



NOVASOIL

INNOVATIVE BUSINESS MODELS FOR SOIL HEALTH

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PIL Integrated production in Olive groves (Spain)



Project Consortium

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1 Background, focal question and needs

Integrated production in olive groves seeks to balance agricultural production with the protection of the environment and human health, applying practices that improve the sustainability and efficiency of cultivation. Integrated olive production places a strong emphasis on sustainable soil management, which is critical to ensuring ecosystem health and product quality. Conservation of soil structure, erosion control and fertility management are the main soil health issues focused by integrated production. However, there is still a high level of resistance to the incorporation of soil conservation practices on the part of many producers in many cases, there is no awareness of the importance of having healthy soil.

In this context, **environmental challenges due to climate change** are expected in the olive sector. Extreme heat events and changes in precipitation patterns, including reduced rainfall and increased frequency of droughts, affect water availability and can lead to reduced yields and lower oil quality. Intense rainfall events can also lead to increase soil erosion, particularly in areas with sloped terrain. Erosion can reduce soil fertility and affect tree health. Warmer temperatures and changes in humidity can alter the distribution and behaviour of pests and diseases and increase the prevalence and impact of existing pests.

Some of the main **social and economic challenges** affecting the development of healthy soil business are similar to those affecting sustainability and profitability in the olive oil sector: lack of workforce, ageing of farmers and increasing costs related to cultivation operations. More specifically, increasing organic matter in olive grove soils in Andalusia faces several difficulties due to soil features and management practices.

To overcome these difficulties, it is important to consider **long-term strategies** such as the use of plant covers, the incorporation of pruning remains and the adoption of sustainable management techniques that promote soil health and the accumulation of organic matter.

Integrated production in olive groves provides **technological solutions** not only to improve soil health, but also to develop sustainable and profitable business models. By focusing on practices that favour soil and environmental health, it is possible to achieve greater productivity, reduce costs, add value to the product and adapt to the challenges of climate change. Integrated production in olive groves play a key role in the development of business models based on healthy soils by promoting agricultural sustainable practices which help improve soil structure and fertility. Integrated production also focuses on the biological control of pests and diseases, which reduces the need for chemical pesticides and minimises the negative impact on soil microbiota. By reducing the use of chemicals and encouraging the presence of beneficial organisms in the soil, integrated production techniques also promote biodiversity which can contribute to the overall stability and health of the agricultural ecosystem.



Integrated production can facilitate obtaining quality and sustainability certifications that can add value to the product and improve brand image and reputation. However, some of the main **barriers and needs** refer to the lack of consumers' knowledge about this production system. Besides, there is also a need for fostering farmers' education and training in sustainable practices and soil management, which can strengthen human capital and the capacity of producers to innovate. Finally, greater support from the administrations is needed in order to improve the regulation and optimise the benefits of integrated production among farmers as well to promote the knowledge of this production system among consumers.

2 Policy mix

Table 1 Key elements of national **policy mix and institutional framework around soils**, based on and adapted from Rogge and Reichardt, 2016; Williamson, 2000.

Domains	Elements to consider	Description	Lickert (1-5)	
			P ¹	Q ²
0.Awareness and understanding	Definition of soil health	As we have developed a specific workshop with farmers, technicians, researchers and agricultural policy experts, a healthy soil is a soil that maintains its potential productive ability and it is in an optimal state to fulfil its multiple ecological, productive and environmental functions.	4	4
1.Policy concern	Soils as policy priority	There are very different opinions on this matter, with farmers believing that there is too much regulation of soil through the Common Agricultural Policy (CAP), while researchers believe that there is still a long way to go. There is agreement that the regulation is rather confusing.	4	3
2.Policy agenda on soils	Political commitment towards soil health, non-binding targets	The CAP is clearly perceived as the policy that is most concerned with soil health, establishing obligations for farmers both within the framework of rules of conditionality, including statutory management requirements (SMRs), which	4	3

¹ P=priority. Please rank accordingly to 5 point-Likert scale based on how these elements are currently considered in your case study: 1 no priority; 2 low priority; 3 neutral; 4 moderate priority 5 high priority

² Q=quality. Please rank accordingly to 5 point-Likert scale based on the current quality of the political process in your case study: 1 very poor -2 poor; 3 acceptable; 4 good 5 very good



		apply to all farmers whether or not they receive support under the CAP, and good agricultural and environmental conditions (GAECS), which apply only to farmers receiving support under the CAP. Eco-schemes and second pillar aids also focus on soil issues. However, these obligations mostly set action requirements and are not results-oriented.		
3.Institutional environment	Binding national regulations on soil	National and regional regulation is mainly related to environmental conditions, such as water management, land use, and natural sites. There are also binding national regulations adapted to specific conditions on some specific CAP rules concerning soil within the framework of compliance and the National Strategic Plan.	3	3
4.Policy integration	Interactions between and within policy sectors	There is a certain lack of coordination and issues related to land are addressed in a fragmented manner in each sector. In many cases, a more integrated approach is desirable.	3	3
5.Governance structures	Levels of governance involved, roles and functions	There is clearly a lack of coordinated action. When it comes to integrated production, in Andalusia there is a high level of commitment on the part of the regional authorities. However, at a national level, the Ministry of Agriculture understands that each regional government must establish its priorities on this matter. There is also a lack of support for this system in the European Union.	3	3
6.Contracts	Property rights enforcement , land tenure agreements	This section was difficult to understand for participants. Contracts are particularly identified with the administration, as many participants understand that the implementation of the CAP is a contract with implications for soil management. At a voluntary level, some participants identify contracts for the generation of carbon credits as a contract with specific obligations to obtain results in the content of organic matter in the soil. The most common form of land tenure is land ownership, often combined with rented land. There are many types of farms in terms of size. The average size of olive farms is 20 hectares, although larger farms are	3	2



		common, as well as groups of farmers in the form of family businesses and other forms of private companies.		
7.Validation and coherence	Mechanisms in place to measure impacts and ensure compliance to targets and limits	There are numerous controls to monitor compliance with regulations, both within the framework of the CAP and in terms of land use. Remote sensing controls greatly facilitate this task and the effectiveness of this type of control is growing very rapidly. However, in the opinion of the participants, it is clear that satellite controls often require validation on the ground. One example presented by the participants is the monitoring of soil organic matter, which, in the context of the generation of carbon credits, requires the taking of soil samples.	3	2
8.Non-governmental actors	Role of different actors and multi-stakeholder coordination	It is unanimous to recognise the key role of farmers as main land managers. It is also admitted the important role of research centres, service suppliers, cooperatives, farmers organisations and advisory services in developing actions to support farmers in learning and putting into practice measures that favour soil health.	3	2
9.Allocation of resources and sources of finance	Available budget for soil health and blended finance	In the opinion of participants, consumers do not sufficiently recognise the work of farmers in favour of a healthier soil. In the absence of private financing, it remains essential to have public policies that protect soil and promote practices that improve its quality and fertility in the long term.	3	3
10.Policy consistency with soil health	Synergies and trade-offs between policy sectors and towards soil ES	The workshop confirmed the need to create synergies with the different actors in the value chain as a way of promoting and encouraging the adoption of agricultural practices that improve soil health. Participants also believe that farmers' interest in soil health would increase if there were some incentive or recognition via price from the industry or buyer of agricultural products.	3	2
11.Contextual factors	Enabling and disabling conditions	According to participants, the interest in soil health on the part of the agricultural community would increase if they receive free training and advice. Carbon markets are seen as an opportunity to implement actions in favour of soil health, although	3	2



		there are still many doubts about the viability of these contracts.		
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3 Policy directionality

Aim of this section is to assess how existing instruments (regulatory and economic) put in place by the national policy mix are able to support business models for soil health. Policy instruments constitute the concrete tools to achieve overarching objectives and are usually associated with specific goals, i.e. the intended effect of instruments on the medium-long term. Furthermore, policy narrative are defined as the key words and concepts that express the political understanding of a problem, i.e. soil health.

3.1 Instruments

Table 3 Assessment of **policy instruments** (adapted from Rogge and Reichardt, 2016)

PRIMARY TYPE	PURPOSE TYPE		
	Supply	Demand pull	Systemic
Economic instruments	RD&D* grants and loans, tax incentives, state equity assistance	Subsidies, feed-in tariffs, trading systems, taxes, levies, deposit-refund-systems, public procurement, export credit guarantees	Tax and subsidy reforms, infrastructure provision, cooperative RD&D grants
Regulations	Patent law, property rights; land tenure;	Technology/performance labels and standards, prohibition of products/practices, application constraints; public procurement	Market design, grid access guarantee, priority feed-in, environmental liability law Information
Information	Professional training and qualification, entrepreneurship training, vocational training, advisory	labelling programs, public information campaigns; consumers organizations	Education system, thematic meetings, public debates, cooperative programs, clusters

PRIMARY TYPE	PURPOSE TYPE
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	Supply	Demand pull	Systemic
Economic instruments	Farm income support	Support farmers in adopting practices that minimise the negative impact of agriculture on the environment and climate, and help them evolve towards more sustainable farming models.	CAP incentives for climate-and environment-friendly farming practices
Regulations	Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013.	CAP Strategic Plan. Voluntary incentives for Carbon farming: living and inert plant covers in woody crops	CAP 2023-2027, EU Green Deal
Information	Farming workshops and events.	Public information campaigns.	Thematic meetings, public and private initiatives to disseminate



			knowledge and information.
Description*	<p>Eco-scheme: P6. Practice of spontaneous or planted vegetation covers</p> <p>Eco-scheme: P7. Practice of inert covers of pruning remains in woody crops</p> <p>The target of this instrument are farmers, specifically, CAP applicants.</p> <p>It serves to implement several EU to achieve a sustainable system of agriculture in the EU economic sustainability, environmental sustainability, and the social sustainability of farms. Eco-schemes meet these three main goals by providing income support to farmers, supporting them in the transition towards sustainable production, and contributing towards the ambitions of the EU Green Deal.</p> <p>It is based on the obligation of means: implementation of spontaneous or planted vegetation covers and inert covers of pruning remains in woody crops.</p> <p>In the event of non-compliance with the provisions of the incentives, the financial contribution is lost.</p> <p>These instruments, both direct and indirectly, impact on soil health.</p>		

3.2 Policy narrative

Table 3 Description of the policy narrative (based on Lehmann et al, 2020)

Policy narrative (and scale of action)	Policies and incentives in place	Land tenure and contracts	Management strategies applied	Soil functions interested	Ecosystem services addressed
Field pedon Local Regional National	Support for, voluntary schemes for the climate, the environment and animal welfare ('eco-schemes').	The CS focuses on private farms under the system of integrated production.	1) Implementation of cover crops. 2) Compliance with Integrated	1) Primary productivity. 2) Nutrient cycling.	1) Plant production. 2) Economic viability.



			Production regulation.	3) Carbon sequestration. 4) Water cycling. 5) Habitat provisioning.	3) Carbon sequestration. 4) Water quality. 5) Biodiversity.
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4 Mapping exercise

4.1 Synthesis of the value mapping

Aim of the value mapping is to understand level of awareness of and purpose towards soil health as framed by the business model (Barth et al, 2015).

Looking at the business model, please describe the following elements:

a. Value proposition

- **What are the causes of degradation?**

Intensive tillage combined with Mediterranean climatic conditions aggravates the effects of erosion in farmland.

- **What are the socio-technical solutions proposed (BM)?**

Application of the system of Integrated production and soil conservation techniques in olive groves.

- **Why do soils matter in the BM?**

Soil is essential to ensure the long-term viability of agricultural activity. New opportunities are also emerging to make the accumulation of carbon in the soil profitable.

b. Value creation and delivery

- **What soil ES are targeted by the business model? (list based on soil strategy)**

Plant production
Water quality
Human health
Biodiversity
Climate control



Landscape heterogeneity

- **What soil ES are not provided / neglected?**

Not specifically targeted: Policy culture and Recreation

- **Public/private - who can benefit from that values?**

Both, farmers and consumers.

- **What trade-offs emerge? Are the causes addressed?**

The CS is based on a feasible and tested system. No significant trade-offs emerge. The main barrier may lie in overcoming traditional practices that have been scientifically proven to be inefficient and harmful to soil health (i.e. intensive tillage).

c. Value capture

- **What soil ES are targeted by the incentives?**

Plant production, biodiversity and climate control

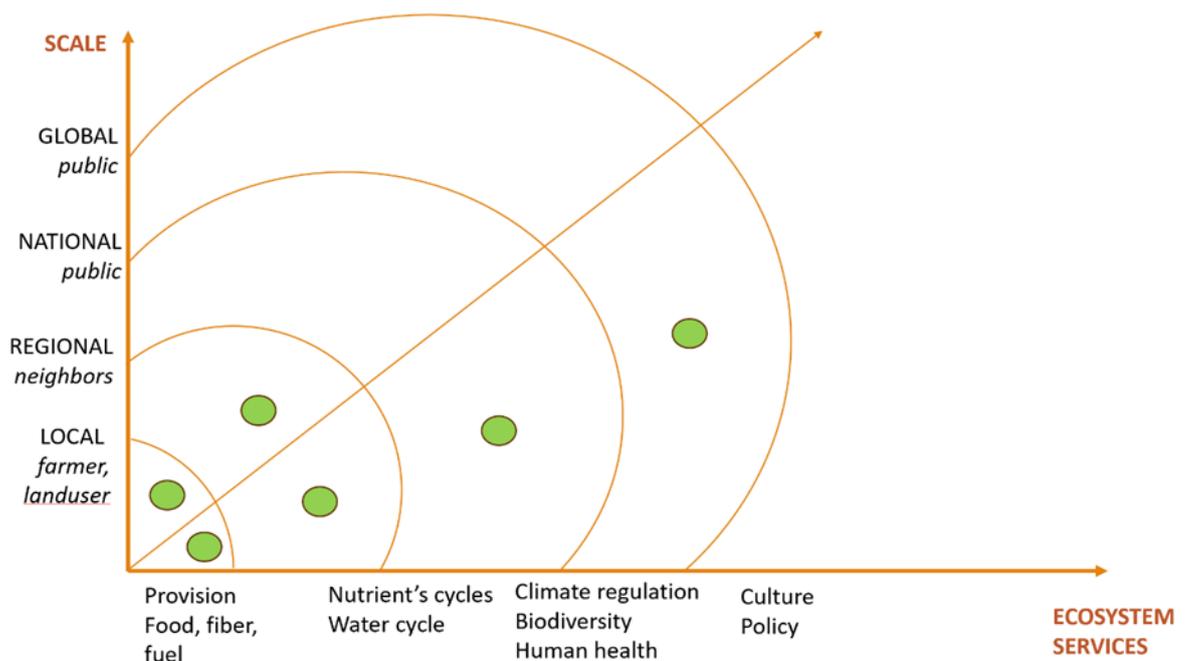
- How is value distributed along the stakeholders?

Farmers, industry and consumers are recipients of the CS value. However, farmers are responsible and have to afford the cost of certification.

- Where do the resources come from (public/private)?

Public and private.

- How is soil health described and framed by the business model?
(place in the picture)





4.2 Solution mapping synthesis

a. What innovations and changes are we looking for?

There are different opinions. For farmers, most innovations and changes are related to the availability of tools to combat pests, weeds and diseases. Also, there is consensus on the fact that the market does not reward sufficiently their efforts for being more sustainable. Among other stakeholders (authorities, industry and researchers), they claim for more support from the EU in order to improve the knowledge of integrated production and to have more harmonisation on the requirements of this production system.

b. What regulatory and policy conditions would we need?

- What regulations (binding or not) and resources (new incentives) are needed?

For the collective of farmers taking part in the workshop, there is no need for more regulation. They also claim for more clarity on new incentives linked to carbon markets. Also, they believe that the CAP is essential to provide income support to farmers since the consumers usually do not want to pay more for a sustainable method of production.

In the opinion of other participants, there is a need for new private incentives, for a labelling regulation informing about the carbon footprint of products and also a better involvement of all the value chain actors to support farmers implementing practices that improve soil health.

- Are there some contradictions between tools and/or policies?

Farmers clearly consider that contradictions exist between different policies (i.e. CAP regulation, land-use regulation, environmental regulation). Other participants see contradictions in the way to reach sustainability (i.e. are really sustainable energy generation projects for building big solar/wind plants?).

- What could be the effect of the soil monitoring law?

For farmers it is perceived as more bureaucracy. However, for other participants it can be an opportunity to have more reliable information on soil parameters and a useful tool for policy makers.

- What contractual solutions and terms and what kind of guarantees are needed for business model implementation? (e.g. certification)

There is consensus on the fact that it is crucial to involve all actors of the supply chain. Certification, even if it is perceived as a burden for many participants, is a way of guaranteeing that the production process complies with sustainability and quality standards.



c. What resources could facilitate the change?

- Adequate resources for implementing soil conservation practices, such as cover crops.
- A narrower collaboration between researchers and farmers.
- A better understanding of the carbon cycle under different climate and soil conditions.
- Flexibility in regulation when it is needed.

4.3 Pathways mapping

Based on what discussed above, complete the table below (i.e. not all categories might be applicable, in case not please write n.a.). If relevant point emerges also indicate what trends and divers as well as activities and resources might be needed.

Table 4 Pathways mapping

	Short term (up to 3 years)	Medium (3 - 7 years)	Long term (after 7 years)
INNOVATIONS			
Regulations and binding policies	- Simplification - Clear and simple rules for accounting carbon sequestration.	- Simplification - Better targeted regulations.	- Clear rules - Stable legal framework
Incentive instruments	- CAP direct payments	- CAP Agri-Env. Schemes - Carbon markets - Consumer acknowledge (higher price)	- Private incentives from industry. - CAP Agri-Env. Schemes - Carbon markets - Consumer acknowledge (higher price)
Contractual solutions	- Results oriented agreements. - Advisory contracts	- Better involvement of value chain actors. - Innovation partnerships	- Results based solutions - Certification - Large offer of value chain schemes



Infrastructure	n.a.	n.a.	n.a.
Product	n.a.	n.a.	n.a.
Services	- Advisory services - Training	- Personalised and quick advisory system	- Real-time information exchange - Decision support system
Technology	n.a.	- Simple monitoring techniques	- Complete and transparent information on carbon removal
Institutions	- Guidance and flexibility in application of regulation from public authorities.	- Adapted Research to farmers' needs.	- Holistic approach to stimulate sustainable practices. - Mix of support measures for sustainable Ag
Actors' configuration	- Creation of Networks	- Integration of different actors	- Mechanisms for collective action
Coordination mechanisms and partnerships	- Innovative pilot projects	- Stimulation of public-private partnerships	- Value chain actors' partnerships
RESOURCES			
skills, knowledge, R&D	- Knowledge easily available and "ready to use"	- Transparent and reliable information	- Effective dissemination of long-term research
DRIVERS: social habits, economic, environmental	- Adequate remuneration. - Overcoming of resistance to cultural change	- Mutual understanding of farmers and consumers needs - Consumers' acknowledgment	- Higher profitability of sustainable practices

5 References



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