

The cooperative annually handles over 120,000 tons of grains, rapeseed, and legumes, and processes around 100,000 tons of grain in its elevator. In recent years, it has sold about 15,000 tons of fertilisers and pesticides, generating approximately €2.5 million in sales. Through collective efforts, it has strengthened its community, reduced costs, and increased profitability for its farmer members.

Promising potential

The initiative's data-driven decision-making and efficient logistics offer growth potential. Real-time data management enhances operational efficiency, allowing for reduced energy use and better grain handling, which directly lowers costs and increases profitability[133]. Global trends towards

[133] General Director of Joniškis aruodas, personal communication, September 2024

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sustainability and digital transformation in agriculture provide opportunities for this initiative. The European Green Deal, for example, promotes sustainable food systems, encouraging transitions to models that minimise resource use and environmental impacts[134] [135]. Additionally, as digital technologies become more embedded in agriculture, cooperatives that use precision farming tools, like real-time data analysis, are well-positioned to expand due to the rising demand for more sustainable and efficient farming practices[136]. Finally, many farmers would be interested in joining an association that uses digital solutions, which could undertake the burden of storing, processing (e.g., drying, cleaning), and logistics or help them do it more efficiently[137].

Limitations to Consider

The reliance on advanced technology and real-time data means that high initial investments in infrastructure and training are required, which can be a barrier for cooperatives with limited capital[138]. Furthermore, fluctuating grain prices and the volatile global economy can threaten profitability, especially in regions where grain farming is sensitive to market shifts[139]. Environmental regulations, while encouraging sustainability, may also impose additional costs related to compliance and adaptation, adding pressure to cooperatives that may not have the flexibility to quickly adjust their operations[140].

Dictionary

Precision agriculture: *"Precision agriculture is an umbrella term for using modern data-driven technologies for growing crops. [..] It provides an improved understanding of the spatial demands of a particular agricultural area, which can be coupled with highly accurate decision support tools and early warning systems. Application of these tools prevents wasteful actions, and provides information for timely management. [..] This allows farmers to control important processes remotely, saving time, energy and resources. The technologies used in precision agriculture are constantly evolving. The Internet of Things (IoT), Big Data analysis, artificial intelligence (AI), and machine learning could all be used, optimised and combined to make informed management decisions."*[141]

Read more

Information on Joniškis aruodas is on their website, https://www.joniskioaruodas.lt/.

[134] Malorgio, G., & Marangon, F. (2021). Agricultural business economics: the challenge of sustainability. *Agricultural and Food Economics*, *9*(1). https://doi.org/10.1186/s40100-021-00179-3
[135] Bilali, H. E., Strassner, C., & Hassen, T. B. (2021). Sustainable Agri-Food Systems: environment, economy, society, and policy. *Sustainability*, *13*(11), 6260. https://doi.org/10.3390/su13116260
[136] Malorgio, G., & Marangon, F. (2021). Agricultural business economics: the challenge of sustainability. *Agricultural and Food Economics*, *9*(1). https://doi.org/10.1186/s40100-021-00179-3
[137] Online Survey results, December 2024, find out more in Annex 6
[138] General Director of Joniškis aruodas, personal communication, September 2024
[139] Berge, S. T., Bokoumbo, K., Johnson, K. A., Yabi, J. A., & Yegbemey, R. N. (2021). Cooperative Development: Sustainability Agricultural Planning viewed through Cooperative Equilibrium Management Theory in Togo, Africa. *Frontiers in Sustainable Food Systems*, *5*. https://doi.org/10.3389/fsufs.2021.758363
[140] Malorgio, G., & Marangon, F. (2021). Agricultural business economics: the challenge of sustainability. *Agricultural and Food Economics*, *9*(1). https://doi.org/10.1186/s40100-021-00179-3
[141] European Climate Adaptation Platform Climate-ADAPT (2023). *Precision agriculture*. https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/precision-agriculture

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3.9. Good Practice 9

Data-as-a-Service for precision agriculture

Keywords: Precision agriculture, Data-as-a-Service, agricultural digital solutions, pay-per-use access to technologies	*Type of good practice:* Changes in key activities and production (Maximising material and energy productivity and efficiency)

Description

The firm offers precision agriculture solutions through a Data-as-a-Service (DaaS) model, where farmers access services such as digital field mapping, soil analysis, and crop monitoring on a pay-per-usage basis. This approach aims to keep costs manageable and support more efficient resource use by offering real-time data analytics to guide decision-making. The primary target market includes farmers and agricultural consultants. Key aspects of this firm's model include its democratisation of advanced farming technologies and the flexible pay-per-use pricing model, which allows farmers of various scales to adopt precision farming without heavy upfront investments.By decoupling data access from ownership of equipment, the supply chain becomes more flexible and accessible for smaller farms. The value proposition is that farmers can reduce upfront investment and operational uncertainty while improving productivity and sustainability, as the pay-per-use DaaS model provides affordable access to precision tools that could optimise resource use, thereby reducing waste and emissions.

Figure 20: Data-as-a-Service for precision agriculture (Source: ChatGPT)

Societal Impacts

1. The firm's environmental impact derives from promoting environmentally responsible farming practices through the use of precision agriculture technologies. By optimising resource use, it helps reduce waste, lower water consumption, and minimise the environmental footprint of agricultural operations.
2. Economically, the firm enhances farmers' productivity and profitability by increasing crop yields and reducing input costs through data-driven decision-making.
3. Socially, it fosters the democratisation of cutting-edge technologies, making them accessible to a wider range of farmers, supporting social equity and contributing to more sustainable agricultural practices at a broader scale. However, adopting precision agriculture technologies can be burdensome for some farmers, adding to their workload and potentially excluding those less tech-savvy.

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Who, When and Where Can Adopt it[142]

Groups of professionals **who could benefit from buying digital solution services from a firm like** this to shift towards precision agriculture could be:

Large-scale farmers in developed regions (with strong internet connectivity) looking to (i) capitalise on real-time data analytics and advanced precision tools; (ii) optimise yields and reduce inputs to improve profitability.

Small to medium farmers with access to subsidies: who want to (i) improve efficiency and reduce waste while staying within their budget; (ii) align with environmental regulations and (iii) enhance productivity.

A real-life example

A real-life example of a firm offering DaaS services is the ART21 boutique innovation house delivering AgriFood Tech solutions, which was founded in 2007 and is based in Mažeikiai, Lithuania. The firm was established to address the lack of digital solutions in the agricultural sector, aiming to reduce human errors and enhance decision-making through automation. Over time, it has grown into the largest developer of digital technologies for agriculture in the Baltic States. The company provides precision agriculture solutions through a DaaS model, offering affordable, pay-per-use access to technologies like field mapping and soil analysis. It has achieved significant success, becoming the largest organisation in Lithuania to secure Horizon Europe projects and collaborating with international partners across all continents except America. It also plays a key role in European initiatives, including 5G-enabled forest management and food safety innovations.

Figure 21: ART21 boutique innovation house (from their website)

Promising potential[143]

The firm provides cost-effective, data-driven solutions that help farmers optimise yields and reduce waste, making it appealing to a broad customer base, from small-scale farmers to large agricultural operations[144]. The pay-per-use approach democratises access to cutting-edge technologies, such as real-time data analytics, field mapping, and soil monitoring, making them affordable to a wide range of farmers, ensuring that farmers can adopt these solutions, driving efficiency and higher yields with reduced resource use[145]. The precision agriculture market is projected to expand substantially, with technological advancements like IoT, AI, and drone usage

[142] The text included here explains who could benefit from buying Data-as-a-Service services from a firm like this to shift towards precision agriculture, in order to examine the potential for farmers.
[143] The text included here explains the promising potential of adopting precision agriculture practices in order to examine the potential for farmers.
[144] Founder of ART21 boutique innovation house, personal communication, September 2024
[145] Founder of ART21 boutique innovation house, personal communication, September 2024

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playing a critical role[146] [147] [148]. This growth is in many cases supported by government initiatives and investments in agricultural technology aimed at improving productivity and sustainability[149].

Limitations to Consider[150]

The complexity of integrating and maintaining advanced precision agriculture technologies can be a barrier that prevents adoption, as farmers are in some cases reluctant to leave their comfort zone and explore new options[151]. The precision farming market also faces challenges related to data privacy, the need for robust digital infrastructure, and varying levels of awareness and skills among farmers across different regions[152]. Furthermore, the cost of purchasing these services as well as regulatory hurdles and the need for compliance with environmental standards, can impact the ease of implementing these technologies[153] [154]. Finally, not many farmers see advisory services and access to information as crucial to their long-term sustainability, and only a few of them use precision agriculture and cutting-edge technologies to improve their yields[155].

Dictionary

Precision agriculture: *"Precision agriculture is an umbrella term for using modern data-driven technologies for growing crops. [..] It provides an improved understanding of the spatial demands of a particular agricultural area, which can be coupled with highly accurate decision support tools and early warning systems. Application of these tools prevents wasteful actions, and provides information for timely management. [..] This allows farmers to control important processes remotely, saving time, energy and resources. The technologies used in precision agriculture are constantly evolving. The Internet of Things (IoT), Big Data analysis, artificial intelligence (AI), and machine learning could all be used, optimised and combined to make informed management decisions."*[156]

Read more

Information on ART21 is on their website, https://www.art21.lt/, and on their LinkedIn and Facebook.

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[146] *Precision Farming Market Size & Share Analysis – Growth, trends and forecasts (2024-2029) | Mordor Intelligence*. (n.d.). https://www.mordorintelligence.com/industry-reports/global-precision-farming-market-industry

[147] *Precision Farming Market Size, share & Trends Analysis Report by offering (Hardware, software, service), by application (Yield monitoring, field mapping, crop scouting, irrigation management), by region, and segment Forecasts, 2024 - 2030*. (n.d.). https://www.grandviewresearch.com/industry-analysis/precision-farming-market

[148] Technavio. (2024, July). *Precision Agriculture Market Analysis North America, Europe, APAC, South America, Middle East and Africa - US, China, Germany, UK, Australia - Size and Forecast 2024-2028*. Technavio, https://www.technavio.com/, All Right Reserved 2024. https://www.technavio.com/report/precision-agriculture-market-industry-analysis

[149] *Precision Farming Market Size, share & Trends Analysis Report by offering (Hardware, software, service), by application (Yield monitoring, field mapping, crop scouting, irrigation management), by region, and segment Forecasts, 2024 - 2030*. (n.d.). https://www.grandviewresearch.com/industry-analysis/precision-farming-market

[150] The text included here explains the limitations of adopting precision agriculture solutions, in order to examine the limitations farmers might face.

[151] Founder of ART21 boutique innovation house, personal communication, September 2024

[152] *Precision Farming Market Size & Share Analysis – Growth, trends and forecasts (2024-2029) | Mordor Intelligence*. (n.d.). https://www.mordorintelligence.com/industry-reports/global-precision-farming-market-industry

[153] Technavio. (2024, July). *Precision Agriculture Market Analysis North America, Europe, APAC, South America, Middle East and Africa - US, China, Germany, UK, Australia - Size and Forecast 2024-2028*. Technavio, https://www.technavio.com/, All Right Reserved 2024. https://www.technavio.com/report/precision-agriculture-market-industry-analysis

[154] *Precision Farming Market Size, share & Trends Analysis Report by offering (Hardware, software, service), by application (Yield monitoring, field mapping, crop scouting, irrigation management), by region, and segment Forecasts, 2024 - 2030*. (n.d.). https://www.grandviewresearch.com/industry-analysis/precision-farming-market

[155] Online Survey results, December 2024, find out more in Annex 6

[156] European Climate Adaptation Platform Climate-ADAPT (2023). *Precision agriculture*. https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/precision-agriculture

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3.10. Good Practice 10

Hardware as a Service for precision agriculture

Keywords: Precision agriculture, Hardware as a Service, consultation, agrochemical services	*Type of good practice:* Changes in key activities and production (Maximising material and energy productivity and efficiency)

Description

The firm revolves around providing precision agriculture technology (machinery and data) through a Hardware as a Service (HaaS) model, primarily targeting wheat growers. The service allows farmers to rent advanced agricultural machinery and access real-time data, reducing the need for significant upfront investments. This can help farmers optimise their operations, lowering resource and energy use while promoting sustainability. One innovative aspect is the rental of robots and drones for soil cultivation, crop scanning, and variable spraying, allowing more precise resource application. Another innovative aspect includes consultation services for farms and farmers regarding certified seeds, sales, agricultural and agrochemical products and machinery. This approach aims to support both small-scale and large farms, facilitating access to cutting-edge technology through flexible agreements.

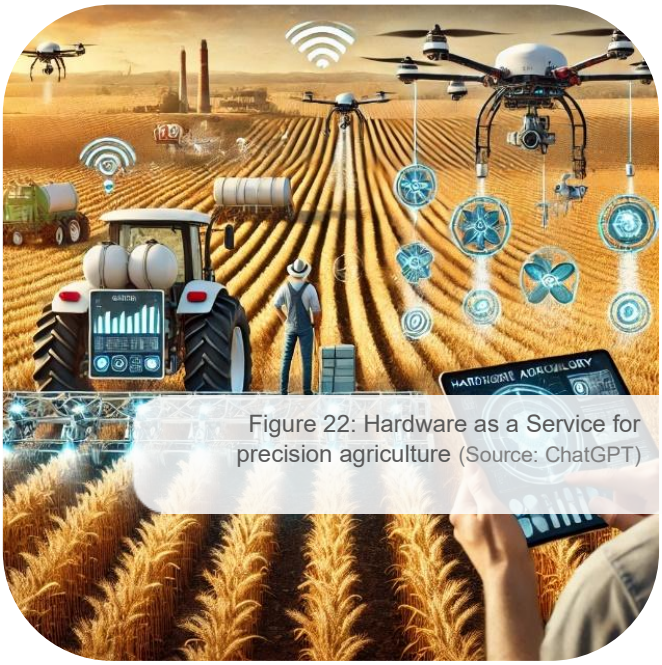

Figure 22: Hardware as a Service for precision agriculture (Source: ChatGPT)

Societal Impacts

1	Environmental impact by promoting more efficient use of resources, particularly through precision agriculture technologies that reduce the application of fertilisers, pesticides, and water. This contributes to a cleaner environment and healthier ecosystems.	2	Economically, it helps farmers increase productivity and profitability by lowering costs associated with resource overuse and minimising initial investments in expensive equipment.	3	Socially, the firm fosters inclusivity by making advanced agricultural technologies accessible to a wider range of farmers, regardless of farm size, and supports rural communities by enhancing agricultural efficiency and sustainability. On the other hand, learning to use new technologies can be challenging for some farmers, as it requires training, and smaller farms may struggle to adopt advanced features, widening the economic gap between small and large-scale producers.

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Who, When and Where Can Adopt it[157]

Groups of professionals **who could benefit from buying HaaS services from a firm like this** to shift towards precision agriculture could be:

Small and medium-sized farmers with limited access to capital (who cannot afford the large upfront investment required to purchase modern machinery), who are looking for a cost-effective way to optimise their crop yields, reduce resource use, and improve profitability.

Farmers (and private forest owners) in drought-prone or resource-scarce regions who want to conserve valuable resources (control water use and target specific areas for fertilization using real-time data) while maintaining or increasing yields; (ii) meet sustainability goals.

A real-life example

A real-life example of a company offering HaaS services is the Agrokoncernas Group which operates in Lithuania, offering its services across multiple sites, focusing on precision agriculture. The company is a pioneer in the Baltic region in offering advanced agricultural technologies, such as robotic soil cultivation and drone-based crop scanning, on a rental basis. This firm was shaped by the desire to make advanced technologies accessible to all farmers, regardless of size, by reducing the financial barriers associated with large upfront investments. It offers consultation and trade services in the sectors of agrochemical services, sales of agricultural products and other areas of agricultural industry. Its activities include (i) sharing knowledge with farmers (through regional field days and seminars); (ii) high-quality consultations in choosing agrochemical products, certified seeds, and agricultural machinery; (iii) recommendations in choosing plant varieties, fertilizers, and other issues associated with plant protection, cultivation and agricultural machinery; (iv) improvement of plant growing technologies; (v) individual consultations at the farms; (vi) farm management programme „Agrosmart for farms 2.1“. The company has seen success, with farmers achieving up to 25% higher yields and 20% lower resource usage through its services.

Figure 23: Agrokoncernas Group (from their website)

Despite facing challenges with the slow adoption of digital tools, it continues to grow, driven by a commitment to sustainability and innovation in agriculture.

Promising potential[158]

Through such a firm, offering HaaS for precision agriculture, farmers can ensure access to high-tech tools and data analytics at a fraction of the cost of ownership[159], which lifts one of the most

[157] The text included here explains who could benefit from buying Data-as-a-Service services from a firm like this to shift towards precision agriculture, in order to examine the potential for farmers.
[158] The text included here explains the promising potential of adopting HaaS precision agriculture practices in order to examine the potential for farmers.
[159] Agrokoncernas Group commercial director, personal communication, September 2024

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crucial barriers in adopting precision agriculture and cutting-edge technologies: the significant upfront investment for equipment[160]. The flexibility offered by firms like this eliminates the financial burden of upfront capital investments, allowing farmers to improve productivity and resource efficiency[161]. The growing global demand for sustainable farming practices and government incentives for green technologies are critical drivers of market growth and indicate a transition from conventional agricultural practices to precision farming[162]. For instance, the precision agriculture market is projected to grow at a significant compound annual growth rate (CAGR) of around 12-13% (from 2024-2030) due to increased adoption of technologies like drones, sensors, and advanced data analytics[163]. Additionally, the environmental benefits of reduced input usage, such as water and fertiliser, further boost the appeal of this firm as it aligns with regulatory trends promoting sustainability[164].

Limitations to Consider[165]

The need for familiarisation with new technologies might pose a limitation for some farmers, as precision agriculture technologies such as drones, sensors, and data platforms require training and experience to operate effectively, and smaller farms especially might struggle to adopt the advanced features offered by HaaS services[166]. Furthermore, interoperability issues can arise, as many precision agriculture technologies are developed by different companies with proprietary systems that may not integrate well with each other. This can limit the farmer's ability to combine data or seamlessly use multiple systems[167]. Lastly, farmers in regions with limited infrastructure or slow adoption of digital technologies may face connectivity challenges, particularly in rural areas with poor internet access, as without reliable connectivity, accessing real-time data and leveraging the full potential of precision tools may not be feasible[168]. Finally, measurements show that only a few farmers see advisory services and access to information as crucial to their long-term sustainability[169].

Dictionary

Precision agriculture: *"Precision agriculture is an umbrella term for using modern data-driven technologies for growing crops. [..] It provides an improved understanding of the spatial demands of a particular agricultural area, which can be coupled with highly accurate decision support tools and early warning systems. Application of these tools prevents wasteful actions, and provides information for timely management. [..] This allows farmers to control important processes remotely, saving time, energy and resources. The technologies used in precision agriculture are constantly evolving. The Internet of Things (IoT), Big Data analysis, artificial*

[160] Online Survey results, December 2024, find out more in Annex 6
[161] Agrokoncernas Group commercial director, personal communication, September 2024
[162] *Precision Farming Market Size, share & Trends Analysis Report by offering (Hardware, software, service), by application (Yield monitoring, field mapping, crop scouting, irrigation management), by region, and segment Forecasts, 2024 - 2030*. (n.d.-b). https://www.grandviewresearch.com/industry-analysis/precision-farming-market
[163] *Precision Farming Market Size, share & Trends Analysis Report by offering (Hardware, software, service), by application (Yield monitoring, field mapping, crop scouting, irrigation management), by region, and segment Forecasts, 2024 - 2030*. (n.d.-b). https://www.grandviewresearch.com/industry-analysis/precision-farming-market
[164] Agrokoncernas Group commercial director, personal communication, September 2024
[165] The text included here explains the limitations of adopting HaaS precision agriculture practices in order to examine the limitations farmers might face.
[166] *Precision Agriculture: Benefits and Challenges for technology adoption and use*. (2024, January 31). U.S. GAO. https://www.gao.gov/products/gao-24-105962
[167] *Precision Agriculture: Benefits and Challenges for technology adoption and use*. (2024, January 31). U.S. GAO. https://www.gao.gov/products/gao-24-105962
[168] *Precision Farming Market Size | Mordor Intelligence*. (n.d.). https://www.mordorintelligence.com/industry-reports/global-precision-farming-market-industry
[169] Online Survey results, December 2024, find out more in Annex 6

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intelligence (AI), and machine learning could all be used, optimised and combined to make informed management decisions."[170]

Read more

Information on Agrokoncernas Group is on their website, https://www.agrokoncernas.lt/.

[170] European Climate Adaptation Platform Climate-ADAPT (2023). *Precision agriculture*. https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/precision-agriculture

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3.11. Good Practice 11

Sustainable winemaking incorporating circular procedures

Keywords: Winemaking, circular procedures, organic farming, vineyard	*Type of good practice:* Changes in key activities and production. (Substituting with renewables and natural processes)

Description

A farm that produces wine using sustainable practices and circular methods, targeting environmentally conscious consumers and the global wine market, particularly those interested in quality wines. The farm applies a 360° sustainable viticulture approach, incorporating organic farming practices and favouring natural treatments over chemical products. Energy for production is sourced from renewable sources, with photovoltaic systems and/or through renewable energy providers. The farm also employs circular economy principles, utilising eco-friendly materials in both vineyard management and packaging, and repurposing organic waste. These innovative practices are certified by various sustainability standards. The value proposition is that the farm offers certified, high-quality wines produced using sustainable and circular practices, including bio-based renewable materials and energy, appealing to environmentally conscious consumers while reducing resource use, waste, and reliance on non-renewable resources.

Figure 24: Sustainable winemaking incorporating circular procedures (Source: ChatGPT)

Societal Impacts

1. Environmentally, the farm reduces reliance on chemical products by employing organic farming methods and promotes biodiversity by using natural solutions for pest control. Additionally, the exclusive use of renewable energy and rainwater harvesting helps lower its carbon and water footprints. However, intensive organic viticulture, if not carefully managed, can still cause soil

2. Economically, the farm generates value by focusing on high-quality wine production for global markets. Additionally, the company enhances profitability through resource efficiency, including the use of renewable energy and water-saving techniques, which reduce operational costs over time. By engaging local suppliers and workers, it strengthens

3. Socially, it benefits the local community by creating employment opportunities and supporting local suppliers, while also ensuring worker well-being through safety measures and continuous training. These efforts are further enhanced by promoting the cultural and

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compaction, erosion, or disrupt local ecosystems.	the regional economy and promotes a sustainable supply chain.	environmental heritage of the region.

Who, When and Where Can Adopt it

Vineyard owners or winemakers who want to (i) have a competitive edge in global markets, where demand for organic and eco-friendly wines is increasing; (ii) contribute to protecting biodiversity and cultural heritage in their region, strengthening their region's fame.

Farmers looking to (i) appeal to health-conscious consumers and premium markets; (ii) reduce operating costs by utilising renewable energy in their operations; (iii) benefit from a regulatory environment that promotes sustainability; and (iv) ensure that water resources are used responsibly, safeguarding them from droughts or water scarcity due to climate change phenomena.

A real-life example

A real-life example is Feudo Arancio, a sustainable winemaking business based in Sambuca di Sicilia, in the renowned wine-producing region of Sicily, Italy. It was established in 2000 by a group with a long history in wine production, leveraging Sicily's rich viticultural tradition and favourable climate. The company has developed a fully sustainable business model, focusing on organic farming, renewable energy, use (owning photovoltaics and purchasing only renewable energy), circular processes (use of recyclable wooden poles, wires and aluminium poles, re-use of pruning waste to improve organic matter in the field, pomace sold for distillation purposes, waste sent to recycling companies, certified materials used for packaging), and efficient water conservation and management. Over the years, it has achieved significant growth, producing 5 million bottles annually and exporting 85% of its wines to 60 countries. Its products are recognised for their high quality, supported by certifications such as VIVA, SOStain, and EMAS.

Figure 25: Feudo Arancio ((from their website)

Promising potential

The firm's full adoption of renewable energy, water-efficient practices, and organic farming aligns well with consumer preferences for environmentally responsible products[171]. Earning certifications (such as VIVA and EMAS), supports its position in the sustainable wine industry, which continues to experience premiumisation trends, where consumers are willing to pay more for high-quality, eco-friendly products[172]. Growing global demand for sustainable and organic wines and supportive regulations in regions like the EU, which provide financial incentives for

[171] External Relations and Sustainability Programs Manager of Feudo Arancio, personal communication, September 2024
[172] External Relations and Sustainability Programs Manager of Feudo Arancio, personal communication, September 2024

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green practices, create an advantageous environment[173]. Markets like the U.S. and parts of Europe are seeing a rising interest in lower-alcohol and health-focused wines, which may further benefit companies that can be flexible and adopt such models[174]. Finally, 30% of consumers see value in organic agricultural products like wine from a certified brand and would be willing to pay a little more to buy them[175].

Limitations to Consider

The reliance on organic and renewable practices may involve high initial costs, particularly for technology and certification processes, which could limit scalability for smaller operations[176]. Other challenges include climate change, which impacts crop yields and water availability, posing a significant threat to the wine industry[177]. Economic factors, such as rising energy and packaging costs, also put pressure on profits[178]. Furthermore, the global wine market is currently facing an oversupply crisis, with wine consumption declining, particularly among younger consumers who gravitate toward alternative beverages[179] [180].

Read more

Information on Feudo Arancio is on their website, https://www.feudoarancio.it/en-gb, and on their Instagram, Facebook and TikTok.

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[175] Online Survey results, December 2024, find out more in Annex 6
[176] External Relations and Sustainability Programs Manager of Feudo Arancio, personal communication, September 2024
[177] External Relations and Sustainability Programs Manager of Feudo Arancio, personal communication, September 2024
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[180] *European Commission adopts market measures to support EU wine producers*. (2023, June 23). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/european-commission-adopts-market-measures-support-eu-wine-producers-2023-06-23_en

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3.12. Good Practice 12

Eco-Viticulture Network offering certifications and digital services

Keywords: Eco-Viticulture, network of producers, voluntary certification system, direct sales, digital solutions, efficient logistics

Type of good practice: Changes in key activities and production
(Repurposing the business for society/ the environment)

Description

This social innovation initiative revolves around a network of producers which provides its members with eco-sustainable viticulture practices, transport and other services, a digital platform to facilitate direct sales and certifications of the production to support their efforts in protecting the environment and the local vineyard landscape. The members include wine producers who seek to adopt greener agricultural methods. The initiative's key aspects include implementing a voluntary certification system that enforces environmentally friendly practices, supporting partnered transportation (partnerships among wineries for transporting their goods) and utilising a logistical platform to streamline direct sales while reducing environmental impact through digital solutions and more efficient logistics. The certification system offers farmers who implement a set of good practices (for example, at least 4 out of 10 selected practices, which could include reducing chemical inputs, enhancing biodiversity, establishing and maintaining pollinating insects, etc.) a certification verified by a recognised third-party certifying body. This certification is a mark of recognition of top-quality products that adhere to sustainability standards. The logistical platform is digital and provides opportunities for direct sales, supporting farmers to simplify the relations with consumers and offering on-site and online options.

Figure 26: Eco-Viticulture Network offering certifications and digital services (Source: ChatGPT)

Societal Impacts

1. Environmentally the initiative promotes sustainable agriculture and supports long-term environmental preservation by encouraging practices that reduce chemical inputs, protect biodiversity, and enhance soil health
2. The economic impact includes helping farmers maintain high-quality standards and increasing the value of their products through sustainable certification, contributing to economic resilience and market competitiveness. However, the high costs of sustainable certifications may limit participation to larger producers,
3. Socially, it fosters collaboration among local farmers, businesses, and public institutions, strengthening community ties and shared

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through cover crops and pollinator-friendly methods.

putting smaller farmers at a disadvantage.

responsibility for the landscape.

Who, When and Where Can Adopt it

Winegrowers in UNESCO-listed or environmentally sensitive regions aiming to enhance the value of their product through eco-certifications and increase both their market appeal and their region's preservation efforts.

Small to medium-sized farmers with a focus on high-quality, premium markets: who want to (i) target niche, premium markets (e.g., organic or biodynamic wine consumers); (ii) promote sustainable practices and receive certification; (iii) utilize channels for direct-to-consumer sales and e-commerce.

A real-life example

A real-life example is The Green Experience, an initiative based in the Cuneo Province, in the southern Piedmont region of Italy, within the UNESCO-listed Vineyard Landscape of Langhe-Roero and Monferrato. It was launched in 2013 and formally established in 2016 and was developed by a prominent agricultural organisation, the Coldiretti Cuneo, with the goal of creating a sustainable pathway for local farmers. They aim for environmental preservation and biodiversity, with a focus on sustainable wine production that minimises chemical inputs and promotes ecological balance. The initiative offers a voluntary certification system focused on eco-sustainable viticulture practices with two main guidelines: one for integrated sustainable wine production and another for organic practices. To date, it has involved over 100 wineries, managing more than 900 hectares of vineyards across 28 municipalities. With 15 DOC and DOCG[181] designations of origin, it has successfully elevated the quality and marketability of local wine products while promoting eco-sustainability and sustainable practices.

Figure 27: The Green Experience (from their website)

The Green Experience is related to a logistic platform that provides two services: ECOLOG Trade, which supports partnerships of wineries for transporting their products and improving the road system, reducing the impact of transporting wine products through the territory, and ECOLOG CONSUMER, which supports farmers with direct sales while complying with fiscal rules.

Promising potential

The initiative focuses on environmentally sustainable viticulture, which appeals to modern consumers who prioritise ecological and ethical products[182]. This sustainability-driven approach, combined with voluntary certifications that promote transparency, boosts the brand value of wine

[181] Denominazione di Origine Controllata (DOC), and Denominazione di Origine Controllata e Garantita (DOCG) are Italian wine classifications.
[182] Project Manager of The Green Experience, personal communication, September 2024

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products, especially in premium markets[183]. Additionally, the use of logistics platforms, enabling direct-to-consumer sales and e-commerce, taps into growing trends in wine tourism and online shopping, offering diversified revenue streams[184]. The rise in consumer demand for organic and biodynamic wines globally and the focus on low-alcohol, premium wine segments present an opportunity for companies adopting this initiative's model to attract younger, conscious buyers[185]. Furthermore, ongoing innovations in viticulture, such as precision agriculture and GIS technology, can enhance yield and quality, reducing costs and environmental impact, thus improving profitability[186]. Finally, many farmers would be interested in joining an association that uses digital solutions, which could undertake the burden of storing, processing (e.g., drying, cleaning), and logistics to help them do it more efficiently[187].

Limitations to Consider

The high cost associated with sustainable certifications and advanced technological investments might limit participation to larger producers, leaving smaller ones at a disadvantage[188]. Additionally, while the focus on direct-to-consumer sales and sustainability aligns with market trends, external threats, such as shifting consumer preferences towards alternative beverages (e.g., craft beer and ready-to-drink products), could reduce demand for wine among younger generations[189]. Regulatory restrictions in regions such as the EU, which limit the use of innovative technologies like drones for farming, could slow down the adoption and expansion of sustainable practices[190]. Additionally, climate change poses an existential threat to viticulture, affecting grape quality and harvests, leading to inconsistent production that could impact profitability[191] [192].

Read more

Information on The Green Experience is on their website, https://www.thegreenexperience.it/, and on their, Facebook and Instagram.

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3.13. Good Practice 13

Cooperative of farmers and foresters creating pellets from biomass waste

Keywords: Cooperative, pellets, biomass waste	*Type of good practice:* New products and services & Changes in key partners and forms of collaborations (Creating value from waste, Producer organisation models)

Description

A cooperative initiative utilises tree and crop residues to create bioenergy products, specifically biomass pellets[193], primarily targeted to be used for heating. The initiative is centred on creating value from agricultural and forestry residues (e.g., tree prunings, wood chips, etc.), which are processed into pellets. This approach can help reduce waste and reliance on conventional energy sources, offering farmers and foresters an extra revenue stream. A key feature of the initiative is its cooperative structure, which involves local farmers, foresters (public forest management agencies), community members and key local stakeholders, supporting broad participation and social inclusion. The cooperative operates sustainably by sourcing local materials and reinvesting profits to expand its operations.

Figure 28: Cooperative of farmers and foresters creating pellets from biomass waste (Source: ChatGPT)

Societal Impacts

1. Environmental impact due to its focus on utilising local biomass waste, reducing reliance on fossil fuels, and contributing to a cleaner energy transition. By processing agricultural and forestry residues into bioenergy, it helps decrease carbon emissions and promotes sustainable resource management. However, these environmental benefits depend on sustainable sourcing practices, efficient logistics, and local biomass availability, which can vary across regions.

2. Economically, the cooperative model fosters local engagement, creating jobs and supporting rural economies. These outcomes' effectiveness depends on market conditions, energy prices, and the cooperative's

3. Socially, it empowers community members, including farmers and foresters, by involving them directly in energy production and promoting energy independence. The initiative also enhances environmental awareness through its educational activities and partnerships with local institutions. Nevertheless, coordinating multiple stakeholders in a cooperative can be challenging, and difficulties in management or decision-making may threaten

[193] Biomass pellets are not a new product, but their implementation has been increasingly observed across the EU.

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organisational capacity.

the stability or long-term viability of the initiative.

Who, When and Where Can Adopt it

Small to medium-sized farmers that want to (i) utilise their agricultural waste to create additional income; (ii) reduce their waste disposal costs; (iii) take advantage of subsidies, grants, and regulatory support that promotes renewable energy solutions.

Foresters and private forest owners looking (i) for sustainable ways to dispose of their waste; and (ii) to engage in renewable energy production in response to increasing government incentives for sustainable practices.

A real-life example

A real-life example is the Energy Community of Karditsa (ESEK), based in Agiopigi, Karditsa, Greece. It operates as a cooperative that produces biomass pellets from local agricultural and forestry residues. It was founded by local citizens, agricultural cooperatives, and regional organisations aiming to harness unexploited biomass while fostering social cohesion. Initially focused on electricity production, the company shifted to pellet manufacturing due to the high cost of electricity generation. Since its establishment, the cooperative has grown to around 380 members, mostly small and medium-sized enterprises, and produces around 1,200 tons of biomass pellets annually. They charge a membership fee and have made use of EU funding programs to kick-start their operations. The cooperative has built a local supply chain for biomass and reinvests its profits into expanding its operations.

Figure 29: Energy Community Of Karditsa (ESEK) (from their website)

They raise environmental awareness through school visits and informational events. They have also created bonds with the local University, offering educational open days for students and receiving evaluations of the pellet quality (unofficial testing to help them better understand their product quality).

Promising potential

The cooperative nature of such an initiative fosters collaboration with local stakeholders, ensuring a stable supply of raw materials such as agricultural residues and wood waste[194]. This approach supports cost-efficient production while reinvesting profits back into operations enhances scalability[195]. The global biomass pellet market is projected to grow by 2030, driven by increasing demand for renewable energy sources and government incentives (e.g., in Europe) aimed at reducing carbon emissions[196]. This is supported by trends showing a shift towards eco-friendly energy solutions for power generation, residential, and industrial heating applications, particularly in regions like Europe and Asia-Pacific, where environmental regulations and energy policies

[194] Project manager in ESEK & Member of management board, personal communication, September 2024
[195] Project manager in ESEK & Member of management board, personal communication, September 2024
[196] Ltd, R. a. M. (2024). *Biomass Pellet Market Report: Trends, forecast and Competitive Analysis to 2030*. Research and Markets Ltd 2024. https://www.researchandmarkets.com/reports/5980049/biomass-pellet-market-report-trends-forecast

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favour biomass energy[197,198]. Finally, 30% of consumers would consider changing their house's heating source to pellets if it was convenient and provided quality heating, while an additional 31% would be willing to even pay a slightly higher price for it[199], indicating a positive consumer attitude towards alternative energy choices. Also, many farmers would be interested in joining a local cooperative collecting and transforming farm residues and waste into new products, seeing it as an opportunity to generate additional revenue streams[200].

Limitations to Consider

Maintaining consistent profitability can be difficult due to competition from fossil fuels, which often have lower tax rates[201]. Moreover, the cost of creating infrastructure that can manufacture good quality pellets from many different biomass sources (trees, crops, etc.) might be too high, leading to solutions that limit the variety of materials that can be utilised[202]. The industry is subject to fluctuations in energy prices and regulatory uncertainty, particularly as governments periodically revise policies related to renewable energy incentives[203]. Furthermore, compliance with eco-design regulations for local space heaters and solid fuel boilers, as well as the EU's Ecodesign for Sustainable Products Regulation (ESPR), may affect the market for pellet consumers and impose additional costs. Additionally, the high initial capital investment in equipment and technology, combined with competition from larger firms with advanced infrastructure, may limit the ability of smaller operations to compete on price and scale[204,205].

Dictionary

Biomass: The term biomass indicates the "*dead plant and animal material suitable for using as fuel*"[206]. Biomass resources include agricultural waste, wood waste, aquatic plants, urban garbage and household effluents[207].

Read more

Information on ESEK is on their website, https://www.esek.gr/en/archiki-english/, and on their Facebook and LinkedIn.

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[199] Online Survey results, December 2024, find out more in Annex 6
[200] Online Survey results, December 2024, find out more in Annex 6
[201] Project manager in ESEK & Member of management board, personal communication, September 2024
[202] Project manager in ESEK & Member of management board, personal communication, September 2024
[203] Project manager in ESEK & Member of management board, personal communication, September 2024
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3.14. Good Practice 14

Responsible forest management through common forests and ecosystem services

Keywords: joint forest management, shared forest ownership, common forest, biodiversity, carbon sequestration, timber production

Type of good practice: Changes in key partners and forms of collaborations
(Producer organisation models)

Description

A firm that focuses on joint forest management through a shared ownership structure (where individually owned forest plots are combined in bigger units to be managed more efficiently). It involves acquiring and managing several forest properties collectively owned by shareholders or separately owned, with the goal of sustainable forest management. The forest owners can thus have the benefits of forest ownership, without the obligations[208], as the management falls in the hands of the firm. The firm's target customers are institutional investors and individual forest owners, particularly those who seek sustainable investments but may lack the expertise or desire for active property management. A key feature of the firm is the combination of smaller forest plots into larger, more efficiently managed units, leveraging expert knowledge and partnerships with local entities. The firm also provides transparency and neutrality, offering revenue not only from timber but also from ecosystem services such as carbon markets and recreational and conservation initiatives[209]. The value proposition is that forest owners and investors could gain the financial and ecological benefits without the management burden, while tapping on carbon markets (timber revenue), as the firm provides expert and sustainable management of consolidated forest units

Figure 30: Responsible forest management through common forests and ecosystem services (Source: ChatGPT)

Societal Impacts

1. Environmentally, it potentially promotes biodiversity, carbon sequestration, and sustainable forestry practices, including continuous cover forestry and longer rotation
2. Economically, it provides stable financial returns for forest owners through responsible timber sales while also
3. Socially, the firm engages forest owners who may be disconnected from active management, offering them a transparent, neutral service that balances profitability with sustainability. Nonetheless, shareholders might still retain obligations related to ownership

[208] We note here that forest owners as shareholders might still retain certain obligations.
[209] We note here that recreational activities may not always generate income, and in some cases, forest owners may prioritise alternative management objectives over timber profits.

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periods, which contribute to healthier, older forests. However, these environmental benefits are not guaranteed in joint forest management.

tapping into ecosystem markets such as carbon credits and conservation efforts.

(depending on local contexts). Navigating complex national and EU forestry regulations can be challenging, as firms must balance compliance with legal requirements while meeting the needs and expectations of local forest owners.

Who, When and Where Can Adopt it

Small and medium forest owners in rural areas (especially in regions with fragmented land ownership or where family forest plots are common) who want to (i) benefit from economies of scale, shared management expertise, and diversified revenue streams (timber, carbon credits, conservation) without needing to handle day-to-day operations; (ii) create new income opportunities through carbon markets.

Forestry cooperatives in regions with strong community ties: wishing to (i) sustainably manage forests collectively, ensuring that both economic benefits and ecosystem services are shared among all stakeholders; (ii) monetize ecosystem services.

A real-life example

A real-life example is the firm AARI Metsä Oy, which is based in Helsinki, Finland, and focuses on sustainable forest management through a model that integrates smaller forest properties into a larger, collectively managed "common forest". The founders, who previously worked in institutional forest investment, identified a gap in the market for individual forest owners (including passive or absentee forest owners) seeking sustainable management without the complexities of active involvement and the need for an alternative to traditional forest funds. This led to the development of a model that caters to individual forest owners and investors, combining their resources to manage forests sustainably while delivering economic returns. As of 2023, the firm manages over 100,000 hectares of forest across Finland. It emphasises biodiversity, carbon sequestration, and recreational use alongside timber production, achieving a balance between environmental and financial goals.

Figure 31: AARI Metsä Oy (from their website)

In recent years, it has acquired forest properties worth over €100 million and actively seeks further growth through responsible forest stewardship.

Promising potential

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The firm's ability to consolidate smaller forest plots into larger, efficiently managed units offers economies of scale, improving profitability by enabling cost savings and higher returns[210]. The firm's diversified revenue streams, which include both timber sales and ecosystem services such as carbon credits, position it well to capture value from both traditional and emerging markets[211]. The firm aligns with EU-wide environmental policies, including the *Nature Restoration Law* and *Deforestation Regulation*, which promote sustainable forest management and biodiversity protection[212] [213]. The EU's push for climate neutrality by 2050, coupled with increasing demand for sustainable wood products, provides significant growth opportunities for companies using this model[214] [215]. Moreover, access to EU funds, such as those under the *European Regional Development Fund*, can support further expansion[216]. It is important here to note that there is a growing prevalence of "passive forest owners" (on an EU level and specifically in Finland)[217], especially absentee forest owners (those who do not live in the vicinity of their owned land)[218] [219], due to multiple factors[220] that lead to neglected forest areas that are not sufficiently managed. The firm shows potential to solve this issue as it offers responsible forest management through common forests and ecosystem services[221]. At the same time, respondents of the online survey believe that many private forest owners would delegate their forest management to a firm if it promises lower managerial costs and increases the income generated from their forest[222].

Limitations to Consider

The complexity of managing diverse forest properties and balancing profitability with sustainability goals may increase operational costs, especially when dealing with smaller or more fragmented plots[223]. Volatile markets for carbon credits and biodiversity offsets, along with potential fluctuating timber prices due to economic downturns or global supply chain disruptions, present risks[224]. Regulatory changes in the EU, particularly around forest harvesting limits and biodiversity protection, may also constrain revenue-generating activities, as stricter regulations could limit

[210] Development Director of AARI Metsä Oy, personal communication, September 2024
[211] Development Director of AARI Metsä Oy, personal communication, September 2024
[212] *Nature Restoration Law enters into force*. (2024, August 15). Environment. https://environment.ec.europa.eu/news/nature-restoration-law-enters-force-2024-08-15_en
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[220] Attributes linked to passive forest ownership as listed by Matilainen and Lähesmäki (2023): having small forest holdings, lack of knowledge/competence, no forest management plan, lack of frequent visits, absentee/urban forest owners, older people, younger people, forests seen as a burden, males with higher education, inherited or gifted land, female forest owners, more motivated by tree survival and environmental factors (e.g. aesthetics, groundwater protection) and other non-wood values than by wood production factors, voluntary conservation, fewer forest owner networks.
[221] Development Director of AARI Metsä Oy, personal communication, September 2024
[222] Online Survey results, December 2024, find out more in Annex 6
[223] Development Director of AARI Metsä Oy, personal communication, September 2024
[224] Development Director of AARI Metsä Oy, personal communication, September 2024

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timber extraction, impacting both timber and ecosystem service income[225] [226]. The legislative regulatory framework, particularly Finland's national legislation, presents significant challenges for firms like this, as it struggles to achieve a balance between EU directives and the needs of local forest owners[227]. More specifically, it is essential to maintain restrictions that prevent deforestation from premature tree harvesting, ensuring a balance in carbon sequestration and biodiversity[228]. Moreover, carbon markets, though promising, remain volatile, with fluctuating prices and uncertainties in regulatory frameworks, which could affect long-term profitability[229] [230].

Dictionary

- Carbon credits: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Used interchangeably with "carbon offsets", (although, in theory, a credit could be purchased by an entity wanting to contribute to climate action, but without claiming it has "offset" its own emissions).*"[231]
- Carbon markets: "*Trading systems in which carbon credits can be bought and sold.*"[232]

Read more

Information on AARI Metsä Oy is on their website, https://aarimetsa.fi/en/, and on their LinkedIn, Facebook and Instagram.

[225] Development Director of AARI Metsä Oy, personal communication, September 2024
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3.15. Good Practice 15

Community Organic Co-op for affordable and sustainable food

Keywords: cooperative organic food shop, vulnerable groups, cooperative store	*Type of good practice:* New products and services & New markets and customers & Changes in key partners and forms of collaborations (Repurposing the business for society/ the environment, Focus on a specific customer segment,: Producer organisation models)

Description

The initiative centres on a cooperative organic food shop that primarily targets local residents seeking affordable, sustainably sourced food and provides an inclusive space for volunteers and vulnerable groups. The shop could be located within a social service facility (e.g., community care centre, psychiatric centre, etc.) to benefit from low or rent-free facilities and integrate community support by involving beneficiaries/patients and volunteers, creating both social engagement and an accessible pricing model. The shop sources most products directly from local organic farmers, prioritising fair farmer compensation and minimising reliance on supermarket purchases. In addition, its operational model emphasises refillable bulk packaging, limited plastic use, and a smaller product range, focusing on essential, sustainable items to reduce waste.

Figure 32: Community Organic Co-op for affordable and sustainable food (Source: ChatGPT)

Societal Impacts

1. Environmentally, the cooperative organic shop promotes sustainable consumption by prioritising locally sourced organic produce, reducing plastic use, and food waste through refillable bulk packaging and a "Too Good To Go" section for near-expiry items.

2. Economically, the initiative supports small-scale local farmers with fair compensation practices, creating a fairer distribution of profits and encouraging resilience within the local food economy.

3. It impacts society by fostering community engagement and supporting social inclusion, particularly by offering volunteering opportunities to e.g., retirees, individuals experiencing burnout, marginalised people, psychiatric patients etc., who gain purpose and social contact through participation. However, managing volunteers can be complex and resource-intensive, requiring ongoing engagement and

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training to ensure effective participation.

Who, When and Where Can Adopt it

Small-scale organic farmers in rural communities who want to (i) directly reach local consumers; (ii) skip middlemen to achieve fair pricing; (iii) have a stable customer base; (iv) reduce reliance on large-scale distributors.

Agri-entrepreneurs with community-focused objectives who want to (i) increase sustainable food accessibility and social impact in cities; (ii) offer fresh produce and essentials without the high price premiums of conventional stores; (iii) connect directly with local customers; (iv) provide a feasible alternative to large retailers.

A real-life example

A real-life example is a cooperative organic neighbourhood store, located in north-western Belgium[233]. It was established by a group of local residents after the closure of a beloved organic shop left a gap in the community. It offers a full range of organic vegetables and fruit, bread, dairy, dry goods, refrigerator products, care, and household products. Initially launched as a non-profit organisation, it evolved into a cooperative model focused on providing affordable, locally sourced organic products while supporting the fair treatment of farmers. Situated on a local Psychiatric Center premises on a rent-free basis, the shop offers a unique social environment where patients and volunteers assist in daily operations, fostering inclusivity. The cooperative has grown steadily, now serving around 200–220 customers weekly, and relies on a dedicated team of 40 volunteers. The cooperative benefits its members (the ones who own shares) and volunteers (discounts for 4 hours/week of work).

Figure 33: Cooperative organic store in north-western Belgium (Source: ChatGPT)

With minimal markup solely to cover costs, the shop prioritises community welfare over profit, supporting local farmers and ensuring accessible organic options for customers.

Promising potential

The initiative's community-focused structure, reliance on local suppliers, and affordable pricing enhance customer loyalty, especially among those seeking sustainable and socially responsible consumption options[234]. This approach aligns well with the rising global trend towards local sourcing, as cooperatives often support small, local producers, adding resilience to regional food systems. The initiative aligns with favourable trends in the EU, where consumer demand for

[233] The co-founder of the cooperative organic store did not provide permission to mention the farm's name, so it will not be mentioned in the report.
[234] Co-founder of the cooperative organic store in Beernem, Belgium, personal communication, October 2024

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organic products has increased, and organic farming has seen significant growth[235]. These trends are supported by policies such as the EU's Common Agricultural Policy (CAP), which offers financial aid for organic practices[236]. In recent years, organic retail demand has grown, with EU organic farmland increasing by 50% between 2012 and 2020[237]. Based on the results of the Online Survey, more than half of the responding consumers appreciate initiatives that compensate farmers fairly and provide opportunities to vulnerable groups. That said, 51,2% would sometimes give up the convenience of a nearby supermarket for a smaller one with these characteristics[238], indicating a positive consumer attitude that still, though, needs to be enhanced.

Limitations to Consider

Reliance on volunteer support and minimal profit margins could impact long-term financial sustainability[239]. Managing volunteers can also be complex and resource-intensive, as it requires continuous engagement and training[240]. The initiative faces potential threats from large-scale retailers increasingly offering organic and private-label options at competitive prices, while operating more days a week and offering a convenient one-stop shopping experience with a wider variety of products (other than organic and sustainable food)[241]. Rising operational costs, including energy and rent, are critical external pressures that could restrict profitability unless offset by further financial support (e.g., through EU funding, through rental free spaces in community care centres) [242]. Additionally, the varied commitment level among the EU member states to developing the organic sector may restrict the adoption of this cooperative's model in countries that haven't prioritised organic production[243]. Also, current economic trends, such as food inflation, are impacting EU consumers' purchasing power and influencing the demand for organic products[244].

[235] *Organic farming in the EU: a decade of growth*. (2023b, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
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[237] *Organic farming in the EU: a decade of growth*. (2023b, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en
[238] Online Survey results, December 2024, find out more in Annex 6
[239] Co-founder of the cooperative organic store in north-western Belgium, personal communication, October 2024
[240] Co-founder of the cooperative organic store in north-western Belgium, personal communication, October 2024
[241] Co-founder of the cooperative organic store in north-western Belgium, personal communication, October 2024
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[243] European Court of Auditors. (2023). Organic farming in the EU: Gaps and inconsistencies hamper the success of the policy. In *https://www.eca.europa.eu*. European Union. https://doi.org/10.2865/186183
[244] *Organic farming in the EU: a decade of growth*. (2023, January 18). Agriculture and Rural Development. https://agriculture.ec.europa.eu/news/organic-farming-eu-decade-growth-2023-01-18_en

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3.16. Good Practice 16

Cooperative model for mowing buffer strips with removal of the grass

Keywords: Cooperative model, buffer strips, service for farmers mowing buffer strips, removal of grass

Type of good practice: Changes in key partners and forms of collaborations. (Intermediary models)

Description

The initiative focuses on a cooperative model among a local government's land agency, a local advisor on sustainable agriculture, and a local cooperative of farmers, who are providing a service for farmers who need to comply with regulations that require mowing buffer strips with the removal of the mown grass. The initiative targets farmers who lack the machinery or resources to perform this task themselves. The advisor coordinates the mowing and removal activities for clusters of buffer strips and seeks local opportunities to valorize the grass clippings. The land agency provides the information on the buffer strips that need mowing and the farmers' cooperative acts as the contractor, undertaking the mowing and removal of the grass. The key aspect is the collaboration between the government, a local agriculture advisor, a cooperative of farmers, and local processors (for the valorisation of the mowed grass), ensuring efficient logistics and cost management. The farmers only pay a fixed cost for mowing, while the coordination costs are covered by the government, making the service accessible and practical for farmers. Coordination across farmers, authorities, and biomass users enables an efficient supply chain that turns landscape management into resource valorisation.

Figure 34: Cooperative model for mowing buffer strips with removal of the grass (Source: ChatGPT)

Societal Impacts

1. Environmentally, the initiative helps maintain buffer strips along watercourses, which contribute to reducing pollution and enhancing biodiversity in agricultural areas. By ensuring that farmers continue to manage these strips despite stricter regulations, the initiative prevents the reversion of buffer strips into fields, thus preserving vital ecosystems. Additionally, the valorization of grass clippings, whether through composting, soil improvement, or use as livestock fodder, promotes local resource

2. The initiative also generates economic benefits for farmers by alleviating the burden of compliance with new regulations, while facilitating local collaborations that enhance the economic viability of rural communities. On the other hand, high logistics costs, can increase expenses potentially discouraging

3. Socially, it builds strong networks among farmers, cooperatives, and local processors, encouraging collaboration that eases the burden of meeting stricter environmental regulations.

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recycling, further supporting sustainable practices.

some farmers from participating.

Who, When and Where Can Adopt it

Small-scale farmers in areas with strong environmental regulations who cannot afford the necessary machinery and want to (i) outsource the mowing and valorisation; (ii) comply with regulations and avoid penalties without investing in expensive equipment; (iii) contribute to sustainability efforts.

Agricultural cooperatives or rural communities who want to (i) utilise cooperative resources to reduce operational costs, and collectively valorise biomass; (ii) help sustain smallholder livelihoods by reducing the burden of environmental compliance; (iii) transform agricultural residues into valuable products such as biofuels, compost, or animal fodder, aligning with the circular economy and sustainability goals.

A real-life example

A real-life example is the Boerennatuur Vlaanderen's initiative for "Mowing with removal of the grass". Boerennatuur Vlaanderen is an advisory organisation for sustainable agriculture and an association of farmers and horticulturists operating in Flanders, Belgium. In cooperation with the Flemish Land Agency (VLM) and Werkers in Aanneming (a cooperative of farmers who is the contractor undertaking the mowing), they provide a vital service to local farmers by coordinating the mowing and removal of grass from buffer strips along watercourses. They started providing this service in 2023 when a new requirement was introduced by tightened environmental regulations, which required farmers to remove the grass clippings after mowing the buffer strips. The cooperative initiative was established in response to farmers' challenges in meeting these new conditions, particularly the lack of appropriate machinery and viable outlets for the removed grass. The VLM contracted Boerennatuur Vlaanderen to manage this process and collaborate with Werkers in Aanneming, a cooperative of local farmers, to perform the mowing and explore local valorisation options for the grass. Since its inception, the initiative has supported 21 farmers over two years, helping them maintain compliance with the regulations while promoting sustainable land management practices.

Figure 35: Boerennatuur Vlaanderen's initiative for "Mowing with removal of the grass" (from their website)

Its achievements include developing multiple applications for grass clippings, such as soil improvement, livestock fodder, and green energy generation. The farmers they have accommodated seem to be very satisfied with the support provided, based on a satisfaction questionnaire they have deployed, which translates into new registrations this year.

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Promising potential

The initiative's collaborative approach between farmers, cooperatives, and local processing units streamlines the logistics of mowing and valorising grass clippings[245]. This structure reduces the burden on farmers and ensures that grass is turned into useful products like soil improvers, livestock fodder, or green energy[246]. Regulatory frameworks in regions (like Flanders) encourage sustainable land management practices, and the demand for biodiversity preservation in agriculture provides an ongoing need for such services[247] [248]. The growing bioeconomy sector, which promotes the valorisation of agricultural waste into valuable products, aligns well with this initiative, offering opportunities for expanded markets in bioenergy and bioplastics[249] [250]. Moreover, environmental policies and incentives for biodiversity and circular economy practices arising in the EU are favourable to the adoption of such sustainable services[251]. Finally, based on the results of the Online Survey, the farmers' perception is that many of their peers already participate in some type of farmers' association or cooperative[252], indicating that many would be familiar with the procedures and might find it appealing to join a cooperative like this. Also, for more than half respondents, mowing and removing grass is part of their work, and thus, they would find it helpful if a local cooperative could do it for them quickly and affordably using the appropriate machinery[253].

Limitations to Consider

High logistics costs, particularly in the transportation of grass clippings between scattered buffer strips, increase operational expenses and reduce efficiency, especially when small or irregularly shaped strips are involved[254]. This can deter some farmers from participating due to rising costs[255]. The evolving waste legislation, which, in some cases, classifies grass clippings as waste rather than a resource, imposes administrative hurdles and complicates local valorisation efforts[256].

Dictionary

Buffer strip: The term refers to "*a grassed strip between strips of cropland subject to erosion*"[257].

Read more

Information on "Mowing with removal of the grass" initiative at the Boerennatuur Vlaanderen website, https://www.boerennatuur.be/eindrapport-beheerovereenkomsten-maaien-met-afvoer/.

[245] Project coordinator at Boerennatuur Vlaanderen, personal communication, September 2024
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[247] Project coordinator at Boerennatuur Vlaanderen, personal communication, September 2024
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[255] Project coordinator at Boerennatuur Vlaanderen, personal communication, September 2024
[256] Nzeteu, C., Coelho, F., Davis, E., Trego, A., & O'Flaherty, V. (2022). Current Trends in Biological Valorization of Waste-Derived Biomass: The critical role of VFAs to fuel a biorefinery. *Fermentation*, *8*(9), 445. https://doi.org/10.3390/fermentation8090445
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3.17. Good Practice 17

Forest grazing sheep-based land management

Keywords: forest grazing, agroforestry, sheep grazing, biodiversity, animal well-being, landscape management, agritourism

Type of good practice: Changes in key activities and production
(Substituting with renewables and natural processes)

Description

A farm that provides forest grazing using sheep, combining commercial forestry with sustainable land and landscape management (including management of rural landscapes and protected areas). The main service involves grazing sheep in young forest areas, which can supportbiodiversity and animal well-being while reducing forest management costs. The primary clients of the farm include local municipalities, private landowners, and tourism visitors. Wool and lamb products are sold locally, and the farm operates as an agri-tourism destination with rentable cottages. A key innovative aspect is the use of sheep for early-stage forest management, replacing some traditional human labour for tasks like pre-commercial thinning.

Figure 36: Forest grazing sheep-based land management (Source: ChatGPT)

Societal Impacts

1 Environmentally, the use of sheep for forest grazing fosters biodiversity by creating diverse habitats for various species, and it reduces the need for traditional forest management methods like pre-commercial thinning, lowering the ecological footprint. However, grazing in young forests may also negatively affect seedling survival and regeneration if not carefully managed, which can undermine long-term forest productivity[258]. In addition, legal and regulatory constraints on agroforestry and

2 Economically, the model provides financial benefits not only to the farm but also to municipalities and forest owners, as it offers a cost-effective solution for large-scale land management. However, high upfront costs for infrastructure, such as fencing and animal care, can be a barrier for farmers without established resources,

3 Socially, the areas managed by sheep grazing become accessible recreational spaces, enhancing the quality of life for local communities through national parks and municipal areas.

[258] Hester, A.J., Mitchell, F.J.G. & Kirby, K.J. (1996). Effects of season and intensity of sheep grazing on tree regeneration in a British upland woodland. Forest Ecology and Management, 88, 99–106. DOI: 10.1016/S0378-1127(96)03815-7.

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grazing in forest land may limit where and how this practice can be implemented.

potentially widening economic inequalities.

Who, When and Where Can Adopt it

Farmers and public and private forest owners in northern and boreal regions where grazing forests have been traditional but underutilised practices, who want to (i) reduce forest management costs (like thinning); (ii) manage forests and farmlands more efficiently; (iii) manage large-scale forested areas without the intensive labour costs of traditional methods.

Farmers with experience in livestock management (e.g., sheep) who want to (i) enhance their profitability by increasing the utility of their livestock for purposes beyond traditional meat or wool production, such as land management and ecosystem services; (ii) tap into the market for eco-tourism and farm stays.

A real-life example

A real-life example is the Vaahermäki farm, which is based in Savonranta, Finland. It is a family-run farm that has been passed down through generations. Originally focused on traditional farming, it shifted its business model in 2005 during a generational transfer, transitioning to environmental conservation and agroforestry through sheep grazing. Starting with just 20 sheep, the farm now manages around 250 sheep, using them to maintain large forest areas and support biodiversity. Over time, the farm's operations have expanded significantly managing large forested areas, with partnerships stretching across several regions in Finland, including from Oulu in the north to Southern Savonia. The farm offers a comprehensive "turnkey" service package for landscape management. This includes everything from setting up fences, transporting and caring for the sheep, to removing them after grazing.

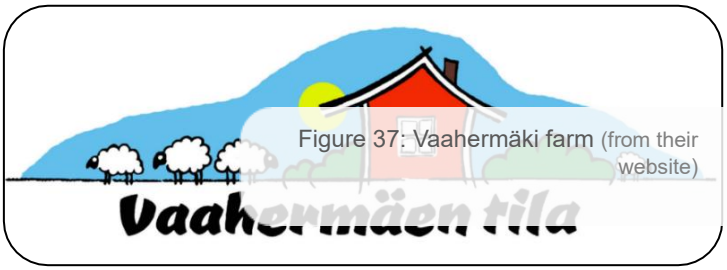

Figure 37: Vaahermäki farm (from their website)

The farm handles all aspects of the process, making it convenient for municipalities, private landowners, and other clients who wish to maintain large areas of land efficiently. It also partners with organisations like the Grazing Bank, which connects landowners with livestock for landscape maintenance. The farm also offers agritourism stays in cottages, taking advantage of the beautiful rural landscape, shaped by sheep grazing, as well as its agricultural activities. Apart from the sheep grazing and agritourism services its products include wool and lamb. The business has grown tenfold financially, showcasing its success in combining agroforestry and agrotourism.

Promising potential

Combining forest grazing with sustainable forestry reduces costs, such as through savings in forest management, and generates diverse revenue streams for farms[259]. The use of sheep for forest management makes the firm's services attractive to municipalities and landowners looking

[259] Farm owner of the Vaahermäki farm, personal communication, October 2024

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for ecological solutions[260]. Trends such as increasing consumer awareness of environmental issues, demand for sustainable tourism, and supportive EU policies for agroforestry practices and sustainable farming (e.g., the Common Agricultural Policy[261] and Farm to Fork strategy[262]) provide favourable conditions for growth. Furthermore, rising consumer demand for eco-friendly tourism and local, sustainable products provides additional market opportunities[263]. These trends make agroforestry particularly resilient, appealing to farmers seeking both ecological and economic benefits across the EU[264]. Based on the results of the Online Survey, private forest owners believe that around 40% of their peers would be open to alternative forest management solutions, like collaborating with a firm that brings their sheep to graze[265]. Also, 25% of consumers would choose sustainable tourism if the price was not too high. Many of them (20%) would also consider it depending on the quality of services and convenience. That said, there is still a significant number of respondents who wouldn't pay more and wouldn't choose it[266], indicating that firms could benefit from combining their farming activities with agri-tourism, if they manage to offer affordable prices.

Limitations to Consider

Agroforestry requires specialised knowledge of both forestry and livestock management, making it labor-intensive and challenging for small or inexperienced farmers to adopt it[267]. Upfront investments for infrastructure, such as fencing, and animal care can be high, particularly for those without established resources[268]. Changes in subsidy structures, economic downturns, or market volatility for agricultural products can threaten profitability. Additionally, the regulatory complexity surrounding agro-environmental services and the new knowledge, skills and management procedures required can be factors because of which farmers, foresters and private forest owners hesitate to engage with agroforestry practices[269].

Read more

Information on Vaahermäki Tila is on their website, https://www.vaahermaki.com/.

[260] Farm owner of the Vaahermäki farm, personal communication, October 2024
[261] *CAP at a glance*. (2024, October 28). Agriculture and Rural Development. https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-glance_en
[262] *Farm to fork strategy*. (n.d.). Food Safety. https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en
[263] Farm owner of the Vaahermäki farm, personal communication, October 2024
[264] *Policy Insights - Agroforestry opportunities | EU CAP Network*. (2023, January 19). https://eu-cap-network.ec.europa.eu/publications/policy-insights-agroforestry-opportunities_en
[265] Online Survey results, December 2024, find out more in Annex 6
[266] Online Survey results, December 2024, find out more in Annex 6
[267] Farm owner of the Vaahermäki farm, personal communication, October 2024
[268] Farm owner of the Vaahermäki farm, personal communication, October 2024
[269] *EIP-AGRI Focus Group on Agroforestry: Final report | EU CAP Network*. (2017, January 1). https://eu-cap-network.ec.europa.eu/publications/eip-agri-focus-group-agroforestry-final-report_en

Funded by the European Union

3.18. Good Practice 18

Mutual Eco-Protection Fund

Keywords: farmers' association, mutual fund, insurance, new technology solutions, grape farmers, winegrowers, eco-protection fund, Integrated Pest Management

Type of good practice: Changes in key activities and production

Description

A farmers' association that focuses on offering farmers a mutual fund service, specifically targeting wine grape cultivators. The service helps protect farmers from financial losses due to plant diseases and parasitic infestations. Membership in the fund is dependent on farmers adhering to best practices in Integrated Pest Management (IPM) to reduce chemical usage. The initiative operates on an annual fee structure, and compensations are determined by collective contributions. A key innovation of the initiative is the use of modern technology, like drones and forecasting tools, to keep track of plant health and support eco-friendly solutions. It also operates without relying on traditional insurance methods, making it more flexible and accessible for farmers.

Figure 38: Mutual Eco-Protection Fund
(Source: ChatGPT)

Societal Impacts

1. From an environmental point of view by requiring adherence to IPM best practices, the SI initiative helps reduce the use of chemical treatments, thereby fostering more environmentally friendly cultivation methods. However, compliance with strict regional agricultural practices, while important for sustainability, can be burdensome for farmers.
2. Economically, it helps farmers' financial stability by compensating for damages, helping them maintain productivity and competitiveness in the market while adopting more sustainable approaches.
3. Socially, the initiative enhances collaboration and solidarity among farmers, creating a mutual assistance network that helps them manage risks and recover from losses due to plant diseases.

Who, When and Where Can Adopt it

Funded by the European Union

Small to Medium-Sized Farmers in disease-prone areas who are looking to (i) mitigate financial risks associated with outbreaks of diseases; (ii) integrate more eco-friendly practices into their operations while still needing financial stability in times of crisis; (iii) find alternatives to expensive or unavailable traditional crop insurance.

Farmers in countries with supportive policies looking to (i) enhance their financial resilience; (ii) comply with environmental regulations, reducing their environmental footprint and integrating sustainable agricultural practices; (iii) benefit from the technological support of such an initiative.

A real-life example

A real-life example is the "Agrifondo Mutualistico Fitopatie Veneto- Friuli", an initiative of Condifesa Veneto (a large agricultural consortium that helps protect farming businesses from the increasing risks posed by climate change and other agricultural threats). The initiative takes action in the Veneto and Friuli Venezia Giulia regions of northeastern Italy. It operates as a mutual fund supporting wine grape farmers by compensating for losses due to plant diseases (e.g., Downy mildew, Powderymildew, Bacteriosis, Botrytis, Golden Flavescence, etc.). It was established in 2010 as a mutual fund system created by farmers for farmers and was funded solely by member contributions. Its goal is to provide financial protection against agricultural losses not covered by traditional insurance, specifically due to plant diseases and infestations. In 2019, it was adapted to align with EU regulations, enabling access to public funding.

Figure 39: Agrifondo Mutualistico Fitopatie Veneto- Friuli (from *the Condifesa Veneto* website)

It requires farmers to follow IPM to qualify for compensation. Since its inception, the initiative has grown significantly, with 6,000 farmers participating, including 1,000 winegrowers. To date, it has disbursed over €3 million in compensation for damages caused by various diseases, such as Downy mildew and Golden Flavescence.

Promising potential

The initiative's focus on sustainability, such as promoting IPM practices, positions its members well to meet growing consumer demand for environmentally friendly agricultural products[270]. Additionally, using modern technologies like drones and predictive models for crop monitoring enhances efficiency and resilience in agriculture[271]. EU financial support for mutual funds could offer a foundation for economic sustainability, helping such farmer associations mitigate climate change and crop disease risks[272] [273]. With increasing awareness of environmental sustainability,

[270] General Manager of "Agrifondo Mutualistico Fitopatie Veneto- Friuli", personal communication, September 2024
[271] General Manager of "Agrifondo Mutualistico Fitopatie Veneto- Friuli", personal communication, September 2024
[272] General Manager of "Agrifondo Mutualistico Fitopatie Veneto- Friuli", personal communication, September 2024
[273] *How to tackle price and income volatility for farmers? An overview of international agricultural policies and instruments*. (2016). https://www.farm-europe.eu/travaux/how-to-tackle-price-and-income-volatility-for-farmers-an-overview-of-international-agricultural-policies-and-instruments/

Funded by the European Union

policies supporting green farming practices are likely to grow, potentially expanding both membership and financial support for such initiatives[274] [275]. Finally, based on the results of the Online Survey, the farmers' perception is that more than half of their peers see farmers' associations or cooperatives as a good way to access amenities (equipment, information and markets) that they couldn't afford otherwise and are keen to join more of them[276]. Many farmers also consider that their peers would be interested in participating in an association that can compensate them for plant diseases and parasitic infestations instead of traditional insurance[277].

Limitations to Consider

The fund's reliance on member contributions for compensation limits its scalability compared to traditional insurance, particularly in times of widespread crop failure when available capital may fall short[278]. Moreover, compliance with strict regional agricultural practices, although necessary for sustainability, can be burdensome for farmers and may reduce participation[279]. The slow bureaucratic processes in accessing public funding and regulatory inconsistencies across EU member states could hinder the initiative's financial viability[280]. Additionally, increasing volatility in agricultural markets due to climate change and fluctuating commodity prices may strain the fund's resources, posing long-term economic risks[281]. Finally, based on the Online survey, farmers consider that one of the most crucial barriers in adopting precision agriculture and cutting-edge technologies is the hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain[282]. This highlights the need for greater assurance and evidence of these technologies' effectiveness to address the concerns of the farming community.

Read more

Information on Agrifondo Mutualistico Fitopatie Veneto- Friuli is on this website, https://www.condifesatvb.it/campagna-mutualistica/.

[274] *Agricultural Finance – Trends, Issues and Challenges* (2011) https://www.rfilc.org/wp-content/uploads/2020/08/06__giz2011-0460en-agricultural-finance.pdf
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[276] Online Survey results, December 2024, find out more in Annex 6
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[278] General Manager of "Agrifondo Mutualistico Fitopatie Veneto- Friuli", personal communication, September 2024
[279] General Manager of "Agrifondo Mutualistico Fitopatie Veneto- Friuli", personal communication, September 2024
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[282] Online Survey results, December 2024, find out more in Annex 6

Funded by the European Union

3.19. Good Practice 19

Agroecology partnerships of farmers and companies for sustainable growth

Keywords: agroecology, partnerships, collaborations, financial support, sustainable farming

Type of good practice: Changes in key partners and forms of collaborations (Intermediary models)

Description

This initiative involves connecting farmers transitioning to agroecological practices with companies willing to provide financial support. The primary service of the non-profit organisation is facilitating funding for farmers' long-term sustainability projects, targeting two main groups: farmers in need of resources to implement eco-friendly practices and companies seeking to align with visible, local sustainability goals. Key features of the model include a collaborative approach where farmers outline and validate their projects against agroecological criteria before being matched with corporate sponsors. Additionally, the model ensures that 70% of the funds raised directly support the farmers and their advisors, while the remainder sustains the nonprofit's operations and research. This innovative approach focuses on farmer motivation rather than purely outcome-based metrics, offering a unique space for experimentation.

Figure 40: Agroecology partnerships of farmers and companies for sustainable growth (Source: ChatGPT)

Societal Impacts

1. Environmentally, the initiative enhances biodiversity, improves soil health, and contributes to carbon sequestration, aligning with climate change mitigation efforts.
2. Economically, it connects farmers with funding sources through long-term corporate sponsorships, enabling them to sustain and expand eco-friendly operations while offering companies a tangible way to integrate sustainability into their operations. This approach strengthens local agri-food systems and encourages partnerships that benefit both farmers and supporting entities.
3. Socially, it empowers farmers by addressing critical resource gaps and providing a platform to implement sustainable practices that align with their priorities, fostering community resilience. However, relying solely on private sector sponsorship can be volatile, and without public support for sustainable agriculture, farmers may face difficulties accessing funding, limiting inclusivity and long-term impact.

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Who, When and Where Can Adopt it

Farmers transitioning to sustainable practices: who are looking (i) to unlock new financial resources, while minimising financial risks, (ii) to adopt agroecological practices, (iii) for structured support through financial backing and advisory services, (iv) to appeal to consumer demand for sustainable products.

Farmers and private forest owners: who want to (i) take advantage of the biodiversity frameworks or carbon credit regulations, (ii) prioritise motivation over immediate results, and have room for experimentation and learning, while minimising financial risks.

A real-life example

A real-life example is “Farming for Climate”, a non-profit organisation based in Belgium. The initiative was founded in 2019 in response to the youth-driven climate marches of 2018, seeking to bridge the gap between the corporate world and sustainable farming. It focuses on accelerating agroecological transitions by connecting farmers with businesses willing to support these efforts financially. The initiative’s innovative model emphasises motivation over immediate outcomes, providing farmers with funding and expert advice for three-year transition projects that enhance soil health, biodiversity, and carbon sequestration. The initiative currently (2024) supports 38 farms, contributing to the sequestration of over 4,046 tons of CO2 between 2021 and 2024, with a goal of reaching 1,000 farms by 2030. This local approach provides both measurable environmental impacts and a tangible method for corporations to fulfil sustainability goals.

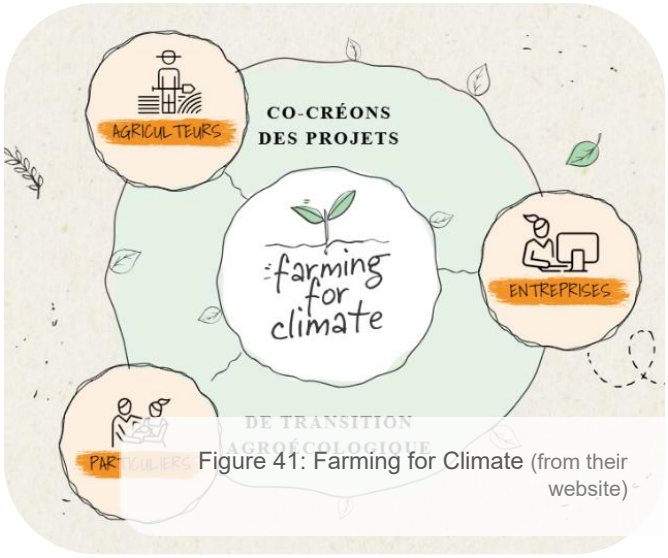

Figure 41: Farming for Climate (from their website)

Promising potential

This initiative integrates structured long-term funding from corporations with tailored support for farmers, ensuring alignment with both stakeholders' goals[283]. This approach effectively mobilizes resources to enhance agroecological practices, benefiting the environment and local economies[284]. The rising global focus on regenerative agriculture, with projected growth at a CAGR of 15.6% by 2034[285] (12.6% by 2028[286]), provides a favourable context for scaling. Supportive trends include increasing consumer demand for sustainable products, increasing emphasis on climate change mitigation, and government policies promoting biodiversity and

[283] Coordinator of “Farming for climate”, personal communication, November 2024
[284] Coordinator of “Farming for climate”, personal communication, November 2024
[285] *Regenerative Agriculture Market*. (2024, April 26). https://www.futuremarketinsights.com/reports/regenerative-agriculture-market
[286] Technavio. (2024, January). *Regenerative Agriculture market Analysis : US, China, India, UK, Germany - size and forecast 2024-2028*. Technavio, https://www.technavio.com/, All Right Reserved 2024. https://www.technavio.com/report/regenerative-agriculture-market-industry-analysis

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carbon sequestration[287] [288]. Finally, based on the results of the Online Survey, 87% of consumers see value in initiatives that also fund side environmental responsibility projects and would consider buying their products, with 22,6% considering them quite important[289], indicating favourable conditions in environmentally woke audiences.

Limitations to Consider

The reliance on corporate sponsorships could pose a risk, as potential changes in corporate priorities, economic downturns, or shifts in sustainability strategies could reduce funding availability[290]. Competition from other platforms that also offer certification for the products could result in constraining adoption by farmers[291]. Lack of knowledge among farmers regarding sustainable agriculture poses a prohibiting factor in adopting regenerative practices[292].

Dictionary

- Carbon credits: "*Tokens representing one tonne of CO2 equivalent that can be traded between an entity that continues to emit and an entity that reduces its own emissions or removes carbon dioxide (CO2) from the atmosphere. Used interchangeably with "carbon offsets", (although, in theory, a credit could be purchased by an entity wanting to contribute to climate action, but without claiming it has "offset" its own emissions).*"[293]
- Carbon Farming: Based on the Carbon Cycle Institute[294], carbon farming is a way of managing land to help capture and store more carbon in plants and soil. By using eco-friendly practices, farmers can pull CO_2 from the air and lock it in the soil, improving its quality and making farms more productive. This approach helps fight climate change and boosts the overall health of the land.
- Carbon markets: "*Trading systems in which carbon credits can be bought and sold.*"[295]

Read more

Information on "Farming for climate" is on their website, https://farmingforclimate.org/, and on their Facebook, LinkedIn and Youtube.

[287] *Regenerative Agriculture Market*. (2024, April 26). https://www.futuremarketinsights.com/reports/regenerative-agriculture-market
[288] Technavio. (2024, January). *Regenerative Agriculture market Analysis : US, China, India, UK, Germany - size and forecast 2024-2028*. Technavio, https://www.technavio.com/, All Right Reserved 2024. https://www.technavio.com/report/regenerative-agriculture-market-industry-analysis
[289] Online Survey results, December 2024, find out more in Annex 6
[290] Coordinator of "Farming for climate", personal communication, November 2024
[291] Coordinator of "Farming for climate", personal communication, November 2024
[292] Technavio. (2024, January). *Regenerative Agriculture market Analysis : US, China, India, UK, Germany - size and forecast 2024-2028*. Technavio, https://www.technavio.com/, All Right Reserved 2024. https://www.technavio.com/report/regenerative-agriculture-market-industry-analysis
[293] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html
[294] Carbon Cycle Institute. (2021, June 4). *What is Carbon Farming? | Carbon Cycle Institute*. https://www.carboncycle.org/what-is-carbon-farming/
[295] Pearson, D. D. J. G. T. (2023, September 25). *Glossary: Carbon Brief's guide to the terminology of carbon offsets*. Carbon Brief. https://interactive.carbonbrief.org/carbon-offsets-2023/glossary.html

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3.20. Good Practice 20

Cultivation of medicinal mushrooms in birch forests

Keywords: medicinal mushrooms, birch forests, forest management, mushroom cultivation, Chaga mushrooms	*Type of good practice:* Changes in key activities and production & New products and services (Maximising material and energy productivity and efficiency, Repurposing the business for society/ the environment)

Description

A firm offering a service that supports the cultivation of medicinal mushrooms, particularly chaga, in birch forests. This service is primarily targeted at forest owners, enabling them to transform low-value birch trees into higher-value assets by cultivating mushrooms. A key aspect of this firm is the inoculation service combined with a buyback agreement, aiming to ensure that forest owners are not left with unsellable products. The cultivation process is designed to be environmentally sustainable, as it enhances forest biodiversity and reduces the need for intensive forest management, thereby contributing to carbon sequestration. This niche product relies on specialised, short supply chains connecting forest owners directly with high-value food and health markets. The value proposition is that forest owners can generate additional income from low-value birch trees while supporting environmental sustainability, enhancing biodiversity, reducing the need for intensive management, and minimising resource use and emissions.

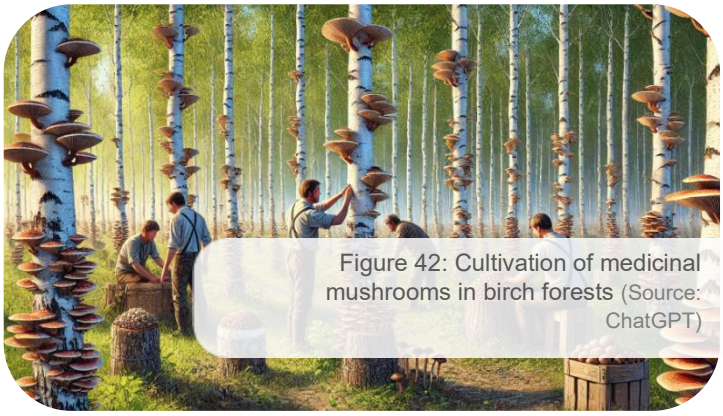

Figure 42: Cultivation of medicinal mushrooms in birch forests (Source: ChatGPT)

Societal Impacts

1. Environmentally, such a firm creates impact by promoting sustainable forest management and enhancing biodiversity by cultivating chaga mushrooms. By reducing the need for thinning and allowing more decaying wood in forests, it supports carbon sequestration and improves ecosystem health. However, legal and certification rules (such as FSC/PEFC standards or national regulations on fungal inoculation) may restrict where and how this practice can be used. In addition, its long-term

2. Economically, it provides forest owners with an additional revenue stream, increasing the value of otherwise low-yielding birch trees. However, mushroom cultivation can be resource-intensive, which may limit participation for smaller or less-experienced forest owners, excluding them from potential economic benefits. In addition, chaga cultivation may reduce timber quality or delay harvesting, which can affect overall forest income

3. Socially, the firm engages local forest owners in sustainable practices, helping to preserve forest resources while offering a long-term, profitable alternative to traditional

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effects on tree growth, wood quality, and carbon storage can vary depending on local conditions.

depending on market conditions and management objectives.

forestry activities.

Who, When and Where Can Adopt it

Forest owners in boreal and temperate regions (i) looking to increase the economic yield from their land without resorting to more invasive practices; (ii) seeking stable, long-term investments that also enhance their green credentials and support carbon sequestration efforts.

Organic and agroforestry practitioners: who want to take advantage of biodiversity benefits and the alignment with organic certification processes; (ii) diversify income streams; (iii) increase carbon sequestration; (iv) enhance biodiversity.

A real-life example

A real-life example is the Kääpä Forest, a firm based in Karjalohja, Finland, that focuses on the sustainable cultivation of chaga mushrooms in birch forests and specialises in innovative biotechnology applications involving mushrooms, particularly in the nutraceutical and forestry sectors. Founded in 2018, it has grown rapidly to become one of Europe's leading producers of mushrooms for dietary supplements. It emerged from the recognition that wild chaga supplies would eventually run out, leading to the commercialization of cultivated chaga. Its core business model centers around chaga mushroom cultivation, where it partners with forest owners by offering inoculation services and purchasing the harvested chaga for further processing (buyback agreement). The company has pioneered sustainable forest management practices and developed an innovative ultrasonic extraction technology to enhance the potency of its mushroom extracts.

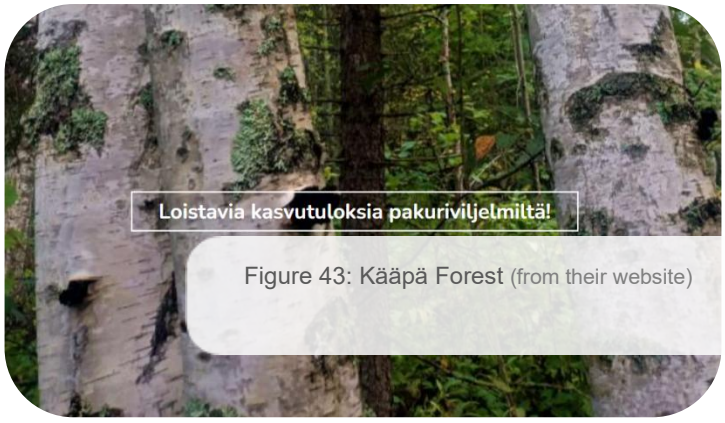

Figure 43: Kääpä Forest (from their website)

It offers premium products which are certified as organic, are trustworthy, and come from safe forests. Its achievements include winning the prestigious 2021 NutraIngredients Start-up Award, recognition as Finland's 2022 Natural Product Actor, and expanding international partnerships in North America.

Promising potential

The firm offers an innovative and environmentally sustainable solution by using birch forests for chaga cultivation, providing forest owners with an additional income stream through an agreement that ensures both inoculation and buyback of the mushrooms[296]. Rising global

[296] Commercial Director of Kääpä Forest, personal communication, September 2024

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demand for natural health supplements, particularly chaga-based products in the nutraceutical, pharmaceutical, and personal care sectors, drives market opportunities[297]. The global chaga mushroom market is expected to grow at a Compound Annual Growth Rate of 7.2% (from 2022 to 2031), due to increasing consumer awareness of the health benefits of chaga, including its antioxidant and anticancer properties, with Europe leading in consumption[298] [299] [300]. Finally, based on the results of the Online Survey, private forest owners believe that almost half of their peers consider and actively search for ways to increase the income generated from their forest[301], which indicates that they might consider solutions like this.

Limitations to Consider

The long cultivation period (approximately 10 years for chaga) may delay revenue generation, especially for forest owners seeking shorter-term returns[302]. Managing consistent quality control for organic certification and avoiding issues like mycotoxins during storage can also be resource-intensive[303]. Regulatory challenges, particularly stringent food safety and organic certification rules in some regions (such as Finland), could slow down market entry and expansion for firms like this that fall under the food sector as well [304]. More specifically, operating and developing further in Finland's food sector is challenging due to the restrictive regulatory practices of Ruokavirasto (Finnish Food Authority), which hinder the introduction of novel ideas and create a competitive disadvantage compared to more lenient EU Member States[305]. Furthermore, competition from established producers in countries, where production costs are lower (like China and Russia), poses a threat to premium pricing strategies for products produced in Europe[306] [307]. The limited availability of suitable birch forests and possible environmental constraints also add to the challenges[308]. Finally, based on the results of the Online Survey, private forest owners believe that not many of their peers would be open to alternative revenue streams, like collaborating with a firm that can cultivate medical mushrooms on their trees and trade them[309]. This suggests that companies like this would need to invest significant effort in building trust and demonstrating value to establish itself in the market.

Dictionary

[297] Allied Market Research, https://www.alliedmarketresearch.com/. (n.d.). *Chaga Mushroom Market Size, Share, Competitive Landscape and Trend Analysis Report, By nature, by form, by End use : Global Opportunity Analysis and Industry Forecast, 2021-2031*. Allied Market Research. https://www.alliedmarketresearch.com/chaga-mushroom-market-A47231
[298] Allied Market Research, https://www.alliedmarketresearch.com/. (n.d.). *Chaga Mushroom Market Size, Share, Competitive Landscape and Trend Analysis Report, By nature, by form, by End use : Global Opportunity Analysis and Industry Forecast, 2021-2031*. Allied Market Research. https://www.alliedmarketresearch.com/chaga-mushroom-market-A47231
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[300] Maximize Market Research Pvt Ltd. (2024, January 11). *Chaga Mushroom Market- Industry Analysis and Forecast 2030*. MAXIMIZE MARKET RESEARCH. https://www.maximizemarketresearch.com/market-report/chaga-mushroom-market/186961/
[301] Online Survey results, December 2024, find out more in Annex 6
[302] Commercial Director of Kääpä Forest, personal communication, September 2024
[303] Commercial Director of Kääpä Forest, personal communication, September 2024
[304] Commercial Director of Kääpä Forest, personal communication, September 2024
[305] Commercial Director of Kääpä Forest, personal communication, September 2024
[306] Markets, R. A. (2024, September 27). Chaga Mushroom Market, Competition, and Pricing Insights (2024-2031): Global and regional analysis by product, technology, grade, application, and end-user. *GlobeNewswire News Room*. https://www.globenewswire.com/news-release/2024/09/27/2954382/0/en/Chaga-Mushroom-Market-Competition-and-Pricing-Insights-2024-2031-Global-and-Regional-Analysis-by-Product-Technology-Grade-Application-and-End-user.html
[307] Commercial Director of Kääpä Forest, personal communication, September 2024
[308] Maximize Market Research Pvt Ltd. (2024, January 11). *Chaga Mushroom Market- Industry Analysis and Forecast 2030*. MAXIMIZE MARKET RESEARCH. https://www.maximizemarketresearch.com/market-report/chaga-mushroom-market/186961/
[309] Online Survey results, December 2024, find out more in Annex 6

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Chaga mushrooms: "*the dark brown to black, irregularly shaped, sterile, mycelial mass of a fungus (Inonotus obliquus of the family Hymenochaetaceae) that grows parasitically chiefly on hardwood trees and especially birch in temperate climates of the northern hemisphere*"[310]

Read more

Information on Kääpä Forest is on their website, https://kaapaforest.fi/.

[310] Chaga. (n.d.). In *Merriam-Webster Dictionary*. https://www.merriam-webster.com/dictionary/Chaga

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4. Conclusion and Next Steps

The document at hand is the outcome of the work in PRUDENT to identify and develop good practices of BMs, SIs and cooperation models in agriculture and forestry.

After mapping real-life examples and interviewing their representatives, the document highlights promising practices that integrate environmental sustainability, social innovation, and efficient value chains. Our findings provide insights into how these practices can be adapted to local contexts in the EU, as well as their limitations and future potential. More specifically, the document identifies and analyses 20 good practices that can drive the transition towards more sustainable systems, ranging from carbon farming and precision agriculture to agroecology and cooperative models. These practices illustrate innovative pathways for reducing environmental impacts, enhancing economic viability, and fostering social inclusion in agriculture and forestry.

Our findings support PRUDENT's overarching goal of promoting sustainable, climate-neutral agricultural and forestry systems. By showcasing diverse examples, this document offers a framework to guide farms, policymakers, and other stakeholders to adopt more environmentally friendly approaches. The results underscore the importance of combining innovative farming and forestry techniques with business practices that support environmental goals, such as carbon sequestration, biodiversity enhancement, and resource optimisation. Furthermore, they emphasise the need for cooperation among stakeholders, including farmers, foresters, private forest owners, industry players, and consumers, to facilitate the adoption of sustainable practices and scaling impactful solutions. Our analysis sheds light in each good practice's limitations, including the evolving regulatory framework, market conditions, and technological complexities impacting its scalability. We also outline each practice's future potential in terms of, e.g., consumer demand for sustainable products, supportive EU policies, and evolving markets for carbon credits, organic goods, and eco-tourism.

A core element of our approach is a survey of more than 160 responses from relevant stakeholders, which informs our good practices by providing valuable insights into their norms, values, beliefs, and perceptions. The findings indicate that farmers are more proactive regarding efficiency and profitability, while forest owners are more cautious, weighing benefits against costs and effort. Consumers overall value sustainable products and social responsibility, but their consumption decisions are cautious and depend on price, quality, and convenience. Collaboration is valued across groups. Both farmers and forest owners value cooperative arrangements and consumers show willingness to support initiatives through ethical purchasing. Across all groups, support for sustainability or innovation is conditional (driven by cost, convenience, technical capability, or perceived financial benefit) indicating pragmatism as a common underlying norm.

Contribution in the frame of the PRUDENT project

This document has been developed in the context of PRUDENT Task 3.1, "*Mapping of existing business models (BMs), social innovations (SIs), and models of cooperation affecting the adoption of sustainable behaviours and practices.*" The results of this work will directly inform Task 3.2, "*Identification of sustainable BMs, SIs, and models of cooperation for different industry segments and market conditions in the four Use Cases (UCs)*", as well as Work Package 2 (WP2), which aims to identify the most promising nudges to promote sustained behavioural change towards sustainable agriculture and forestry. Specifically, the outputs of Task 3.1 are intended to support WP2 by informing the selection of nudges to be tested in experimental settings that generate benefits along the value chain. As the project progresses, this interconnection is expected to become increasingly evident through the implementation of Task 3.2 and WP2 activities in the coming months.

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Annexes

Annex 1: Typology of BMs

Type 1: New products and services

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Creating value from waste	Higher-value products/ services using waste from other processes	Using recycled materials, ensuring recyclability of products/services	Economic and environmental costs are reduced, as well as waste and virgin material use

Examples:

- Goat and sheep manure based aerobic conversion producing fertilizers (e.g., Pedrín)
- Cattle manure based anaerobic digestion producing biogas (e.g., HoSt)
- Manure and slurry based anaerobic digestion producing heat, electricity, and fertilizers (e.g., Lantmännen)
- Whey permeate based anaerobic digestion producing bioethanol, biogas and fertilizers (e.g., Carbery)
- Poultry manure based aerobic conversion producing fertilizers (e.g., Pindos)
- Cereal crop straw based growing producing Oyster mushroom and oyster mushroom substrate (e.g., Pilze-Nagy)
- Unsold bread based fermentation producing beer (e.g., Toastale)
- Winery and industrial farming by-products, and mowing waste based fermentation producing fuels, electricity and fertilizers (e.g., Caviro)
- Fruit juice residue streams based pressing and solvent extraction producing specialty oils and additives for food, food supplements & cosmetics (e.g., Add Essens)
- Olive oil industry by-products based extraction producing food additives (e.g., Natac Group)
- Forestry residue based mechanical disruption producing pellets and chips for energy applications (e.g., MW Biomasse AG)
- Wood waste based thermolysis (gasification) producing renewable hydrogen (e.g., Hynoca)

Sub-type #2	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Repurposing the business for society/ the environment	Prioritising the delivery of social and environmental benefits rather than economic profit	A totally new initiative or repurposing activities, channels and partnerships	It may gain profits (social enterprise), be a non-profit (e.g., an NGO) or depend on funding (e.g., ad-hoc project)

Examples:

- Social Consumer Cooperative (e.g., Food Cooperatives)

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- Community gardens (i.e., shared spaces where people come together to grow fruits, vegetables, flowers, and other plants)
- School food programme (i.e., initiatives designed to provide nutritious meals to students)
- Initiatives based on community management of forests, and/or supported by networks of smallholders, stakeholders, and experts or platforms for sharing information and best practices[311]
- Operational Groups that develop innovative technologies or online systems for electronic forest management[312]
- Innovative farming and forestry initiatives that also provide multiple ecosystem services such as recreation, agro- and eco-tourism, sale of non-timber forest products (for reforestation and sustainable forest management), carbon sequestration, and biodiversity conservation[313]

Type 2: New markets and customers

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Focus on a specific customer segment	Offer products/services that meet the preferences of specific, narrower customer segment	Produce such products through relevant processes, e.g., organic, regenerative, and urban farming.	Consumers are willing to pay a premium. Societal and environmental benefits

Examples:

- Organic farming for health-conscious customers and niche markets.
- Sustainable and regenerative farming for environment-conscious customers
- Agrotourism, to offer farm tours to tourists, educational workshops to educate the public about agriculture, and seasonal events, as well as to sell farm products directly to visitors
- Gourmet marketplace for customers that seek luxurious products and unique tastes
- Urban farming in small urban plots, rooftops, or vertical farming techniques. It can engage local communities through educational programs and workshops and supply urban markets and community-supported agriculture schemes.
- Multifunctional Agriculture initiatives targeted to specific groups (*e.g.,* care farms to provide health, social, and educational services for individuals with various needs, green care initiatives, social farming)[314]

Type 3: Changes in key activities and production

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Maximising material and energy productivity	Developing products/services with reduced resource consumption, resulting	Implementing production processes that are both more efficient and safer.	Cutting expenses as material use is optimised while

[311] EIP-AGRI Network (2020) Inspirational ideas: Social innovation for sustainable forest management
[312] EIP-AGRI Network (2020) Inspirational ideas: Social innovation for sustainable forest management
[313] Ludvig, A.; Rogelja, T.; Asamer-Handler, M.; Weiss, G.; Wilding, M.; Zivojinovic, I. (2020) Governance of Social Innovation in Forestry. Sustainability, 12, 1065. https://doi.org/10.3390/su12031065
[314] Genova, A.; Maccaroni, M.; Viganò, E. (2020) Social Farming: Heterogeneity in Social and Agricultural Relationships. Sustainability, 12, 4824. https://doi.org/10.3390/su12124824

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and efficiency	in minimised waste and emissions.		reducing environmental footprint.

Examples:

- Precision Agriculture
- Water-Smart Farming
- Adoption of innovative production methods
- Acquisition of more efficient machinery; construction of livestock houses, storage facilities, slaughterhouse, incinerator for small animals

Sub-type #2	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Substituting with renewables and natural processes	Utilizing bio-based renewable materials and energy in products/services, avoiding resource constraints of non-renewable resources in the production system.	Adopting innovative production methods based on biobased materials and mimicking natural systems.	Bringing new products/services to market while decreasing environmental footprint with renewable resources, less emissions and waste.

Examples:

- Integrated Crop-Livestock Systems
- Hydroponic/Aquaponic farming for farmers with limited arable land
- Agroforestry, combining agricultural and forestry practices to mimic natural processes[315] (also smart agroforestry)
- Buying waste vegetables from other farmers to use as animal feed
- Utilise solar and wind-power based energy innovations
- Utilise circular production processes
- Permaculture (i.e., land management approach that uses methods found in healthy natural ecosystems)

Sub-type #3	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Vertical Integration and Ownership	High-quality, efficiently produced products by controlling multiple stages of the supply chain.	Managing multiple stages of production, processing, and distribution.	More value is captured, and costs reduce by reducing intermediaries and increasing control over the entire supply chain.

Examples:

- Full control over the meat production process (e.g., processing of meat at a farm site)
- Full control over the cultivation, production, standardization and packaging of agricultural products
- Production of own feed

[315] Ludvig, A.; Rogelja, T.; Asamer-Handler, M.; Weiss, G.; Wilding, M.; Zivojinovic, I. (2020) Governance of Social Innovation in Forestry. Sustainability, 12, 1065. https://doi.org/10.3390/su12031065

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Type 4: Changes in customer relations and communication

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Encouraging sufficiency	Products/services reducing demand/consumption or developed through a lower resources intensity process	Promoting sustainable consumption, e.g., via plant-based diets	Societal and environmental benefits. Educated society, using fewer resources. Premium pricing.

Examples:

- Offering plant-based alternatives to dairy, such as oat milk (e.g., Oatly)
- School food programme (i.e., initiatives designed to provide nutritious meals to students)
- Radical transparency about environmental/social impacts
- Consumer education; communication and awareness; Social media as marketing channel

Sub-type #2	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Adopting a stewardship role	Broader benefits to stakeholders often become an important aspect of the value proposition by better engaging the consumer with the full story of production and the supply chain.	Seeking resource co-management and transparency in the supply chain. Also, it may include developing more sustainable alternatives to existing products/services.	Stewardship strategies can generate brand value, making consumers willing to pay a premium. Healthy customers are also good for the firm and society.

Examples:

- Emphasis on meat quality or “No-antibiotics” meat
- Mini-meat boxes for small households, gluten- and soya-free meat products
- Wood-based textile fibre
- Value-Added Products (e.g., jams, cheese, honey) with improved nutritional characteristics
- A supplier accreditation programme[316] (e.g., Forestry Stewardship Council)
- Ecological and certified vegetable local production and product selling
- Information on the specific origin of meat and the production process

Sub-type #3	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Community Supported Agriculture (CSA)	Producers and consumers have a pre-existing agreement. Consumers pay an	Subscriptions or shares are sold prior to the season, ensuring a core group of members while	Conscious consumers seek food sources locally and want good labour conditions for

[316] Organisation that entitles certifications to suppliers and contractors that are compliant with specific minimum criteria (e.g., more ethical or sustainable business practices Consumers pay a price premium for the certified products, and in this way, they fund benefits in the supply chain rather than the retailer or manufacturer funding the premium.

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	agreed membership fee or offer labour services (or both), in exchange for quality and certified products, building trusted relationships.	recruiting more locally. Weekly deliveries are provided, and partnerships are made with local shops.	farmers. High production cost (quality and certified products) with pre-defining orders and partnerships reducing cost.

Examples:

- Traditional CSA Model where members purchase a share at the beginning of the season
- Subscription-Based CSA model
- Multi-Farm CSA, a cooperative model of multiple farms
- Work-Share CSA model, where members can reduce the cost of their share by working on the farm
- Delivery-Based CSA model, where produce is delivered directly to members' homes
- Producer – Consumer Cooperative of Agricultural Products
- Artisanal transformation of local vegetables

Type 5: Changes in distribution and sales channels

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Reusable or sustainable packaging[317]	Shifting from single-use to reusable plastic packaging, becoming part of the circular economy and helping to reduce plastic waste and pollution.	Refilling the packaging by the user or by the business, from home or on the go, utilizing business-to-consumer (B2C) or business-to-business (B2B) reuse models.	Costs are reduced as less is spent on new packaging and storage and also by minimising transport costs or by sharing logistics and cleaning facilities.

Examples:

- Refillable packaging (e.g., by bulk dispenser or parent packaging refill)[318], which can be refilled at home (packaging refilled by user) or on the go (packaging refilled by user away from home, such as at an in-store dispensing system)
- Returnable packaging or Transit packaging, which can be returned from home (packaging returned to business, by collecting it from customer's home) or on the go (packaging returned to business by the customer at a store or drop-off point)
- De-materialisation of products/packaging
- Biodegradable, wood-based packaging solutions

Sub-type #2	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Online trade	Products are traded online using the farmer's websites or shared marketing websites to reach sustainably	Sustainable carriers collaboration agreements, engagement of city councils, promotion and communication	Reduced intermediaries, warehousing and maintenance costs. Revenue streams through online sales and subscription models that

[317] Ellen Macarthur Foundation (accessed 2024) Reusable packaging business models
[318] Reloop & Zero Waste Europe (2020) Reusable vs single-use packaging

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	conscious customers in medium-large cities.	activities, utilization of E-commerce platforms and electronic Word-of-Mouth.	help increase purchases.

Examples:

- Online distribution through e-shops, online platforms or social media
- Electronic platforms /online marketplaces
- Online food delivery services
- Digital food markets
- Home delivery box schemes
- ICT bidirectional platform as commercialisation channel
- Distribution platform of one farmer or farm's own products

Sub-type #3	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Retail trade	Local, healthy, and organic products are produced and sold within the region of production, and consumers are made aware of the local nature of the product at the point of sale.	Sharing delivery, warehousing, and development, preserving the products and creating long-term relationships with retailers, local farmers, farmers associations, and exclusive intermediaries.	Reducing costs through resource sharing in logistics, collective outlets optimising the delivery path and by integrating food processing activities. Higher price in return for product quality and environment conditions.

Examples:

- Physical retail stores providing local food
- Short chain distribution of gourmet agricultural products
- Farmers renting their own counters in stores
- Local food collective outlets
- Common store / specialist retailers, farmers' market
- Partnership with restaurant chefs
- Partnership with local meat shop

Sub-type #4	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Face to face	High quality and ethically produced local food from small producers, which the consumer purchases directly from the producer/processor on a Face-to-Face basis (Farm shops, Farmers' markets, Pick-Your-Own).	Selling products to the public on specific days in rural areas and utilizing local stores close to the farm, creating a positive consumer experience and resulting in food waste reduction.	Food waste and miles are minimised. Distribution costs are reduced as the chain shortens (there are no intermediaries). Sales take place directly on-site or close to production locations and at special events or fairs.

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Examples:

- Sales directly to customers
- Open-Air Organic Farmers Market
- Personal contacts with customers
- Open farms/pick-your-own, Self-picking agriculture
- Direct sales from the farm
- Farmers' markets (open-air and closed space)
- Direct purchase groups (producer-consumer cooperation)
- Mobile farmer markets

Sub-type #5	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Improved logistics	Cooperative-based relationships that reduce transport costs and maintain high product standards, focusing on freshness of products (organic and short-life products) and standardised packaging.	Partnering with local farmers, cooperative associations, packaging and transport entities and cooperative warehouses. Development of own joint transport companies and procurement of packaging and cooperation for supply chain and delivery strategies.	Packaging and transportation costs are reduced and prices become more competitive (improved logistics strategy and joint orders for packaging efficiency).

Examples:

- Business-to-Business cooperation (with groceries, organic food stores, canteens etc.)
- Business-to-Consumer (e.g., establish a network of smaller fulfillment centers within urban areas, or partner with local platforms that deliver products in a specific area to supply individual consumers)
- Collaborative Logistics Networks to share storage facilities, transportation resources, and cold chain infrastructure (refrigerated trucks and storage facilities)
- Developing joint transport companies
- Joint procurement of packaging
- Intermodal transportation to move timber over long distances

Type 6: Changes in key resources and investments in assets

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Developing scale-up solutions	Expanding sustainable products/services commercialisation to maximise benefits for both society and the environment.	Develop adequate infrastructure, leverage the right channels and form strategic partnerships to scale up the sustainable BM, while engaging new and	Ensuring a variable fee (e.g., franchising) or fixed fee (e.g., acquisitions) is paid to scale a solution or venture, while achieving mutual benefits for partners through

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		unconventional partners.	expansion (e.g., market penetration).

Examples:

- Establishment of network for learning and knowledge exchange (e.g., to exchange of information on farm management)
- Use of advisory services (e.g., to improve knowledge of production and marketing)
- Taking courses to improve certain skills (slaughtering techniques)
- Licensing, franchising to expand an existing business
- Participation in incubators and entrepreneur support models
- Participation in Open Innovation Platforms
- Crowd sourcing/funding
- Participation in networks for wider visibility (e.g. the agrotourism network Open Farm)

Type 7: Changes in key partners and forms of collaborations

Sub-type #1	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Producer organisation models[319]	Providing small-scale producers with economic benefits and access to dynamic markets through collective marketing efforts.	Organising producers into co-operatives or similar structures, leveraging existing networks, and receiving support from buyers and other chain actors to enhance market opportunities.	Enabling small-scale producers to benefit economically through collective action, increased market participation, and improved business-oriented services.

Examples:

- Organic Farmers Cooperative Initiative
- Farmer cooperatives with value-added services (such as processing and packaging, marketing etc.)
- Female farming cooperatives
- Networks of farmers and traders
- Clustering of small-scale farmers around lead farmers
- Agro-business cooperatives (e.g., Cuatro Pinos in Guatemala)
- Local integrated group of citizens model [320], a bottom-up approach with small local energy projects, such as biomass boilers.

[319] FAO of the United Nations (2008) Business Models for Small Farmers and SME's
[320] BEcoop project (2022) D2.9 BECoop catalogues for the provision of business and financial support services – First

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Sub-type #2	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Buyer driven models[321]	Enhancing efficiency in the supply chain to benefit processing and retail companies while ensuring the inclusion of small farms.	Organising small farm supply through contract farming and innovative retail models, leveraging capital, technology, and market access.	Benefiting small producers with market access and technological support, while companies gain community goodwill and secure their long-term license to operate.

Examples:

- Milk procurement, where milk producers sign contracts with dairies or processors
- Contract farming, where agreements are made between small farmers and processors, retailers, or food companies, who outline the specific quantities and qualities of crops or livestock to be produced
- Outgrower schemes, where a central company provides seeds, fertilizers, and technical assistance to farmers, who will later sell their harvest back to the company
- Supermarket produce buying, where supermarket chains set the standards and quantities of the produce

Sub-type #3	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Intermediary models[322]	Providing essential intermediary services to balance the needs of small farmers and SMEs with the demands of modelrn markets in terms of quality and volume.	Offering services such as quality assurance, knowledge management, and closer buyer relationships to facilitate chain coordination and product/process upgrading.	NGOs and commercial entities benefit from providing intermediary services, ensuring improved market access and upgraded products for small farmers and SMEs.

Examples:

- Non-Governmental Organisations as capacity builders and providers of market access. NGOs act as intermediaries to provide training to small farmers and foresters/private forest owners on improved production practices, post-harvest handling, and business skills, connect them with potential buyers and support them with certification processes
- Forestry service providers with market access that help small private forest owners create management plans, get certifications and connect with timber buyers.
- Co-working and educational spaces offering comprehensive programs for sustainable farm development in rural areas as intermediaries and meeting points for traditional farmers and socially responsible individuals and organisations

[321] FAO of the United Nations (2008) Business Models for Small Farmers and SME's
[322] FAO of the United Nations (2008) Business Models for Small Farmers and SME's

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Sub-type #4	Value proposition (What?)	Value creation & delivery (How?)	Value capture (For whom?)
Public institutional procurement models[323]	Facilitating connections between smallholders and domestic markets through partnerships with the public sector and large institutional buyers, creating significant market opportunities for small-scale farmers.	Through market-oriented strategies fostering economic development and smallholder integration, small farmers can find a stable market for supplying public sector institutions (e.g., schools, and hospitals) with the large quantities of food they need daily.	Small farmers benefit from increased access to local markets with less strict requirements, while public institutions contribute through large-scale procurement to food security, transforming agriculture into a competitive sector for poverty reduction, and economic growth.

Example:

- Programs that establish democratic forest BMs[324] (e.g., the Forest Farm Facility program of the International Institute for Environment and Development)[325]
- Home-grown school feeding (i.e., public school feeding programmes with food procured from local farmers, such as in the Governments of Kenya, Ghana and Nigeria[326])
- Demand from public institutions is directly fulfilled by smallholder farmers, circumventing traditional, often restrictive bidding processes (e.g., Programa de Aquisição de Alimentos and Programa Nacional de Alimentação Escolar in Brazil)[327]

[323] FAO of the United Nations (2015) Inclusive business models, Guidelines for improving linkages between producer groups and buyers of agricultural produce
[324] i.e., cooperative structures where forest management and business decisions are made collectively by members, often local community members or stakeholders (locally controlled forestry). These models emphasise sustainable practices, ensuring that forest resources are used responsibly and equitably
[325] Macqueen, D., Bolin, A. and Warren, G. (2015). Democratic forest business models: a harder but more rewarding path. IIED, London. Available at https://www.iied.org/17308iied
[326] FAO of the United Nations (2015) Inclusive business models, Guidelines for improving linkages between producer groups and buyers of agricultural produce
[327] FAO of the United Nations (2015) Institutional procurement of food from smallholder farmers – The case of Brazil

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Annex 2: Template for Real-life Examples

Name	***State the title/brand name of the firm or SI initiative.***
Type of BM	*Mention the type and subtype of BM from section 4 (if applicable)*
Contact and position	*Do you know anyone working or related to that firm/initiative who could be interviewed if the case is selected? What is the position/role of this person within the firm or initiative?*
Website	*Please provide the link to the firm's or SI initiative's site, if available.*
City, Country	*In which city and country is the firm or SI initiative located?*
Value Proposition	*(max 100 words) Please describe the innovative elements of the firm or SI initiative (that make it worth looking into) regarding any of the following: (i) Product/ service and why it is better than others, (ii) customer segments and (iii) customer relations.* *Key notes:* • *It is not required to refer to all the above points, but only to those that make this firm or SI initiative special (i.e., different to existing, successful, more sustainable, etc). This applies to all the fields of this table.* • *The reason why a product/service is better than the existing ones may range from convenience for the customer to environmental or societal benefits (especially in the case of SI).* • *In the case of SI initiatives, you may need to refer to beneficiaries instead of customers (e.g., in more grassroots initiatives)*
Value creation & delivery	*(max 100 words) Please describe the innovative elements of the firm or SI initiative regarding any of the following: (i) key activities, (ii) resources and partners, (iii) distribution channels (e.g., marketing and distribution strategy), and (iv) technology.*
Value capture	*(max 100 words) Please describe the innovative elements of the firm or SI initiative regarding any of the following: (i) cost structure (e.g., how it manages to generate revenue or describe the types of expenses it has) and (ii) revenue streams (e.g., how it makes money, pricing strategy, opportunities it takes advantage of to sell at a price premium or reduce costs)*
Why a good case?	*(max 100 words) Please tell in which UCs farmers and foresters may adopt it and why. Which challenges and barriers can be addressed if adopted, and what are some prominent expected impacts? Why it may be popular among farmers/foresters? And why it can be successful if adopted (e.g., opportunities such as policy priorities that may drive its success)?*

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Annex 3: Other Real-life Examples (not Shortlisted)

BoerenCompanie

Name	BoerenCompanie
Type of BM	Changes in key activities and production & Changes in customer relations and communication (Substituting with renewables and natural processes, Encouraging sufficiency, Adopting a stewardship role, Community Supported Agriculture)
Contact and position	Yes (contact information not included to protect their privacy)
Website	https://www.boerencompagnie.be/
City, Country	Abdij van Park 7 - 3001 Heverlee
Value Proposition	The farm avoids resource constraints of non-renewable resources in the production system by using solar panels on grain houses and agroecology. It offers visits for school to educate children, better animal welfare and agroecological production. It is a CSA model (you can become a shareholder of the farm). - The farm produces crops, fruits and vegetables as well as meat (pig and beef meat) and dairy products using an animal friendly and agro-ecological approach. Customers can buy meat packages of ca. 10 kg or become members of the CSA. - Organisation of educational activities (1-day visits for kids).
Value creation & delivery	They create environmental value by adopting an agro-ecological approach and by utilizing renewable resources (solar panels) and trying to be as circular as possible. They also create social value through their educational activities (1-day visits for kids).
Value capture	- CSA model - People can become Shareholders if they invest a min. of 250 euros - revenues from educational activities - online webshop (for meat packages or CSA membership) - bread vending machine
Why a good case?	It could be interesting as it provides an alternative production method that supports biodiversity and opens up an extra revenue stream. Expected impacts from this model's adoption are: enhanced biodiversity protection, enhanced animal welfare, income stabilization, and improved farm resilience. Adoption entails social benefits as well, as it strengthens community resilience and environmental awareness through workshops.

Social cooperative working with grape varieties[328]

Name	-
Type of BM	New products and services & New markets and customers (Repurposing the business for society/ the environment, Focus on a specific customer segment)
Contact and position	Yes (contact information not included to protect their privacy)
Website	-
City, Country	eastern Belgium
Value Proposition	Coperative and organic production The main aim of the social cooperative is to reconcile people and the environment with the business world. To achieve this, they try to ensure that the profit motive is not the only priority and carry out activities to improve workers' well-being and respect for the environment, promote the social economy and sustainable development, and promote agro-tourism and quality agriculture.
Value creation & delivery	**Environmental value**: The social cooperative has chosen to work with interspecific grape varieties. Selected for their organoleptic qualities, these recent varieties are the result of crossbreeding European vines with more resistant vines. Developed to adapt to the local terroir and its specific climatic conditions, they require very few treatments and are produced

[328] Anonymised as the information is not available openly.

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Name	-
	under the organic label. The grapes are harvested by hand, with the help of the many cooperators. **Social value**: All the cooperators (2300 beneficiaries) are involved in the process of maintaining the vineyard and collecting the grapes. In addition, visits of the vineyards are also organised and a reception room can be rented for events.
Value capture	- Sales of organic wine products - Visits of the vineyards - Rental of a reception room
Why a good case?	The cooperative character of the initiative is very interesting. However, it must be noted that this is not for everyone, as the aim is to make limited profit.

La poule qui roule

Name	La poule qui roule
Type of BM	New markets and customers & Changes in distribution and sales channels & Changes in key partners and forms of collaborations (Focus on a specific customer segment, Retail trade, Producer organisation models)
Contact and position	Yes (contact information not included to protect their privacy)
Website	https://lapoulequiroule.bio/
City, Country	Froidefontaine, 1D – 5370 Barsy
Value Proposition	(i) Organic production and enhanced animal welfare; (ii) collaboration with restaurants and chefs; (iii) cooperative slaughterhouse. "La Poule Qui Roule" raises organic chickens (Coucou de Malines breed) in mobile hen houses. This type of housing ensures that the poultry always benefits from an open-air run with grass and high nutritional quality. The mobility of the hen houses also has a positive impact on the plant cover, preventing soil degradation and preserving ecosystems.
Value creation & delivery	Animal welfare value: The chicks grow up in runs and facilities designed to encourage their natural instincts. They are slaughtered at a minimum of 84 days and benefit from slow growth. They are slaughtered at "the Petit Abattoir Coopératif" near Namur. This cooperative slaughterhouse was created to enable small producers to slaughter their animals close to their farms, thus avoiding long transports that can be stressful for the animals. Environmental value: The chickens are produced under the organic label. In addition, synergies were created with adjacent arable land and orchards, were the chickens feast on insect pests.
Value capture	- Collaborations with restaurants - Sales in bio stores and local markets
Why a good case?	Very innovative and out of the box idea.

Tzoumakers

Name	**Tzoumakers** Open lab for communities
Type of BM	New products and services (Repurposing the business for society/ the environment)
Contact and position	Yes (contact information not included to protect their privacy)
Website	https://www.tzoumakers.gr
City, Country	Kalentzi village in region of Tzoumerka, Greece (location on the map **here**).
Value Proposition	Tzoumakers offer an innovative community-driven makerspace focused on enabling the local farming community to design and manufacture tools for small-scale agricultural production (where modern agricultural heavy machinery can't be used as the terrains are hard and the fields are small and climb up the mountain in the form of "terrasses"). Local farmers and artisans of the mountainous area of Tzoumerka come together and collaboratively design and manufacture tools and share the knowledge openly online for others to reuse and create their own tools. The initiative promotes self-sufficiency and

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Name	**Tzoumakers** Open lab for communities
	technological literacy in rural areas, helping farmers reduce costs, and promoting sustainable farming practices.
Value creation & delivery	Tzoumakers' key activities include developing tools to address specific local agricultural needs (like a harvester for small vegetables, herb grinder, weather station, solar dryer, mobile chicken coop etc.), offering workshops to teach design and manufacturing skills and deploying community-driven projects. They bring together farmers from the villages of the Tzoumerka region, through on-site activities but also through online channels (sharing knowledge among peers and the designs of the tools they have manufactured). They provide open access to the makerspace and its resources (open lab) to all community members and help farmers network with other social innovation initiatives, cooperatives and municipalities.
Value capture	This SI initiative fosters local partnerships among the farmers and collaborations with local organisations and communities, through which they share resources. They provide services and knowledge for improving small farmers' resources. The makerspace received funding from EU projects, so its purpose is non-profit but social. Participation in its workshops is free. They aim for it to gradually be managed by the local community, through becoming a Civic Non-Profit Company.
Why a good case?	It could be useful for all UCs (probably more for the Lithuanian and Italian). Its adoption could address the lack of access to training and information of foresters and the lack of knowledge of traditional, more sustainable practices for farmers. Also, it could empower the local communities and foster community resilience by enhancing the self-sufficiency of small farmers and foresters (private forest owners), reducing equipment costs, developing the farmers' skills and fostering collaboration. It can be beneficial particularly to areas with challenging terrains and small-scale farming needs.

Salamousas Agrifood

Name	**Salamousas Agrifood** LEMNIAN REBORN SEEDS
Type of BM	New markets and customers & Changes in key partners and forms of collaborations (Focus on a specific customer segment, Buyer driven models)
Contact and position	No
Website	https://www.salamousas.gr/
City, Country	Moudros, Lemnos Island, Greece
Value Proposition	Salamousas Agrifood offers high-quality, sustainably produced agrifood products from local varieties of legumes, cereals (variety of durum wheat and Lemnos barley couplet), and flour. Emphasising traditional cultivation methods (such as crop rotation for soil quality) and contract farming, the company aims to preserve biodiversity and support local agriculture. Through contract farming they offer agricultural consulting to their collaborator farmers throughout the year, advice on financial management to maximise sustainability (especially useful for new farmers), networking with other growers and better prices for agricultural supplies. Their products, such as Lemnian wheat and pulses, cater to consumers seeking authentic, natural, and environmentally friendly food options.
Value creation & delivery	Salamousas Agrifood creates value by: 1. **Sustainable Practices**: Utilizing organic farming techniques and avoiding synthetic chemicals. 2. **Local Partnerships**: Collaborating with over 10 local farmers through contract farming to ensure consistent quality and support the local economy. 3. **Traditional Methods**: Milling grains using traditional stone mills, preserving the nutritional value and authenticity of their products. 4. **Quality Assurance**: Achieving certifications and awards for biodiversity conservation, ensuring high standards. They have also won prizes for their quality and innovative products. Their local products' agricultural identity has also been certified.
Value capture	Salamousas Agrifood captures value by: 1. **Premium Pricing**: Charging premium prices for their high-quality, authentic, and sustainably produced products. 2. **Market Differentiation**: Differentiating their products through unique local varieties and sustainable practices, appealing to environmentally conscious consumers.

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Name	**Salamousas Agrifood** LEMNIAN REBORN SEEDS
	3. **Brand Loyalty**: Building a loyal customer base by maintaining high product quality and promoting their commitment to sustainability. 4. **Expanding Markets**: Exploring B2B collaborations and online sales channels to reach a broader audience and increase market share.
Why a good case?	It could be useful for the Lithuanian UC as it provides a good example for farmers cultivating wheat (i) focused on organic and sustainable farming, (ii) interested in traditional crop varieties, (iii) seeking to enhance biodiversity. It addresses challenges such as soil degradation and the difficulties farmers face in accessing the market. Expected impacts include enhanced biodiversity, reduced chemical usage, improved income stability through contract farming, and stronger community ties via local partnerships. The model could become popular among farmers due to the rising consumer demand for organic products and the economic benefits it offers. Its alignment with EU Green Deal policies and its role in raising public awareness for eco-friendly products are key strengths driving its success.

Famelia Asterousion

Name	**Famelia Asterousion**
Type of BM	Type 3: Changes in key activities and production & Changes in key partners and forms of collaborations (Maximising material and energy productivity and efficiency, Producer organisation models)
Contact and position	No
Website	https://www.famelia-asterousion.gr/
City, Country	Stavies, Asimi, Crete
Value Proposition	Famelia Asterousion is an agricultural Cooperative of olive producers in Crete. They offer premium quality olive oil, produced through sustainable and innovative farming practices. The cooperative emphasises environmental stewardship, using methods that enhance soil health, reduce carbon footprints, and promote biodiversity. Their products attract consumers who value eco-friendly and high-quality agricultural products.
Value creation & delivery	The cooperative integrates cutting-edge technology and sustainable farming techniques, such as soil runoff improvement, early pest detection systems, and integrated management systems. They train their members on sustainable practices and provide modern equipment to enhance production efficiency (harvesting and processing). Their electronic traceability system ensures transparency from farm to table, enhancing consumer trust and product integrity. They have a holistic strategy and their work program includes: - Implementation and dissemination of practices to improve soil drainage - Installation of a pilot dacus (olive fruit fly) population monitoring system - Implementation of Integrated Management System - Demonstrative application of carbon footprint measurement techniques in olive cultivation - Training program for producers in the field regarding Integrated Plant Protection - Techniques to improve olive tree nutrition, and harvest - Supplying producers with equipment - Electronic Traceability System to continuously monitor the products as they are moved or transformed in the various phases of the production process - Development of a monitoring system for olive oil characteristics - Communication of the cooperative's actions - Development and operation of a website
Value capture	By leveraging EU funding and aligning with Green Deal policies, Famelia Asterousion captures value through improved product quality and market competitiveness. The cooperative's emphasis on sustainability attracts eco-conscious consumers willing to pay higher prices for responsibly produced olive oil. Continuous quality monitoring and certification further strengthen their market position and consumer trust.
Why a good case?	Farmers likely to adopt Famelia Asterousion's practices are those valuing sustainability, premium product quality, and technological innovation. These include environmentally conscious farmers seeking to enhance soil health and biodiversity, producers aiming for high-quality outputs, and those open to integrating modern farming technologies. Challenges such as initial investment and market competitiveness are addressed through

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Name	Famelia Asterousion
	cooperative support, training, and EU funding. Expected impacts include environmental benefits like reduced carbon footprints, economic gains from premium pricing, and social advantages through stronger community bonds. Alignment with EU Green Deal policies and consumer trends toward eco-friendly products might further enhance adoption potential and market success.

Biomimesis Lab

Name	Biomimesis Lab
Type of BM	Changes in key activities and production (Maximising material and energy productivity and efficiency)
Contact and position	No
Website	https://biomimesislab.gr/
City, Country	Thessaloniki, Greece
Value Proposition	Biomimesis Lab focuses on enhancing agricultural productivity and sustainability by leveraging soil microbiology. Their primary value proposition is to demonstrate scientific data and share the benefits of living soil microbiology in restoring and maintaining soil health. This approach supports healthier plants, animals, and humans while also saving time and resources for farmers, thus increasing profitability. The Lab offers detailed soil microbiological analyses that help farmers understand the biological capacity of their soil, ensuring that nutrients and water are more efficiently utilized by plants even during stress periods.
Value creation & delivery	Biomimesis Lab employs advanced technologies and practices such as regenerative agriculture, holistic land management, and soil microbiology enhancement. The Lab creates value by conducting comprehensive microscopic analyses of soil samples. These analyses reveal the presence and balance of key microorganisms such as bacteria, fungi, protozoa, and nematodes. They provide farmers with actionable insights into the microbial health of their soil, which in turn helps in improving soil fertility and plant health. By recommending practices based on these analyses, they assist farmers in creating a sustainable farming environment. The Lab also offers workshops, seminars, and hands-on experiences to educate farmers and the public about sustainable farming. Additionally, they utilize the technologies and practices on their own farm to produce high-quality organic products, adhering to strict ecological standards.
Value capture	Biomimesis Lab captures value through the provision of soil analysis services, consultancy, and educational programs. By selling these services to farmers and agricultural businesses, they generate revenue. The improved soil health and productivity resulting from their recommendations lead to cost savings and increased yields for farmers, creating a cycle of value capture that benefits both the Lab and its clients. Additionally, the focus on sustainability and resource efficiency aligns with broader environmental goals, potentially attracting funding and support from environmentally focused organisations and initiatives.
Why a good case?	It could be useful for all use cases as their model holds the potential for replication in various agricultural contexts. Farmers who seek improved soil health and productivity could be interested in getting consultation on soil microbiology. By offering detailed soil analyses and tailored recommendations, the lab supports sustainable farming practices that enhance nutrient efficiency and crop resilience. Challenges such as knowledge gaps are addressed through educational programs and proven results, making it appealing to farmers seeking higher yields and reduced environmental impact.

Hodmedod's British Pulses and Grains

Name	Hodmedod's British Pulses and Grains
Type of BM	Changes in distribution and sales channels (Retail trade)
Contact and position	No
Website	https://hodmedods.co.uk/

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Name	Hodmedod's British Pulses and Grains
City, Country	East of England, UK
Value Proposition	Hodemedod's British Grains and Pulses was set up to supply produce from British farms directly to consumers. They specialise in producing less well-known foods Carlin Peas, Fava Beans and Quinoa that are grown in the UK. They work directly with farmers to produce the uncommon crops and then process and pack them before selling them directly to consumers and businesses. Hodmedod works with individual farmers and with those who have sustainable farming practices at the heart of their system. The prices are negotiated directly with each farmer for each crop and vary depending on the success or challenges that they have faced that year. Consumers buying their products pay a premium for the quality of the product and the assurance that the growers are working sustainably. By looking for small supplies of niche crops, with a supportive pricing strategy they help sustain a greater variety in rotations on farms. This reduces the requirement for chemical pest control which reduces biodiversity and has embodied carbon.
Value creation & delivery	Hodmedod is a small but growing independent business, founded in 2012 to source and supply beans and other products from British farms. They are committed to provide quality food from British farms that's more sustainably produced. They aim to offer the highest possible standards of service to customers. Hodmedod supplies their products to individual retailers and caterers, both direct and through a number of distributors.
Value capture	The implementation costs of the products are equal to the normal costs of production for cereals. However, the yield is typically lower. The crops are sold at a premium and under contract with an agreed minimum price. The product is sold directly to the food processor and retailer who then markets the product.
Why a good case?	The benefits of this service are direct and indirect and the premium allows farmers to differentiate their product and gain a premium for farming in a sustainable way. Society benefits from improved biodiversity and reduced embodied carbon in food. Farmers can get a premium price for the products. Customers get access to a wider variety of products with the assurance that it's grown in a sustainable system. Society can benefit from the increase in biodiversity.

Jordans Farm Partnership

Name	**Jordans Farm Partnership** Conservation grade cereals
Type of BM	New markets and customers & Changes in key activities and production (Focus on a specific customer segment, Repurposing the business for society/ the environment, Substituting with renewables and natural processes)
Contact and position	No
Website	https://jordanscereals.be/nl/home-nl/
City, Country	Southwest England, UK
Value Proposition	A UK family-owned business Jordans set up a conservation grade brand to support environmental farmers with a premium for their crops. This was to support those who could not commit to organic farming but wanted to support wildlife. Although no longer an independent business there is still a verified brand with a Fair to Nature standard. It requires a minimum of 10% of the farmed area to be managed to this standard. Inspections assess farms against these standards and also benchmark the use of fertilizer and plant protection products to ensure they are lower than average and are declining over time. Where wildlife features and priority species have been found on farms through monitoring programmes, any opportunities should be taken to enhance those features and create further habitats. Nature based integrated pest management must be utilized. Crops are sold directly to be included in granola and breakfast cereals. Crops sell for 5% premium over market price at time of sale.
Value creation & delivery	As part of the Jordans Farm Partnership, every one of our British oat farmers works with a dedicated wildlife advisor from their local wildlife trust to make sure at least 10% of their land is managed for the unique mix of wildlife on their farm. At the same time, all their farms are LEAF-Marque certified, making sure that their oats are grown as sustainably as possible, paying particular attention to soil health, carbon, water and minimising any inputs.

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Name	**Jordans Farm Partnership** Conservation grade cereals
	They like to keep things local when they can and over half of the Jordans Farm Partnership oat farmers are within 50 miles of their bakery in Biggleswade. When they do get ingredients from abroad, however, they always look to use sea freight to make sure they're coming with the lowest impact possible. Jordans had now a variety of granola, cereal bars, muesli, and sells them in over 30 countries.
Value capture	Price premium is confidential but is likely in the region of 5-10% above market price. Crop is sold through a contract with food manufacturing company or onto potential local markets.
Why a good case?	The benefits of this measure are direct and indirect and can be listed as the increase of wildlife areas on the farm, the reduction of use of chemical fertilisers and plant protection products with added environmental benefits. It can also help increase water infiltration and reduction of leaching. Farmers, inhabitants and local population can benefit from the product in a direct and indirect way. Recreation and eco/agro tourism are also one of the opportunities from this measure.

3 Fonteinen brewery

Name	3 Fonteinen brewery
Type of BM	Changes in key partners and forms of collaborations & Changes in distribution and sales channels & Changes in key resources and investments in assets (Producer organisation models, Improved logistics, Developing scale-up solutions)
Contact and position	Yes (contact information not included to protect their privacy)
Website	https://www.3fonteinen.be/nl/
City, Country	Flanders, Belgium
Value Proposition	Local farmers set up a Cereal Collective to grow wheat and barley at a fair and mutually agreed price. They organise the cleaning, storage and malting of the barley. They collaborate with the brewery "3 Fonteinen" which is an organic brewery that brews Geuze beer, an 'uncommon' beer with typical characteristics and taste. Farmers work with FAB-flower strips, crop rotation, agroforestry, cover crops or non-inversion tillage. They experiment with selections of cereal varieties which are adapted to the local climate and soil and test which agroecological and organic cultivation methods have the utmost care for the soil, biodiversity, cultivation techniques and farmers' craft.
Value creation & delivery	(i) Brewing organic Geuze beer from local, mostly old varieties of barley with respect for soil, biodiversity, and farmers' income. (ii) The partners are a collective of about 10 farmers and the brewery (iii) The Geuze beer is sold in different bars, restaurants and shops in the whole of Flanders. The brewery also has its own bar and webshop.
Value capture	Brouwerij 3 Fonteinen pays more than triple of the current industry prices for wheat and barley, directly to the farmers. The brewery also carried the investments in a grain selection machine and grain silos. Each farmer gets a base price per hectare (€/ha). But if farmers would only be valued based on surface area, they would lose incentives to produce high quality and quantity yield. Therefore, the farmers can also get a bonus, an extra price based on the amount of yield (€/ton). However, there is a maximum value on the valuation of tons/ha. A farmer gets paid for every ton he/she produces until this maximum value is reached.
Why a good case?	Consumers can benefit if they buy this beer because in that way they support the local economy in general. Farmers that are involved in the learning network, but are not producing barley/wheat for the brewery, can still exchange relevant knowledge with other farmers in the network. The agroecological measures these farmers implement have direct benefits for the biodiversity and environment on and near the farms. The measures that improve soil structure and increase carbon sequestration in the soil.

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Auga group

Name	**Auga group** Vertically integrated organic food company with a startup-village approach
Type of BM	New products and services & Changes in key activities and production (Repurposing the business for society/ the environment, Substituting with renewables and natural processes)
Contact and position	Yes (contact information not included to protect their privacy)
Website	https://auga.lt/en/
City, Country	Lithuania, regions
Value Proposition	The value proposition of AUGA group lies in its commitment to organic and sustainable farming practices: Organic Certification: AUGA produces organic food, which appeals to health-conscious consumers. Their products are free from synthetic pesticides, herbicides, and genetically modified organisms (GMOs). Environmental Responsibility: AUGA prioritizes eco-friendly practices, such as crop rotation, soil enrichment, and reduced chemical usage. They actively contribute to biodiversity and soil health. Quality and Traceability: AUGA ensures product quality and traceability. Consumers can trust that their food is grown without harmful chemicals and with respect for the environment. Innovation: AUGA embraces technology and sustainable solutions. For instance, they invest in biomethane infrastructure and hybrid tractors to reduce emissions. Vertical Integration: AUGA manages the entire production chain, from farming to processing. This control allows them to maintain quality standards.
Value creation & delivery	AUGA group develops crops and livestock on cooperative farms. The farming activities apply the AUGA sustainable farming standard and technologies to ensure a lower environmental impact in the primary production of agricultural raw materials, such as the use of min-till technologies, regenerative crop rotation, green electricity, circular economy principles and the implementation of new technologies. More sustainable raw materials produced on farms are supplied to processors and food producers. Organic feed is used for livestock. AUGA farms do more than required by organic standards, applying multi-year crop rotation, min-till technologies, and innovative agricultural machinery. AUGA group operates on 38,000 hectares of agricultural land and employs more than 1,200 people in Lithuania.
Value capture	This working initiative fosters local partnerships among the farmers and agrifood startup collaborations with innovative business structures. AUGA group consistently implements the objectives set out in the strategy to develop sustainable agricultural technologies and apply them on farms in a cooperative principle, thus reducing emissions from agriculture. To increase the scale of impact, AUGA group will start implementing more sustainable practices in regenerative conventional agriculture by converting a part of the company's organic lands into conventional ones. Additionally, AUGA group will invite all farmers to join the sustainable farming community. This will ensure a greater expansion of AUGA's sustainable farming standard and significantly reduce agricultural emissions not only in organic but also in conventional farms. It is also expected to improve AUGA group's financial results and provide greater scaling opportunities.AUGA group has been a deeply committed pioneer on the sustainable side of agriculture for many years and has been preparing to expand its footprint internationally to the widest possible audience.
Why a good case?	AUGA's combination of sustainability, innovation, cooperation with farmers and market positioning makes it a strong case study in the organic food sector.

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Consorzio Fitosanitario Piacenza

Name	Consorzio Fitosanitario Piacenza
Type of BM	Changes in customer relations and communication & Changes in key activities and production & Changes in key partners and forms of collaborations (Community Supported Agriculture, Maximising material and energy productivity and efficiency, Intermediary models)
Contact and position	Yes (contact information not included to protect their privacy)
Website	www.fitosanitario.pc.it
City, Country	Located in Piacenza Province, Emilia Romagna Region.
Value Proposition	Consorzio Fitosanitario Provinciale of Piacenza since 2006 launched a free service for sustainable protection of production through technical information, monitoring phytosanitary problems regarding the principal cultivations relevant in the province, in particular grapevine. It publishes weekly bulletins on the website and gives alerts in real-time via SMS, and e-mail about the emergence of cryptogamic diseases. Bulletins make available technical information necessary to assess the phytosanitary status of grapevine production in the province. They contain suggestions for products and dosage to be applied depending on the phenological stage of the culture, weather forecasts and data, level of the pest infestations. The DSS are sent on the basis of data coordination.
Value creation & delivery	The activity of the Consorzio consists of technical information to which all farmers and other stakeholders of the province, such as technicians, dealers, experts, operators of cooperatives and farmers associations, etc., have free access. The Consorzio promotes the sustainable use of phytosanitary products in compliance with a National Plan applying EU legislation. The Consortium commits a large part of its resources to disseminate best practices for sustainable use of inputs and realizes technical assistance, taking into account in every moment the emergence of pest infestations and plant diseases. Thanks to his activity the volume of annual quantity of phytosanitary products has significantly decreased, by 20 /30%.
Value capture	Service is free because Consorzio is a public agency and the cost of information is very low, but the value for farmers and the environment is relevant. Alerts sent about the most important phytosanitary problems and risks are elaborated taking into account various factors, including information based on scouting on the field, thresholds used to support the control of various harmful pest infestations, reference models, in collaboration with technicians acting on the territory, summarized and collected in the weekly bulletins, available on the website. The text is drafted clearly, simply and precisely, which makes it easy for the farmers to identify the best practices to follow.
Why a good case?	Sustainability is today a key element for all sectors. In agricultural activity it could be possible to reach goals if farmers receive proper and timely practices information, elaborated by skilled, reliable experts, using analysis of geospatial data, combining tools of predictive models. Climate change and the environmental decline, as various unpredictable, adverse climatic events should induce the agricultural sector to adopt behaviours more sustainable and safe. Farmers should actively engage with environmental issues and sustainable development and use of natural resources. The activity of Consorzio Fitosanitario could help farmers to follow this way.

Luonnonperintösäätiö

Name	**Luonnonperintösäätiö** Finnish Natural Heritage Foundation
Type of BM	New products and services & Changes in key partners and forms of collaborations (Repurposing the business for society/ the environment, Intermediary models)
Contact and position	No
Website	https://luonnonperintosaatio.fi/
City, Country	Hämeenlinna, Finland
Value Proposition	The foundation promotes the protection of old-growth forests. They purchase old untouched forests with donation funds and apply for permanent protection for them according to the Nature Conservation Act. The foundation focuses more on forest plots that host a high degree of biodiversity which is beneficial for society and the environment – through the protection of biodiversity and forests as a natural resource. This initiative is sustainable and

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Name	**Luonnonperintösäätiö** Finnish Natural Heritage Foundation
	successful because anyone from the general public could make donations, and purchase plots of forests to be protected in the name of a loved one as a gift as well. Their initiative ensures that the general public as well as forest owners benefit from their activities.
Value creation & delivery	The foundation, currently, has acquired over 200 conservation areas and 5300 ha of land – wherein the flora and fauna are protected. They partner with local environmental agencies and public authorities to place forest plots in protection. Their marketing strategy focuses on word of mouth and digital channels – but is immensely popular among Finnish nationals.
Value capture	To our knowledge, the costs are associated with forest acquisition, care and management. Revenue generation is based on gifted forest plot purchases from its webshop, donations and sponsorships.
Why a good case?	Applies to Finland. The foundation and its activities are immensely popular domestically and it creates a significant impact in protecting forest land.

Putkisalo Manor

Name	**Putkisalo Manor**
Type of BM	Changes in key activities and production (Substituting with renewables and natural processes & Sub-type 3: Vertical Integration and Ownership)
Contact and position	No
Website	https://putkisalo.fi/
City, Country	Rantasalmi, Finland
Value Proposition	Putkisalo Manor is a working farm with three forms of production initiatives: forestry, sheep farming, and crop cultivation. The farm has innovatively preserved its traditions for supporting the local economy and biodiversity by using technological, forestry and agroforestry-related innovations to develop a site that is also a tourism destination.
Value creation & delivery	The farm delivers immense value in the following ways: • Meat production and delivery to specific regions. Meat products are also available online. • Sheep grazing at the farm promotes animal well-being and biodiversity. Grazing maintains the semi-open character of traditional rural landscapes such as wood pastures and grazed forests and with the appropriate grazing intensity (low to intermediate grazing) it has a beneficial impact on biodiversity. In addition, forest grazing reduces the need for grassland leading to more efficient land use. While growing, trees take up CO2 which compensates for the emissions from livestock • The sheep farm and the manor are open to public visits creating a valuable avenue for promoting public engagement
Value capture	The website gives some details regarding the investments they have made in making the production site (i.e. the manor) as state-of-the-art as possible while maintaining the integrity of the original construction. The revenue streams include – sheep farm, onsite dinners/tour groups/accommodation, marketing & distribution of meat products through the website and local orders
Why a good case?	It applies to Finland but we believe it can also be beneficial for Belgium because the business model of the manor focuses on preserving traditions while also advancing farms to develop a vertical/ integrated supply chain with control over the entire production line while being self-sustaining and providing community support. This can be extremely advantageous for other farmers/foresters looking to develop a similar business model, especially if being ethical is of core interest. The barriers may relate to gathering investments and generating enough momentum to develop self-sufficiency while generating enough revenues to support the functioning.

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Annex 4: Interviews Questionnaire

 # Please complete your organisation's info where needed in the first two pages before handing them out to the participant to ensure their consent.

 # While interviewing the stakeholders, please take notes on the template, summarizing the discussion.

 # Please translate the questions in your local language, if needed.

*# **After** completing **the interviews**, please **upload the filled in documents** here.*

Dear participant,

Thank you for participating in this interview performed by <Insert Name of your organisation>! The interview is taking place in the context of PRUDENT, a project funded by the European Union.

The purpose of the interview is to understand better how a few innovative firms or initiatives operate in the farming/forestry sector and what could help them grow or become more competitive. The insights you provide will help us make recommendations to national and European policy-makers on what policy measures they need to take to improve the context in which your firm or initiative operates.

As the results will be included in public available reports, remember to share informations that you are comfortable to share with others. You may refuse to answer in any questions you find sensitive or personal. In case you prefer even more anonymity, you may ask to not mention the name of your firm or initiative at the public deliverables.

Thank you,

Name

< **Insert your signature**>.

INFORMED CONSENT FORM

Thank you for participating in this Interview performed by <Insert Name of your organisation>! We are sharing with you the following questionnaire in the context of PRUDENT, a project funded by the European Union under the Horizon Europe Framework Programme for Research and Innovation. A detailed description of how we handle personal data is presented in the Privacy Policy that can be accessed here.

Project partner: ……..
Address: ……..
Phone: ……
Email: ……..

Responsible persons:

#	Role	Name	E-mail
1	……	……	……
2	……	……	……

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What do we need from you?

We need you to participate in a short interview. It won't take you more than 60 minutes. Your replies will help us gather valuable information to suggest policy recommendations that will enable the adoption of sustainable solutions. In this context, we need to process some of your personal data:

- Some basic demographics (position in organisation);
- Your opinions on the subject matter.

You may refuse to answer in any questions you find sensitive or personal. In case you prefer even more anonymity, you may ask to not mention the name of your firm or initiative at the public deliverables.

What will we do with your data?

We will use your data to understand better how a few innovative firms or initiatives operate in the farming/forestry sector and what could help them grow or become more competitive. The insights you provide will be included in policy recommendations and a public report. Finally, we are obliged to grant access to your data to:

- EU officials such as our Project Officer for purposes related to project's evaluation;
- EU agencies and other authorities for project's auditing purposes.

How can you withdraw your consent?

You can withdraw your consent at any time by communicating by email with the responsible persons listed above.

I hereby give my consent to the processing of my personal data needed for:

#	Consent Subject	Tick box
1	My participation in an interview that is being carried out by PRUDENT to collect information on the adoption of green and sustainable practices in farming/forestry.	
2	The inclusion of the information deriving by the interview for the elaboration of policy recommendations and a public report.	
3	The inclusion of my firm's/initiative's title in the above-mentioned report.	

_____ _____ _____

Name of participant Date Signature

QUESTIONNAIRE

Title of BM or SI	……
What is your position within the firm/initiative/association?	……

1. Could you share a bit about how this firm/initiative/association started and what inspired you to create it?

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Recommended answer: 150 words

……

2. You were suggested by _____ as an example to be followed. What do you see as the most innovative thing you are doing compared to (i) what the majority of your peers does or (ii) the current practices implemented so far? Tell us about it.

Recommended answer: 150 words

……

3. What do you consider as the main contribution of your firm/initiative/association to the environment, society, and the economy? Also, what is your main contribution to the local community?

Recommended answer: 150 words

……

4. Are you happy with what you have achieved so far? Which elements do you consider indicative of the success of your firm/project/initiative, and for which are you most proud? Do you keep track of any numerical data that showcase that success (e.g., market share size)?

Recommended answer: 150 words

……

5. What are your goals for the future? Do you see any potential for expanding your sales or outreach? What makes you optimistic about it? Maybe some policies, trends you're noticing in consumer preferences or technological developments?

Recommended answer: 150 words

……

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6. One the other hand, what do you perceive as difficulties to operating and developing further? Are there any sector-specific difficulties? Maybe also some market difficulties and law limitations?

Recommended answer: 150 words

……

7. Is the competition from other firms or initiatives intense? Do you think it will increase in the future or not particularly? How do you manage to survive in this competition (what are your strengths and the things that you are better at)?

Recommended answer: 150 words

……

8. Who usually buys your products or requests your services and what do you think makes your firm/initiative/association special for them? I'd like to know *"what keeps them coming back"*.

Recommended answer: 150 words

……

9. What are some of the big expenses that come from running your firm/initiative/association and how do changes in the economy (like price changes or economic downturns) affect your business? After all, are you happy with the financial compensation you get out of it?

Recommended answer: 150 words

……

10. Do you know other people who have done something similar with you? Are there many of them and where are they located (in your area or elsewhere)? Would you encourage someone who is just starting out their career (like a youg farmer) to do something similar to what your firm/initiative/association does?

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Recommended answer: 150 words

……

11. Would you say that an important factor for your success has been your collaborations or partnerships with other local actors, organisations, or communities? If yes, what kind of partnerships and with who?

Recommended answer: 150 words

……

12. What difficulties did you encounter at the beginning when setting up this firm/initiative/association? And what had been the key factor that contributed to your success?

Recommended answer: 150 words

……

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Annex 5: Survey Questionnaire[329]

Survey to understand trends
for a sustainable agricultural sector

Demographics

1. Gender
   - Male
   - Female
   - Non-binary
   - Don't want to say

2. Age

……

3. Country

……

4. What is your type of stakeholder?

	farmer or farm manager
	other stakeholder type working with farmers (advisor, intermediary, cooperative/association, agronomist, trader, distributor, retailer, food processor, etc.)
	forest-owner or forest manager
	other stakeholder type working with forest-owners (advisor, cooperative/association, forester, trader, food processor, etc.)
	nothing of the above, I am a consumer

Based on the type of stakeholder, please reply only to the related questions below.

[329] The survey captured norms, values, beliefs, and perceptions of people towards each of the selected cases. Apart from participants' own perceptions (see question 2 in only farmers' part, question 2 in only foresters' part and all questions in consumers' part of the survey), many questions aimed to identify their perceived knowledge about their sector/field in their region.

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Only for farmers, farm managers & stakeholders working with farmers

1. How many of your region's farmers do you think they:

Please make a rough estimation considering the opinions of the farmers you know.

	Few to none (0% or 10%)	A minority (20% or 30%)	Half or less (40% or 50%)	Half or more (50% or 60%)	Many (70% or 80%)	Almost everyone (90% or 100%)	I can't estimate, even roughly
consider and actively search for ways to improve their firm's profitability							
already use precision agriculture and cutting-edge technologies to improve their yields							
see the further adoption of precision agriculture and cutting-edge technologies as crucial to their long-term sustainability and would like to increase their use?							
already participate in some type of farmers' association or cooperative							
see farmers' associations or cooperatives as a good way to access equipment, information and markets that they couldn't afford otherwise and are keen to join more of them							
already collaborate with firms that provide advisory services, e.g., on what is better to cultivate and how to do it efficiently.							
see advisory services and access to information as crucial to their long-term sustainability and would like to increase their use.							

2. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?

You may choose more than one barrier.

	significant upfront investment required to buy the equipment
	lack of the training or technical expertise to use the equipment effectively
	hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain
	struggle with the collection of data required, the analysis, and interpretation

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	resistance to change due to the lack of an entrepreneurial mindset or fear of technologies
	existing solutions may not always be tailored to specific crops, regions, or farm sizes.
	missing infrastructure like reliable internet or limited compatibility with existing equipment

3. For how many of your region's farmers could the following hold true?

Please make a rough estimation considering the opinions of the farmers you know.

	Few to none (0% or 10%)	A minority (20% or 30%)	Half or less (40% or 50%)	Half or more (50% or 60%)	Many (70% or 80%)	Almost everyone (90% or 100%)	I can't estimate, even roughly
mowing and removing grass is necessary for me, and thus, it would be helpful if a local cooperative could do it for me quickly and affordably using the appropriate machinery							
my farm produces several organic residuals and wastes, and thus, it would be nice if a local cooperative could collect and turn them into another product, creating additional revenues for me							
my farm has hedgerows, and it would be great if an association could certify I manage/maintain them sustainably and sell carbon credits, creating additional revenues for me							
storing, processing (e.g., drying, cleaning), and the logistics are part of my work and it would be great if an association that uses digital solutions could help me do it more efficiently							
plant diseases and parasitic infestations can affect the profitability of my farm, and I would be happy to participate in an association that can compensate me instead of traditional insurance							

4. Do you work with any of the following products?

	Bovines
	Grapevine
	Wheat

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	Other

5. Farm or forest size compared to other farmers in your region.
   - Very small
   - Small
   - Average
   - Big
   - Very big

Only for forest owners, forest managers & stakeholders working with forest owners

1. How many of your region's forest owners do you think they:

Please make a rough estimation considering the opinions of the foresters you know.

	Few to none (0% or 10%)	A minority (20% or 30%)	Half or less (40% or 50%)	Half or more (50% or 60%)	Many (70% or 80%)	Almost everyone (90% or 100%)	I can't estimate, even roughly
face difficulties in covering the cost of managing their forest							
consider and actively search for ways to increase the income generated from their forest							
already collaborate with a firm to manage their forests instead of doing it themselves							
would delegate their forest's management to a firm if it promises lower managerial costs and increases the income generated from their forest (if they don't already)							
would be open to agroforestry forest management solutions, like collaborating with a firm that brings their sheep to graze							
would be open to alternative revenue streams, like collaborating with a firm that can cultivate medical mushrooms on their trees and trade them							
would be open to alternative revenue streams, like collaborating with a firm that can sell carbon offsets for them							

2. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join (if you have)?

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- I don’t like this initiative in any case
- I see value in this, but I don’t want my children to get involved
- I am positive. I would consider it, depending on the circumstances
- I would recommend it to them. I like the idea a lot.

3. Farm or forest size compared to other farmers in your region.
   - Very small
   - Small
   - Average
   - Big
   - Very big

Only for Consumers

1. Would you be willing to pay more for:

	I am not buying such products in any case	I see value in them, but I am not willing to pay more	I would decide based on other factors, like quality & convenience	I see value in them. I would buy them for a little higher price	I would most probably buy them, even at a quite higher price
organic agricultural products like wine from a brand that is certified for using organic farming practices, eco-friendly packaging, and energy from renewable sources?					
products like ice cream, dairy products and desserts from brands that contribute to protecting the earth's climate by combining livestock with algae production to reduce methane emissions?					
organic agricultural products grown in small local farms through direct and online sales to support local economic resilience and autonomy?					
organic agricultural products grown in farms that provide work opportunities to vulnerable groups, such as					

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individuals with disabilities or mental health issues?					

2. Would you give up the convenience of a nearby supermarket for a smaller, more distant shop (knowing that prices are similar) if the second:[330]

	I am not making this choice in any case	Not often. Convenience is important for me	I would decide based on other factors, like the variety of choices	Sometimes yes, but convenience plays a role	Most times yes, as I like such initiatives
sells agricultural products that come from a local farm certified for using farming practices that contribute to soil regeneration, biodiversity, and sustainable land use.					
is a non-profit that compensates farmers fairly and employs vulnerable groups, such as individuals with mental health issues.					

3. Would you make the following consumption choices?

	I am not making this choice in any case	I see value in it, but I am not willing to pay more	I would decide based on other factors, like quality & convenience	I see value in it. I would choose it for a little higher price	I would most probably choose it, even at a quite higher price
spend your vacations on a farm that respects the environment and local society and get involved in farm activities to learn more about nature					
change your house's heating sources to pellets from tree and crop residues to reduce your environmental footprint					

[330] We acknowledge that this question asks respondents to consider two factors simultaneously: convenience and ecological motivation. This was an intentional methodological choice, as we aimed to assess the potential of shops offering organic products, which are typically less accessible than large national retail chains (i.e. they are fewer in number and therefore often located at greater distances). In other words, the question was designed to capture the combined effect of ecological motivation and convenience on consumer behaviour.

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substitute dairy milk, cheese, and yoghurt with Algae-based alternatives, knowing they are high-protein, lactose-free, and have a smaller environmental footprint.					

4. If a company funds environmental responsibility projects, such as farms transitioning from traditional practices to biodiversity conserving practices, then would you be more eager to buy the company's products?
   - Their side projects don't play any role in my decision
   - I see value in this. I would consider it, if not too expensive
   - It would make me more eager. I consider it important
   - It would be less eager, as this could translate to higher prices

5. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join(if you have)?
   - I don't like this initiative in any case
   - I see value in this, but I don't want my children to get involved
   - I am positive. I would consider it, depending on the circumstances
   - I would recommend it to them. I like the idea a lot.

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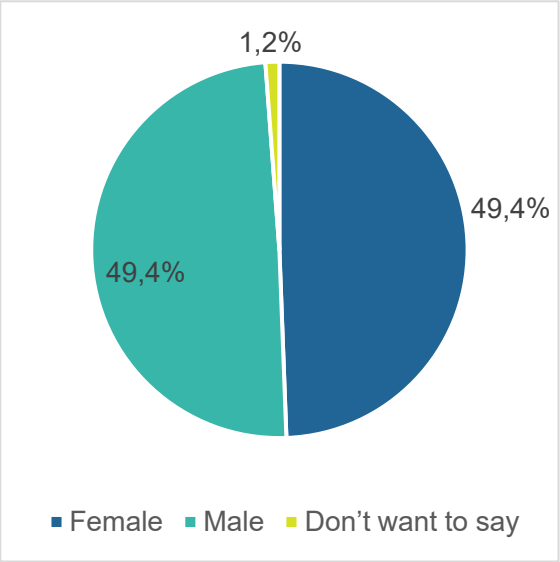
Survey to understand trends
for a sustainable agricultural sector

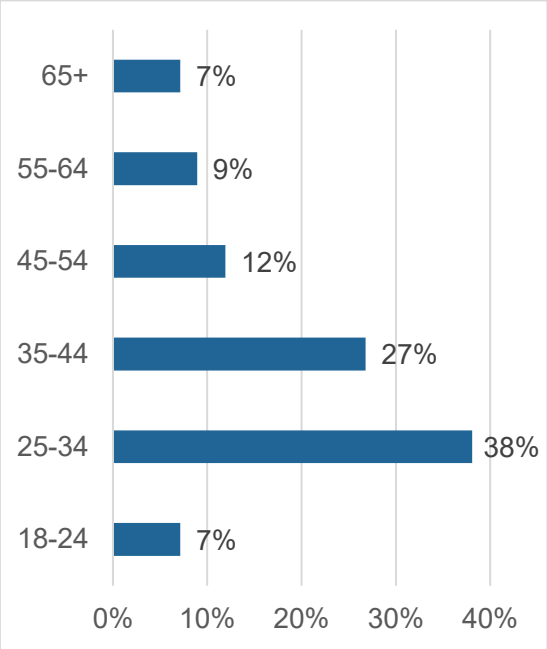
Demographics

1. Gender

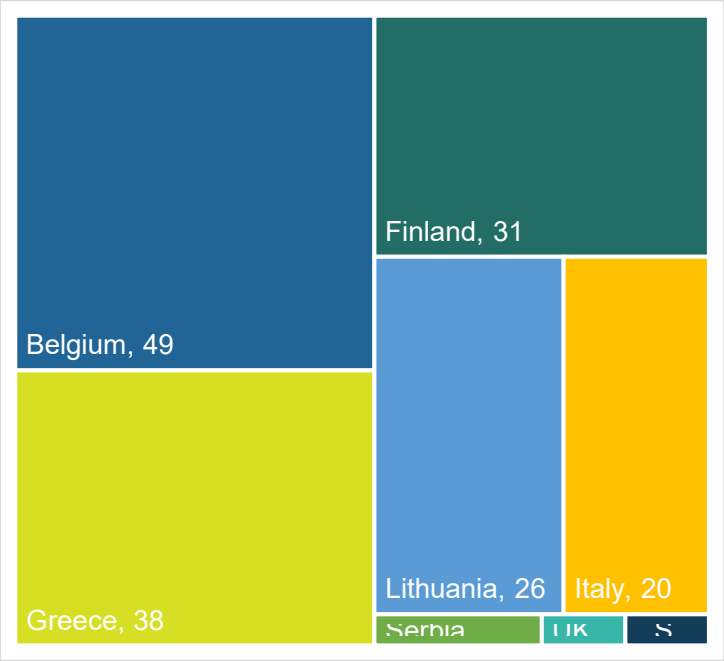


2. What is your type of stakeholder?

3. Age



4. Country



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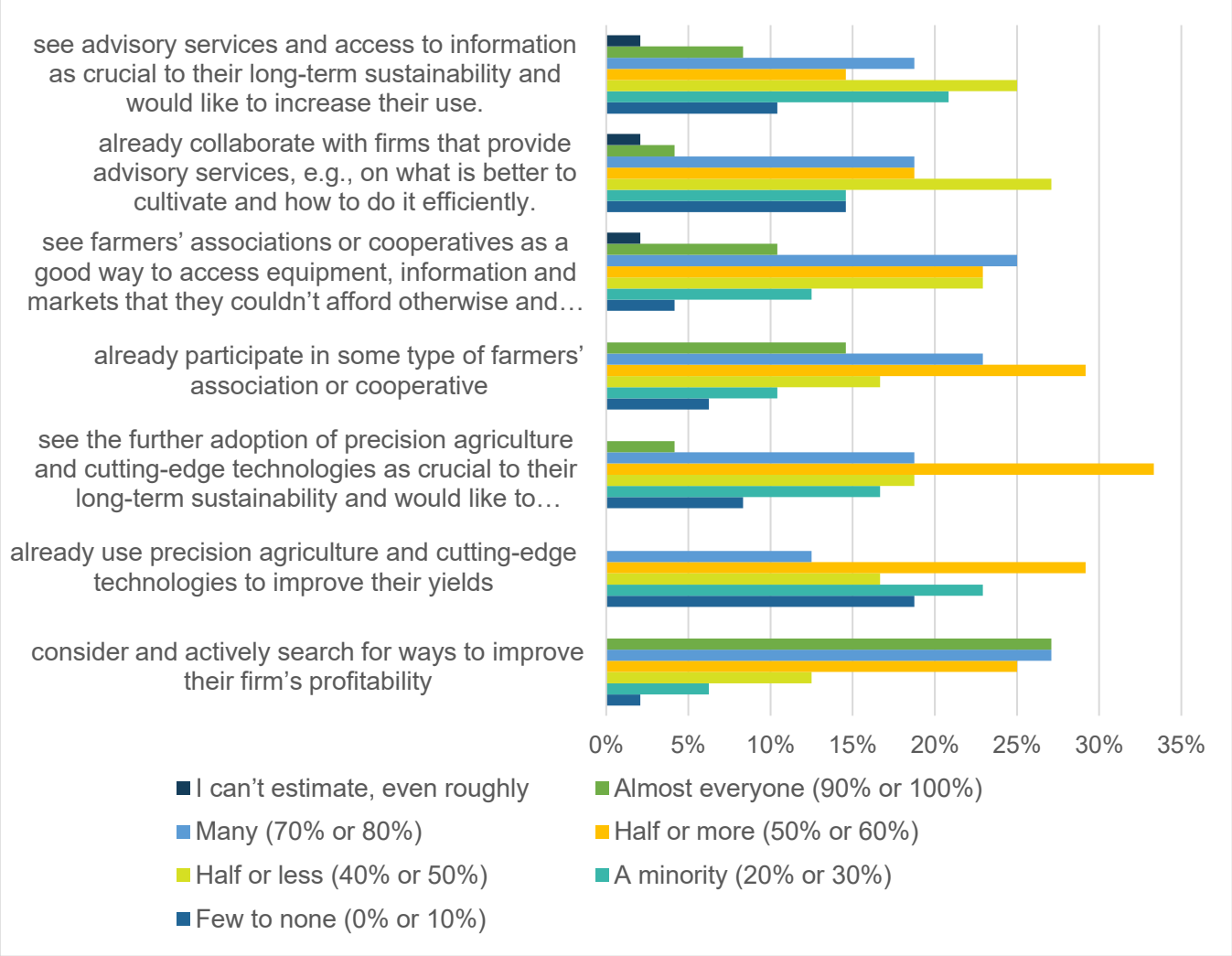
Following the reader may find the analysis of the survey results per stakeholder type, including special mentions in the questions that ask survey participants about their own perceptions.

Only for farmers, farm managers & stakeholders working with farmers

1. How many of your region's farmers do you think they:



2. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?

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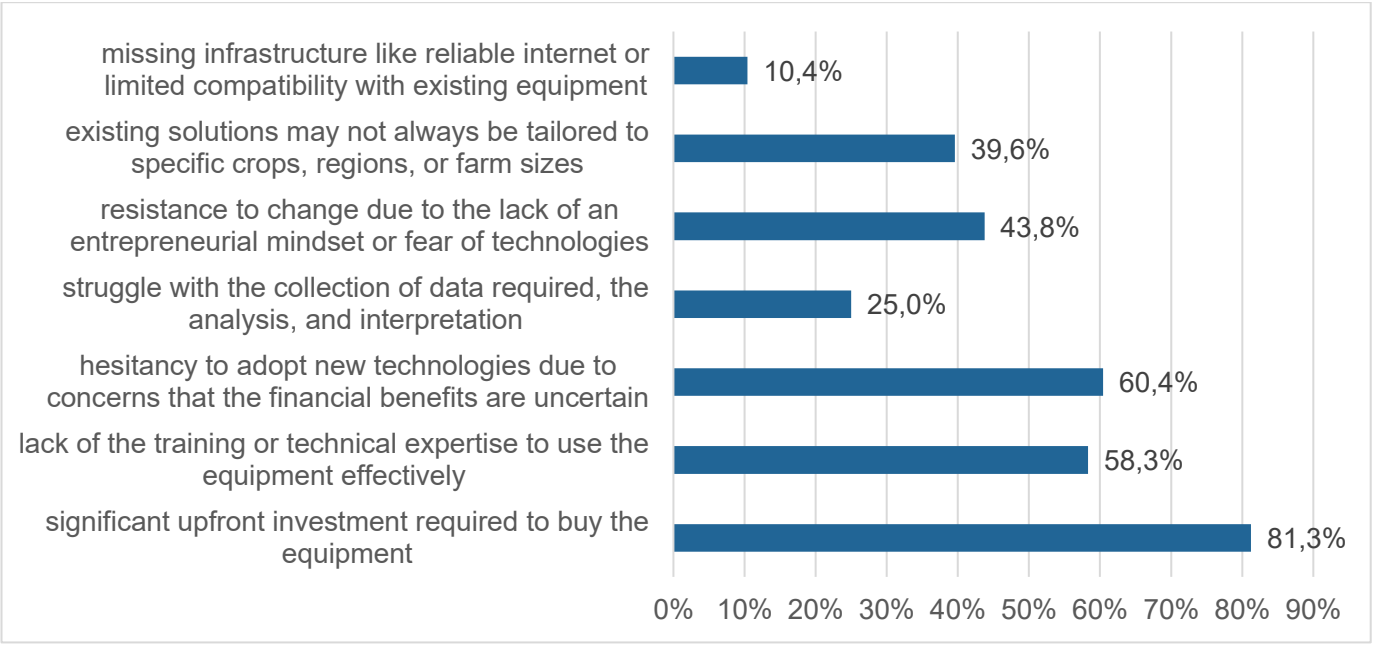

According to "farmers, farm managers & stakeholders working with farmers" own perceptions, the most crucial barriers for them in adopting precision agriculture and cutting-edge technologies are (i) the significant upfront investment required to buy the equipment (81.3%), followed by (ii) the hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain with 60.4%, and (iii) the lack of the training or technical expertise to use the equipment effectively with 58.3%. It is interesting to see also the results per country (see Annex 7) where the following are observed:

- In Belgium the most significant barriers for local farmers are (i) significant upfront investment required to buy the equipment and lack of the training or technical expertise to use the equipment effectively, with 87.5% each and (ii) hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain (75.0%).
- In Greece the (i) significant upfront investment required to buy the equipment and hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain with 83.3% each and the lack of the training or technical expertise to use the equipment effectively (66.7%).
- In Lithuania the (i) significant upfront investment required to buy the equipment with 76.9%, (ii) the hesitancy to adopt new technologies due to concerns that the financial benefits are uncertain with 69.2% and the resistance to change due to the lack of an entrepreneurial mindset or fear of technologies with 53.8%.
- In Italy the (i) significant upfront investment required to buy the equipment 92.3% and (i) in second place with 61.5% the lack of the training or technical expertise to use the equipment effectively, the struggle with the collection of data required, the analysis, and interpretation and the resistance to change due to the lack of an entrepreneurial mindset or fear of technologies.

Overall, the country-level results are largely consistent with the aggregate findings, with high upfront investment costs emerging as the dominant barrier across all countries, alongside concerns about uncertain financial returns and limited technical skills. While the relative importance of secondary barriers varies by country (such as resistance to change in Lithuania or data-related challenges in Italy) the national patterns broadly reinforce the total results, indicating a shared set of structural constraints with some context-specific nuances.

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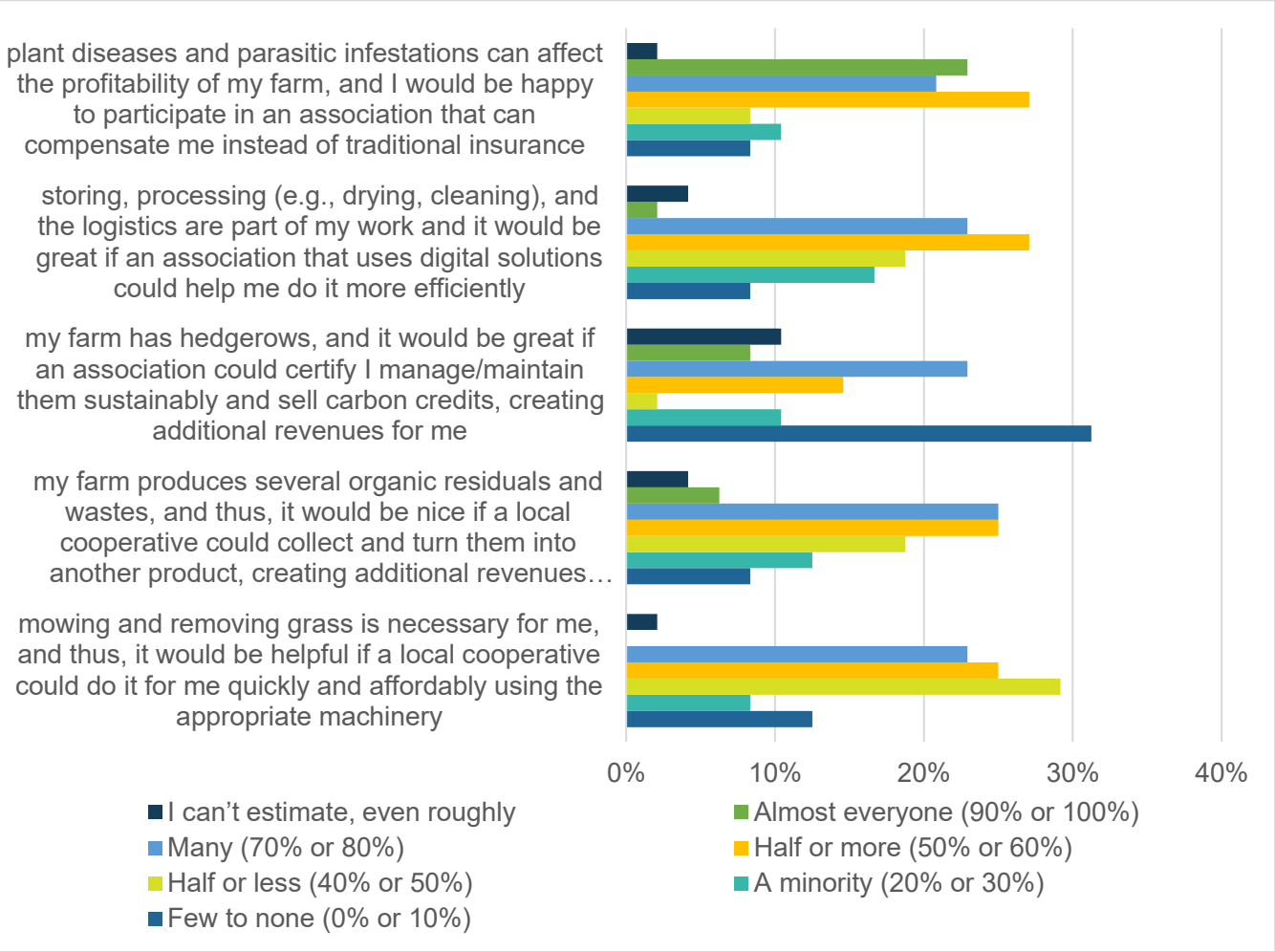
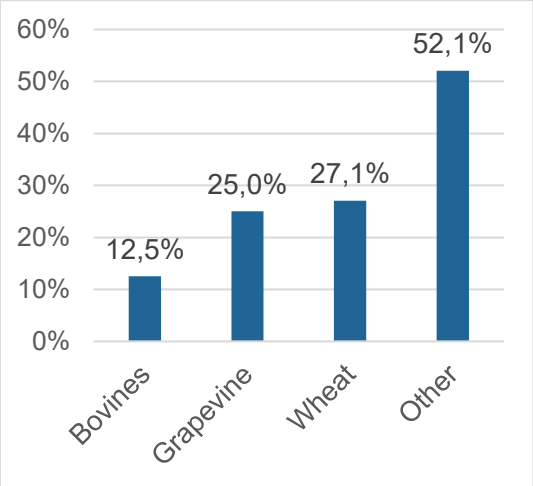
3. For how many of your region's farmers could the following hold true?

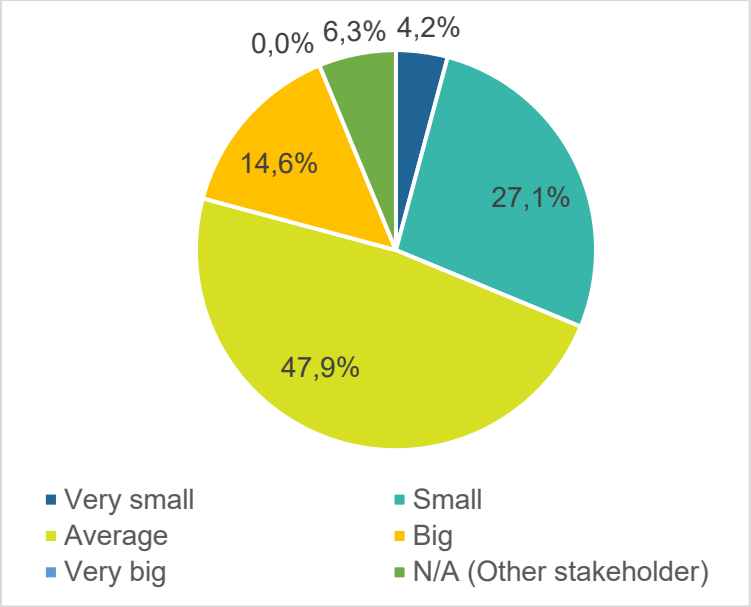


4. Do you work with any of the following products?



** Other including olive trees, peaches, citrus trees, potatoes, forage.*

5. Farm size compared to other farmers in your region



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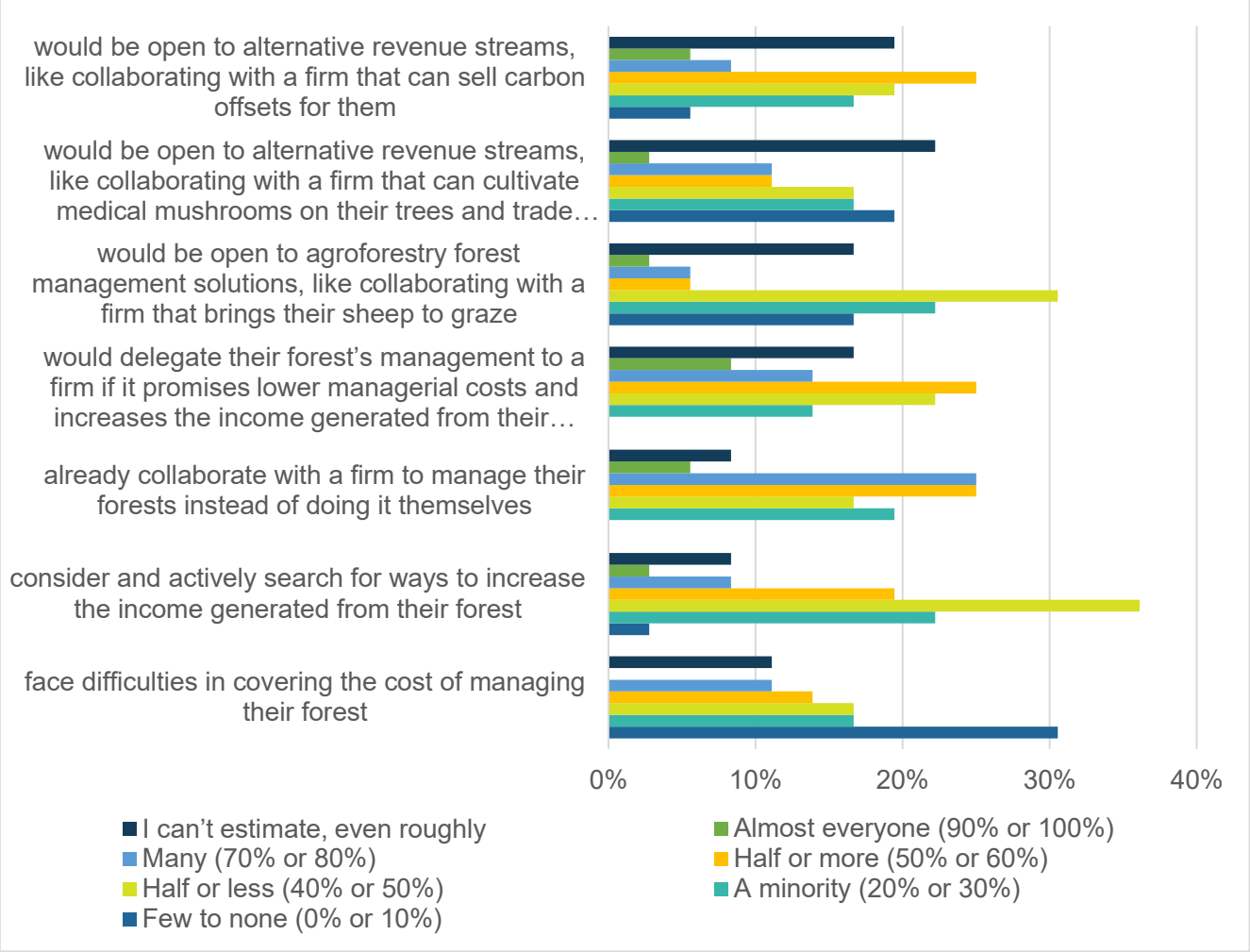
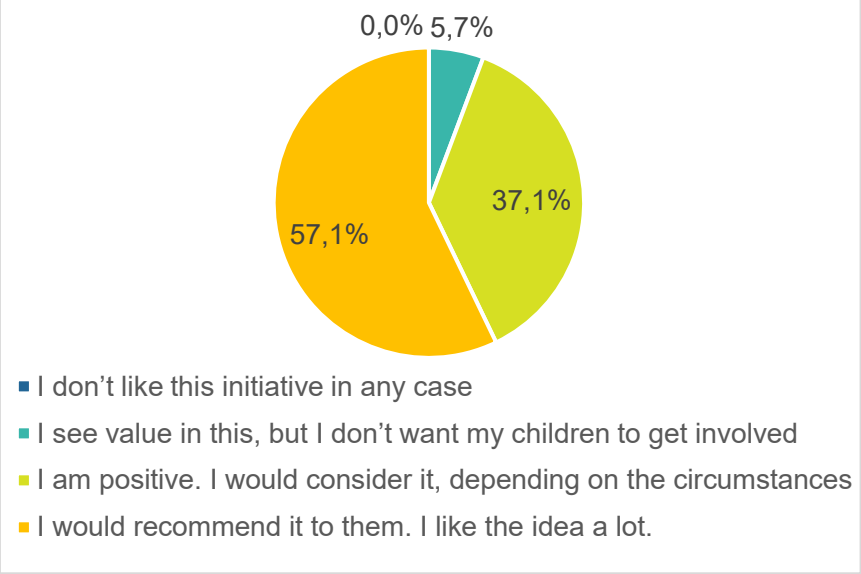
Only for forest owners, forest managers & stakeholders working with forest owners

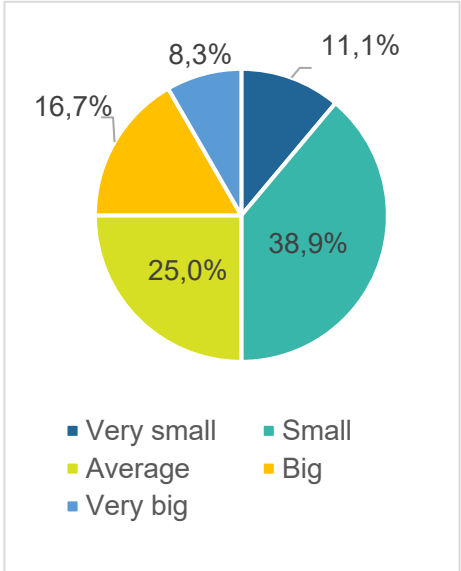
1. How many of your region's forest owners do you think they:



2. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join (if you have)?



3. Forest size compared to other foresters in your region.



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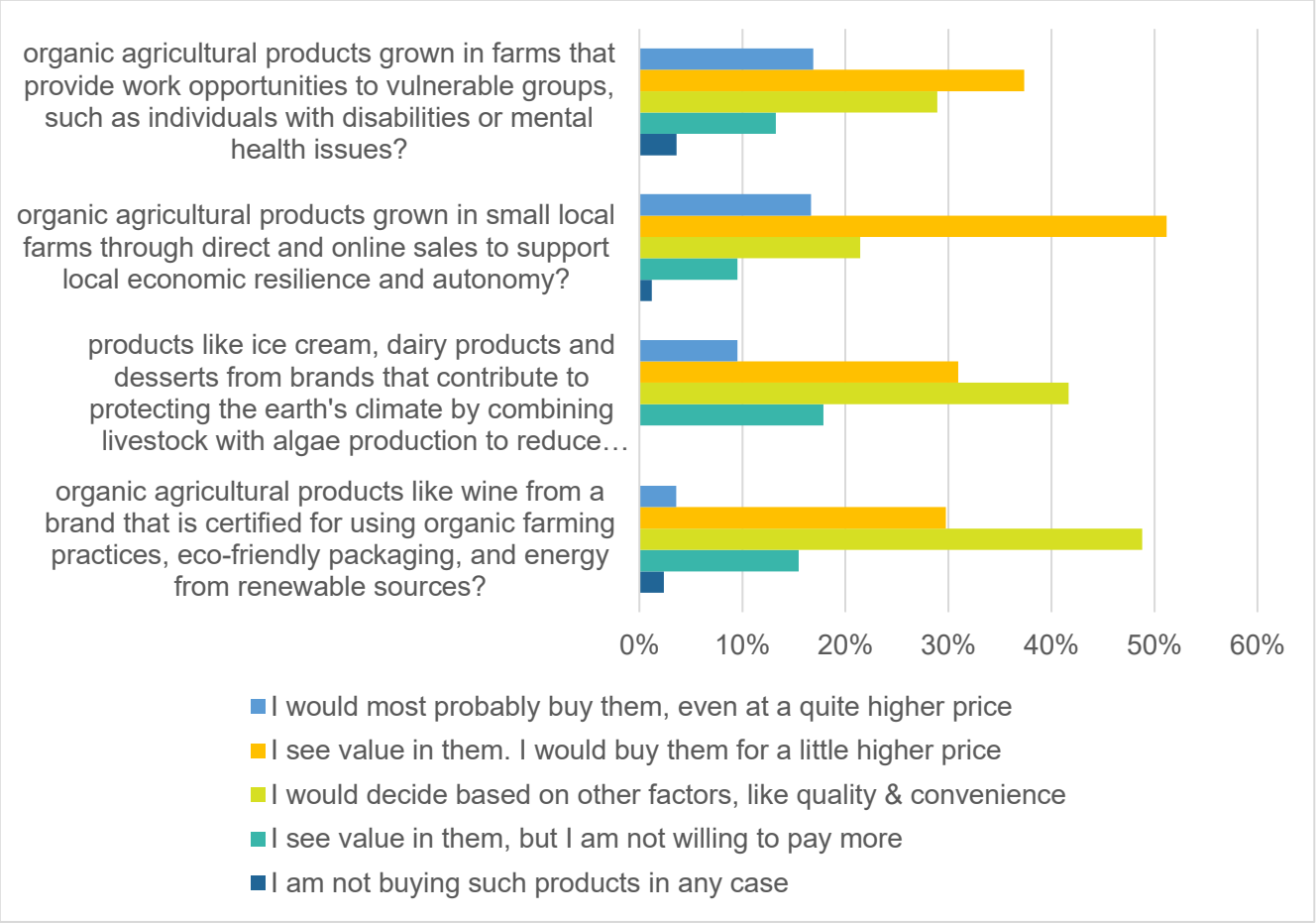
According to “forest owners, forest managers & stakeholders working with forest owners” own perceptions, the vast majority would support an initiative involving teenagers planting new forests on wasteland as a summer job, with 57.1% also willing to suggest it to their own children.

Only for Consumers

1. Would you be willing to pay more for:



Overall, consumers demonstrate a positive perception of sustainability-oriented and socially responsible agricultural practices. While most recognise the value of environmental innovation and ethical production, purchasing decisions are largely conditional on price, quality, and convenience, indicating a pragmatic consumption norm rather than unconditional commitment. Support for local economic resilience and social inclusion stands out as particularly important. Consumers show a comparatively higher willingness to pay for products that strengthen local communities or provide employment to vulnerable groups, suggesting that social and territorial values more readily justify price premiums than environmental attributes alone.

2. Would you give up the convenience of a nearby supermarket for a smaller, more distant shop (knowing that prices are similar) if the second:[331]

[331] We acknowledge that this question asks respondents to consider two factors simultaneously: convenience and ecological motivation. This was an intentional methodological choice, as we aimed to assess the potential of shops offering organic products, which are typically less accessible than large national retail chains (i.e. they are fewer in number and therefore often located at greater distances). In other words, the question was designed to capture the combined effect of ecological motivation and convenience on consumer behaviour.

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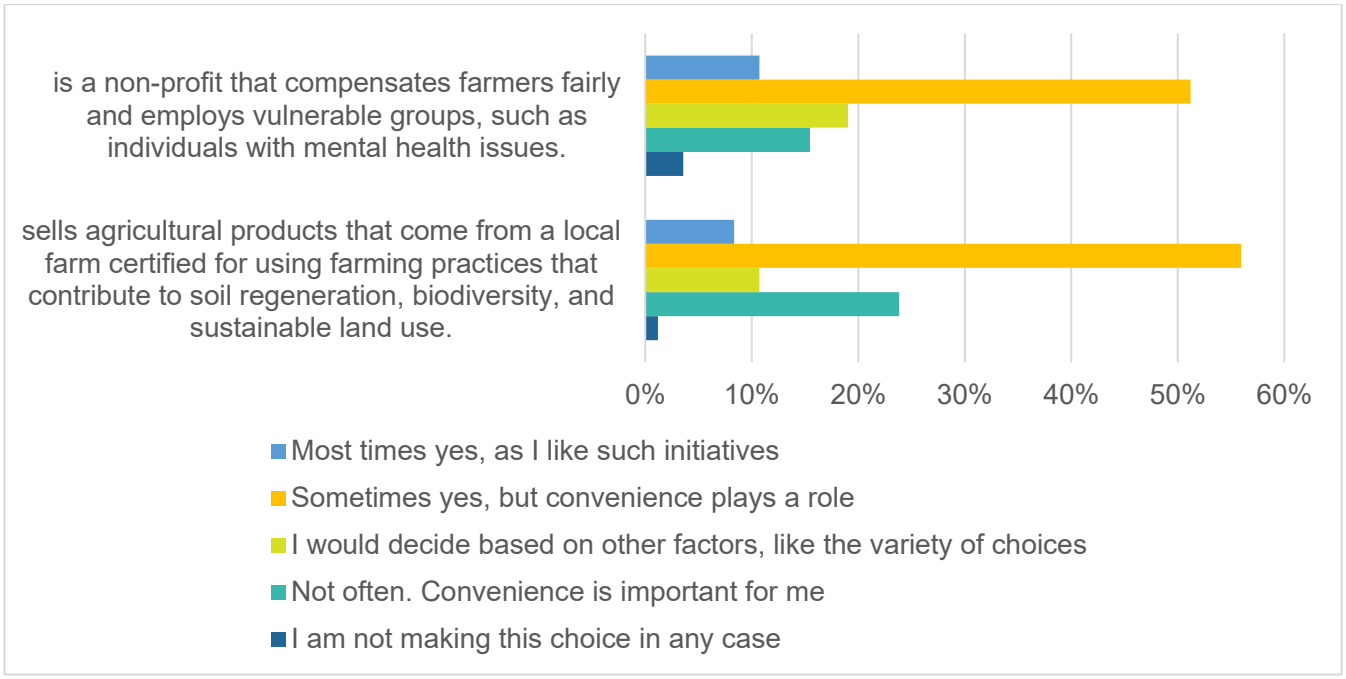
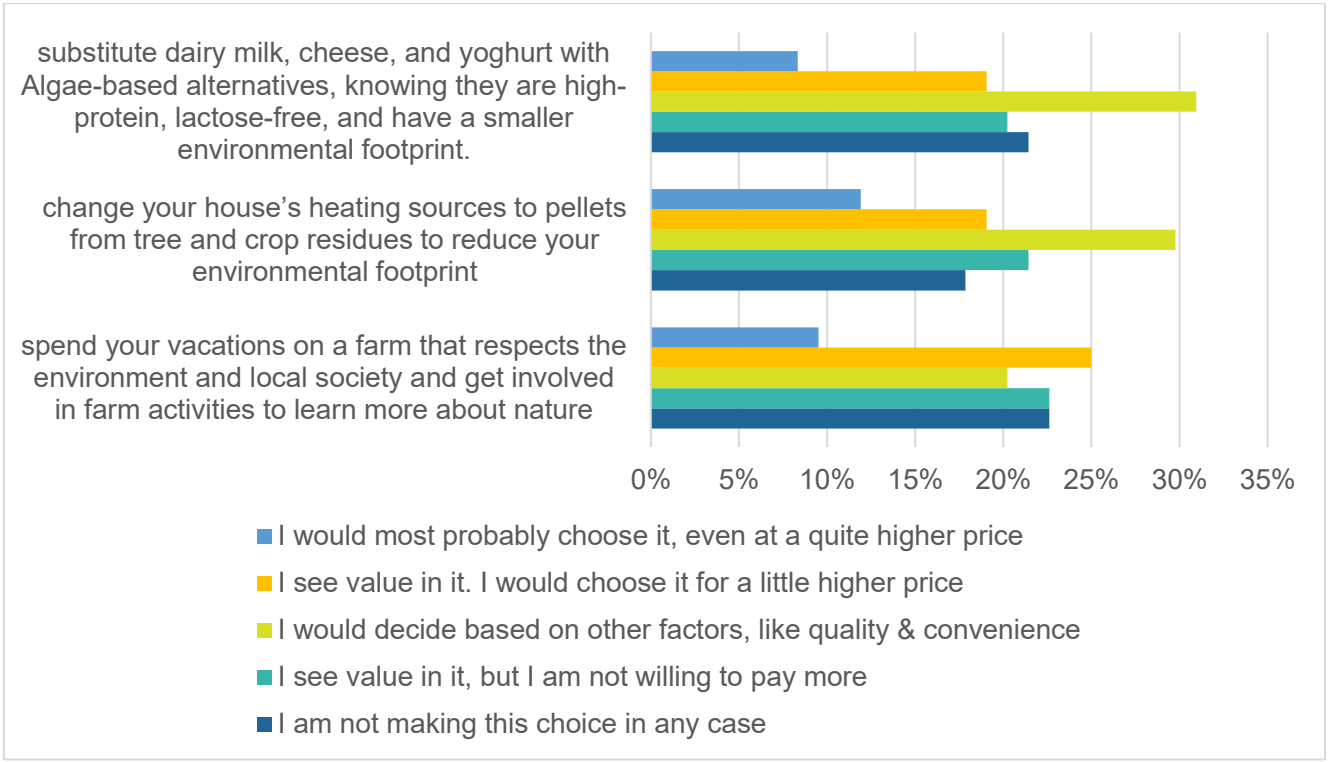


Consumers show a generally favourable attitude toward initiatives that combine environmental sustainability or social responsibility with agricultural production. Most indicate that they would choose such options at least occasionally, reflecting positive norms around regenerative farming practices and fair, inclusive employment. At the same time, convenience and the availability of alternatives remain decisive factors. This suggests that while consumers value ethical and sustainable initiatives, these preferences are conditional and embedded within practical considerations.

3. Would you make the following consumption choices?



Consumers show a moderate and conditional openness toward environmentally oriented consumption choices that require lifestyle changes or financial investment. While many recognise the environmental value of sustainable tourism, alternative heating sources, and algae-based

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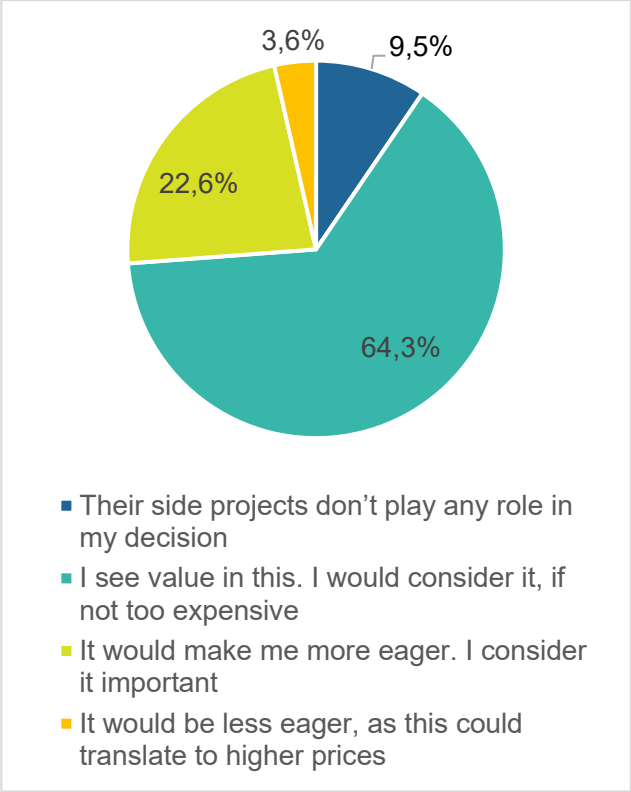
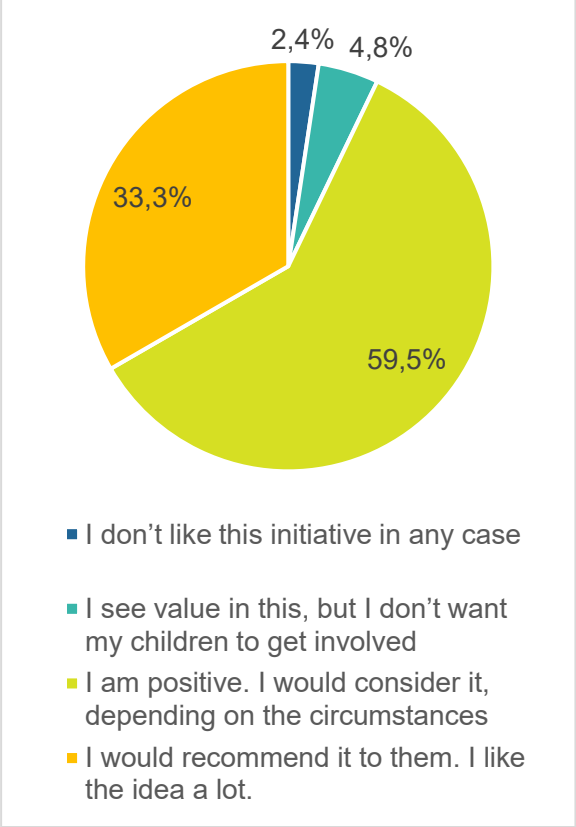
food products, a sizable share is unwilling to adopt these options or to pay a price premium. Decisions are largely shaped by quality, convenience, and personal comfort, indicating that environmental considerations are secondary when choices imply disruption to established habits. Overall, the findings suggest cautious engagement with sustainability-driven consumption.

4. If a company funds environmental responsibility projects, such as farms transitioning from traditional practices to biodiversity conserving practices, then would you be more eager to buy the company's products?



5. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join(if you have)?



Consumers generally perceive corporate funding of environmental responsibility projects as a positive signal. For most, such initiatives add value and can increase their willingness to buy from them, provided they do not lead to significant price increases. Only a small minority views these activities as irrelevant or negatively, suggesting that environmental side projects are broadly seen as important, but primarily as complementary factors that must align with price sensitivity and overall product value.

Consumers express broadly positive perceptions of youth-oriented environmental initiatives. Most recognise the value of involving teenagers in reforestation activities and are open to recommending participation to their own children, at least under certain conditions, indicating supportive social norms around environmental engagement of the youth and environmental responsibility. At the same time, the predominance of conditional support suggests that practical considerations (such as working conditions, safety, or personal circumstances) remain important.

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Annex 7: Survey Results per Country

Annex 7 presents the survey results by country. Of the 168 total responses, the largest numbers were recorded in Belgium (49), Greece (38), Finland (31), Lithuania (26), and Italy (20). The analysis therefore focuses on these countries, as they provide sample sizes sufficient for meaningful interpretation.[332]

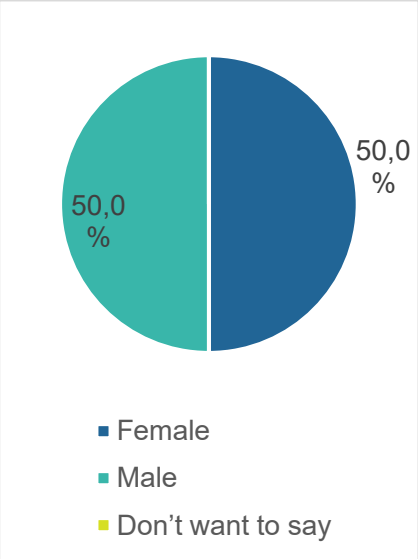
Belgium- Survey Results

In Belgium, the analysis focuses on responses from **farmers, farm managers & stakeholders working with farmers**, comprising a total of 8 responses and from **consumers**, comprising a total of 41 responses.

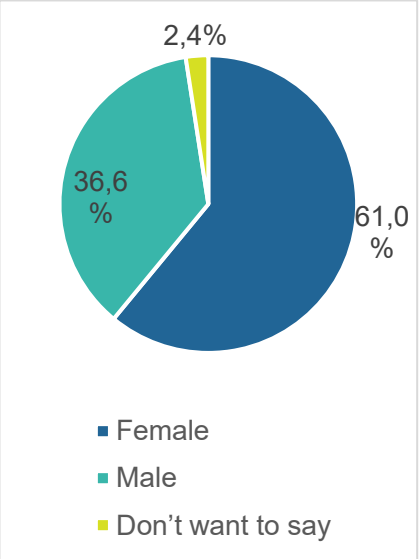
Demographics

1. What is your type of stakeholder?

2. Gender of Farmers



3. Gender of Consumers



[332] The surveyed population comprised three groups: (i) farmers, farm managers, and stakeholders working with farmers; (ii) forest owners, forest managers, and stakeholders working with forest owners; and (iii) consumers. To ensure analytical robustness, only those country–group combinations with at least seven responses were included in the analysis.

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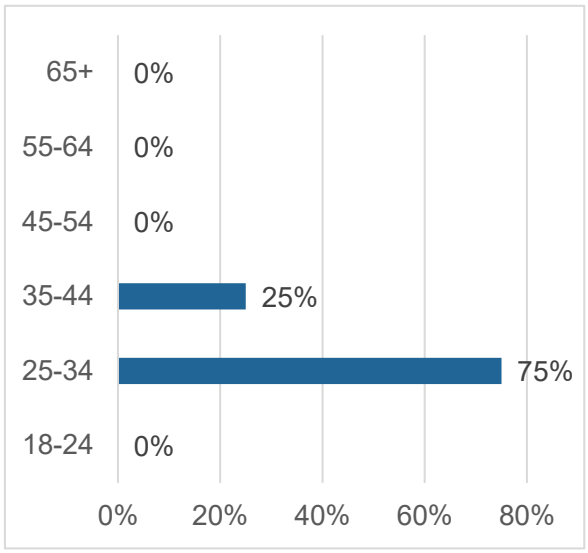
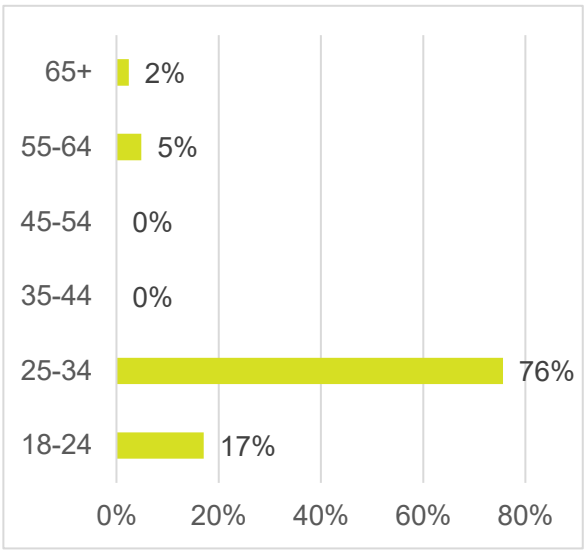
4. Age of Farmers

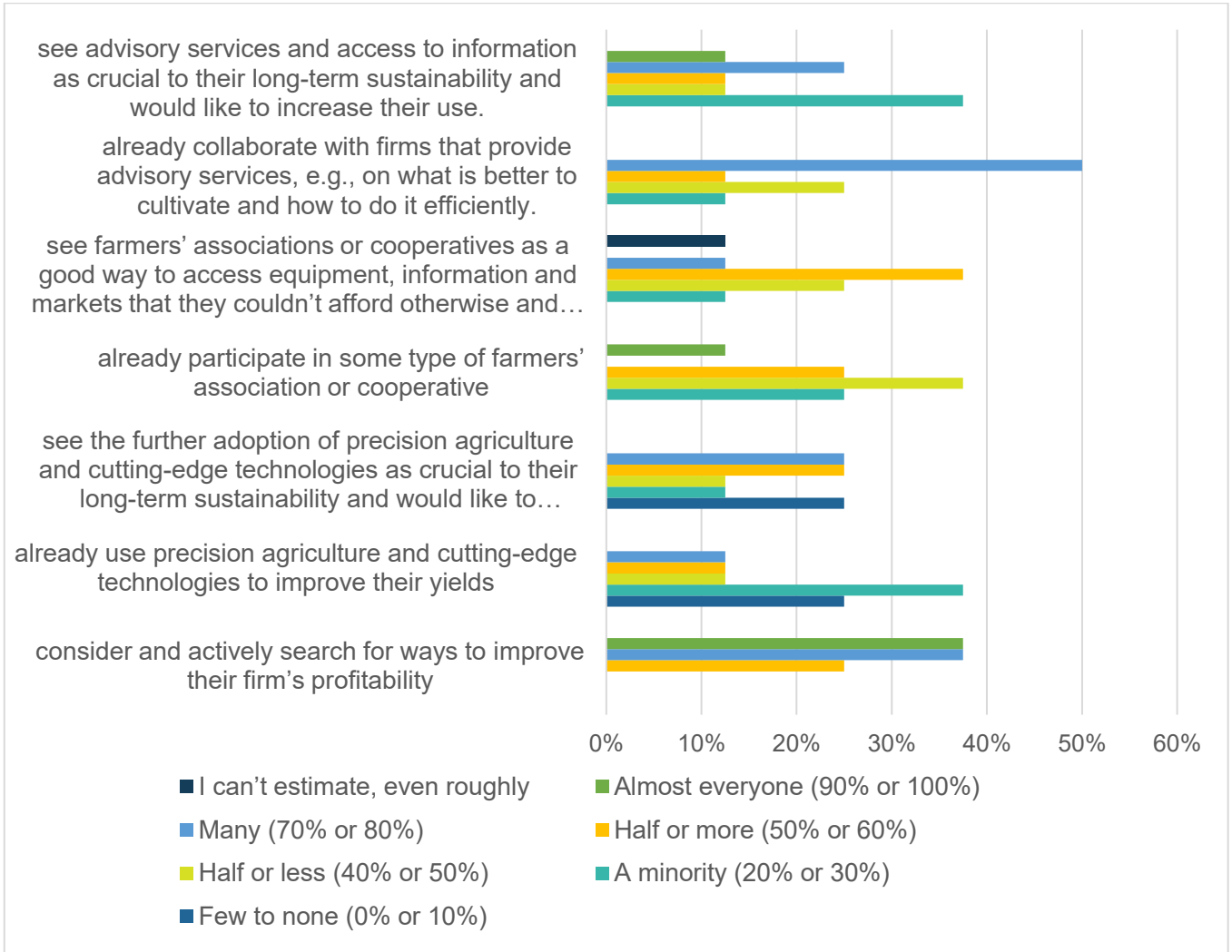


5. Age of Consumers



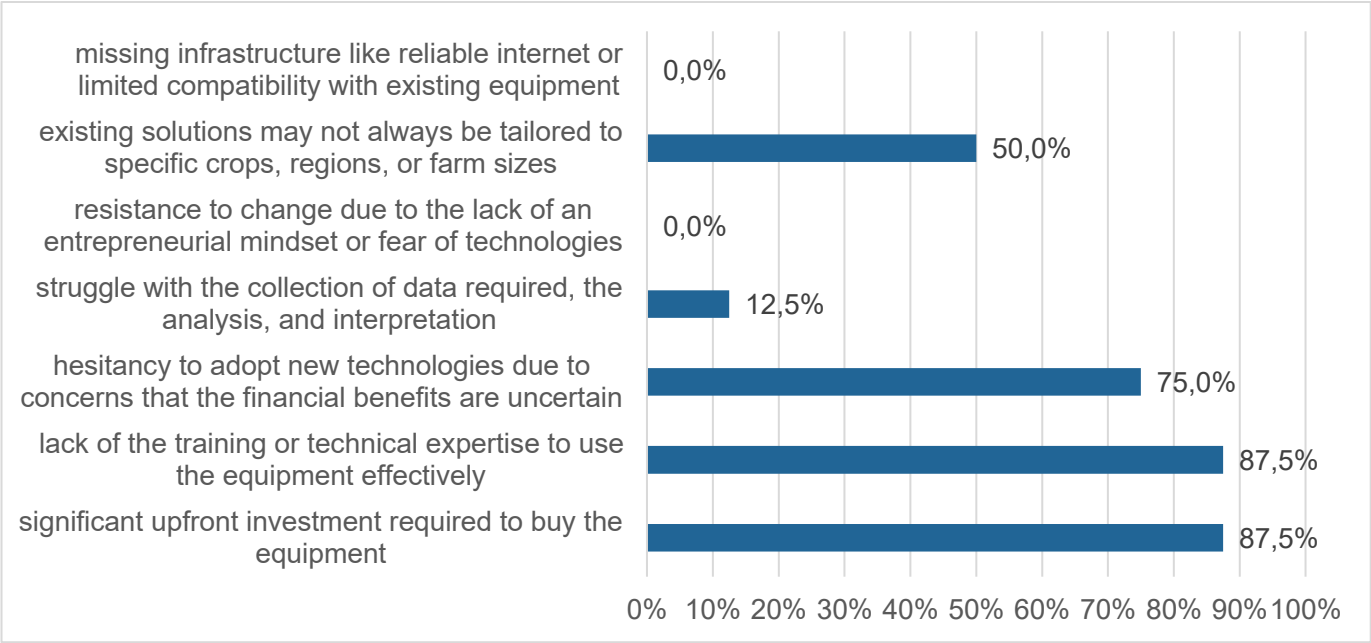
Only for farmers, farm managers & stakeholders working with farmers

6. How many of your region's farmers do you think they:

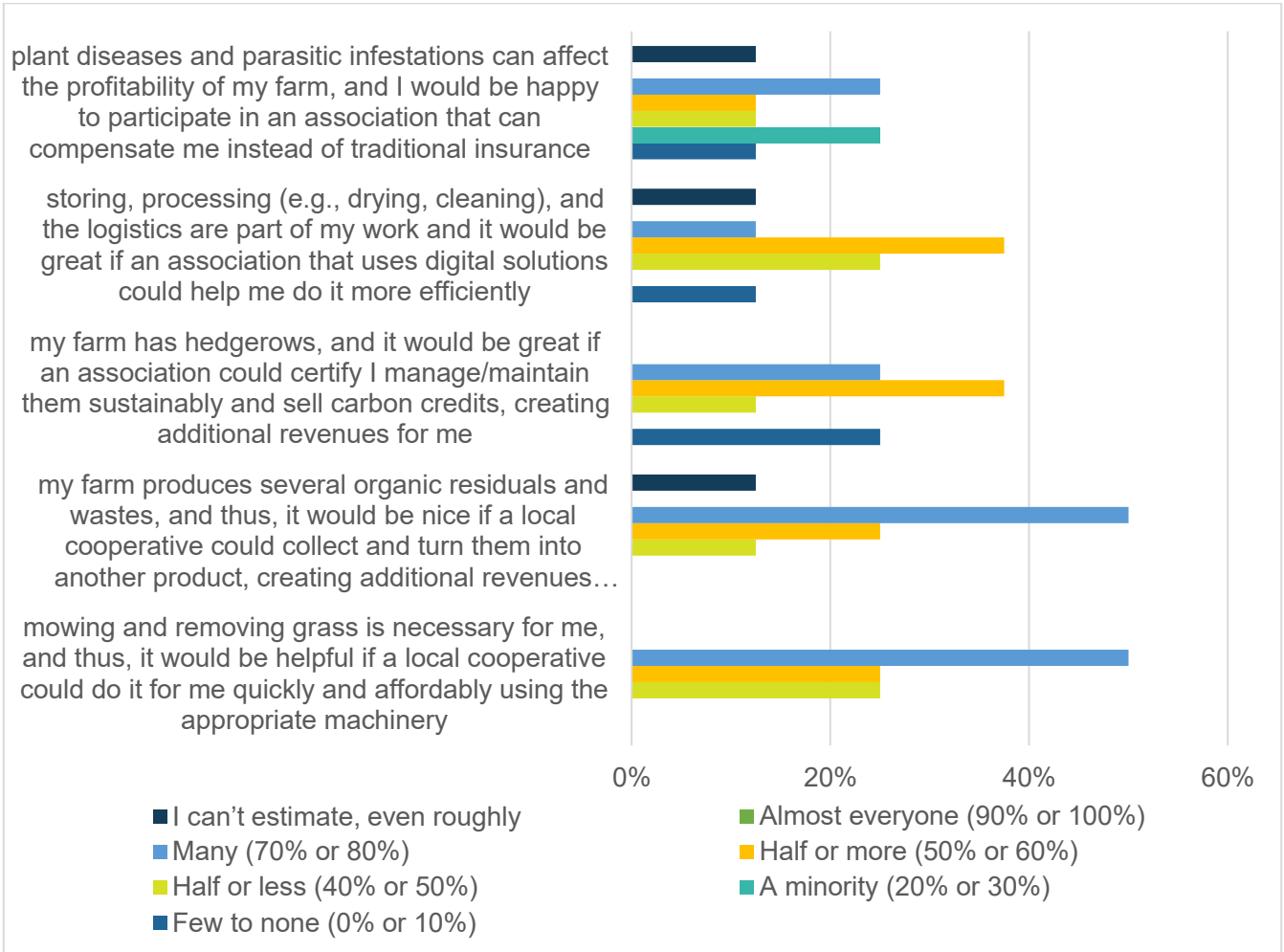


Funded by the European Union

7. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?

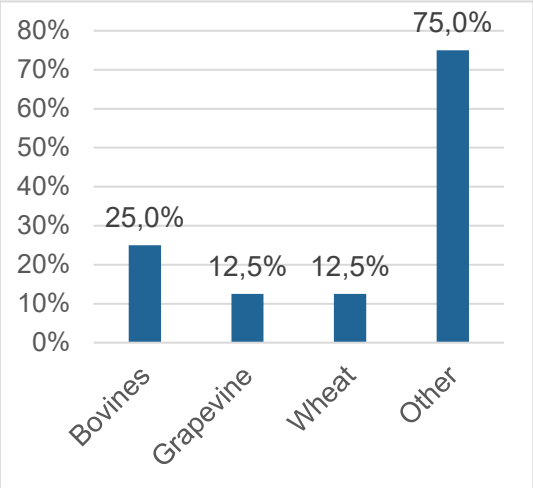


8. For how many of your region's farmers could the following hold true?



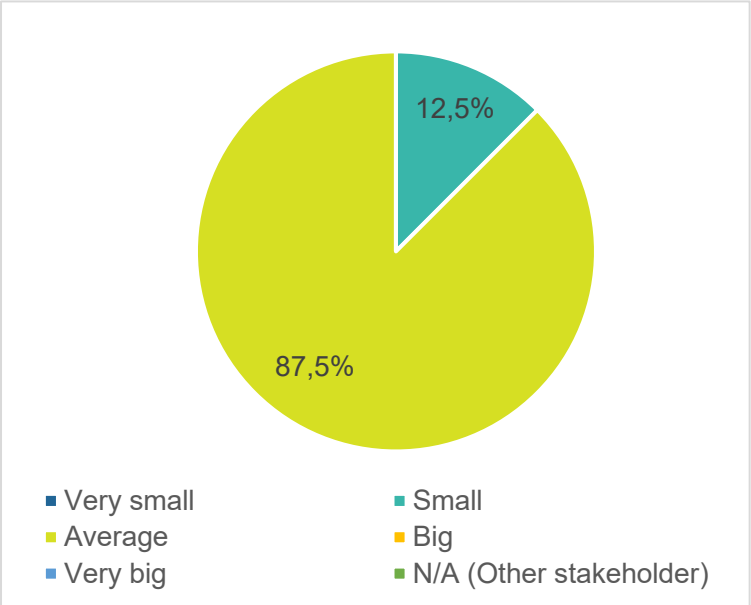
Funded by the European Union

9. Do you work with any of the following products?



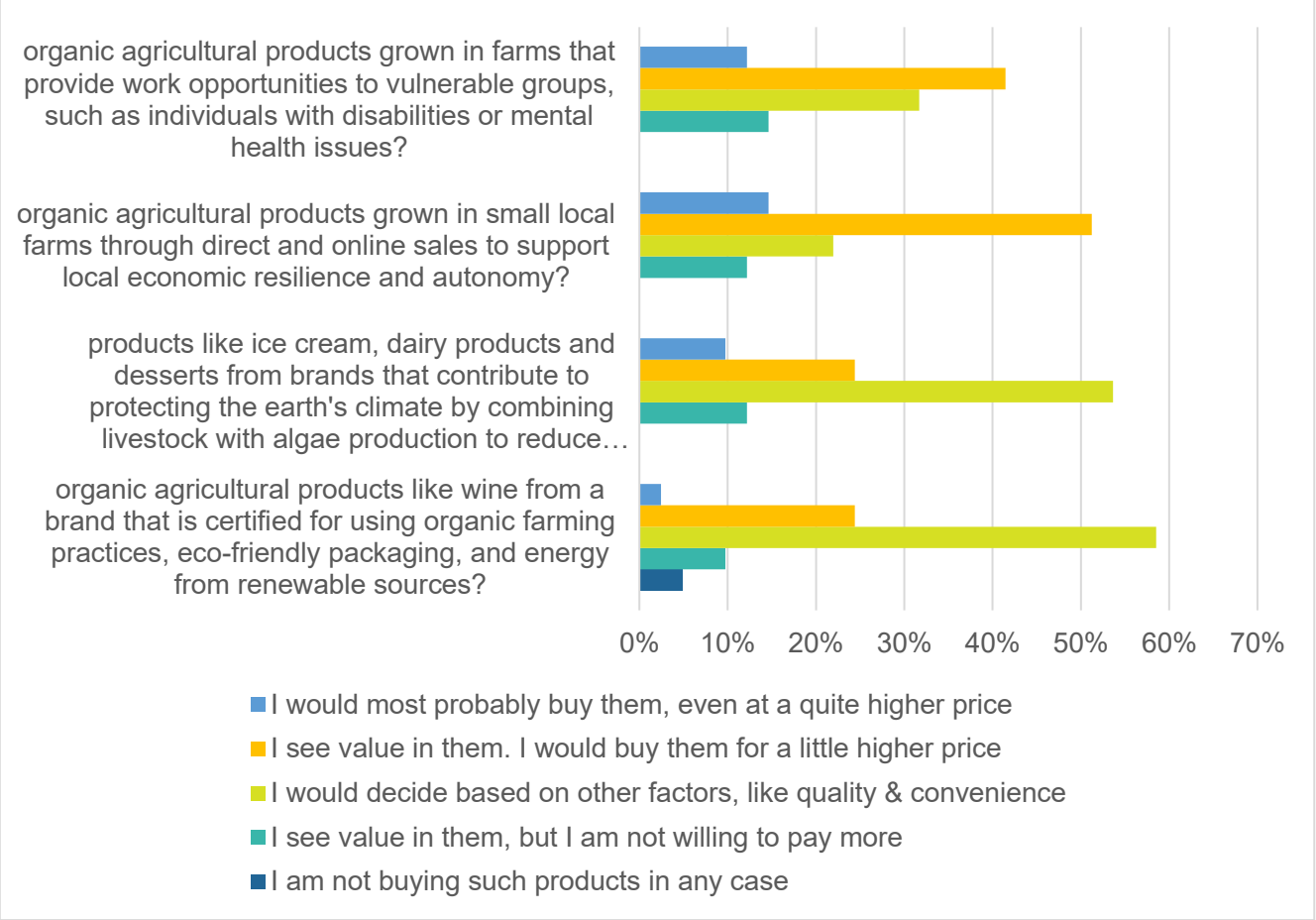
** Other, including arable land or people who are advisors.*

10. Farm size compared to other farmers in your region



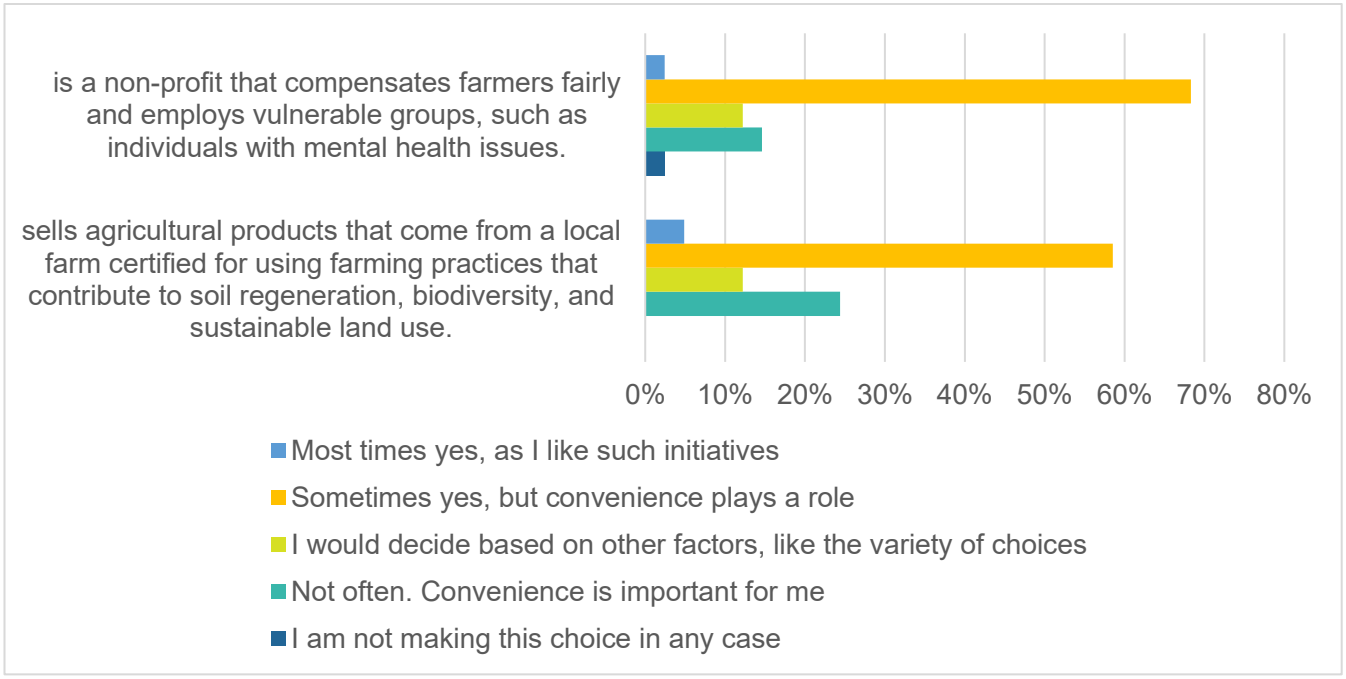
Only for Consumers

11. Would you be willing to pay more for:

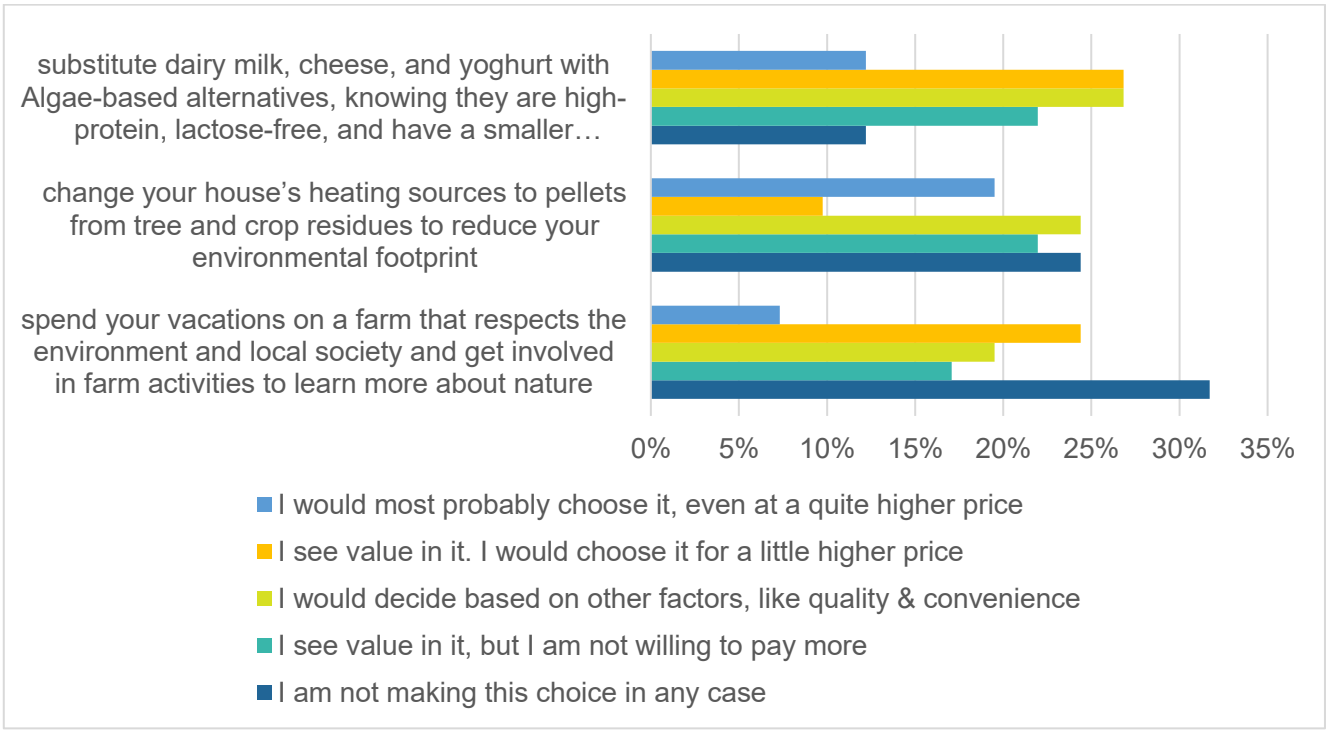


Funded by the European Union

12. Would you give up the convenience of a nearby supermarket for a smaller, more distant shop (knowing that prices are similar) if the second:

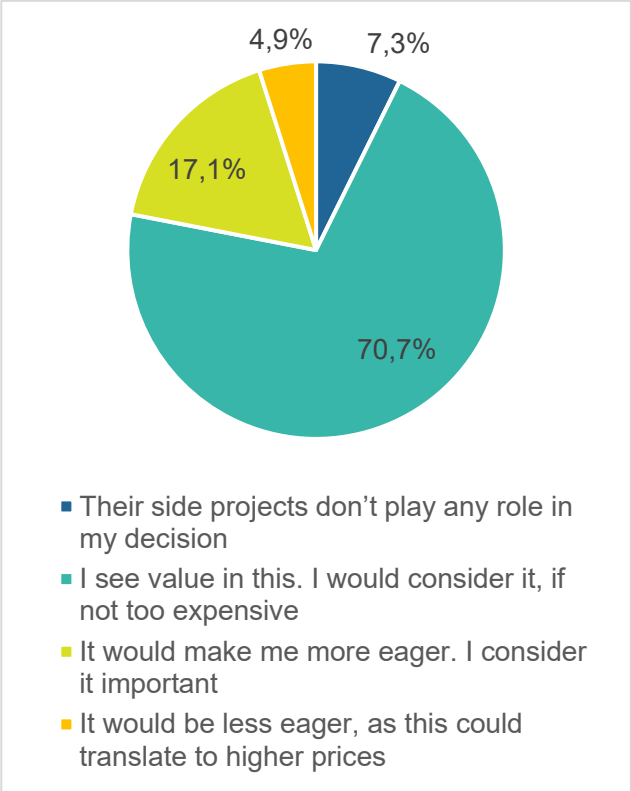


13. Would you make the following consumption choices?

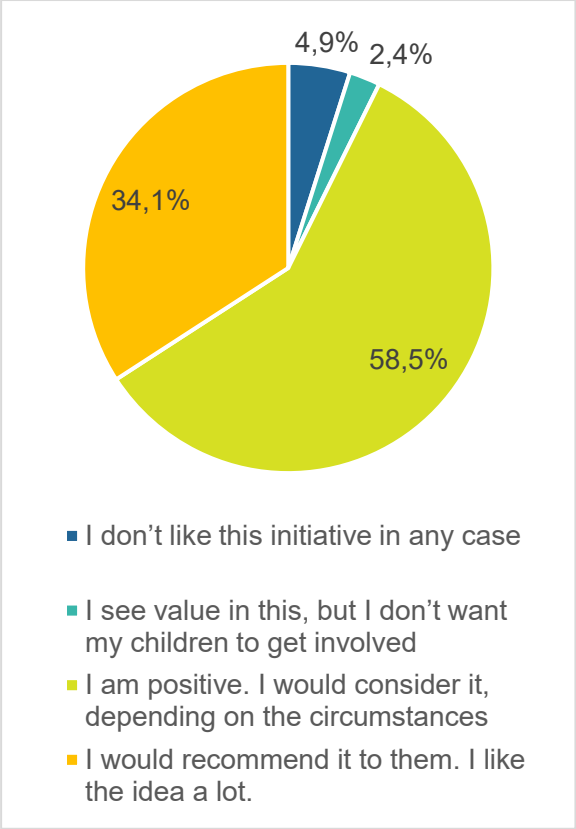


Funded by the European Union

14. If a company funds environmental responsibility projects, such as farms transitioning from traditional practices to biodiversity conserving practices, then would you be more eager to buy the company's products?



15. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join (if you have)?



Greece- Survey Results

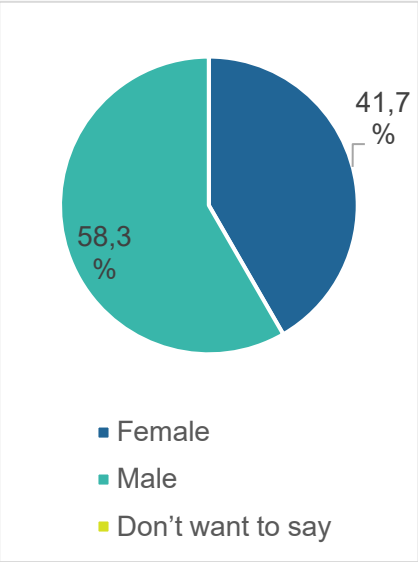
In Greece, the analysis focuses on responses from **farmers, farm managers & stakeholders working with farmers**, comprising a total of 12 responses and from **consumers**, comprising a total of 25 responses.

Demographics

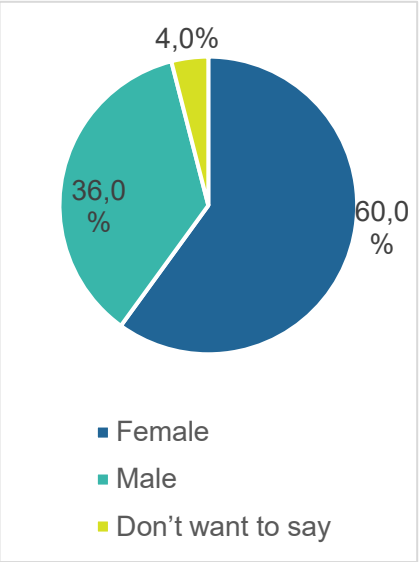
Funded by the European Union

1. What is your type of stakeholder?

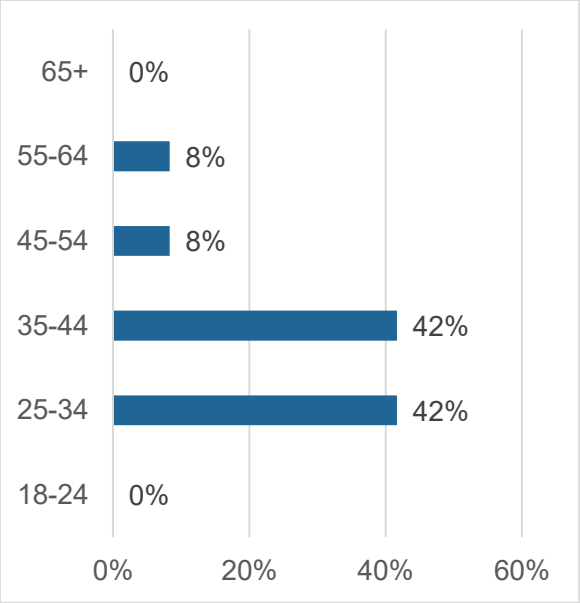
2. Gender of Farmers



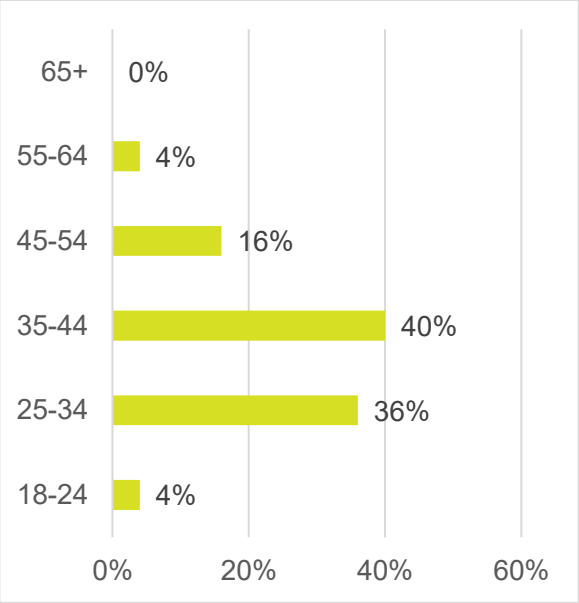
3. Gender of Consumers



4. Age of Farmers



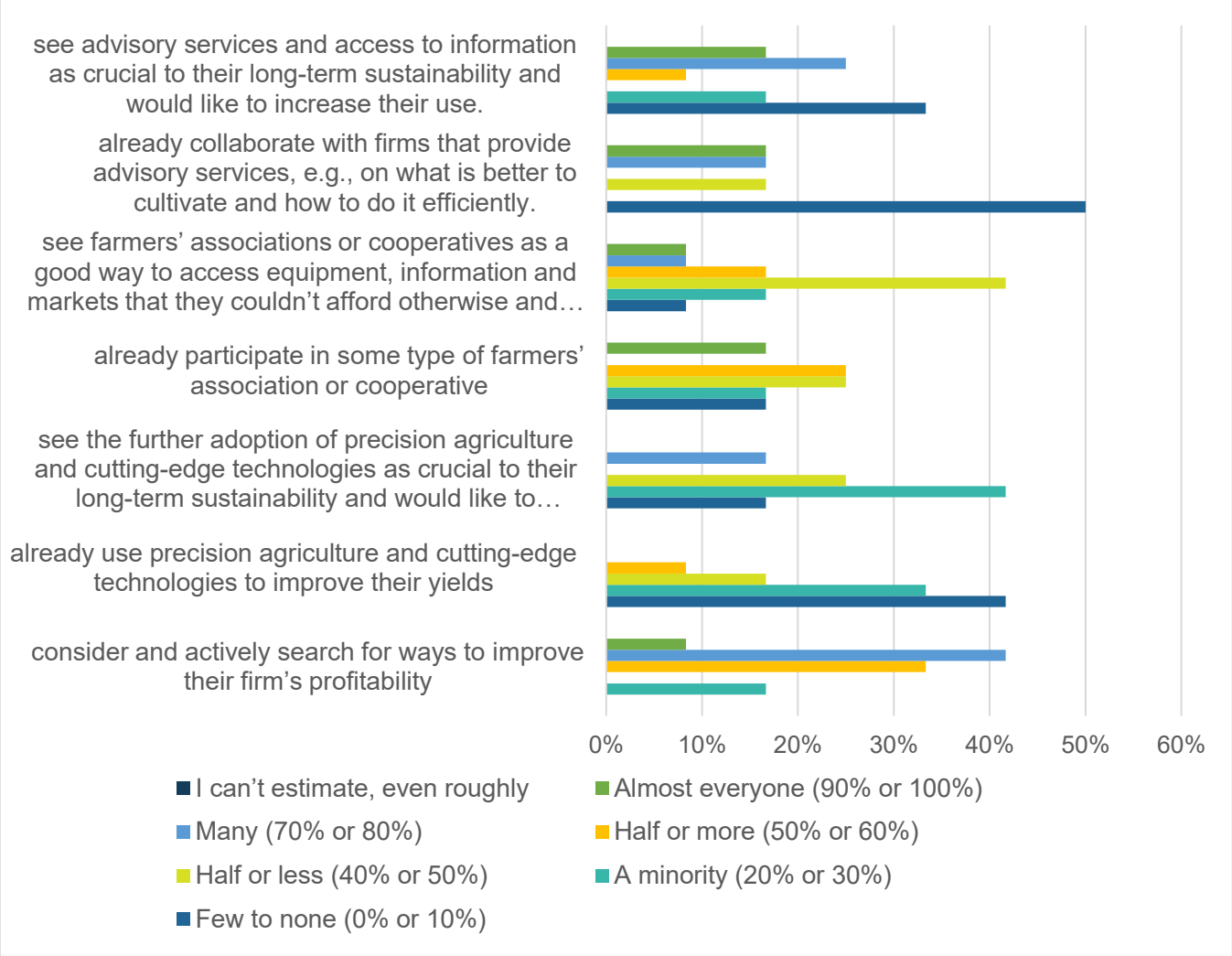
5. Age of Consumers



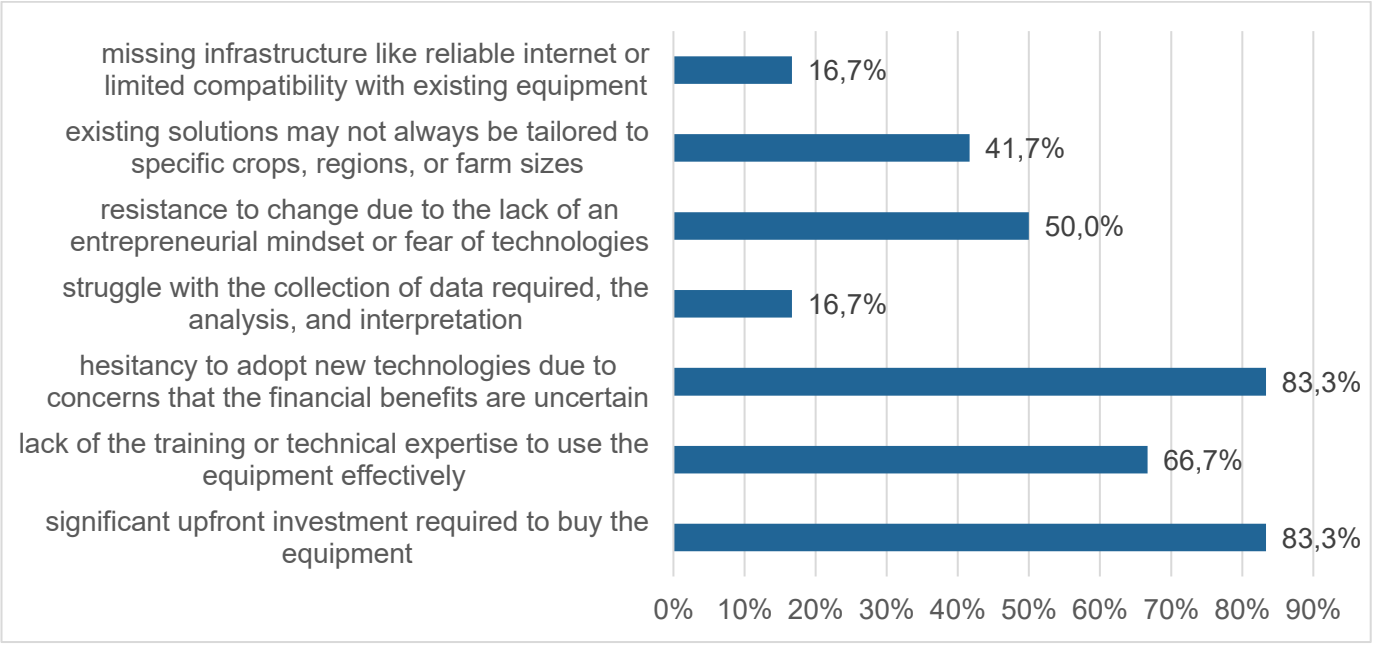
Funded by the European Union

Only for farmers, farm managers & stakeholders working with farmers

6. How many of your region's farmers do you think they:

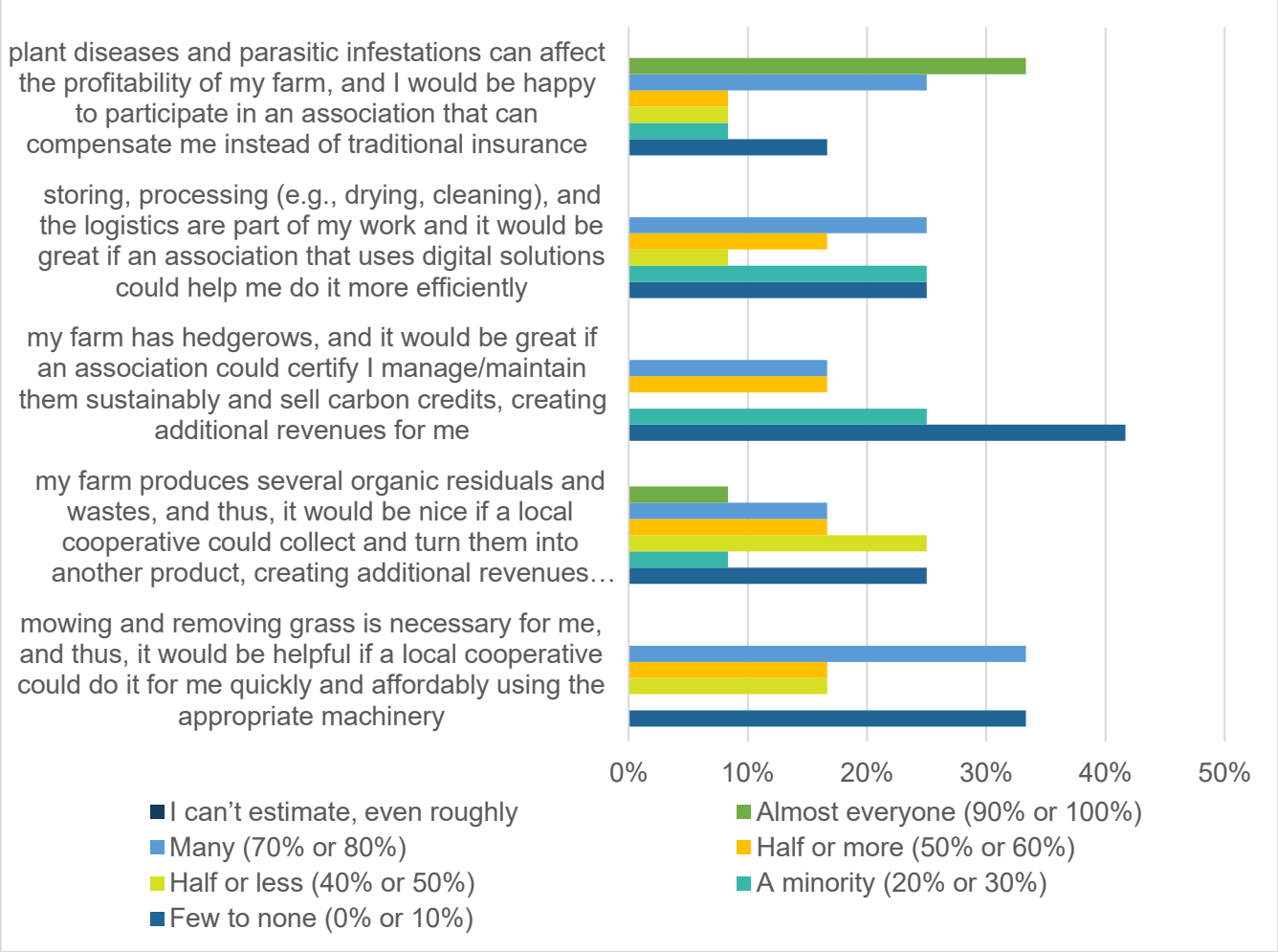


7. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?

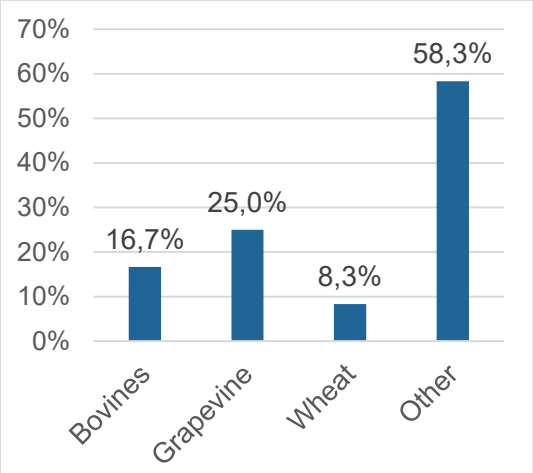


Funded by the European Union

8. For how many of your region's farmers could the following hold true?

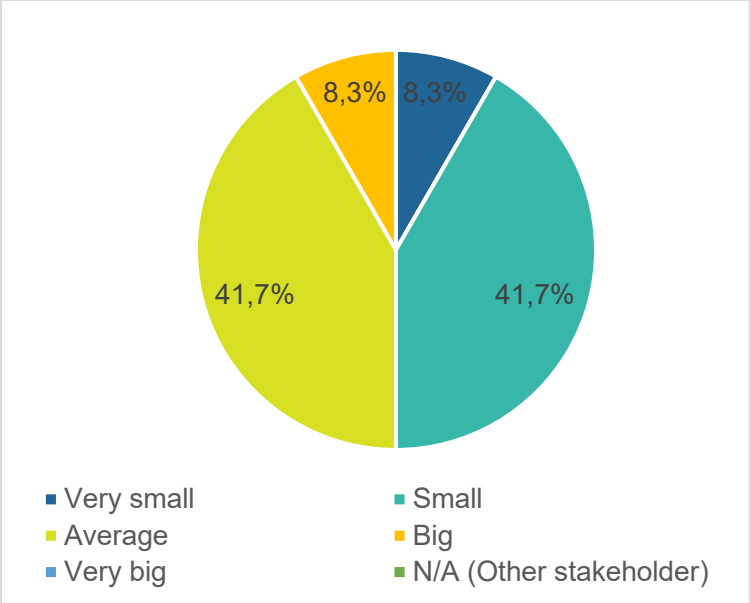


9. Do you work with any of the following products?



** Other, including olive trees, peaches, citrus trees.*

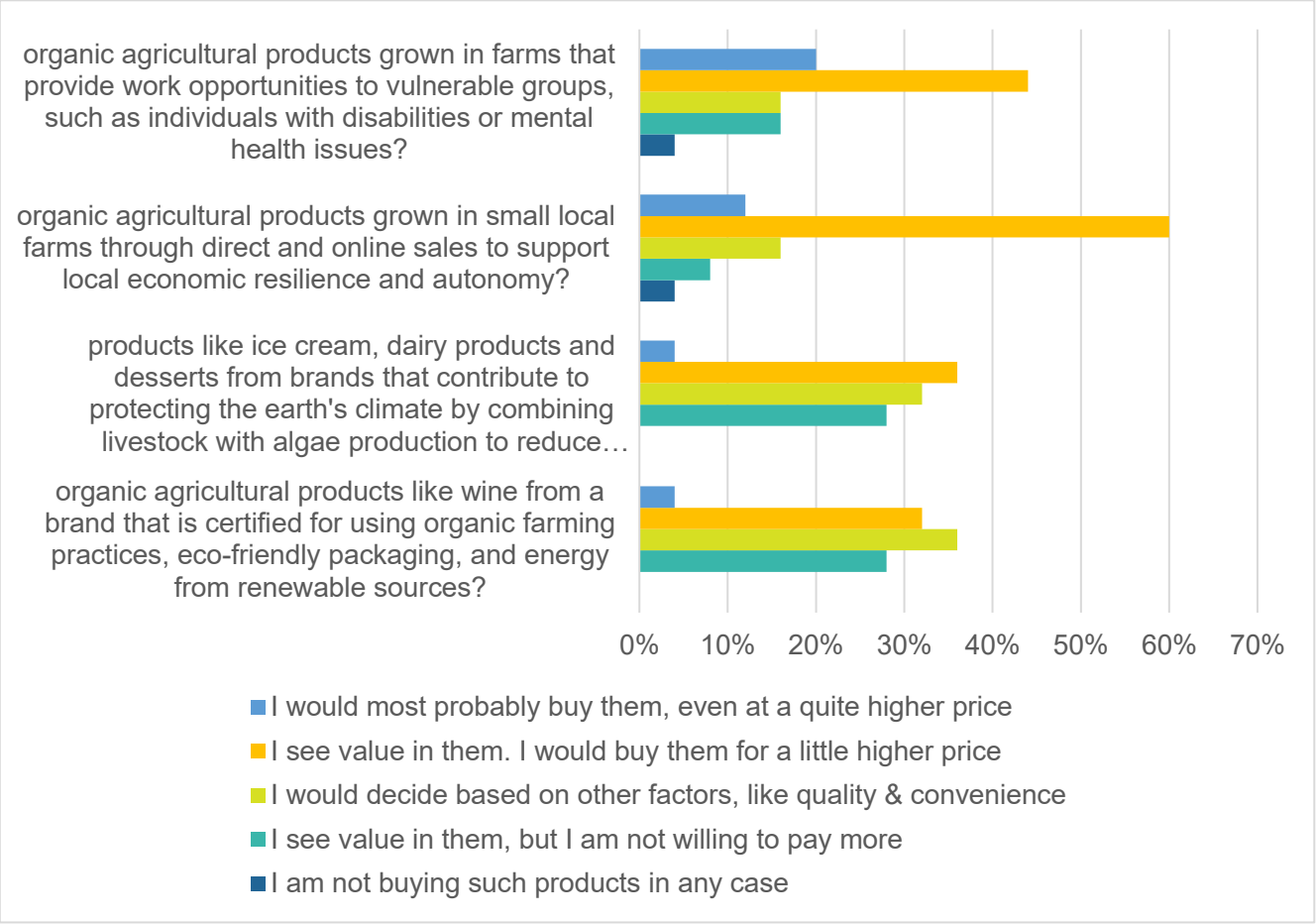
10. Farm size compared to other farmers in your region



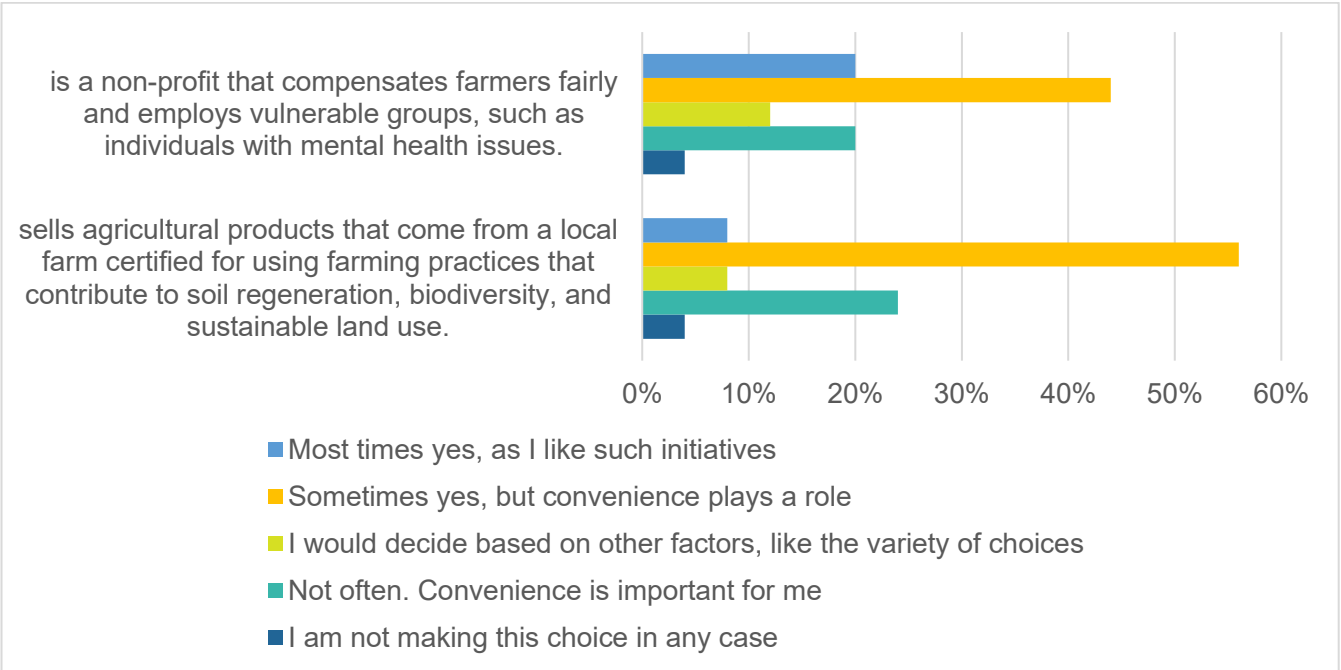
Funded by the European Union

Only for Consumers

11. Would you be willing to pay more for:

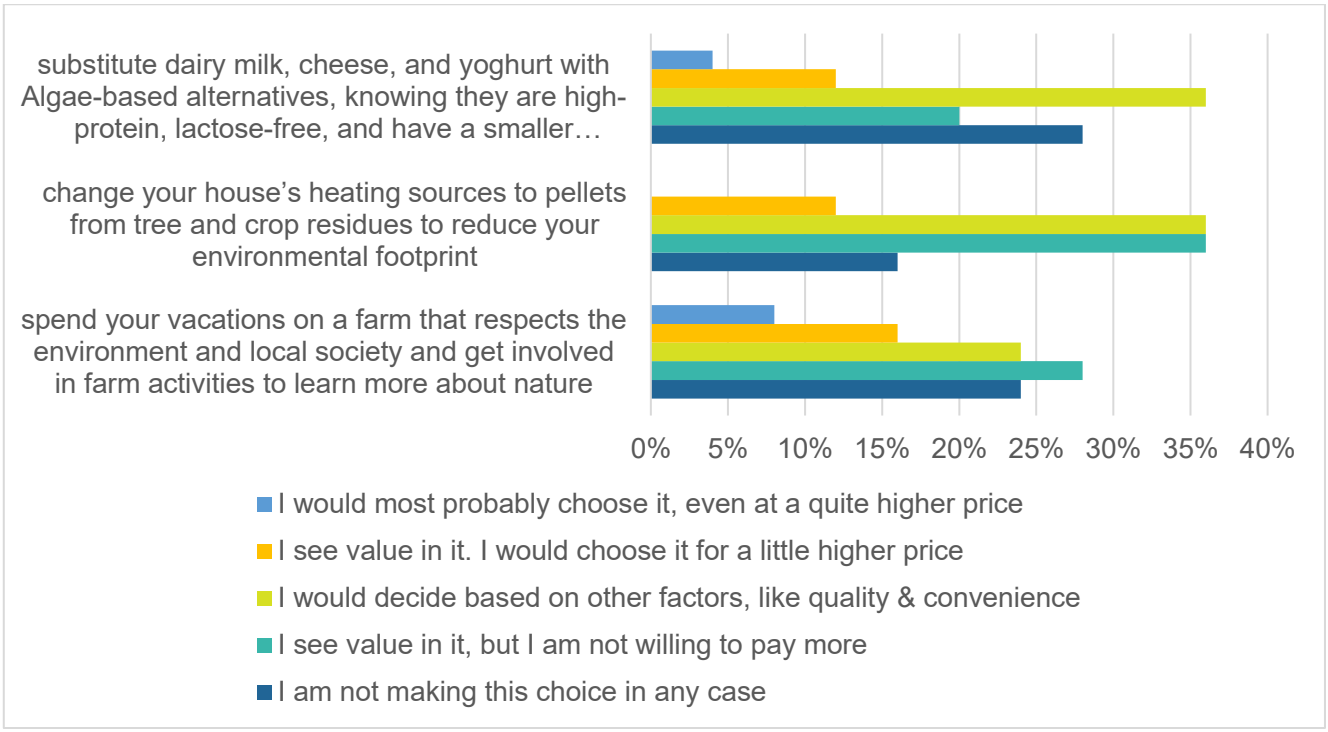


12. Would you give up the convenience of a nearby supermarket for a smaller, more distant shop (knowing that prices are similar) if the second:

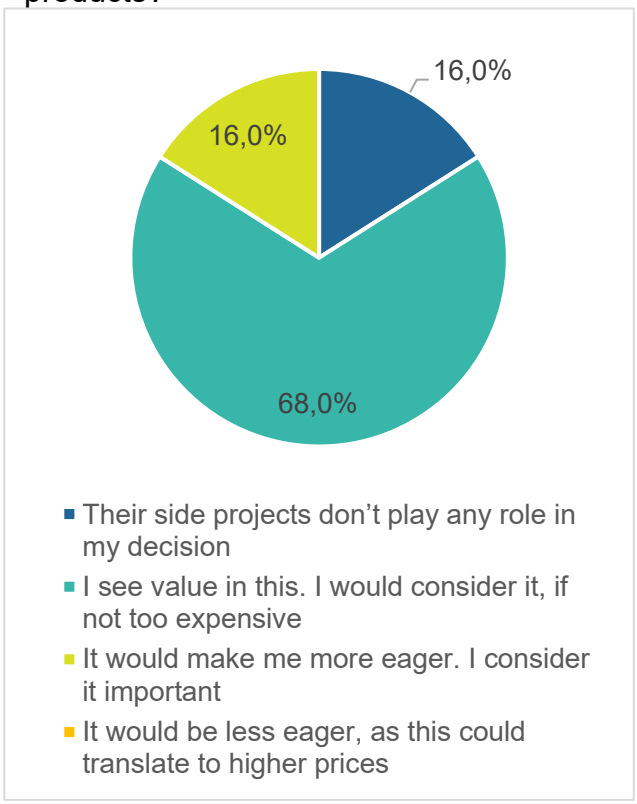


Funded by the European Union

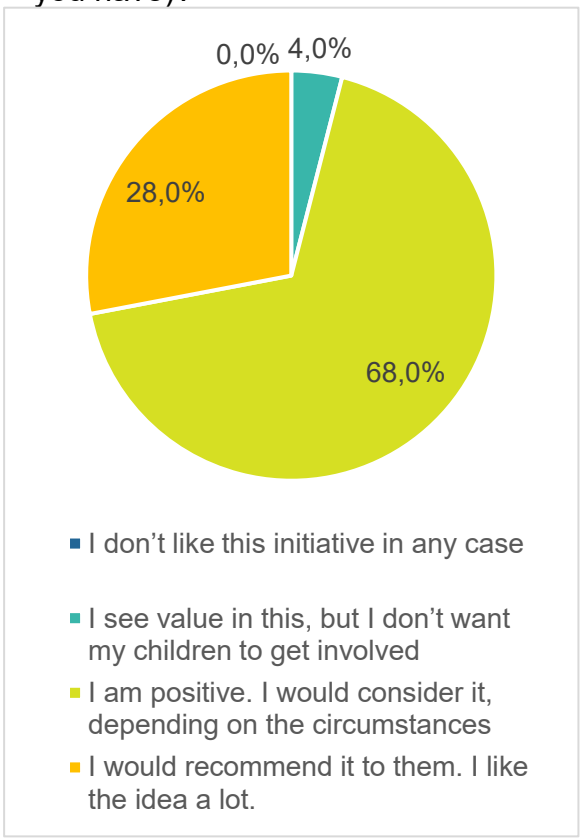
13. Would you make the following consumption choices?



14. If a company funds environmental responsibility projects, such as farms transitioning from traditional practices to biodiversity conserving practices, then would you be more eager to buy the company's products?



15. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join(if you have)?



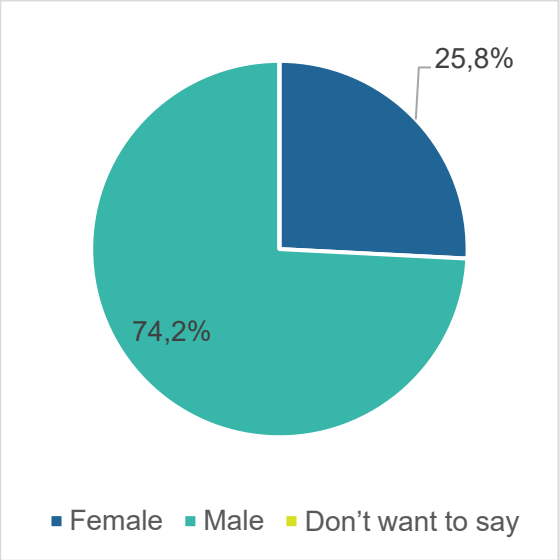
Funded by the European Union

Finland- Survey Results

In Finland, the analysis focuses on responses from **forest owners, forest managers, and stakeholders working with forest owners**, comprising a total of 31 responses.

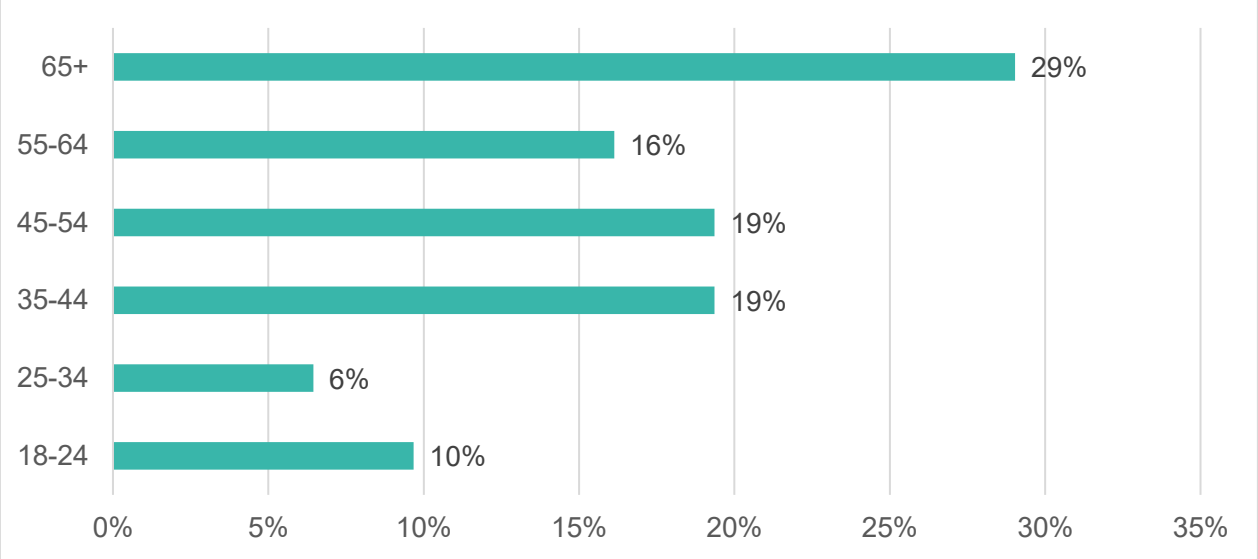
Demographics

1. Gender



2. What is your type of stakeholder?

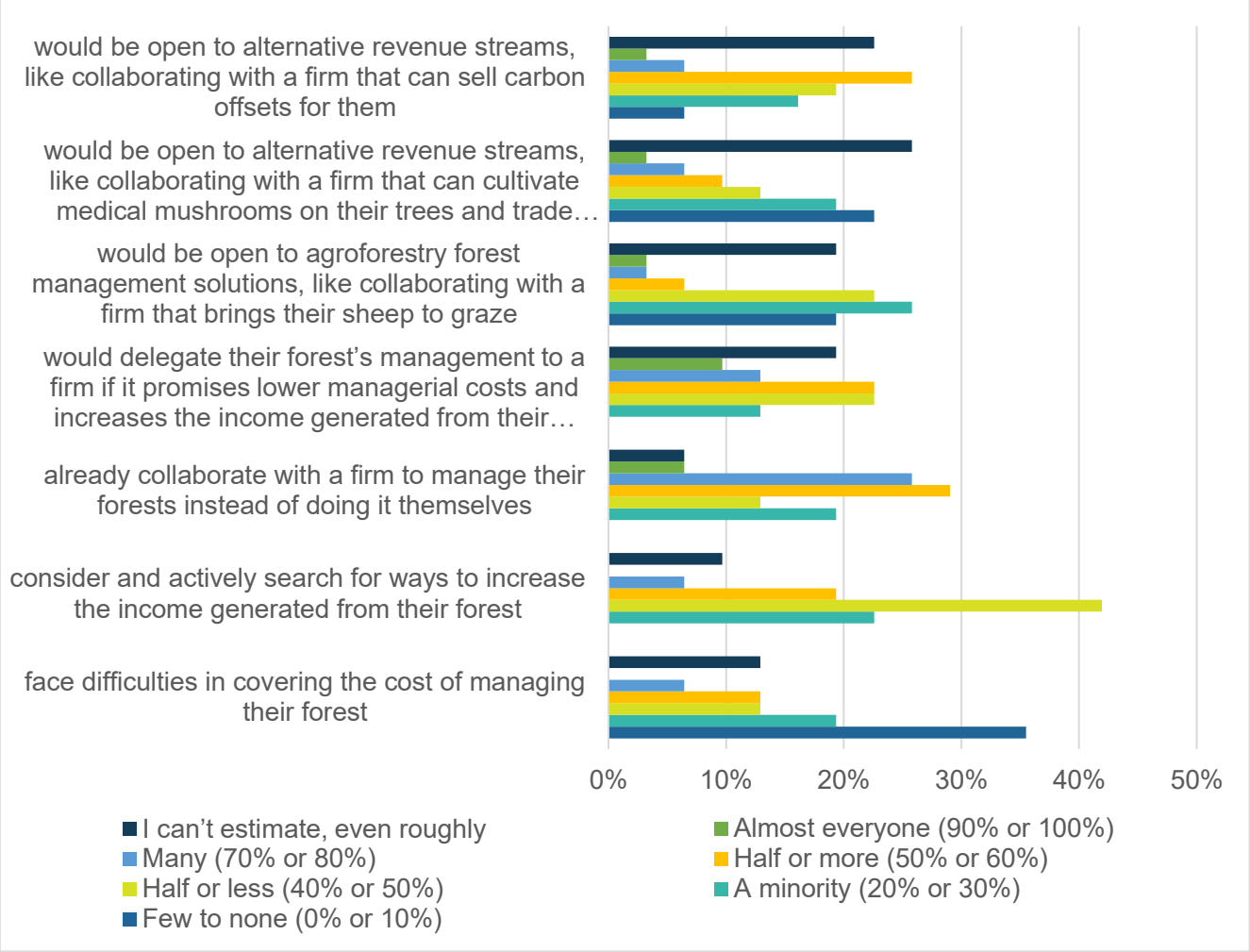
3. Age



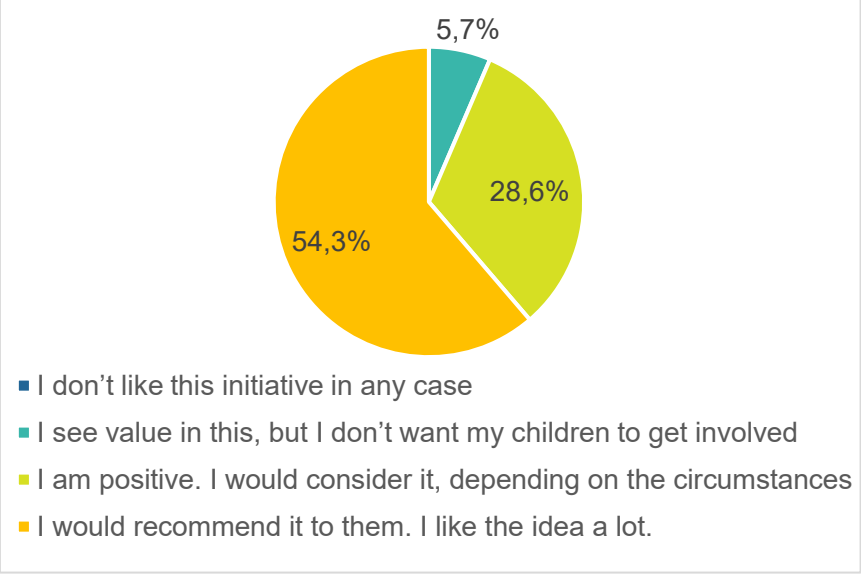
Funded by the European Union

Only for forest owners, forest managers & stakeholders working with forest owners

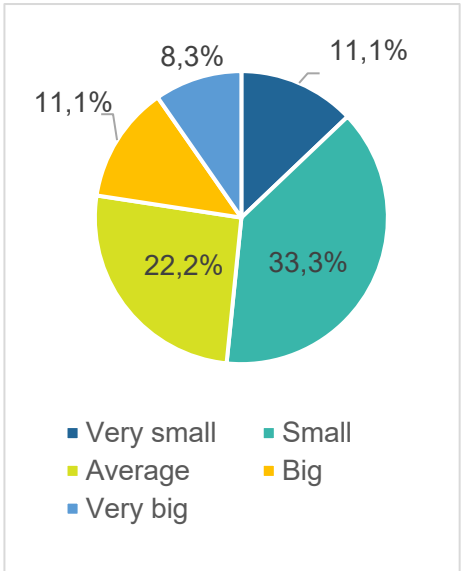
4. How many of your region's forest owners do you think they:



5. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join (if you have)?



6. Forest size compared to other foresters in your region.



Funded by the European Union

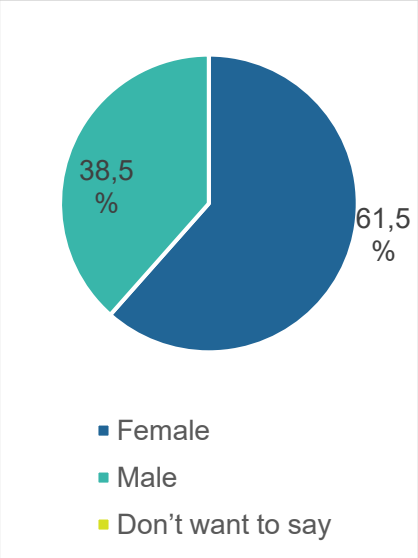
Lithuania- Survey Results

In Lithuania, the analysis focuses on responses from **farmers, farm managers & stakeholders working with farmers**, comprising a total of 13 responses and from **consumers**, comprising a total of 11 responses.

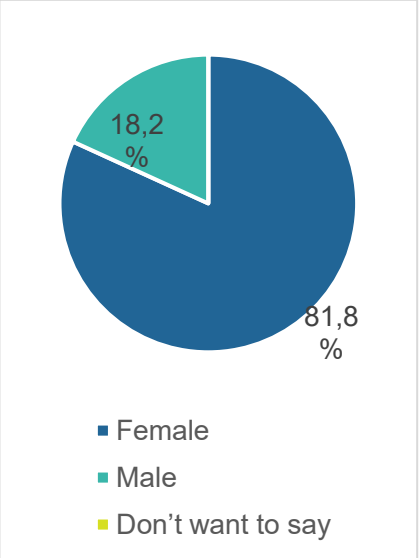
Demographics

1. What is your type of stakeholder?

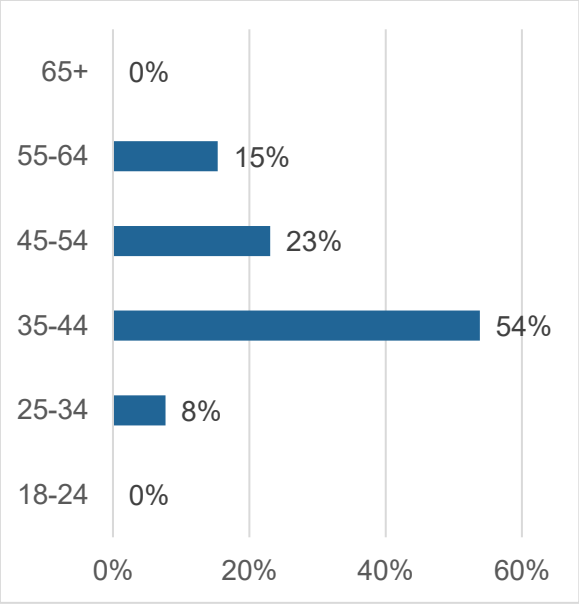
2. Gender of Farmers



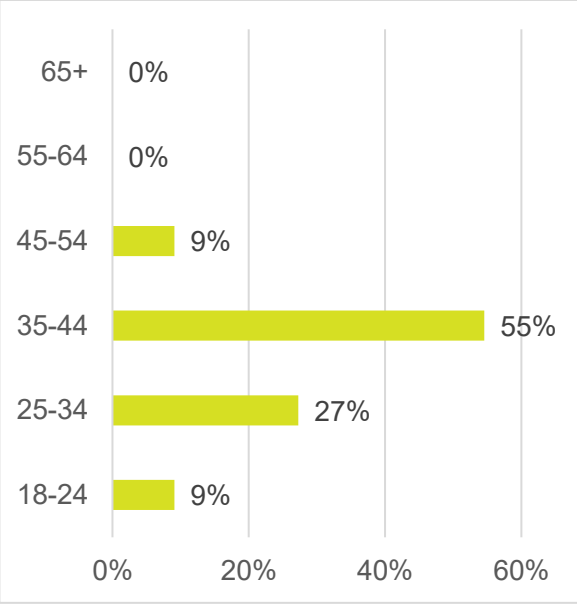
3. Gender of Consumers



4. Age of Farmers



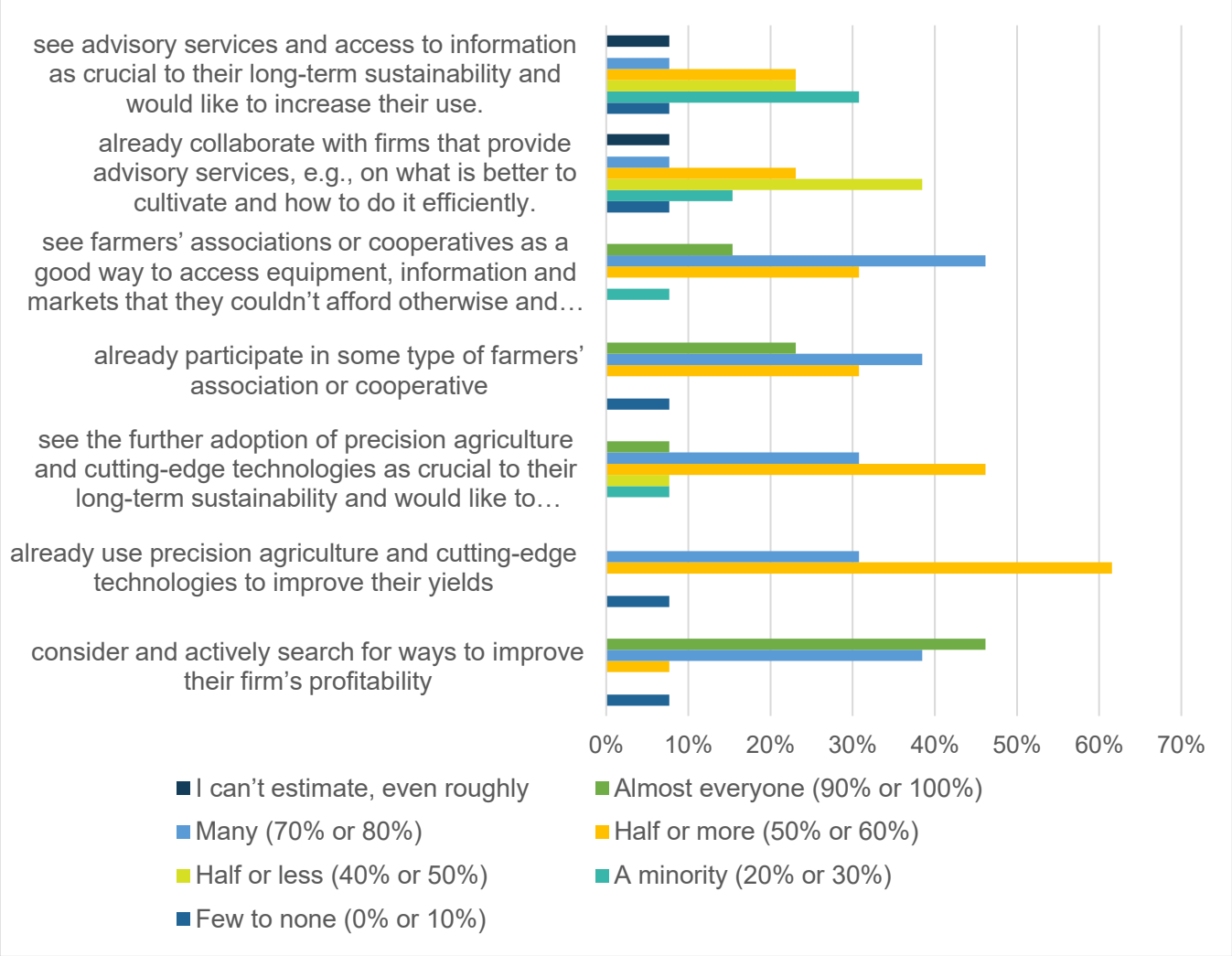
5. Age of Consumers



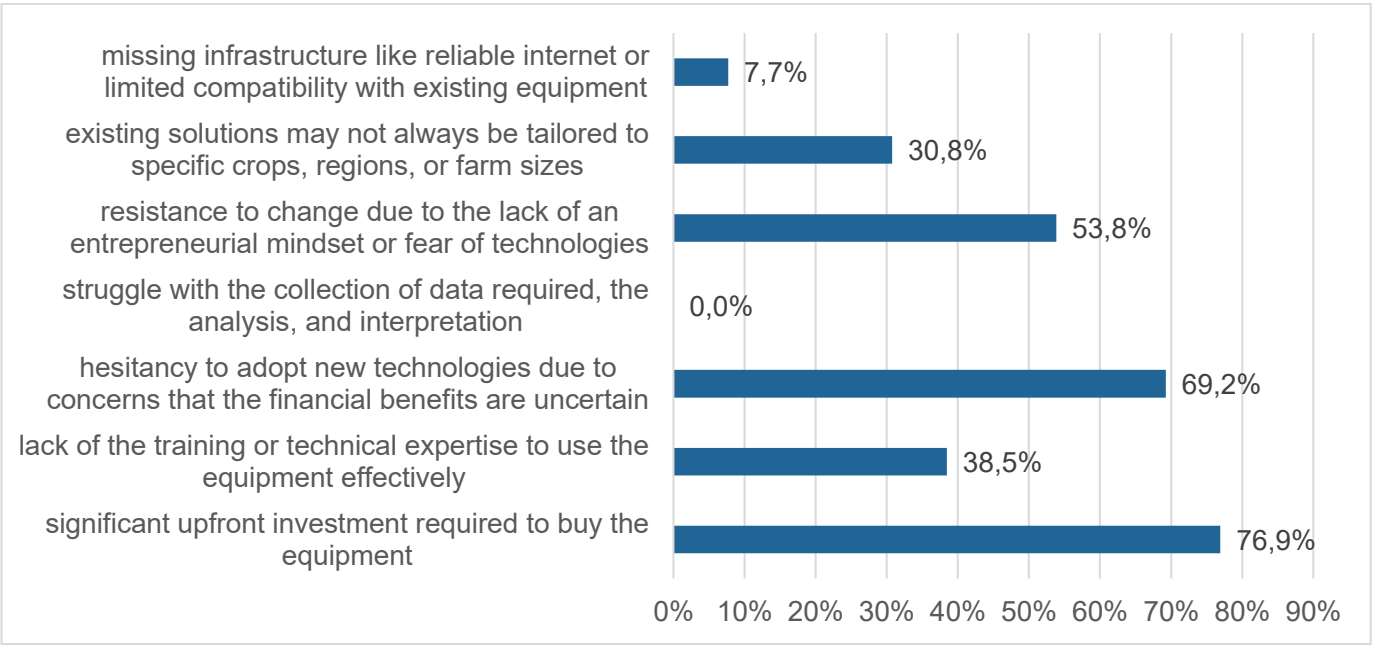
Funded by the European Union

Only for farmers, farm managers & stakeholders working with farmers

6. How many of your region's farmers do you think they:

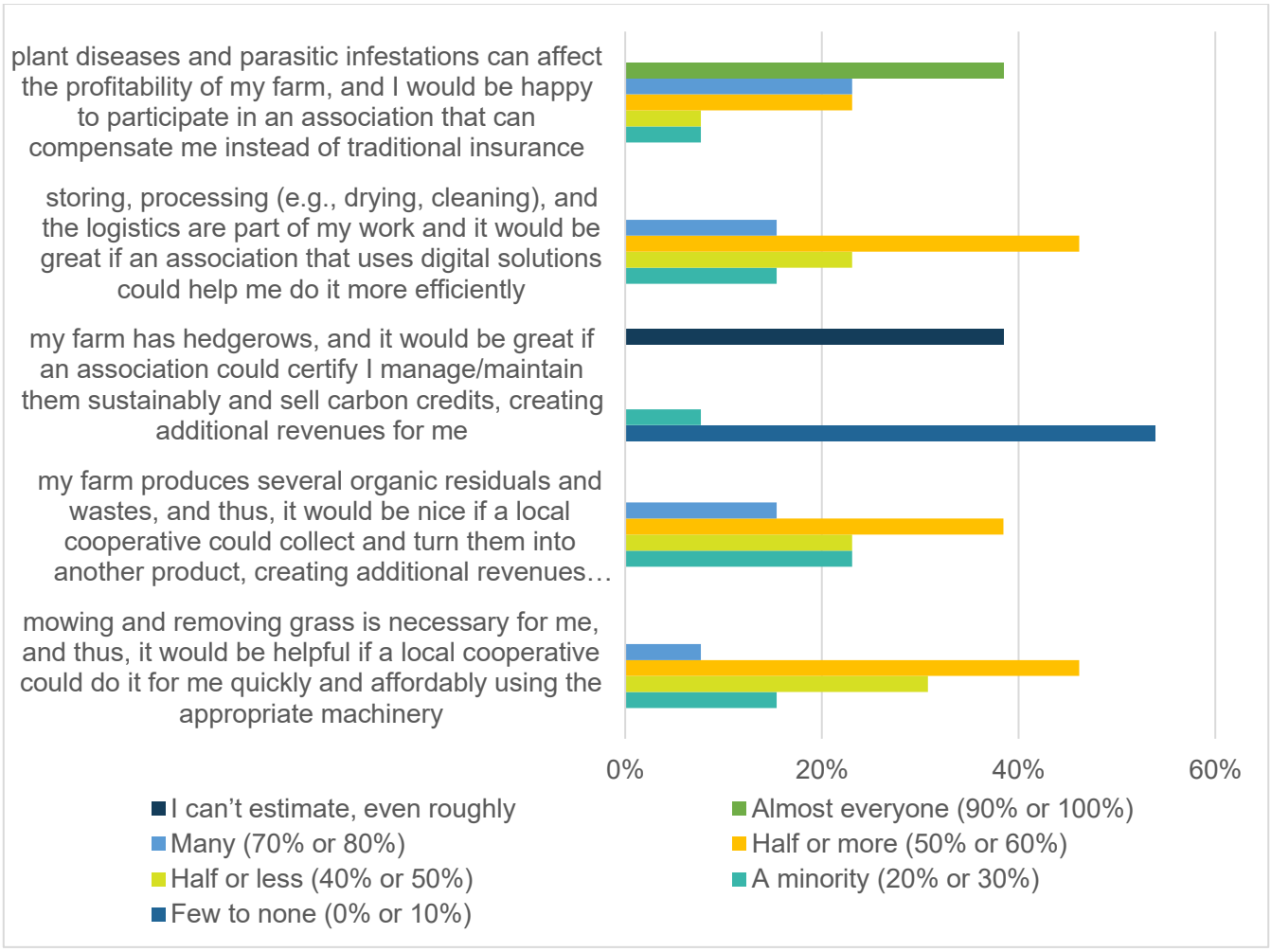


7. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?

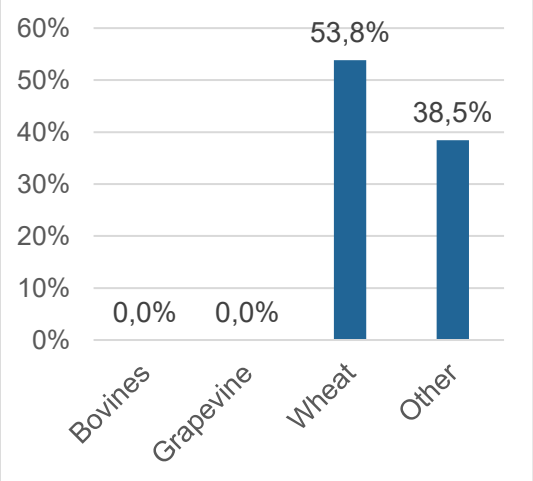


Funded by the European Union

8. For how many of your region's farmers could the following hold true?

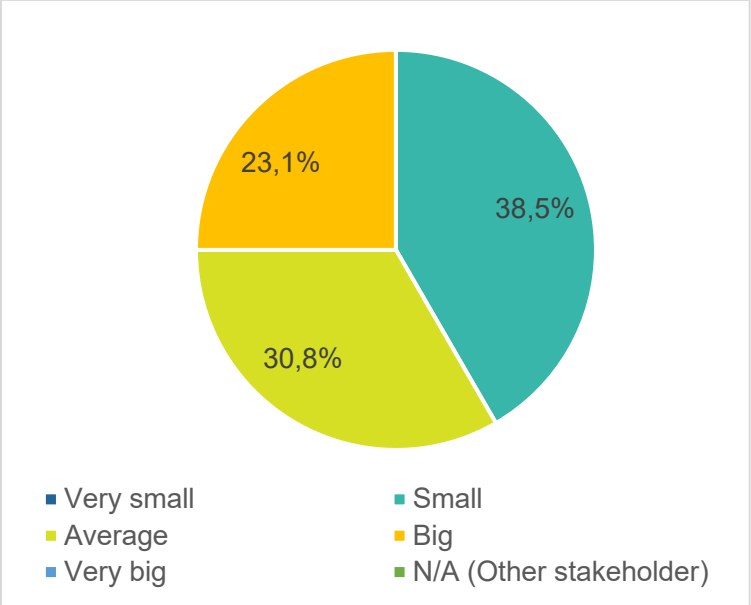


9. Do you work with any of the following products?



* *Other not specified in replies*.

10. Farm size compared to other farmers in your region



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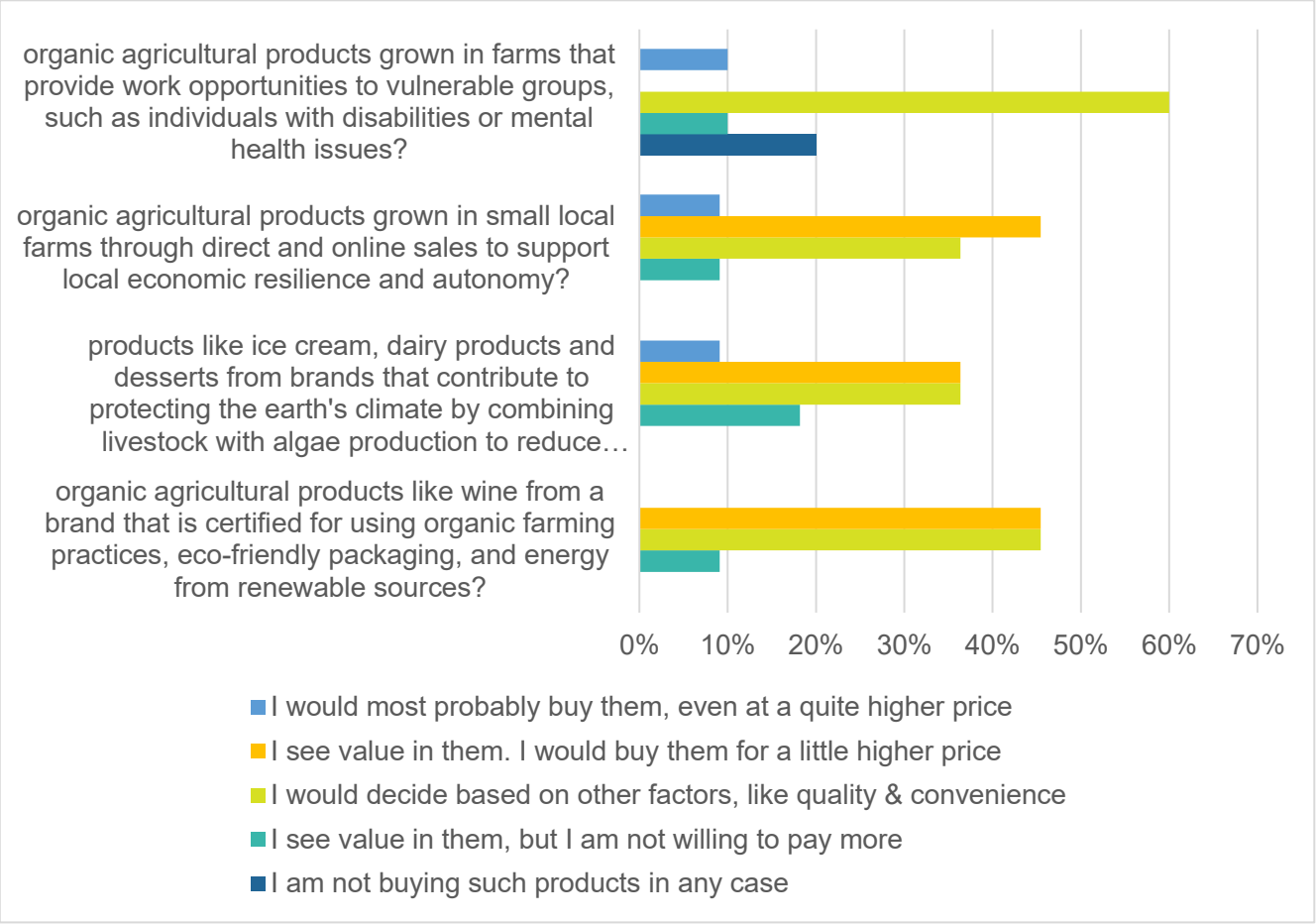
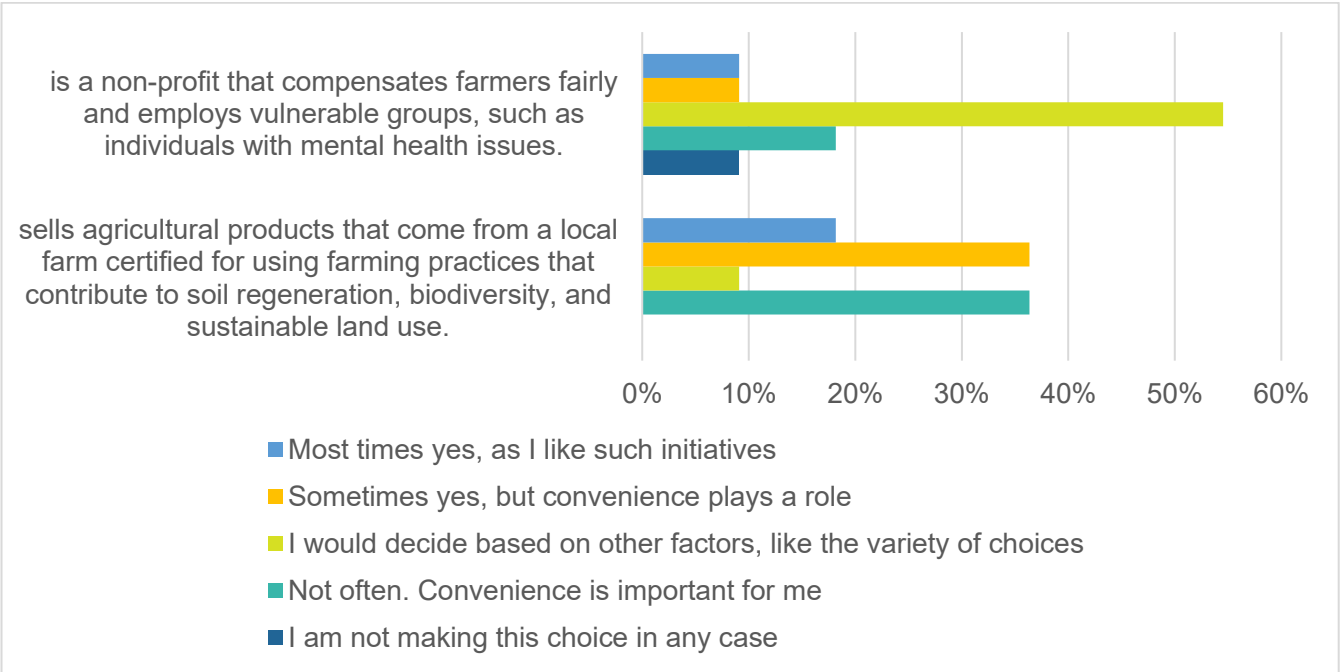
Only for Consumers

11. Would you be willing to pay more for:



12. Would you give up the convenience of a nearby supermarket for a smaller, more distant shop (knowing that prices are similar) if the second:



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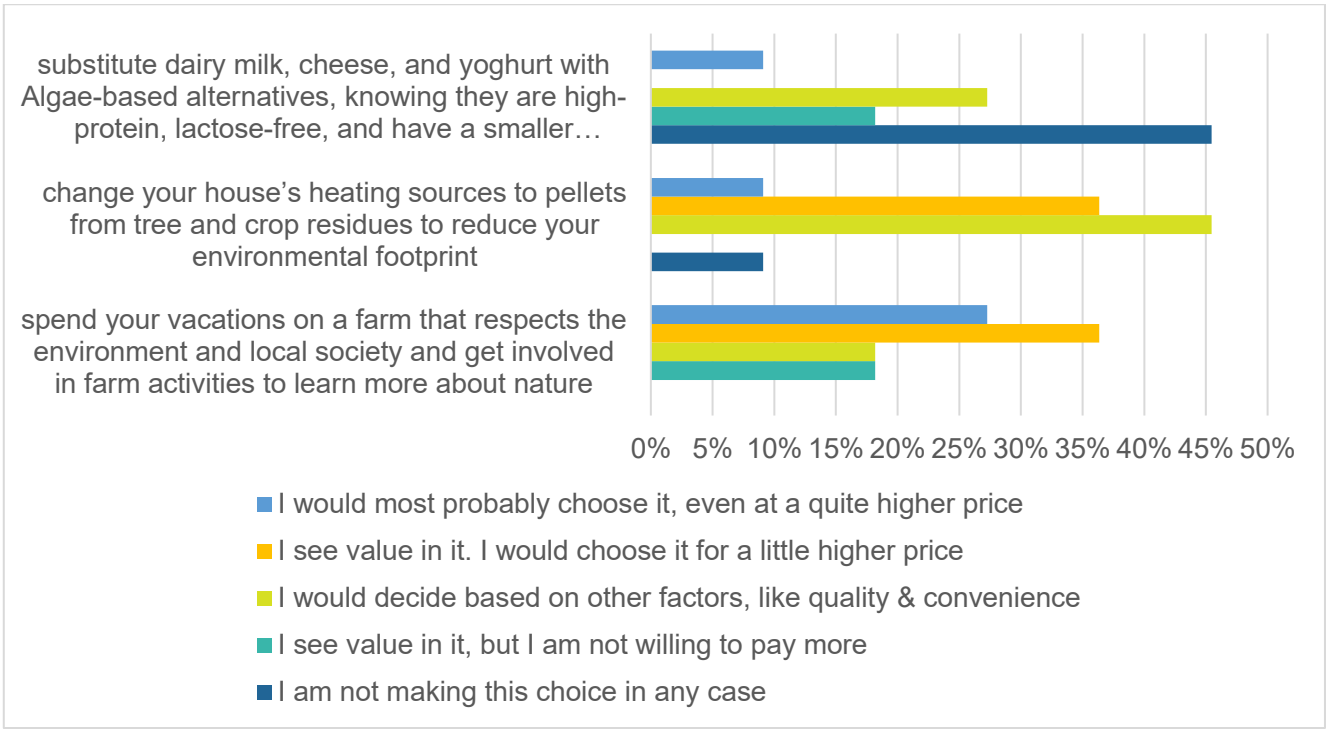
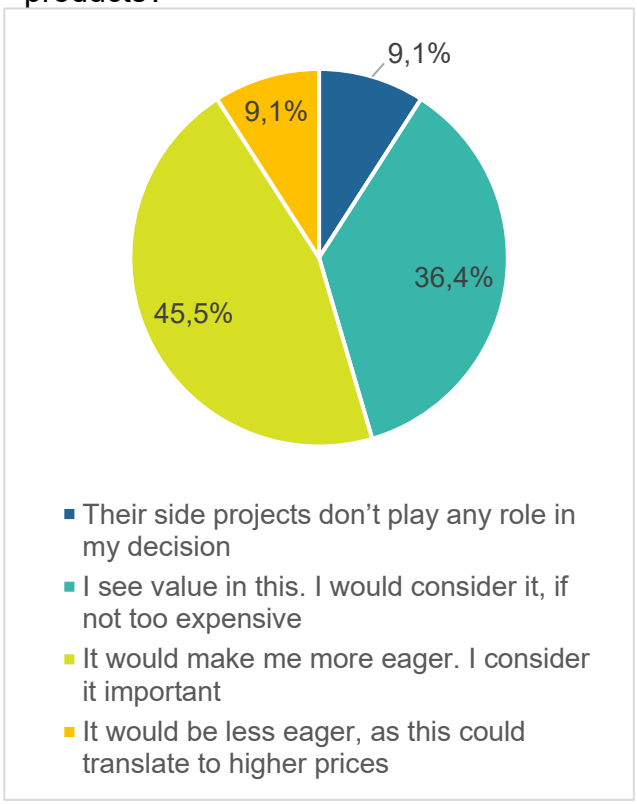
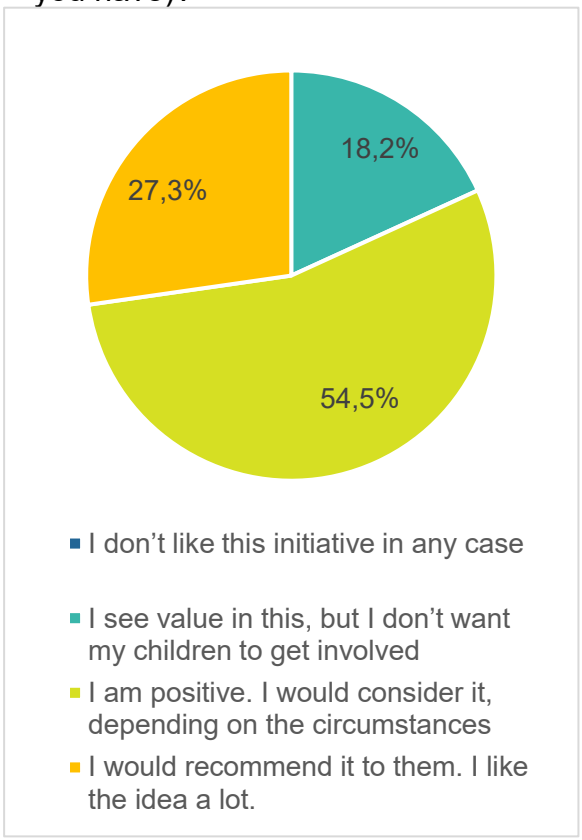
13. Would you make the following consumption choices?



14. If a company funds environmental responsibility projects, such as farms transitioning from traditional practices to biodiversity conserving practices, then would you be more eager to buy the company's products?



15. If there was an initiative involving teenagers planting new forests on wasteland as a summer job, would you recommend that your children join(if you have)?



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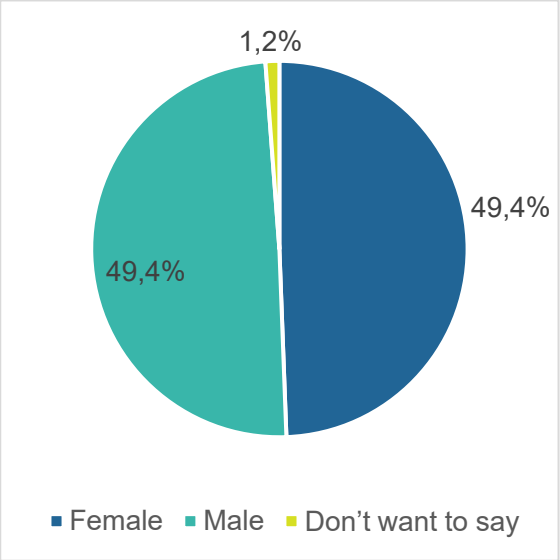
Italy- Survey Results

In Italy, the analysis focuses on responses from **farmers, farm managers & stakeholders working with farmers**, comprising a total of 14 responses.

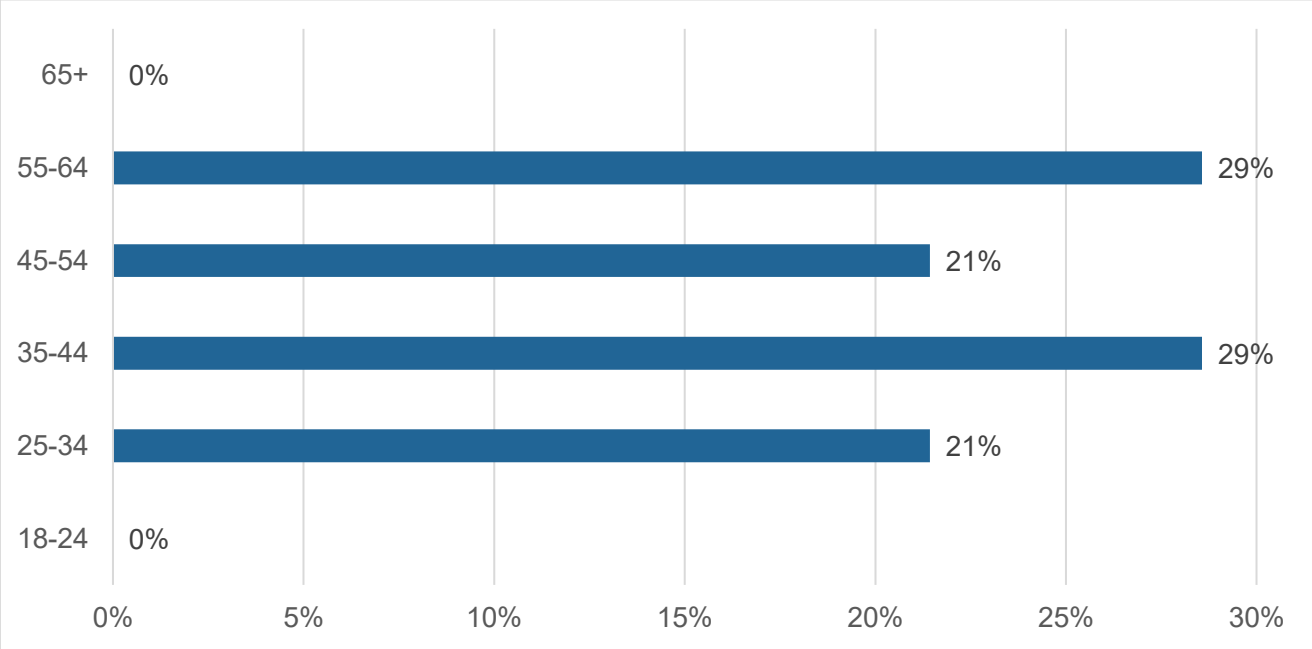
Demographics

1. Gender



2. What is your type of stakeholder?

3. Age



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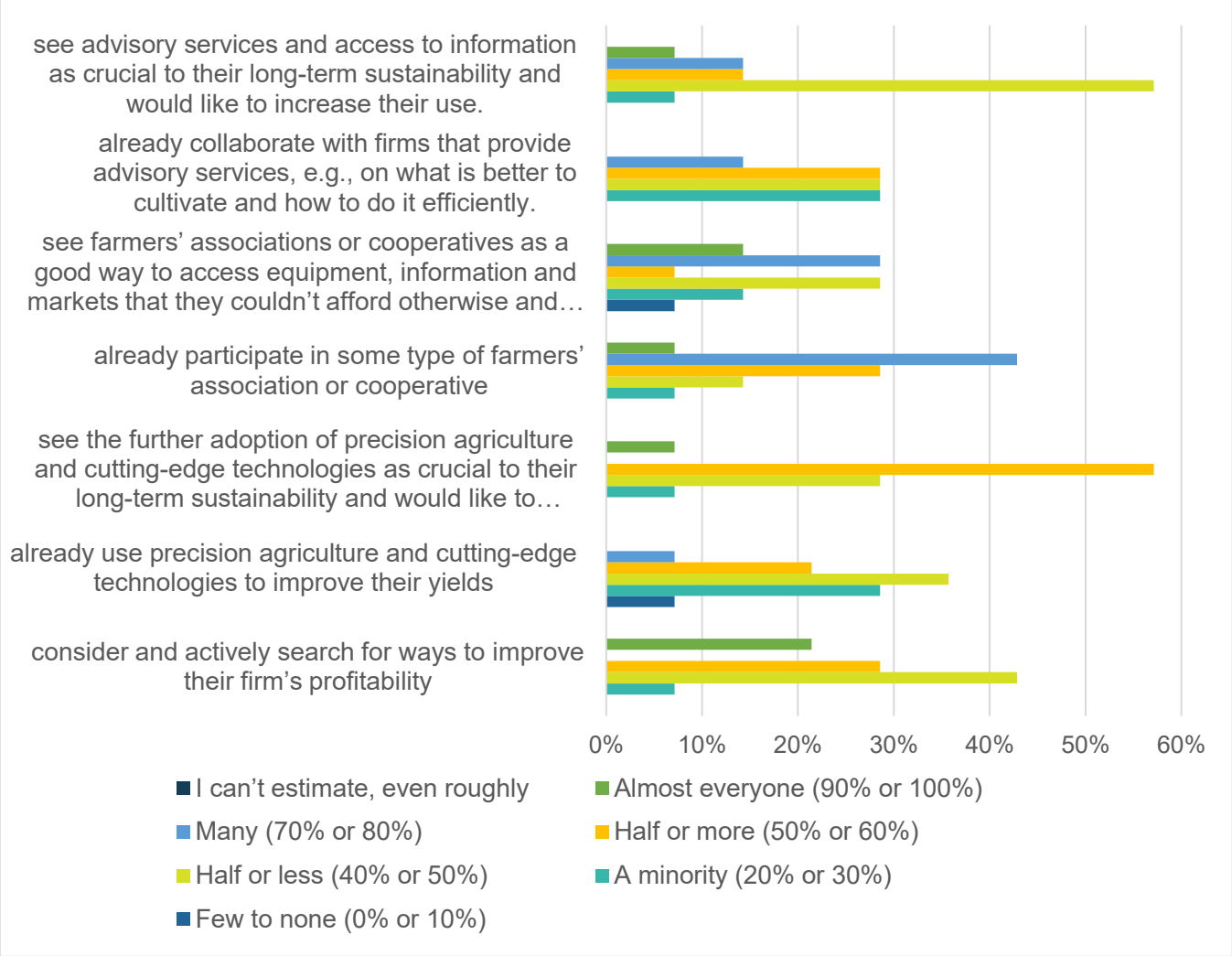
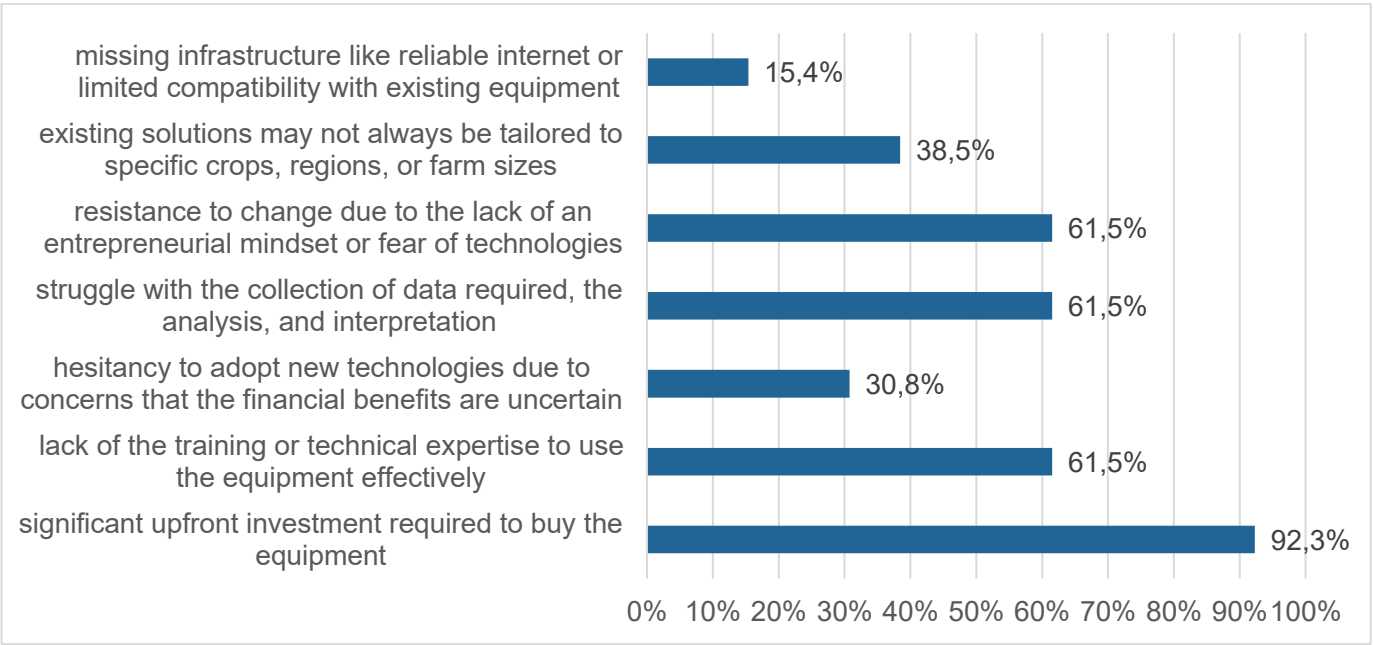
Only for farmers, farm managers & stakeholders working with farmers

4. How many of your region's farmers do you think they:



5. What are the most crucial barriers for farmers in adopting precision agriculture and cutting-edge technologies in your region?



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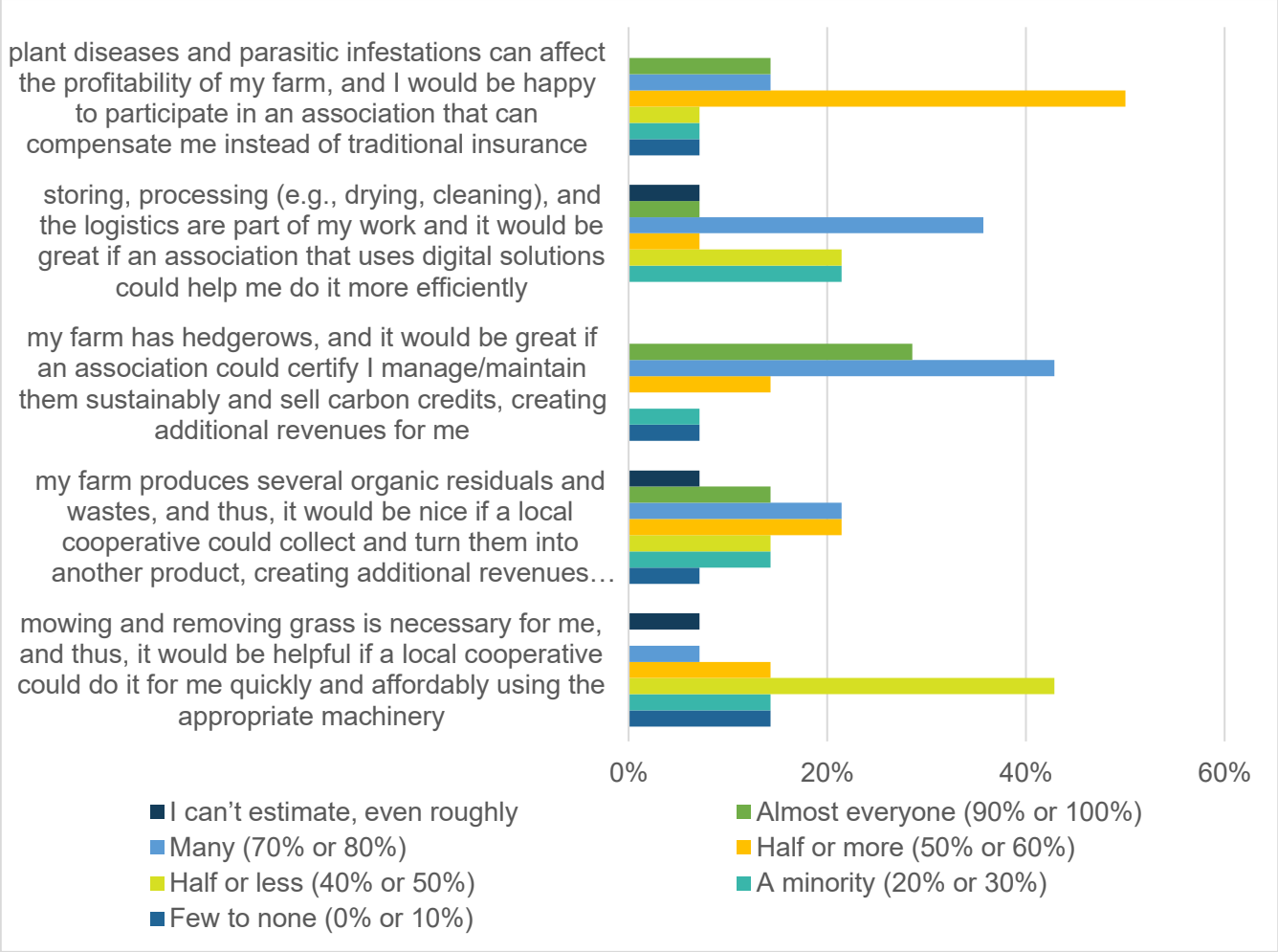
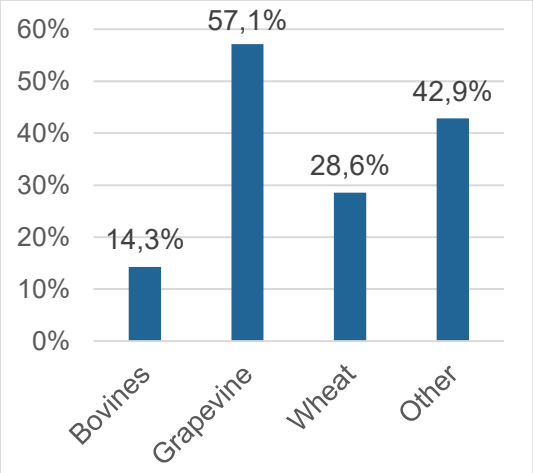
6. For how many of your region's farmers could the following hold true?

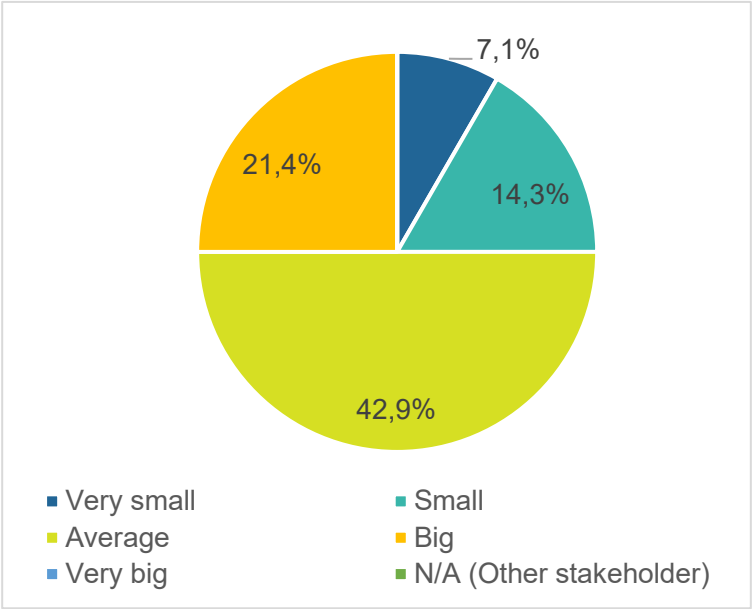


7. Do you work with any of the following products?



** Other, including olive trees, forage.*

8. Farm size compared to other farmers in your region



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