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SUSTAvianFEED

PRIMA
IN THE MEDITERRANEAN AREA

SUSTAVIANFEED

ALTERNATIVE ANIMAL FEEDS IN MEDITERRANEAN POULTRY BREEDS TO OBTAIN SUSTAINABLE PRODUCTS

IMPLEMENTATION OF LIVING LABS ACTIVITIES

DELIVERABLE 4.1

This project (grant Number 2015), is part of the PRIMA programme, supported by the European Union

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Summary

This document outlines the framework for the Living Lab approach used in the SUSTAvianFEED project. It presents not only the Living Lab Implementation Plan and the overall methodological approach but also serves as a report on the activities that were actually implemented throughout the project. These activities were carried out under WP4, closely aligned with WP3, and supported by WP2 and WP5.

The guidelines describe the approach employed within the Living Labs of the SUSTAvianFEED project, including the roles and responsibilities of all involved parties throughout the Living Lab process. It also highlights the key characteristics to consider when applying the Living Lab methodology.

A living lab (LL) is a multi-stakeholder approach set up to carry out innovation projects that follow the principles of open innovation and focus on real-life experimentation to co-create, test, and validate novel solutions. Open innovation involves external stakeholders, mainly users or consumers, making them co-participate in the innovation process.

Throughout the SUSTAvianFEED project, Living Lab activities were implemented to adapt the design of the feeding program to the unique needs and local contexts of each pilot. Relevant stakeholders were engaged in the design and evaluation of the pilots using various methods and tools, including co-creation workshops, surveys, and personal interviews. These activities were crucial in ensuring that the final solutions aligned with stakeholder expectations.

The SUSTAvianFEED project employed an Open Innovation Process through the Quadruple Helix approach, involving civil society, the public sector, industry, and academia. Stakeholders such as consumers, farmers, policymakers, researchers, experts, associations, providers, and retailers were engaged in defining the pilots and validating the business model in each pilot area.

This document not only outlines the planning and approach but also provides a comprehensive report on the implemented Living Lab activities, showcasing the results, insights, and feedback gathered throughout the process.

Table of Contents

Table of Figures

List of Tables

Acronyms and abbreviations

Abbreviation	Description
LL	**Living labs**
CEBM	**Circular Economy Business Models**
SD	**Service Design**

1 Introduction

1.1 SUSTAvianFEED Project

SUSTAvianFEED-2015 is a four-year project part of the PRIMA programme, supported by the European Union., with a project budget of 2,6 million Euros. SUSTAvianFEED project focuses on the development of sustainable poultry feeds as an alternative in the livestock farming sector. The alternative feed will be more environmentally friendly than the regular sources and will have a close relationship with local agriculture and agri-food sector, while accomplishing with feed safety regulations. In order to develop a sustainable feed, the main proposed approaches will be followed: 1) To use insects as source of protein, 2) To formulate and develop a targeted and sustainable diet considering the product of poultry farming (meat and eggs) and production phase.

1.2 Purpose of this deliverable

This deliverable outlines the Living Lab methodology and the plans implemented throughout the SUSTAvianFEED project. It provides a detailed report on the activities carried out during the project, along with the main results obtained from the stakeholder engagement and testing phases.

1.3 Development of this plan

ALIA, in collaboration with all project partners, defined a plan for the participatory activities carried out throughout the project (Project Milestone 3). This plan served as the foundation for the Living Lab activities and was treated as a living document, periodically updated based on project needs. It followed a common framework while addressing the specificities of different project regions. The implementation of this plan was reviewed every six months, with ALIA organizing meetings with partners to monitor progress.

1.4 Living Labs in context

The Living Lab approach aimed to improve the pivotal multi-stakeholder collaboration within the Circular Economy ecosystem. It engaged diverse actors and stakeholders in an open innovation process that contributed to deliver a sustainable and suitable solution, starting from the identification of the sustainable poultry diet, the definition and implementation of the project pilots and to the experimentation towards the development of a Circular Business Model.

Focusing on the following objectives:

- To design a Sustainable feeding program adapted to the context and requirements of each pilot.
- To co-create, co-implement, and co-evaluate this feeding program among relevant stakeholders, including involving end consumers from the first stages of the design.
- To produce a solution suitable to market needs.

2 Methodology

2.1 Living Labs Framework

A living lab is a multi-stakeholder approach set-up to carry out innovation projects that follow the principles of open innovation and focus on real-life experimentation to co-create, test and validate novel solutions.

Open innovation is a concept introduced by Henry Chesbrough, who defines Open innovation as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market"[1][2].

Curley & Salmelin describe the evolution of the concept of Open Innovation into a new paradigm based on the principles of collaboration, co-creation and shared vision and values from multiple committed stakeholders (with special focus on the quadruple helix, which will be defined later in this document). Another key principle is the idea of customers/user participating in the innovation process, "Rather than innovation being something that is done for or to a user, the user co-participates in the innovation process as well as profiting from its outcome", this is represented by a reverse innovation pyramid, being the users in the top of the structure[3]. This new paradigm is named Open Innovation 2.0.

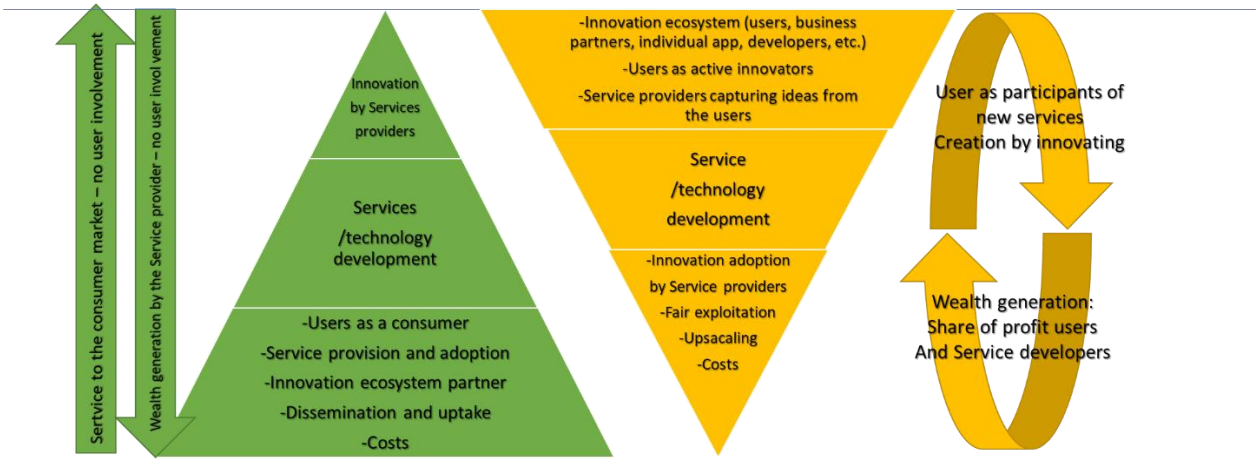


Figure 1. The comparison of traditional and Open Innovation 2.0 approach. **CIRC4Life-project[4].**

[1] Chesbrough, H. (2003): Open Innovation: The new imperative for creating and profiting from technologies. Boston: Harvard Business Scholl Press.
[2] Chesbrough, H. (2006): Open Innovation: Researching a New Paradigm. Oxford University Press.
[3] Curley, M. & Salmelin, B. (2013): Open Innovation 2.0 — A New Paradigm (EU Open Innovation and Strategy Policy Group).
[4] CIRC4Life-project (2019): Living Labs Concepts and Implementation Plan for CIRC4Life (A circular economy approach for lifecycles of products and services) project.

2.2 The key elements of Living Labs

The combination of the following elements is central to the Living Lab approach.

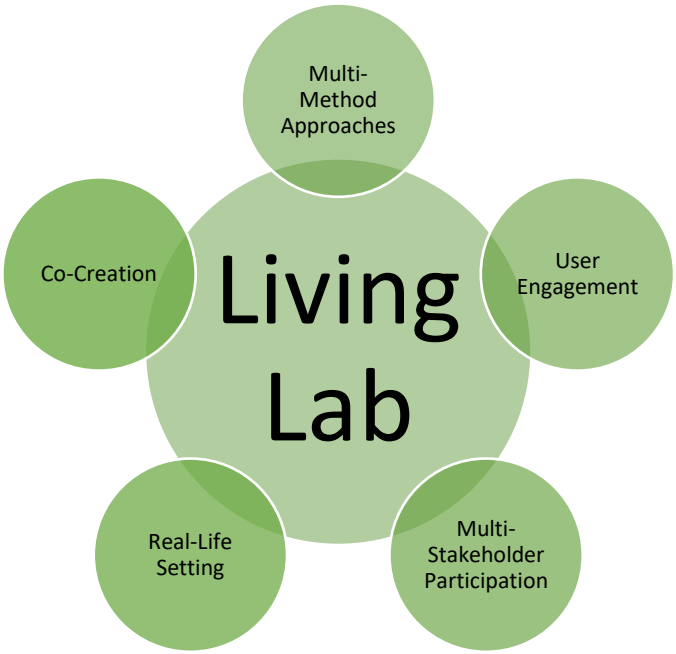


Figure 2. Key elements of the Living Labs. European Network of Living Labs

- **Multi-Method Approaches:** Living Labs combine different user-centered methodologies and tools adapted to the objectives of the project and the nature of the stakeholders involved.
- **User Engagement:** The key to success in any activity is to involve the users from the beginning of the project and ensure their participation and engagement across the whole innovation process.
- **Multi-stakeholder Participation:** Involving relevant stakeholders is crucial, this includes the quadruple helix actors (representatives of public and private sector, academia, and people).
- **Real-Life Setting:** A very specific characteristic of living labs is that activities take place in real-life environments. New solutions are tested and validated in a real usage context from the early stages of the innovation process.
- **Co-creation:** The customers/users become contributors rather than subjects of studies. Other stakeholders may participate in co-creation since quadruple helix actors could collaborate with their particular knowledge and approach. Co-creation is the central process of living labs.

2.3 Phases of iteration on Living Lab Projects

The following phase are conducted during each iteration round:

1. **Exploration:** Getting to know the current state, necessities, and requirements of the users.
2. **Co-Creation:** Respond to the necessities detected in phase 1, by creating solutions together with the stakeholders, using the knowledge acquired in phase 1

3. **Implementation:** Concepts and ideas co-created in phase 2, are put to the test in real-life
4. **Evaluation:** Assess the impact of the implemented solution and obtain feedback to iterate to a new state. The goal is to launch the innovation into the target market.

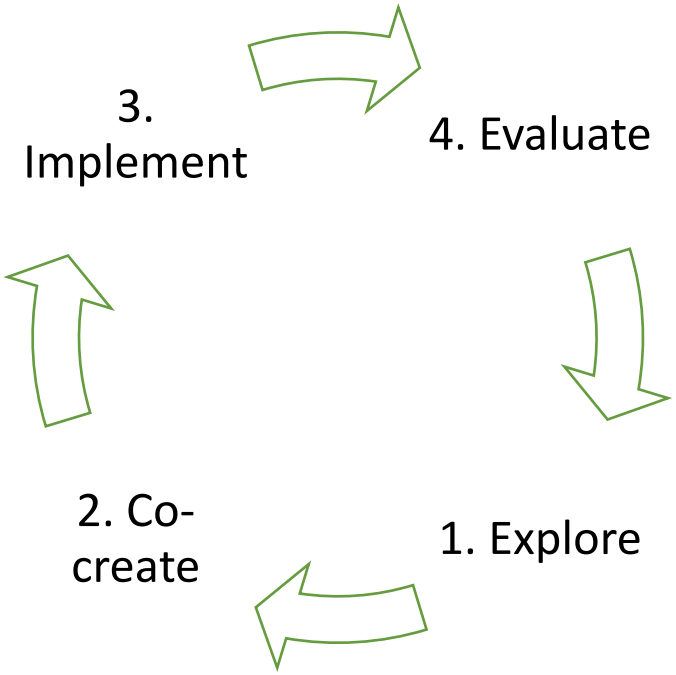


Figure 3. Phases during single iteration round. Modified from CIRC4Life-project.

2.4 Methods and tools

The Living Lab strategy for SUSTAvianFEED combined tools from different methodologies. The first one, Circular Design Guide, is centered in the product or service, developing a set of phases with clear objectives and tools from the understanding of the current situation to the release of the circular economic innovations. The second one, End-User Engagement Toolkit, focused in user engagement tools, developing a more in-depth relationship with the user/customer. Both methods have a similar process, the key was to understand the aim and phases of each one, and select the tools most suitable for SUSTAvianFEED LLs depending on the stage and objectives of the activities to be developed.

2.4.1 Circular Design Guide.

The Circular Design Guide, developed by IDEO and Ellen MacArthur Foundation, introduces a set of methods to understand, define, make, and release circular economy innovations. Some of the methods are related with the objectives of SUSTAvianFEED project. The most suitable are the following:

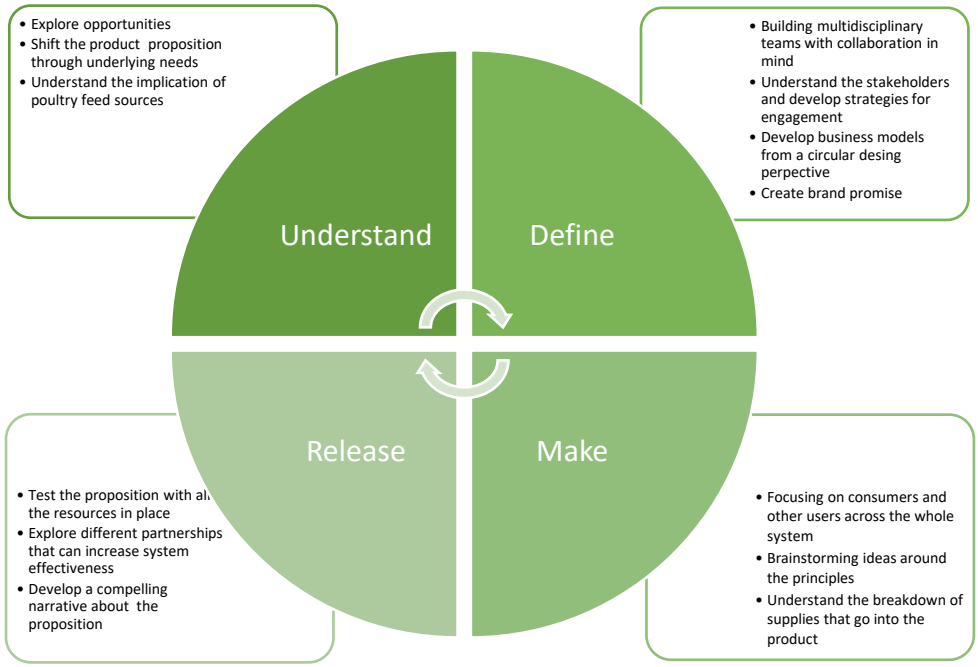


Figure 4. Methods of the Circular Design Guide

Understand
The key is trying to find innovation beyond the conventional solutions. The shift starts with understanding the underlying user/customer needs and thinking more creatively about how they can be met.

On the other hand, with the help of the stakeholders of the supply chain, it is possible to analyze and understand widely the material flows, and the conditions needed to get each poultry feed sources into the process.

Define
Is about detecting and understanding the perspective of the customers and stakeholders. Is it also the stage to detect which elements of sustainability reinforce the brand purpose and how to communicate this message to the customers/users. It is necessary to identify key stakeholders and develop strategies for how you involve these stakeholders throughout the project, from co-creation to keeping them engaged. Develop or redefine your business model from a sustainable or circular perspective.

Materials
Stakeholders Mapping
Business Model Canvas

Make
Develop mechanisms to collect feedback before the release of the product, gaining insight from outside the own organization and enabling continuous and agile learning. Understanding the needs of everyone involved in the use cycle – the end-

users or beneficiaries, but also suppliers, manufacturers, retailers, and others. This knowledge will be valuable for end users, other users in the chain, and the strategy of the business.

Materials
Interview Guide
Ideas captures for brainstorming

Release

Release involves pilot actions, which are the main part of this project, before fully launch to the market. The guide states that when launching a pilot "you should feel confident in your solution and be testing how it works with the staff, support, materials, resources, and partners in place".

The goals, potential learning, feedback, and tools to measure success have to be defined before starting the pilot.

Feedback cycles are very useful to iterate the initial proposition, collecting the feedback, and explore the next steps to continue improving the final product and business proposition.

This is also the stage to go deeper in concepts developed in the DEFINE stage, as of identified potential partners (listed before in the business model canvas) or create an emotional narrative that make people identify with the product.

2.5 End-User Toolkit

The European Project U4IoT5 developed an End-User Engagement Toolkit, to guide the Large-scale pilot (LSP) projects and especially the pilot sites through the innovation processes. Despite this project is related to Pilots in the Internet of Things, the toolkit has useful insights for SUSTAvianFEED mainly due its special focus on user-engagement.

2.5.1 Exploration

This process begins with the "understanding" of the problem, the context and users, followed by observation and immersion in the situation and empathizing with the users/ customers as a "discover" iteration. Once there are discoveries and insights, "define" iteration helps to convert these ideas into defined necessities and opportunities, which are framed as a complete concept in the "conceptualize" iteration. The "think" iteration contains brainstorming and ideation tools to help thorough this entire iteration journey.

[5] U4IoT User Engagement for Large Scale Pilots in the Internet of Things is a European Project funded by Horizon 2020 Program, coordinated by Lulea Tekniska Universitet, Sweden, with the participation of the European Network of Living Labs among other partners.

Understand	Discover	Define	Think	Conceptualize
•WWWWWH •The five why's	•Guided tour •Observation & Shadowing	•Empathy Map •User Personas •Validaded personas •Customer Journey	•How might we •Brainstorming Rules •Idea dashboard	•Co-create workshops

Understand

WWWWWH: Is an interviewing technique utilizing guiding question; Who was involved, what happened, where did it take place, when did it take place, why did that happen, how did it happen? The aim is to understand as more as possible at a general level. Similar to the 5 Why's Technique that goes deeper into why?
The five why's: Is an interview technique that led to a deeper level of explanation. The interviewer should ask "why" to every answer provided by the interviewee five times in a row.

Discover

Observation: There are different ways: the researcher may observe from a distance, separating themselves of the situation, or participate themselves together while observing the participants.
Shadowing: In shadowing, researchers are following the participants around for a set period of time. In doing so, you may or may not interfere at times by asking some questions as an ad-hoc interview throughout the process.
Guided Tour: When conduction a guided tour, the participant is explaining what they are doing, how they are feeling, etc. This provides insights would not always come across in an observation or shadowing.

Define

User persona: (user persona, customer persona, buyer persona), is a representation of the profile and behaviour of a hypothesized group of customers. Personas are used throughout the whole innovation process; however, they are especially useful in market research and go-to-market strategy.

Validated personas: While the user personas are often created as hypothesized representation, not always correspond to the real-world situations. In the other hand,

Personas based on qualitative and quantitative research represent validated personas.

Empathy Map: May be considered as the first step in the creation of the user persona, include the essential to-know of the customer. There are several templates for mapping, but the essential is to thinks the following aspects of your persona, What they… think? feel? say? Do? See?

Customer journey: is a visual representation of the steps or stages the customer goes through in their experience and interaction with the product or service. It is important to detect the touchpoints (specific interactions) and channels (methods of communication), and then map the process including critical points that can determine customer frustration or customer satisfaction.

Think

Brainstorm: Brainstorming sessions are a very popular and useful way to get a lot of ideas and solutions. The key is to have in mind some rules, the most important is to make participants feel comfortable to share their ideas when they come up and not criticize or discard them without going into them deeper or allow others to build or enrich on them. Then there are plenty of ideas to choose the best ones. Perfect solutions may be reached in a collaborative and open way.

Idea Dashboard: Explain something in words is difficult, asking participants to represent a concept or idea in images or another articulated way, may help to confirm if everyone understands the idea.

How Might We: This is an approach to explore different points of view. Is often used to start an ideation or brainstorming session. It starts describing your current insight or idea with "how might we…" and going deeper from this point taking it to an extreme, exploring the opposite, and questioning the original assumptions.

Conceptualize

Co-Creative Workshops: The goal of the method is to bring together partners, stakeholders, and end-users to co-create solutions in a couple of hours. It is composed of four co-creative phases: Co-analysis, Co-design, Co-evaluation, and Co-implementation.

2.5.2 Experimentation/Implementation

On this stage the concept is putted to the test after defining it in the previous stage. The Plan & engage activities aim to plan the pilot or implementation activities ensuring sustainable involvement from the stakeholders. Prototypes may be created to measure the assumptions made, especially in the case of pilot actions. When deciding the prototype to be launch the concepts of MVPs, Solution Prototype vs. Empathy Prototype may be useful. Once there is a prototype is time to test it and collect feedback to improve the initial concept.

The implementation and co-creation phases are often repeated more than once. It is the case of this project, on which there are 3 iteration cycles planned.

Plan &Engage	Prototype	Test
•Community Canvas •Panel Management •Social Media	•Solution Prototype vs. Empathy Prototype •Minimum Viable Product •Test Card	•Prototype Testing Plan •I like I Wish •Learning Card

Plan & Engage

Community Canvas: Is a structure to build meaningful communities. It has 3 sections: Identity (Why the community exist and why they stand for), Experience (translating identity into concrete activities) and Structure (Operational elements of running a community).

Panel Management: Detecting groups and subgroups of users and stakeholders, and them mapping them into a panel connecting those groups with the project' activities. With this panel, it is possible to have an overview on which groups would have to be involved in which activities.

Social Media: The use of social media as a channel to get people involved and connected with the project. It is more effective when there is a strategy and planned social media campaigns.

Prototype

Solution Prototype vs. Empathy Prototype: Solution-oriented prototypes aim to test a concept or explore a solution, and empathy-oriented prototypes intend is to learn about the user o people.
What are we trying to learn with the prototype? Both categories of prototypes are not mutually exclusive, however, is useful to have the intention clear when setting the hypothesis for a pilot.

Minimum Viable Product (MVP): Consist on preparing an initial prototype that fulfil enough requirements to test in a real environment with the least effort and inversion possible. The idea is to collect feedback and improve the product from the initial assumptions while minimizing the risks.

Test Cards: Help to structure the hypothesis and results of an experiment or test. They should include the following aspects: 1. Description of the idea/hypothesis/assumption; 2. Description of the test/experiment; 3. A way of measure the result, is the hypothesis valid or invalid? And 4. Set a Target threshold.

Test

Prototype Testing Plan: A step-by-step process with clear instructions for planning prototypes.

I Like I Wish: Is a creative form to collect feedback from interdisciplinary teams and users. Formulate the feedback and suggest ideas in the form of "I like, I wish, what if" could be more comfortable for participants since it avoids direct criticism.

Learning Cards: Complements the test cards and aim to structure the insights gained during an experiment. Are used mainly for Business Model and have to include the following aspects: 1. Description of the idea/hypothesis/assumption; 2. Outcomes; 3. Insights obtained and 4. Actions to be taken.

Evaluation

This phase is related to the full scale and go to market of the product or solution. Firstly, launching final prototype of product or service after ensuring the outcomes of the whole process are implementing and taken into account, and secondly, identifying the key elements for the ongoing sustainability of the product/service in the future.

Launch	Implement	Identify
•Business Model Canvas •Value Proposition Canvas •Dotmocracy	•Co-Implementation •Social Media Strategy	•Growth Hacking Canvas •Triple Layer Business Model Canvas

Launch

Value proposition Canvas: The value proposition refers to promise of value a product will deliver to customers/users. The aim of the Value Proposition Canvas is to connect the customer profile with the value proposition, ensuring that the product responds to the customer values and needs.

Business Model Canvas: This canvas covers the vital aspects of creating a successful business, the exercise of fill in the template helps to think about what is needed to launch a product and to make sure the project is viable and creates real value for the market. In the beginning, the contents may be sketched with the initial assumptions, then there could be different versions of the canvas as the business model evolves and is being validated.

Dotmocracy: This is a form of accumulative voting on which participants are given a set number of dot stickers, they could distribute their stickers next to options choosing the number of dots or options they may like. Wins the option with the higher number of dots at the end. This tool could be used when it is necessary to vote in a group session, avoiding "winners take it all", knowing which are the different positions of the "ranking" in order of preference from the participants.

Card Sort: Is another tool to help people rank their options in order of preference. This time utilizing a deck of cards with words or images, making the process visual and dynamic.

Implement

Co-Implementation: It refers to engage the customers/users in the phase implementation of the co-creation process.

Social Media: Social media could be an excellent tools also in this phase, developing strategies to "spread the word" and reach a large audience.

Identify

Growth Hacking Canvas: Growth Hacking is a set of techniques focused on the growth of a product or company, detecting which paths or channels represent the most efficient way to reach and retain customers and scaling them very quickly. The Growth Hacking Canvas is an adaptation of the methodology of the Business Model Canvas representing growth hackings' key elements.

Triple Layer Business Model Canvas: Introduces sustainability approach through two additional layers to the traditional Business Model Canvas. Those lawyers are Environmental life cycle Layer and social stakeholder layer.

Each topic of the SUSTAvianFEED approach for LLs is strongly related to one or more stages or iterations of the User Engagement Toolkit and/or the Circular Desing Guide. They inspired the selection of the most suitable tools for the SUSTAvianFEED Living Lab Implementation Plan, after analysing the corresponding phase with its objectives within the process.

3 SUSTAvianFEED approach for Living Labs

3.1 SUSTAvianFEED Demostrations

The implementation of pilot activities was one of the main pillars of SUSTAvianFEED project. Five pilots were developed: Turkish (EGE), Spanish (UMU) and Italian (UNITO) pilots were conducted in experimental farms, using local breeds, or environmentally adapted meat or egg chickens' hybrids. Tunisian case performed one pilot following the same protocols of the universities (ISA-CM) and other in a real context which engaged rural women of Jendouba region focusing on socioeconomic aspects (RAYHANA).

The sustainable feeding program developed in WP2 formed the basis for the pilot activities implementation and was used for produce the feeding. These pilots were designed to conduct experiments within a common framework, following similar experimental protocols, allowing for a comparative study of their differences and similarities.

Living Lab activities were carried out to tailor the feeding program design to the unique conditions and local contexts of each pilot. Relevant stakeholders were engaged in the design and evaluation of the pilots to ensure the program's effectiveness and to assess the expected outcomes.

Living Labs are also a key element assuring the new final products will match the market's needs, being the main source of feedback in the definition of the business model and market approach for a hypothetical final launch.

To comply with the objectives of the Living Lab approach for SUSTAvianFEED, the activities were classified into four main core topics, as proposed:

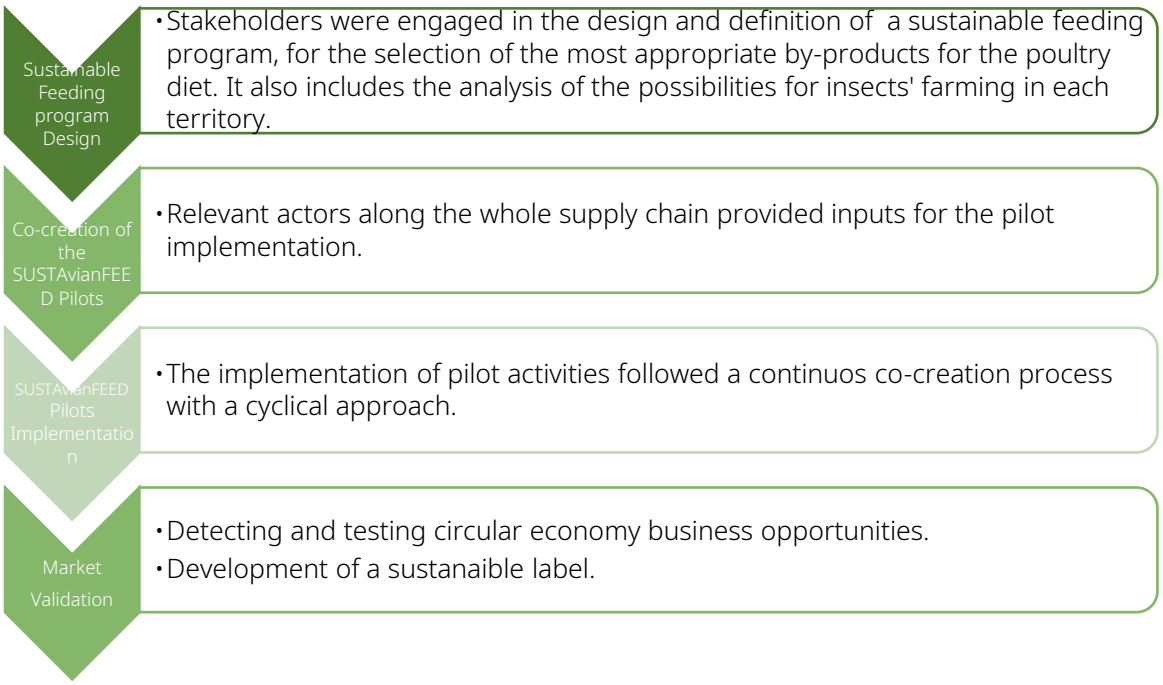


Figure 5. Topics of the SUSTAvianFEED Living Labs

3.2 Partners Roles

- **Management and Coordination/Orchestration** – Alia
- **Pilot partners:** Tunisia (ISA-CM), Spain (UMU), Turkey (EGE), Italy (UNITO) and Tunisia (Rayhana). **Demonstration coordinator:** EGE as the leader of WP3 (SUSTAvianFEED Pilots), as WP3 and LL activities are closely related.
- **Special tasks:** ENTOMO were the responsible for specific LL activities related to the analysis of insects' farming and supply chain.
- **Communication and dissemination:** SLOWFOOD had a two-way exchange with other partners since the LL activities served as material for communication, and communication was a key resource for engaging stakeholders in LL activities.

3.3 Stakeholders

The interdisciplinary and multi-actor approach of Living Labs facilitated collaborating and co-creating solutions, in order to reduce the risks and complexity of the innovation processes, while gaining agility. In this context, the Living Labs acted as a network, orchestrating collaboration and exchange of knowledge and resources between actors.

Curley & Salmelin, consider the use quadruple helix model as a core pattern in the Open Innovation 2.0 paradigm. Is a model where public sector, industry, academia and civil participants collaborating together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone.

The following stakeholder groups constitute the Quadruple Helix, having the private sector a major importance for SUSTAvianFEED project.

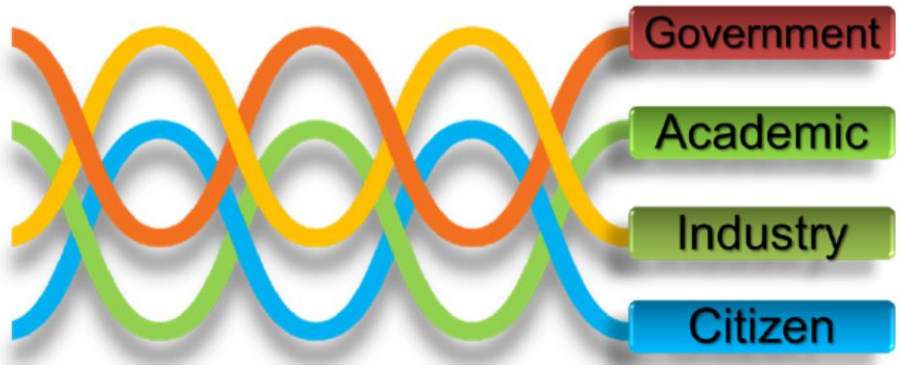


Figure 6. Quadruple Helix Innovation. Curley & Salmelin 2013.

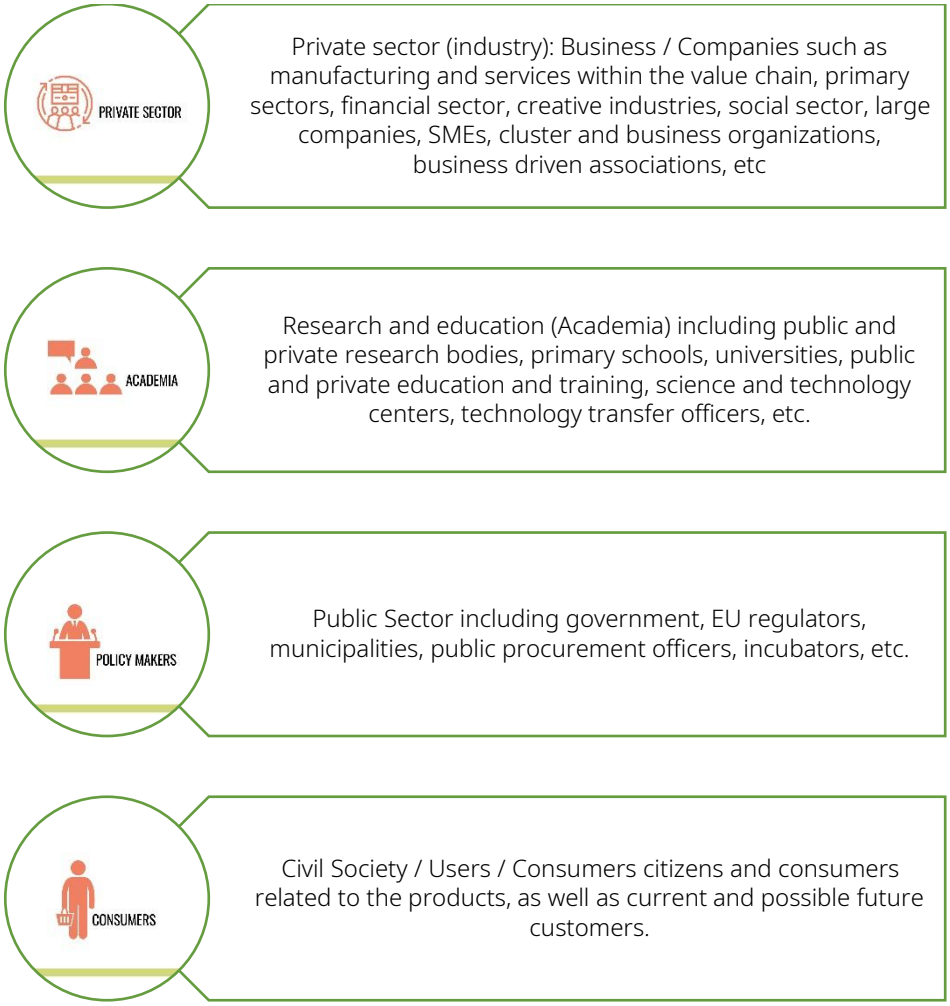


Figure 7. Quadruple Helix Approach

Each stakeholder group was able to contribute to the Living Lab process and benefit from it, enriching the innovation process from their perspectives.

	Benefits of their participation	**Benefits for the participants:**
Private sector (industry, companies)	Produce and invest on products and services that the market needs. Make ideas and innovation come true.	Get new and innovative ideas, test and validated innovations in real-life environments.
Academia (Research and education)	Knowledge and expertise in the field.	Get study cases and multidirectional flows of knowledge.
Citizens (Users, consumers)	First-hand information about the market and validation of innovative ideas before being launched.	The possibility to take part in the innovation process, ensuring that their main needs and desires are met.

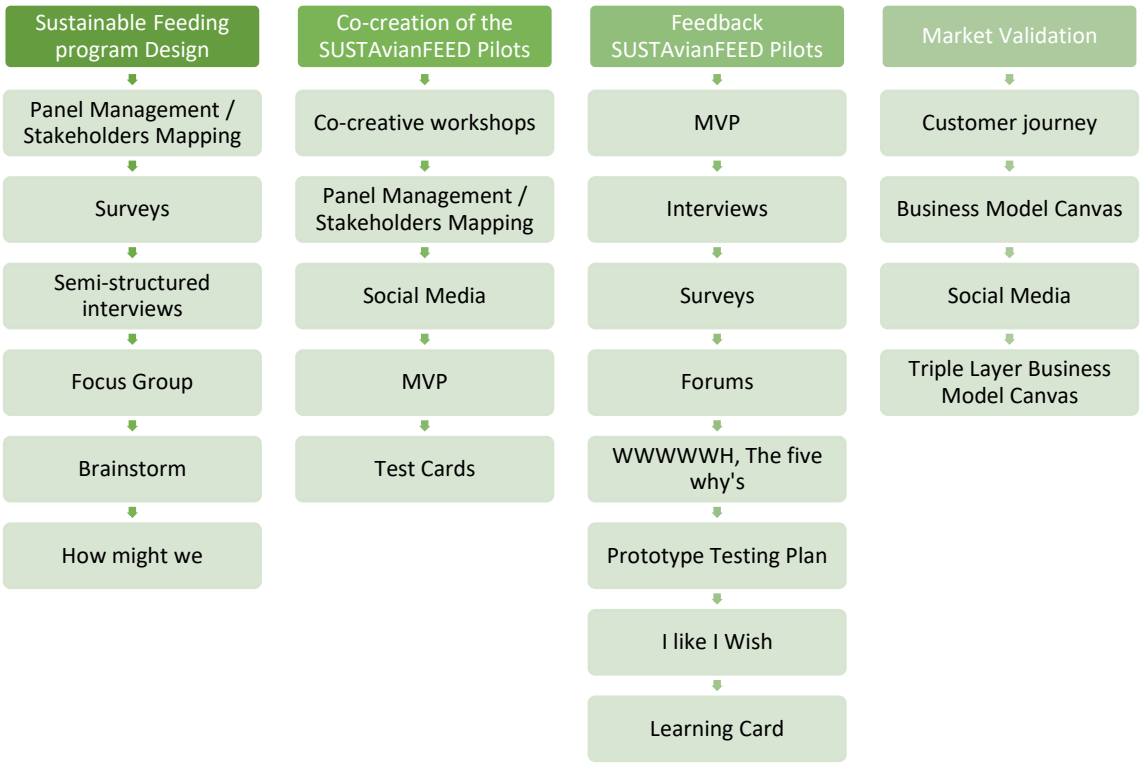
	Benefits of their participation	Benefits for the participants:
Public sector	Take part in the decision-making process, drive structural changes.	Ensure that the innovation process addresses wider social concerns.

Table 1. Role of the Stakeholder Groups

3.4 Plan design

Overall Implementation Plan for SUSTAvianFEED demonstration Living Labs.

Figure 8. Methods and tools for the different objectives of the project



3.4.1 Sustainable Feeding program Design

Related methods: Explore and Co-create (Understand, Think and Define).

Objective of the LL activities:
To elaborate an optimal, realistic and extensive list of possible by-products, local ingredients, etc., to be included in the alternative nutritional diet to be developed in the project.

Actors to be involved:
Each partner identifies relevant actors of their regions. Some of the actors can be:

- Companies of the sector.
- Public organisms.
- Livestock associations.
- Providers.
- Universities.
- Etc.

Tools to be used:

1. Surveys
2. Semi-structured interviews
3. Others (workshops, focus groups, attendance to trade fairs, etc.)

3.4.2 Co-creation of the SUSTAvianFEED Pilots

Related methods: Define, Make, Implement (Plan & Engage, Protype, Test), Evaluate, Discover, Conceptualize.

Objective of the LL activities:
Relevant actors along the whole supply chain will provide inputs for the pilot implementation. It allows clients and actor to co-create the background of the pilot according to their needs and motivations.

Actors to be involved:
Each partner identifies relevant actors of their regions. Some of the actors can be:

- Public organisms.
- Livestock associations.
- Providers.
- Universities.
- Etc.

Tools to be used:

1. Surveys
2. Workshops
3. Focus groups
4. Storyboards

3.4.3 Feedback SUSTAvianFEED Pilots

Related methods: Make, Release, Implement, Evaluate, Discover, Conceptualize.

Objective of the LL activities:
Consumers to take part and provide feedback during the pilot to promote an evolutionary development and involve stakeholders from the first moment.

Actors to be involved:
Actors involved in the pilot actions, and potential new end-consumer identified by the validation of persona profiles.

- Clients (Farmers)
- End-consumers

Tools to be used:
Interviews
Surveys
Forums
WWWWWH, The fine why's
Observation
Prototype Testing Plan
I like I Wish

3.4.4 Market validation

Related methods: Define, Release, Discover, Understand, Implement, Evaluate (Launch, Identify).

Objective of the LL activities:
Consumers to take part in the detection and testing of circular economy business opportunities, and the development of a sustainable label.
Putting focus on the needs that motivate the users to buy and consume a poultry feed with sustainable diet. ¿What triggers their motivation?

Actors to be involved:
Actors involved in the pilot actions, and potential new end-consumer identified by the validation of persona profiles.

- Project internal teams
- Clients (Farmers)
- End-consumers

Tools to be used:
Buyer Personas
Surveys
Observations
Co-creation workshops
Empathy map
Customer journey

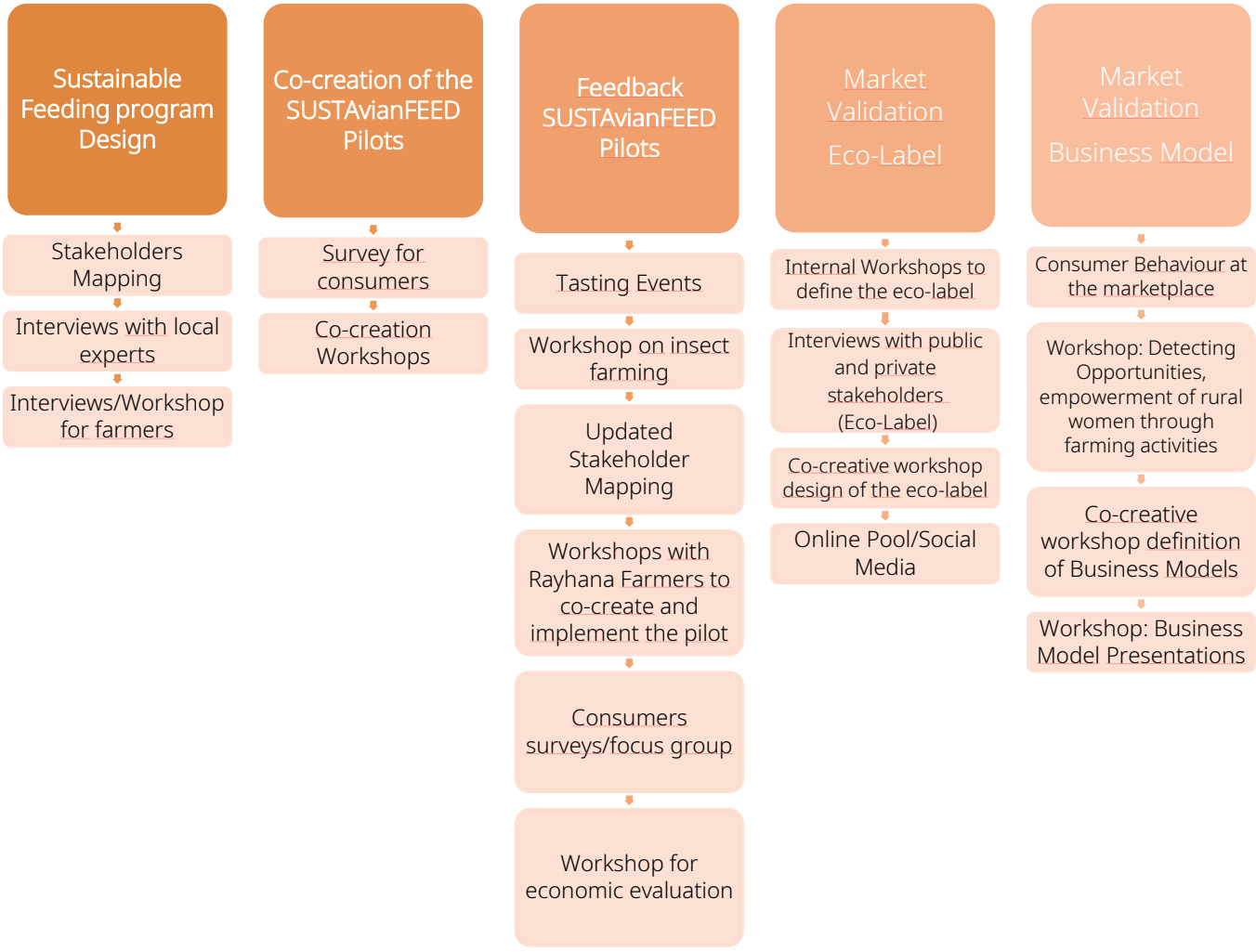
Business Model Canvas
Value Proposition Canvas
Social Media Strategy
Triple Layer Business Model Canvas

4 Implementation SUSTAvianFEED Living Labs

This section focuses on the execution of the Living Labs activities in the SUSTAvianFEED project. It describes the practical steps taken to implement the Living Lab plan across the different pilot regions. The Living Labs served as a space where key stakeholders, including farmers, feed producers, and consumers, worked together to test and refine the different pilots. Activities like co-creation workshops, pilot trials, and surveys were conducted to gather input, assess the program's effectiveness, and make necessary adjustments.

The section also outlines the results of these activities, providing a clear overview of what was achieved and learned during the implementation phase, including the challenges faced and the feedback received.

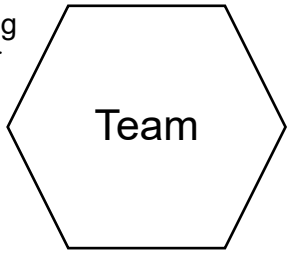
Figure 9. Summary of activities implemented



4.1 Part 0: Preparation activities

LL A1. Sustainable Feeding program Design: Stakeholders Mapping

Objectives of the LL activity:
To detect and map groups and subgroups of users and stakeholders, connecting those groups with the project's activities; think about how and in which of your planned events it is possible to address them.



After sharing the LL strategy, a template of a panel matrix was facilitated by ALIA and explained to the partners to conduct this activity.

Actors involved in the LL activity:
Members from each partner's internal team (beyond the ones directly involved in the project), shareholders, etc.

Table 2. Participants in LLA1

Profile	Spain	Turkey	Tunisia	Italy
Academia	6	8	5	0
Researchers/experts	0	0	0	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	4	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Online/ Partners' premises

Duration:
2-4 hours

Key themes: Detecting groups and subgroups of users and stakeholders, connecting those groups with the project' activities.

Activities to be developed:

1. Brainstorm with the team to share ideas.
2. Completion of the stakeholder panel matrix template

Timing:
Project months 4-8 (July-November 2021)

Involved Partners:
ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA

Description of the activity:

This activity aimed to involve the internal team of each partner in the detection of stakeholders, as they know well the environment of each entity and product, they contributed with useful insights.
It was a great opportunity to discuss and get ideas about the future planned events or spaces suitable for interactions with those stakeholders in order to carry out other LL activities from the LL Implementation Plan.

For this purpose, a brainstorming session was proposed, since they are a very popular and useful way to get a lot of ideas and solutions.
Partners were able to plan and carry out the brainstorming session as they consider, however, the result of the session were the completion of the panel matrix, the template were used as a guide for the sessions.
Partners were reminded some rules and recommendations for brainstorming sessions, the most important was to make participants feel comfortable to share their ideas when they come up, and not criticize or discard them without going into them deeper or allow others to build or enrich on them in that way, there are plenty of ideas to choose the best ones. Perfect solutions may be reached collaboratively and openly.

Stakeholder Panel Matrix
A stakeholder map was used to detect groups and subgroups of users and stakeholders, and then mapping them into a panel connecting those groups with the project's activities. With this panel, it was possible to have an overview of which groups would have to be involved in which activities.
This map has been also be really useful for the definition of the business model and the analysis of interactions along the supply chain (Task 4.2).
The stakeholders were members of public organisms, companies of the sector, livestock associations, providers, professors, researchers, investors, employees, internal stakeholders, and, of course, clients or consumers (including B2B supply chain clients).

The Panel included all the activities to be carried out according to the first version of the plan (horizontal list), and the objective was list stakeholders with name or name an entire group with a profile of specific characteristics (vertical list) and to mart with an "x" in case the stakeholder is suitable for participate in that activity.

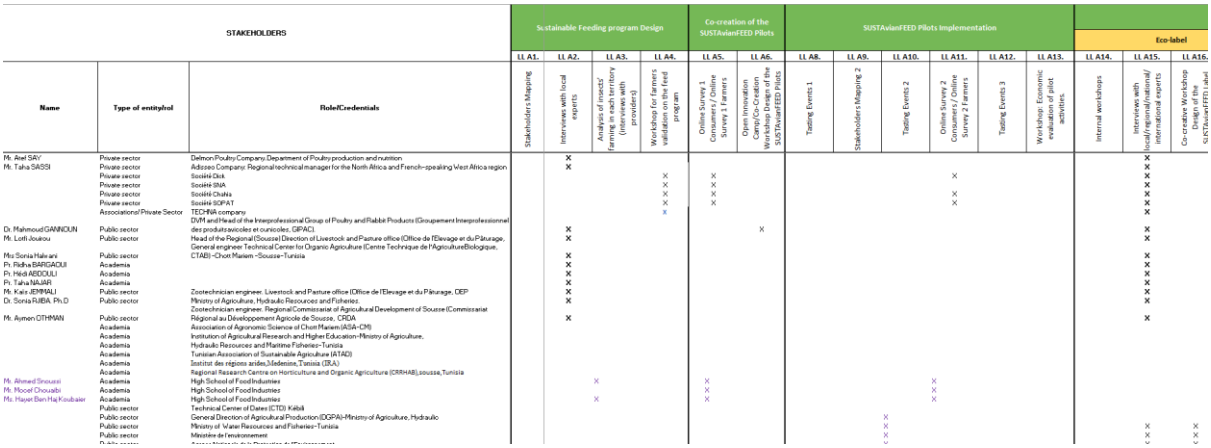
Results
Examples of Panel developed by partners:

			LL A1.	LL A2.	LL A3.	LL A4.	LL A5.	LL A6.	LL A8.	LL A9.	LL A10.	LL A11.	LL A12.	LL A13.
Name	Type of entity/rol	Role/Credentials	Stakeholders Mapping	Interviews with local experts	Analysis of insects' farming in each territory (interviews with providers)	Workshop for farmers validation on the feed program	Online Survey 1 Consumers / Online Survey 1 Farmers	Open Innovation Camp/Co-Creation Workshop Design of the SUSTAvianFEED Pilots	Tasting Events 1	Stakeholders Mapping 2	Tasting Events 2	Online Survey 2 Consumers / Online Survey 2 Farmers	Tasting Events 3	Workshop: Economic evaluation of pilot activities.
Necmettin Ceglan	Academia	Ankara University, Department of Animal Science		x		x		x						
Engin Yenice	Academia	Ankara University, Department of Animal Science, Animal Nutrition Science Association		x		x		x						
Mehmet Bozkurt	Academia	Adnan Menderes University, Department of Animal Science		x		x		x						
Sakine Yalçın	Academia/Association	Animal Nutrition Science Association		x										
	Academia/Association	Turkish Agricultural Economics Association (TEDER)												
	Academia/Association	Expert on Sustainable Label												
	Academia/Association	Expert on Sustainable Label												
	Academia/Association	Expert on Business Model												
Bedri Girit	Associations/ Private Sector	Poultry Promotion Group&Aegean Exporters Association&Egg Producers Association		x										
Multiple members	Associations/ Private Sector	Turkish Feed Manufacturers Association (TURKYEMBIR)		x										
Muharrem DOĞAN	Associations/ Private Sector	Organic Products Producers & Industrialists Association&Orvital Organic Food Co.		x		x								
Devrim Esim	Private Sector	EgeTav (Entegrated Broiler Breeder Company)		x		x								
Hasan KATRANCI	Private Sector	Özlem YEM				x								
Abdullah Koç	Smallholders/Association	Izmir Poultry Meat Producers Association -				x	x	x	x	X?	x	x	x	
	Smallholders/Association	Balıkesir Poultry Meat Producers Association				x	x	x	x	x	x	x	x	
	Smallholders/Association	Manisa Chicken Producers Association				x	x	x	x	x	x	x	x	
	Smallholders/Association	Turkish Poultry Meat Producers Association				x	x	x	x	x	x	x	x	
Damla ÇETİNKOL	Smallholders	Damli Organic Products and Free Range Chicken				x	x		x		x	x	x	
Adnan Zaimoğulları	Smallholders	As Piliç Organic Chicken (Sakarya)				x	x		x		x	x	x	
İsmail Kor	Smallholders	Kor Agro Organic Food Co.		x		x	x		x		x	x	x	
	Consumers	Consumer Food Cooperatives and Community Supported Agriculture Groups					x		x		x	x	x	
	Consumers	Consumers					x		x		x	x	x	
	Consumers	Sustainable Food Platform					x		x		x	x	x	
Nurhayat BAYTURAN	Associations/Consumers	Buğday Ecological Life Association					x		x		x	x	x	
Özge ÇİÇEKLİ	Associations	Ecological Agriculture Organization Association (ETO)												
	Public Sector: Decision Makers	General Directorate of Agricultural Research and Policies												
	Public Sector: Decision Makers	Izmir Agriculture and Forestry Directorate				x		x						
	Public Sector: Decision Makers	Ministry of Agriculture and Forestry (TAGEM, TKDK, HAYGEM, GKGM, Tavukçuluk Araşt.				x		x						
	Public Sector: Decision Makers	Municipality of Izmir						x						
Yildırım İBİLİLER??	Private Sector/Insect producer	Insect producer Yildırım Flourworm Production Co. Bursa			x			x						
Eren Çarkçı	Private Sector/Insect producer	Insect producer BSF- Ankara Canlı Yem												
Hasan Doğan	Private Sector/Insect producer	Insect producer BSF - İskenderun-Hatay			x	x		x						
Taner Çalıkoğlu	Private Sector/Insect producer	Insect producer BSF - Güzelbahçe İzmir			x			x						

Figure 10. EGE Panel Matrix First Version (extract)

STAKEHOLDERS			Sustainable Feeding program Design				Co-creation of the SUSTAvianFEED Pilots	
			LL A1.	LL A2.	LL A3.	LL A4.	LL A5.	LL A6.
Name	Type of entity/rol	Role/Credentials	Stakeholders Mapping	Interviews with local experts	Analysis of insects' farming in each territory (interviews with providers)	Debate with Farmers. (n=5-8). VALIDATIONS	Person/Online Survey 1 Consumers (n=100) On line	debate with technician in avicultura (n=4). Design
Pablo Catalá Gregori	Private sector	Poultry Quality Center for Animal Feed of the Valencian Community		x				x
Miguel José López Asensio	Private sector	Member of the technical department of INTEGA (Industrial Técnica Ganadera S.L).		x				x
Sandra García Carmona	Private Sector	Manager of Granja AGAS		x				x
Silvia Campos	Public organizations	Agriculture department						
Carmen García Frago	Public organizations	Agriculture department						
Enrique Navarrete	Public organizations	Agriculture department						
Lola (madre de Quique Barranco)	Public organizations	Health department						
Tribunal	Public organizations	Consumer advice department						
	Associations	APICOSE (Association of Compound Feed Manufacturers of the Southeast of Spain)						
Teresa López Hernnández	Associations	Veterinary College						
	Associations	(CESFAC) Spanish Confederation of Compound Animal Feed Manufacturers						
	Associations	AGROFOOD (Cluster agroalimentaria)						
Pablo Catalá Gregori, (3 recomendati	FARMER	CECAB				x		
Sandra García Carmona	FARMER	AGAS						
Juan Pablo de Pujante	Veterinary	Pujante						x
Salvador	Veterinary	Pujante				x		
	FARMER	Garrido				x		
	FARMER	Guillem (Valencia)				x		
	Livestock associations	SADA Group				x		
	Livestock associations	(COAG-IR) Coordinator of Organizations of Farmers and Ranchers-Rural Initiative of Murcia.						
	Livestock associations	(ASAJA) Agrarian Association of Young Farmers (Spain)						
	Livestock associations	Interprofesional agrícola						
	Livestock associations	Avícola San Isidro						
David Espigares, Albert Tomás Soler	Suppliers (feed producers)	NANTA						
	Suppliers (feed producers)	AGROCABA						
	Suppliers (feed producers)	ALIMER						
	Suppliers (feed producers)	Granja Santa Isabel						
	Suppliers (feed producers)	INALSA						
	Suppliers (animal producers)	PIGALOMAR						
	Suppliers (animal producers)	El Tomillar						
	Suppliers (animal producers)	Casarejo						
	Suppliers (cages producers)	COPELE						
	Suppliers (cages producers)	GAUN						
	Lecturers	Department of animal production						
Pilar Muñoz Ruíz	Lecturers	Department of animal health						
Laura del Río Alonso	Lecturers	Department of parasitic deseases						
	Consumers	Veterinary Students Murcia					x	
	Consumers	University Students					x	
	Consumers	Veterinary Profesors						
	Consumers	University Profesors						
	poultry slaughterhouse	JOBA S.A. (Alcantarilla)						

Figure 11. UMU Panel Matrix First Version (extract)



STAKEHOLDERS			Sustainable Feeding program Design				Co-creation of the SUSTAvianFEED Pilots		SUSTAvianFEED Pilots implementation						Eco-label		
			LL A1.	LL A2.	LL A3.	LL A4.	LL A5.	LL A6.	LL A8.	LL A9.	LL A10.	LL A11.	LL A12.	LL A13.	LL A14.	LL A15.	LL A16.
Name	Type of entity/rol	Role/Credentials	Stakeholders Mapping	Interviews with local experts	Analysis of insects' farming in each territory (Interviews with providers)	Workshop for farmers validation on the feed program	Online Survey 1 Consumers / Online Survey 1 Farmers	Open Innovation Ideation Co-Creation Workshop Design of the SUSTAvianFEED Pilots	Tasting Events 1	Stakeholders Mapping 2	Tasting Events 2	Online Survey 2 Consumers / Online Survey 2 Farmers	Tasting Events 3	Workshop: Economic evaluation of pilots activities.	Internal workshops	Interviews with local/regional/national/ international experts	Co-creative Workshop Design of the SUSTAvianFEED Label
Mr. Axel SAY	Private sector	Delmon Poultry Company Department of Poultry production and nutrition		×												×	
Mr. Taha SASSI	Private sector	Adiseo Company, Regional technical manager for the North Africa and French-speaking West Africa region		×												×	
	Private sector	Société Dok				×	×					×				×	
	Private sector	Société SNA				×	×									×	
	Private sector	Société Chahia				×	×					×				×	
	Private sector	Société SOPAT				×										×	
	Association/ Private Sector	TECHNA company				×											
Dr. Mahmoud GANNOUN	Public sector	DVM and Head of the Interprofessional Group of Poultry and Rabbit Products (Groupement Interprofessionnel des produits avicoles et cunicoles, GIPAC)		×				×								×	
Mr. Lotfi Jouirou	Public sector	Head of the Regional (Sousse) Direction of Livestock and Pasture office (Office de l'Elevage et du Pâturage,		×												×	
		General engineer Technical Center for Organic Agriculture (Centre Technique de l'AgricultureBiologique,															
Ms Sonia Halvani	Public sector	CTAB) -Chott Mariem -Sousse-Tunisia		×												×	
Pr. Ridha BARGAOUI	Academia			×												×	
Pr. Hédi ABDOULI	Academia			×												×	
Pr. Taha NAJAR	Academia			×												×	
Mr. Kais JEMMALI	Public sector	Zootechnician engineer, Livestock and Pasture office (Office de l'Elevage et du Pâturage, OEP		×												×	
Dr. Sonia RUBIA Ph.D	Public sector	Ministry of Agriculture, Hydraulic Resources and Fisheries		×												×	
		Zootechnician engineer, Regional Commissariat of Agricultural Development of Sousse (Commissariat															
Mr. Aymen OTHMAN	Public sector	Régional au Développement Agricole de Sousse, CRDA		×												×	
	Academia	Association of Agronomic Science of Chott Mariem (ASA-CM)															
	Academia	Institution of Agricultural Research and Higher Education-Ministry of Agriculture,															
	Academia	Hydraulic Resources and Maritime Fisheries-Tunisia															
	Academia	Tunisian Association of Sustainable Agriculture (ATAD)															
	Academia	Institut des régions arides,Médenine, Tunisia (IRA)															
	Academia	Regional Research Centre on Horticulture and Organic Agriculture (CRRHAB),sousse,Tunisia															
Mr. Ahmed Snoussi	Academia	High School of Food Industries			×		×					×					
Mr. Mooel Chouaibi	Academia	High School of Food Industries					×					×					
Ms. Hayet Ben Haj Koubaier	Academia	High School of Food Industries			×		×					×					
	Public sector	Technical Center of Dates (CTD) Kébili															
	Public sector	General Direction of Agricultural Production (DGPA)-Ministry of Agriculture, Hydraulic									×						
	Public sector	Ministry of Water Resources and Fisheries-Tunisia									×					×	×
	Public sector	Ministère de l'environnement									c					c	c

Figure 12. ISA-CM Panel Matrix First Version (extract)

Conclusions: Partners engaged in a group reflection to identify potential contacts for participation in the Living Lab activities, carefully considering which activities aligned best with their profiles. The outcome of this session was a comprehensive list of stakeholders to be approached for involvement, specifically targeting those who could actively contribute to the Living Lab initiatives within the project.

4.2 Part 1: Sustainable Feeding program Design

LL A2. Sustainable Feeding program Design: Interviews with local experts

Objectives of the LL activity:
To elaborate an optimal, realistic and extensive list of possible by-products, local ingredients, etc., to be included in the alternative nutritional diet to be developed in the project.

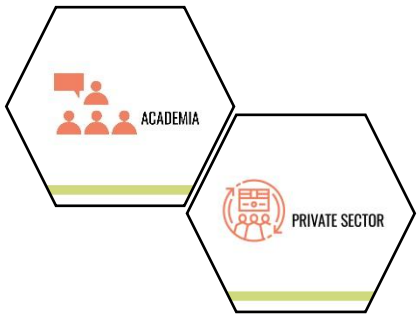
Task related:
Task 2.1

Actors involved in the LL activities:
Professionals and experts in animal feed from academia and private sector

Location:
Online/ Stakeholders' premises

Duration:
30 minutes to one hour per interview

Tools:
Semi-structured Interviews, survey, focus groups.



Timing:
Project months 4-7 (July-October 2021)

Involved Partners:
ALIA; ISA-CM; UMU; EGE; UNITO

Description of the activity:
This first set of Living Lab Activities had the main objective of improving the list of possible by-products, local ingredients, etc., to be included in the alternative nutritional diet to be developed in the project.

The expertise and experience in the field of the persons who participated in the semi-structured interview was thought in order to extract new insights to be included in the formula and to confirm or change the initial ideas.
For the development of the activity, common guidelines were developed for all the partners in order to have relevant results from the different countries and to study the suggestions in a similar format. In addition, a preliminary list of by-products and ingredients was developed by each partner

Participants by country

Spain
- 7 semi-structured interviews (private sector and academia)

Turkey
- 8 semi-structured interviews (academia and private sector)
- 1 focus group meeting (feed manufacturers associations): 17 members.

Tunisia
- 5 semi-structured interviews.
- 6 surveys.
- 1 focus group: 5 participants(private sector, public organism and academia involved)

Italy
- 3 semi-structured interviews.

Figure 13. LLA2 developed per country

Actors involved:

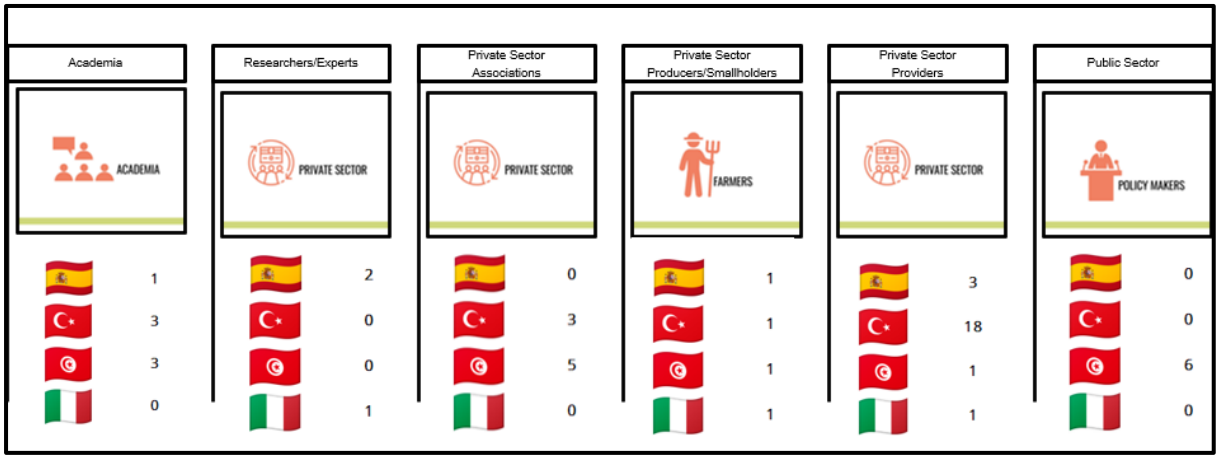


Figure 14. Type of stakeholders engaged per pilot country LLA2

Key findings:

Quality of the Diet

One of the major challenges identified in the feeding program was the inclusion of alternative protein sources, particularly due to the fibre content in many ingredients. To improve nutrient digestibility, the use of enzymes and additives was suggested, with the potential to reduce soybean usage by up to 30%. The inclusion of synthetic amino acids, particularly for lysine and methionine, could help adjust the amino acid profile of the diet. Additionally, phytobiotics (such as onion, garlic, moringa, and basil) were recommended to promote chicken health, especially in alternative farming systems. The focus on slow-growing broilers was emphasized, as these birds have lower nutritional requirements, making them more adaptable to free-range systems and potentially producing higher-quality carcasses. Regional R&D studies were noted as crucial for making alternative ingredients more sustainable, stable, and easy to use. Moreover, the need to update data on the nutritional value of local ingredients was highlighted for better diet formulation.

Reduction in the Use of Soybean

The high dependence on soybean and basic cereals remains a challenge, with economic constraints and a competitive market being major limiting factors. While there may not be a complete alternative to soybean, even partial substitution is seen as valuable. Participants suggested using certified or national soybean to reduce environmental impacts, although availability remains limited. Finding alternatives that minimize raw material costs and ensure sustainability was also identified as crucial for the project's success.

Use of By-Products

Participants noted that the price and variability of by-products could limit their use, but they agreed that regional by-products and local feed crops could improve sustainability. The availability of these by-products in sufficient quantities, ideally for at least six months, and at a reasonable cost, is essential. The high moisture content of many by-products, such as bread or crackers, raises concerns about drying costs, although they could be processed into feed after proper analysis. Some participants also proposed using animal by-products, if regulations allow, as valuable alternative ingredients.

Other Alternative Ingredients

Local raw materials were considered key to reducing costs and increasing sustainability, though it was acknowledged that they may not always match the nutritional value of soybean. Alternative ingredients such as fava beans, barley, and triticale showed promise but were limited by their availability. Non-standard sizes of rice and bulgur were also identified as possible alternatives to standard ingredients.

Sustainability

Sustainability in alternative poultry farming was identified as a priority, with a focus on improving animal welfare and reducing environmental impacts. Moving towards shorter production cycles, local synergies, and regional solutions was seen as essential for long-term sustainability. Incorporating circular economy principles into farming systems was emphasized, ensuring that sustainable feed resources and reproducible farming techniques could be adopted by small and medium-sized farmers, particularly in rural communities. Additionally, national development strategies must consider environmental constraints, such as global warming and water scarcity, to drive sustainable practices in the poultry sector.

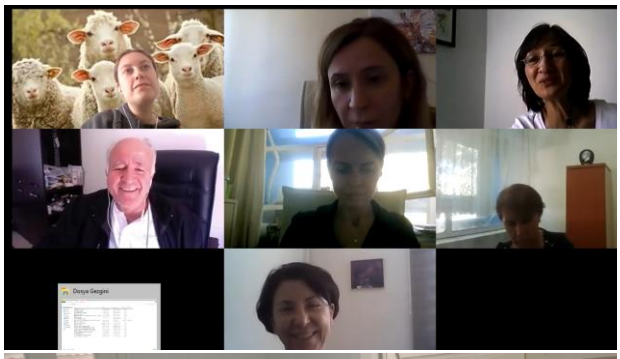
Profitability
To make the sustainable feeding program competitive, the cost of the diet must remain reasonable. It was important to balance the need for sustainability with the goal of making products affordable for consumers, avoiding excessively high costs that could limit market uptake.

Insects
While not within the scope of the activity, many participants highlighted the potential of insects as a valuable alternative protein source. They noted that legislative challenges related to the use of insects in poultry feed must be addressed in various territories. Overall, the SUSTAvianFEED approach of integrating insects into animal feeding was viewed as an innovative and inspiring development for the sector.

Table 3. By-products and ingredients suggested by the involved actors

SPAIN			
Ingredients		By-products	
Pig mucosa	Omega3 ingredients	Olive by-product	
Corn gluten meal	Brewer's yeast		
Rice	Synthetic additives beyond lysine and methionine in order to balance and reduce soybean content		
Oatmeal	Single cell protein		
Carob flour	Meat meal		
Purslane	Aquatic protein		
Camelina oil			
ITALY			
Ingredients		By-products	
Meat meal	Corn gluten	Wheat bran	
Sunflower meal	Wheat gluten	Crushed rapeseed seeds	
Broken rice	Fish meal	Bakery by-products	
Alfalfa protein concentrate	Processed Animal Proteins (PAP) from pigs		
Pea			
TURKEY			
Ingredients		By-products	
Safflower meal	Lupin	Dry brewer residue	Bread left unsold in the bakery
Camelina meal	Egg-processing by-products	Olive mill waste	Egg-processing by-products
Rapeseed (canola) meal	Rendering products	Dairy waste	

Sunflower meal	Rice, bulgur	Tomato processing waste	
Algae	Crackers, biscuits, chips just before expiration date	Black cumin (*Nigella sativa*) seed meal	
TUNISIA			
Ingredients		By-products	
Dried brewing grains	Millet	Chopped vegetable crops waste	
Dried tomato pulp	Triticale	Chopped wholesale and local markets (vegetables, fruits and fish) waste	
Dried citrus pulp	Oat	Organic household waste.	
Peas	Full fat extruded soy	Synthetic amino acids beyond lysine and methionine to balance and reduce soybean content	
Lentils	Expeller soy	Milling by-products	
Vetch (*Vicia narbonensis*)	Sunflower meal	Poultry slaughterhouse by-product	
Prickly pears	Insects' meal		
Medicago arborerea and creeping Medicago	Fish meal		
Lupine	Algae (e.g., Spirulina)		
flax	Azolla		
Rye			



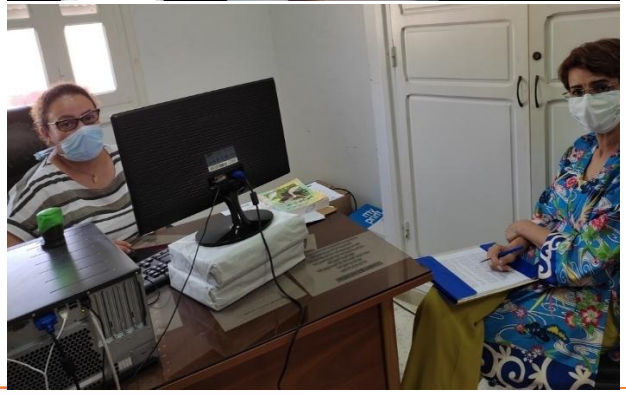


Figure 15. Stakeholders involved in LL A2

Conclusions:
In summary, the participatory activities showed that there is room for the sustainability improvement through the elaboration of alternative diets with some limiting factors due to market competitiveness, products availability and legislation issues. More details can be found in DLV 2.1.

LL A3. Sustainable Feeding program Design: Interviews with providers, Analysis of insects' farming in each territory

Objectives of the LL activity:
To detect and analyse the potential to produce different insects in each area (possible feedstock, connection with other areas, insect feedstock sources and place of consumption of the waste).

Task related:
This LL activity is directly connected to Task. 2.2

Actors involved in the LL activities:
Entomo along with the partners of each region identified relevant actors of their regions. The actors are Insect-based protein producers, Providers, Members of the supply chain (insect feedstock sources), Etc.

Table 4. Participants in LLA3

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	0	0	0
Researchers/experts	0	0	0	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	1	1	1	1
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Online/ Stakeholders' premises.

Duration:
30 minutes to one hour per interview.

Key themes:
Potential to produce different insects in each area (possible feedstock, connection with other areas, insect feedstock sources and place of consumption of the waste).

Tools:
Semi-structured Interviews.

Timing:
Project months 8-12 (December 2021-March 2022).

Involved Partners:
ENTOMO (collaboration with EGE, UNITO and ISA-CM).

Key findings:
The key findings from LLA3 highlight significant challenges and opportunities related to the use of insects as an alternative protein source for poultry feed in project regions. In Turkey, there is no current legislation on the rearing of Black Soldier Fly (BSF) larvae, which makes it difficult to establish insect farms. Additionally, the high selling price of larvae is a barrier to widespread adoption. Despite these challenges, the poultry industry, particularly small producers, is open to using insect protein as an alternative to soybean and fishmeal, which have become costly. Local supermarkets are also actively involved in supplying the feedstock needed for larvae production, indicating a growing interest in sustainable feed options.
In Italy, the insect market is still in its early stages, with a few farms focusing on rearing crickets and Tenebrio molitor primarily for the pet food industry. While the insect protein market is currently limited and prices remain high, there has been ongoing research for over a decade on the use of Tenebrio molitor and BSF larvae in animal feed for poultry, fish, and pigs. However, there is little governmental support for the insect rearing industry, and a lack of adequate rearing facilities for BSF larvae means there is no established market. This presents an opportunity for new enterprises to enter the market and fill this gap.
In Tunisia, the absence of specific legislation on insect rearing means that practices are guided by EU regulations. Currently, the only approved animal protein source is fishmeal, which restricts the use of alternative proteins. While establishing an insect farm is possible, it may take considerable time to receive approval, given the strict regulation of animal proteins. Insect meal prices are aligned with EU market rates, ranging from 2 to 4 euros per kilo, with the primary use of insect meal being for pet food. Despite these barriers, there is potential for insect protein to be used in free-range, eco-chicken production, offering a sustainable alternative in the poultry industry.

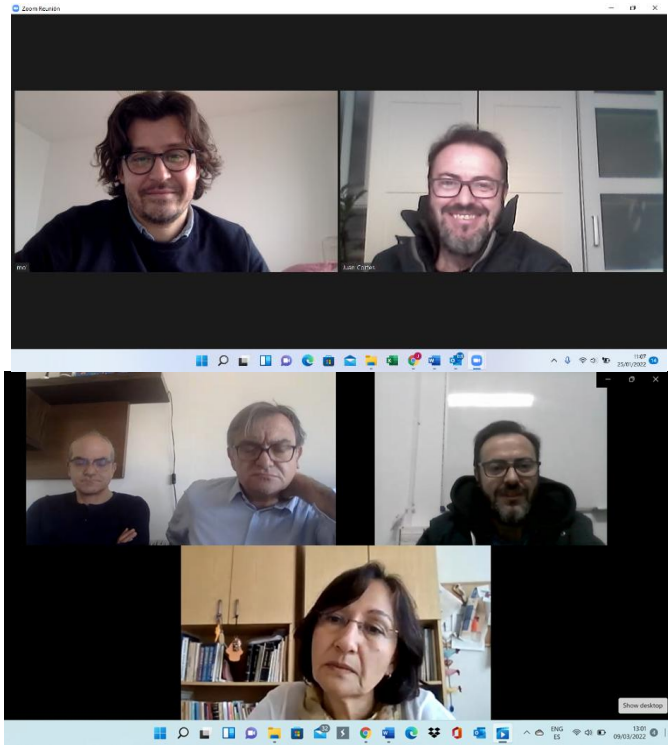


Figure 16. Stakeholders involved in LLA3

Conclusions:
The findings from LL A3 highlight both opportunities and challenges in using insects as an alternative protein source in poultry feed. In Turkey, the lack of legislation on rearing Black Soldier Fly (BSF) larvae and the high cost of larvae present significant barriers. Despite these issues, small poultry producers are open to using insect protein as a substitute for soybean and fishmeal, with local supermarkets becoming involved in larvae feedstock supply. In Italy, the insect protein market is still emerging, with limited production of crickets and Tenebrio molitor for pet food. While government support is lacking, there is potential for new businesses to develop this market. In Tunisia, insect rearing is not yet regulated but is guided by EU standards, with fishmeal being the only approved animal protein. Although the approval process for insect farms is slow, there is potential for insect protein in free-range poultry production, offering a sustainable alternative.

LL A4. Sustainable Feeding program Design: Workshop/Focus Group for farmers validation on the feed program combined with
LL A5. Sustainable Feeding program Design: Interviews with farmers for validation on the feed program

Objectives of the LL activity:
1) To Collect information about attitudes, values, and preferences of the farmers and consumers towards poultry feed sources.

2) To discuss and rank possible feeding options.
3) To consult the acceptance of the farmers on sustainable feeding.

Task related:
Task. 2.1

Actors involved in the LL activities:
Farmers

Location:
Online/ Stakeholders' premises.

Developed activities:
1.Semi-structured interviews using questionnaire
2. Focus groups/workshops

Duration:
30 minutes to one hour per interview, 2 hours in case of focus groups.

Tools:
Questionnaire, Mentimeter, Google Forms.

Timing:
Project months 10-13 (January-April 2022).

Involved Partners:
ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA

Description of the activity:
Individual Semi-Structured Interviews (all) and focus group (Turkey). The semi-structured interview meetings were planned to evaluate the standard and sustainable diets, and to reveal the interviewees' attitudes, preferences towards ingredients, and their acceptance of alternative sustainable diet formulations, drawing on their expertise and experience.
The first preliminary diets were shared with the participants.
The farmers, experts and feed producers who decided to participate in this interview were asked two open questions in which they could express their thoughts on this topic, and questions in which they had to give a value on a scale from 1 to 5 based on their opinion.
The main topics addressed were:

- Producers' opinion on reduction in the soybean meal in the diet and awareness about imported soybean
- Producers' opinion on 1) specific local ingredients and by-products and on 2) introduction of insects into the diets of chickens
- Producers' opinions on the consumers' acceptance regarding the introduction of insects in chickens' diets
- Producers' willingness to use the designed Sustainable Diets (No 1 and 2) and concerns that might prevent producers from using each sustainable diet
- Producers' expectations regarding the environmental impact of each sustainable diet and their interest in the reduction of LCA values by these sustainable diets.

- Opinions of producers regarding the reflection of environmentally friendly diets on broiler meat, eggs and diet prices.
- Intention to pay more for these hypothetic more sustainable diets.
- Opinion about proximate environmental impact reduction related to the use of more sustainable diets.

Spain

•4 Semi-structured interviews (Farmers and providers)

Turkey

•8 semi-structured interviews (Experts, farmers and providers)

Tunisia

•22 semi-structured interviews (Farmers and providers)
•1 Focus Group (5 farmers)

Italy

•7 semi-structured interviews (Farmers)

Figure 17. LLA4&5 developed per country

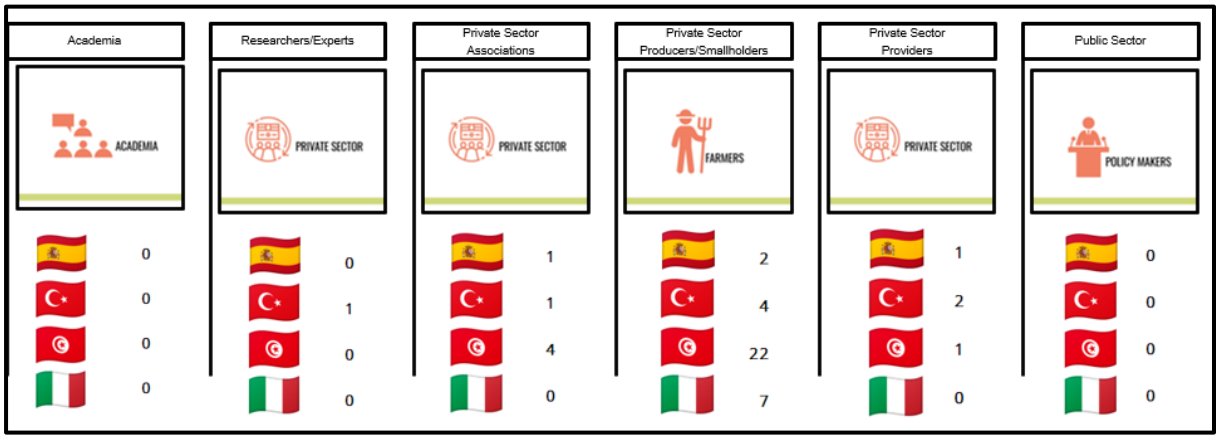


Figure 18. Type of stakeholders engaged per pilot country LLA4&5

Key findings:
The different activities resulted in relevant and interesting key findings which were classified in different topics

Quality of the diet

The main conclusions classified by partners regarding the quality of the alternative diets are explained in Figure 19.

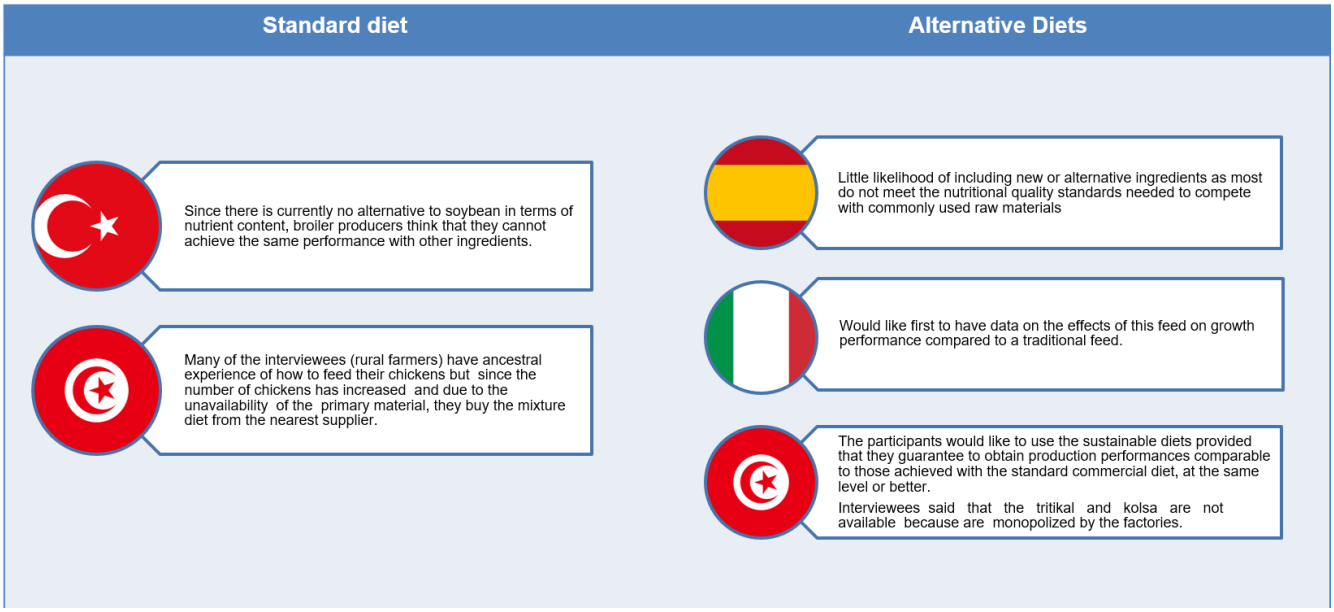


Figure 19. Quality of the diet key findings

Reduction of the use of soybean/imported cereals

The reduction of imported ingredients, especially soybean, has been another important topic addressed. Figure 20 lists the main conclusions obtained from this topic.

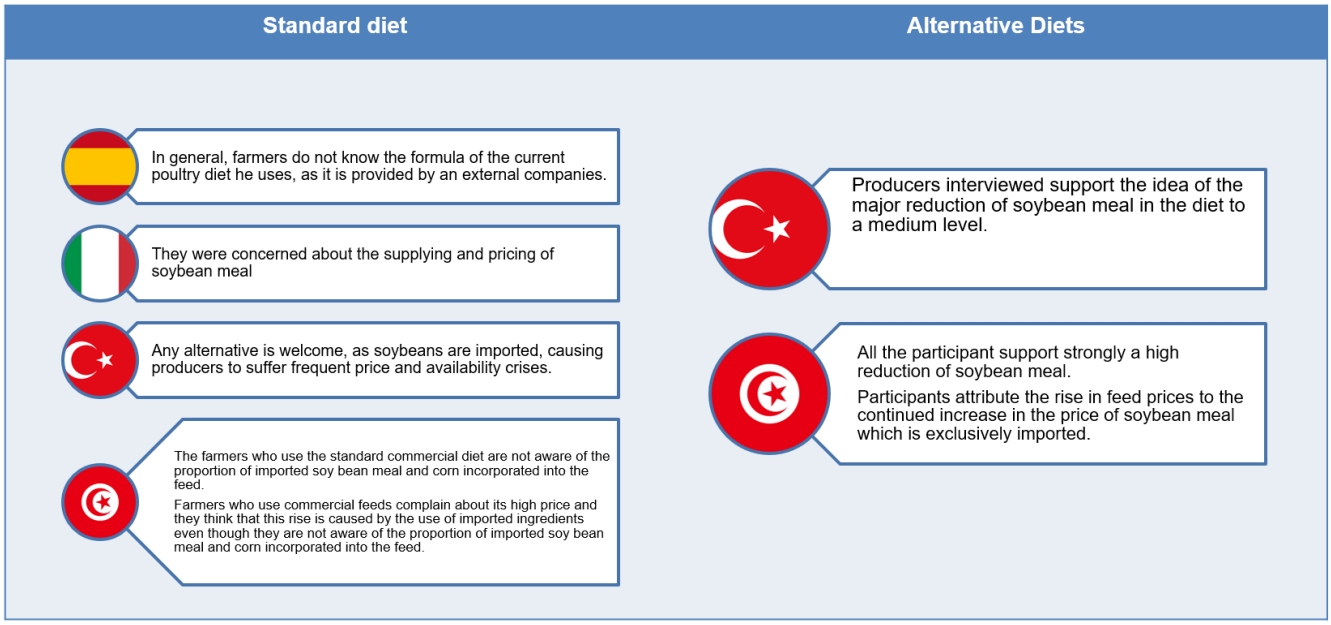


Figure 20. Reduction of the use of soybean/imported cereals key findings

Alternative ingredients and by-products

When discussing about the alternative ingredients and by-products that the alternative diets included, there were new suggestions for adding new ingredients un many occasions. In addition, some other comments were added as it is shown in Figure 21.

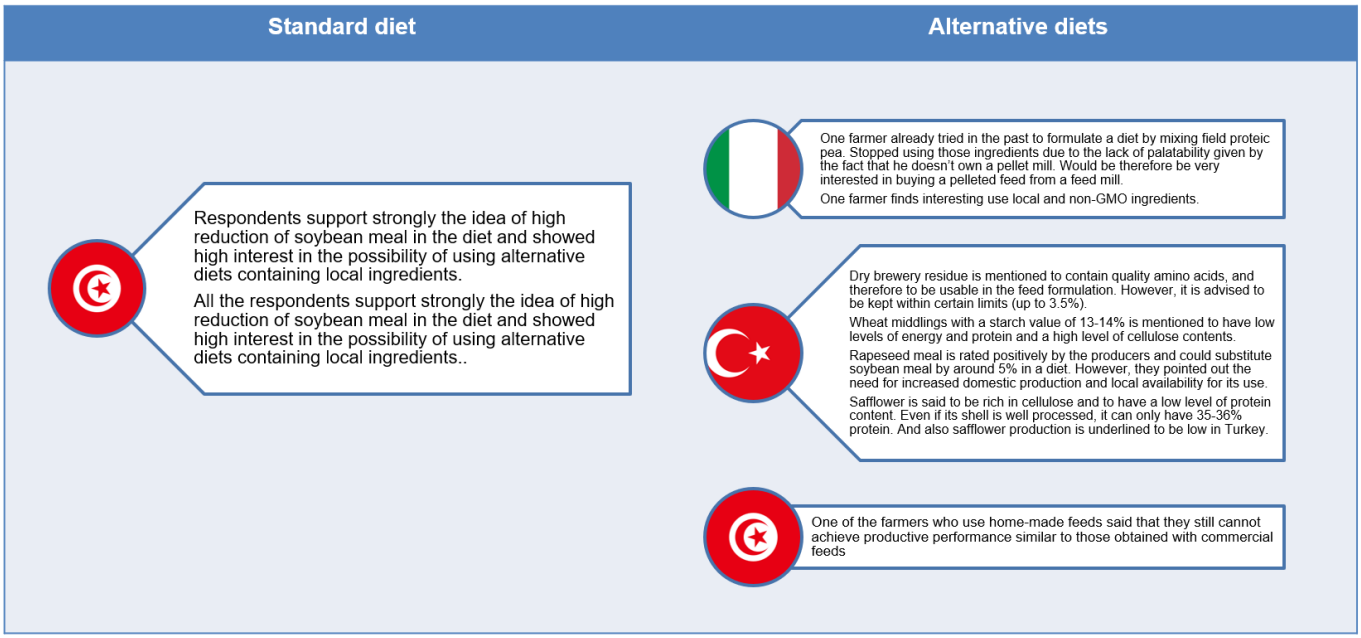


Figure 21. Alternative ingredients and by-products key findings

Sustainability

The sustainability is without any doubt the main pillar of the project. In that sense, it is also important to know the environmental concern of farmers and other stakeholders in this aspect. The main feedback obtained is explained in Figure 22.

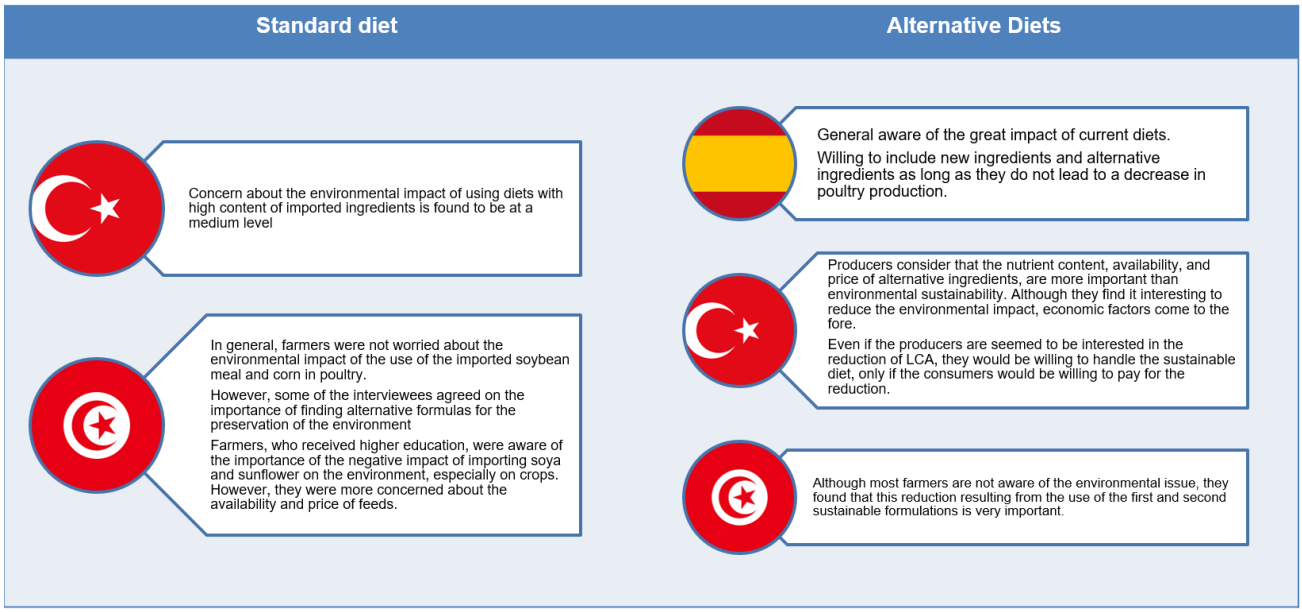


Figure 22. Sustainability key findings

Cost/Profitability

The profitability is, in many occasions, a critical point for the farmers and other actors of the supply chain. The loss of competitiveness or the no willingness of the consumers of paying more for sustainable products are some of the most important aspects mentioned. The summary of all of them is included in Figure 23.

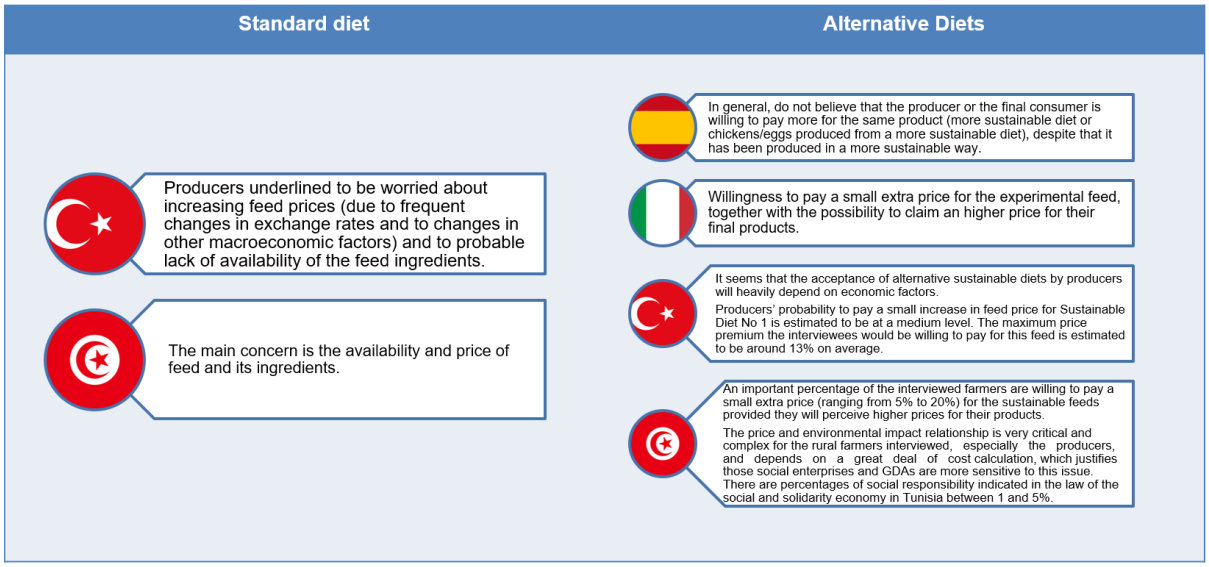


Figure 23. Cost/Profitability key findings

Use of insects

The use of insects, one of the most important innovations of SUSTAvianFEED approach, has attracted a lot of interest from the participants because of the possibilities its use arises. Some of the key aspects mentioned about them are listed in Figure 24.

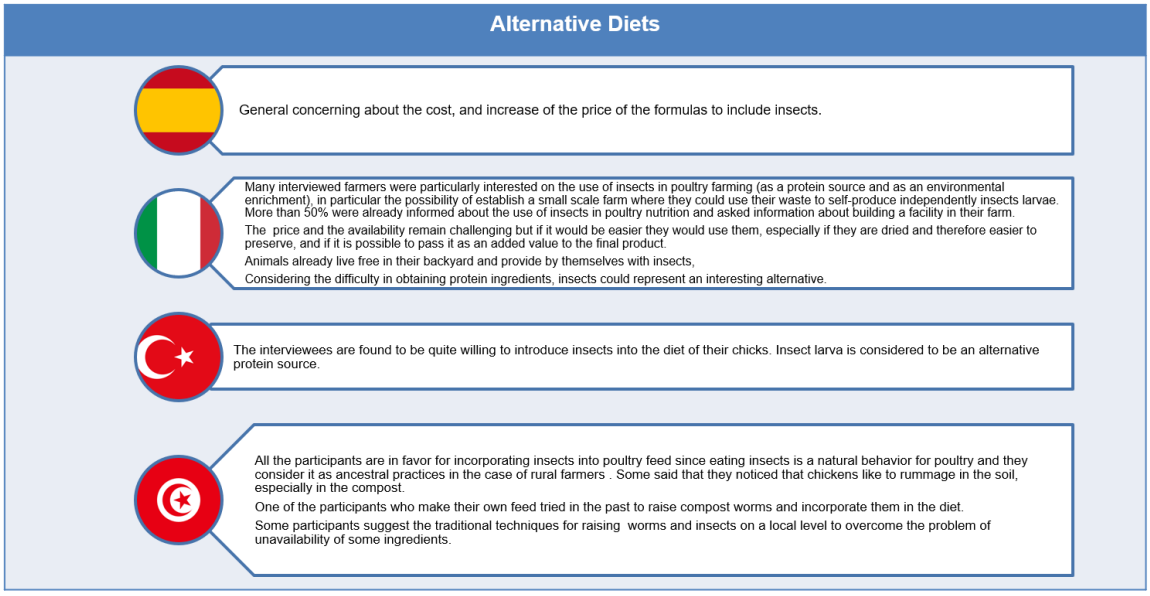


Figure 24. Use of insect's key findings

In addition, other key findings had more general comments and are listed below:

Consumers on price and sustainability
In terms of consumer behaviour, there was a general agreement that if the environmental benefits of using sustainable feed increase the cost of poultry, it could be reflected in the price of the meat. Some consumers, particularly in Turkey, might be willing to pay a premium for more environmentally friendly products, especially if the environmental benefits are clearly communicated. However, in both Turkey and Spain, most interviewees believed that only a small group of consumers (about 3-10%) would be willing to pay extra, and that demand would depend largely on how the product is presented. In Spain, many participants felt that consumers are not yet well-informed enough to understand and accept a price increase resulting from alternative feed ingredients, and that the majority of consumers do not pay attention to product labels or quality seals.

Consumers on the use of insects
Regarding consumer acceptance of insect larvae in poultry feed, Turkey and Tunisia showed similar sentiments. In Turkey, producers felt that consumer acceptance would not be a significant issue, with most agreeing that promotional efforts would play a key role in shaping consumer perceptions. Tunisia echoed this, with farmers not overly concerned about consumer resistance to insects in poultry diets, focusing more on price and quality rather than the composition of the feed. However, some Tunisian farmers suggested that awareness campaigns would be necessary to convince consumers who are hesitant to buy poultry products fed with insects.

Key obstacles

- Alternative ingredients and by-products

Several obstacles were identified regarding the use of alternative ingredients and by-products. Ingredients like sunflower meals and wheat middlings are already used in low quantities, but there are concerns about their efficiency, particularly due to slow growth rates and digestibility issues linked to their high cellulose content. The availability of sunflower meals with higher protein content was also limited, making it challenging for producers to rely on this ingredient.

- Use of Insects

On the other hand, insect protein faced barriers due to legislative restrictions in Turkey, where the Helal labelling prohibited its use in products intended for export to Muslim-majority countries. Additionally, economic concerns such as the high costs and limited availability of insect protein were major obstacles across Turkey, Spain, and Italy, restricting its use in poultry feed.

In the last stage of the interviews, several questions were made to the participants in order to quantify some of the discussed aspects.
When participants were asked about environmental awareness regarding diets with high levels of imported ingredients, Spain and Italy showed higher levels of awareness than Tunisia and Turkey, with socioeconomic factors playing a significant role in these perceptions. There was also a consensus on the need to reduce soybean use and introduce insects into poultry diets to promote sustainability in the farming sector. However, despite support for these changes, participants were sceptical about consumers' willingness to pay more for products from alternative diets, especially considering the price sensitivity of most consumers, particularly in

lower socioeconomic groups. Farmers were more likely to accept an increase in feed prices, whereas consumer acceptance of insects in poultry diets seemed less likely, at least in the near term.

Regarding the interest in proposed alternative diets, Italy and Spain expressed the most enthusiasm, followed by Turkey, which showed moderate interest. Tunisia, although showing some interest, was comparatively less eager to incorporate these diets into their projects. However, all regions indicated at least a moderate level of interest in the adoption of these alternatives, suggesting a positive trend towards sustainability in poultry farming across the project regions.

Conclusions:
In summary, the reduction of import dependency, the animal welfare, the valorisation of traditional techniques, the insects' potential for a sustainable diet development and the key obstacle about the price are the most important aspects for its consideration. Most important remarks of the activities are included in Figure 25.

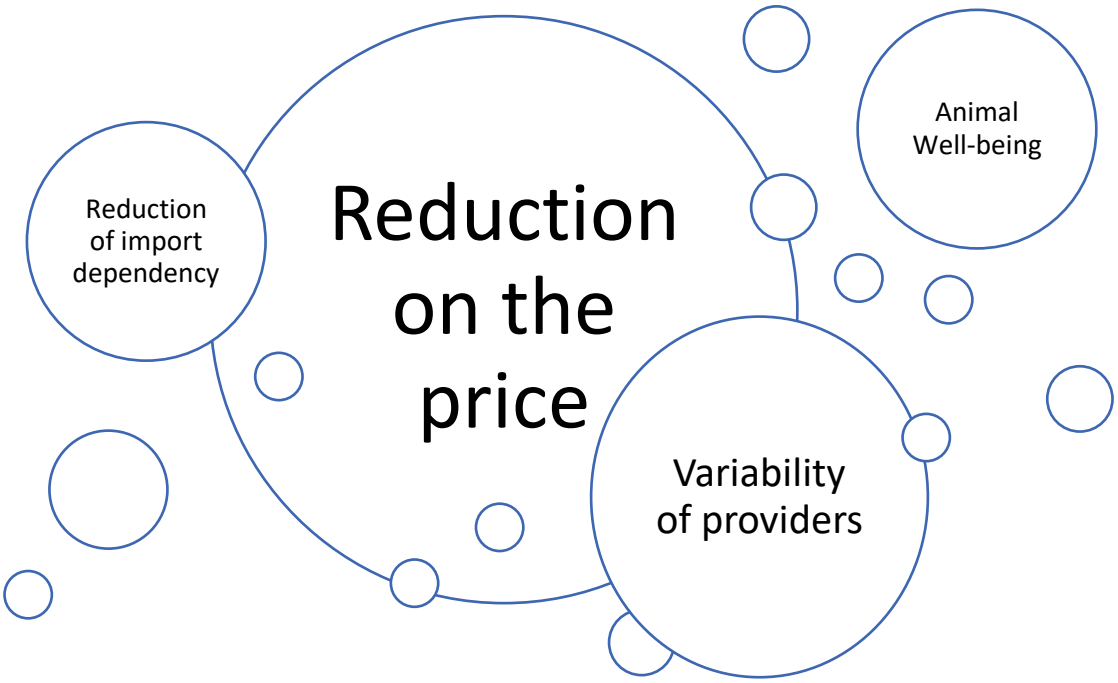


Figure 25. Most important remarks of the activities

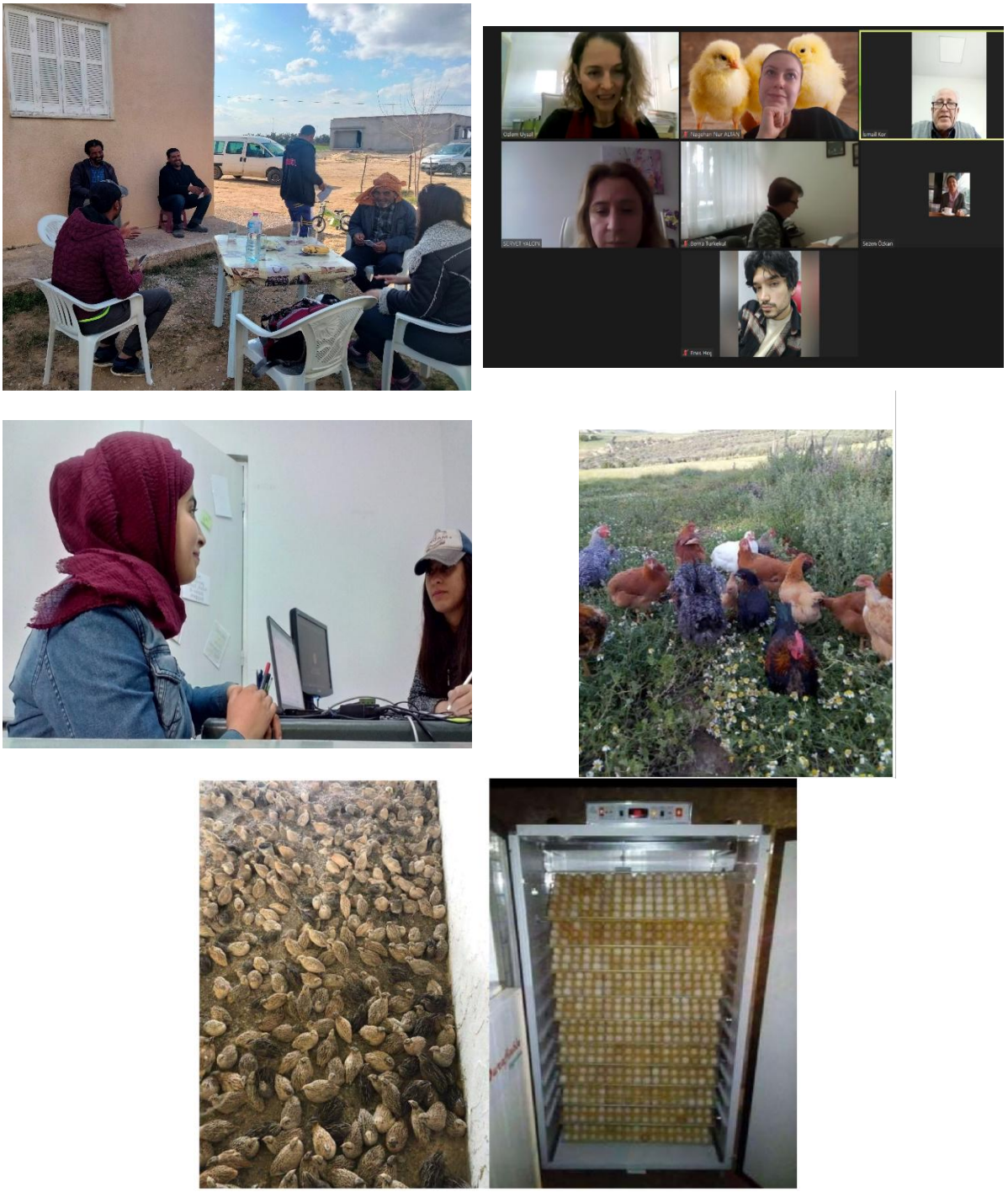


Figure 26. Stakeholders involved in LL A4-A5

LL A6. Co-creation of the SUSTAvianFEED Pilots: Open Innovation Camp/Co-creation workshop/event/meeting/focus groups *- Design of the SUSTAvianFEED Pilots

Objectives of the LL activity:

- To share the objectives and methods of the pilots with relevant stakeholders.
- To detect interesting hypotheses to be tested during pilots.

• To evaluate the relevance for the stakeholders of the KPI of the project.

Task related:

Task 3.2 Implementation of pilot activities

Actors involved in the LL activity:
Experts. Public organisms. Livestock associations. Providers. Universities.
It is expected that participants have appropriate knowledge in the field.
This is an opportunity to present the pilot to relevant decision-makers. Stakeholders that participated in past activities are also welcome.
The recommended number of participants is at least five.

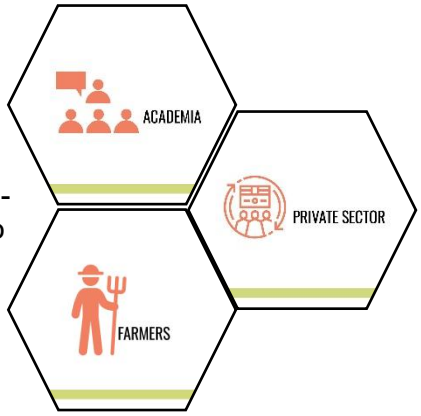


Table 5. Participants in LLA6

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	6	2	1
Researchers/experts	2	3	0	2
Private sector. Associations	0	1	0	0
Private sector. Smallholders and producers	1	0	1	0
Private sector. Providers	3	1	2	1
Public Sector	0	0	5	1
Consumers	0	0	0	0

Location:
Online / conference room / Partners' premises

Developed activities:
Focus groups/workshops

Tools:
Questions, Ranking, Test Cards

Duration:
Two hours. The duration may vary depending on the number of participants.

Timing:
Project months 14-16 (May-July 2022).

Involved Partners:
ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA

Description of the activity:

The objective of this activity was to promote, through meetings with professionals in poultry sector (veterinarians, nutrition experts, poultry department leaders, etc.), conversations, dialogue, and inclusion of new ideas for the implementation of the pilots. Thus, several points of view will be put into perspective, which may or may not rethink or inspire certain aspects or even change the design or development of the pilots. In this way, emphasizing the fundamental concepts and objectives of the project, the partners expected to obtain valuable information and different points of view that can be applied.
The first step of the activity was a short presentation about the project's ambition and expected results to put the public in context.
The content of this presentation covered the following topics:

1. Project overview
2. Project Consortium
3. Objectives
4. Key Performance indicators
5. Description of the pilots

The workshop included three activities with participants, to be carried out after the presentation, once the public had enough information to give their opinion.

First activity: I like/I Wish
Consist on asking the participants to share at least one aspect they evaluate positively and one aspect they would like to be improved or to be included during the experiment.
For this purpose, tools such as Mentimeter, Google Forms, etc. were used to carry out the activity in real-time.

Table 6. Table utilized for LLA6 fist activity

What I Like…	What I Wish…

Second activity: KPI Quadrant
Consist on asking the participants to determine the level of interest and influence of the main KPI of the project. For each KPI:

1. What is the level of interest in this KPI? Rank 1 to 5, where 1 is low and 5 is high.
2. What level of influence do you think this KPI has on the results of the project? Rank 1 to 5, where 1 is low and 5 is high.

Table 7. Table utilized for LLA6 second activity

KPI	Interest (From 1 to 5)	Influence (From 1 to 5)
KPI 1: **reduction of** GHGs emissions per kg of poultry**. LCA methods will be used to quantify this indicator.**		

KPI	Interest (From 1 to 5)	Influence (From 1 to 5)
KPI 2: **Reduction the** imported **ingredients.**		
KPI 3: **number of** local adapted breed **or strain included in pilot activities.**		
KPI 4: **Reduction of** poultry feeding production cost **and reduction of cost of production in the whole value chain process for each pilot.**		
KPI 5: **Number of** synergies **established in the project areas with local farmers.**		
KPI 6: **Number of smallholders directly engaged in the dissemination and replication activities.**		
KPI 7: **number of** rural women **engaged in pilot project activities.**		

Third activity

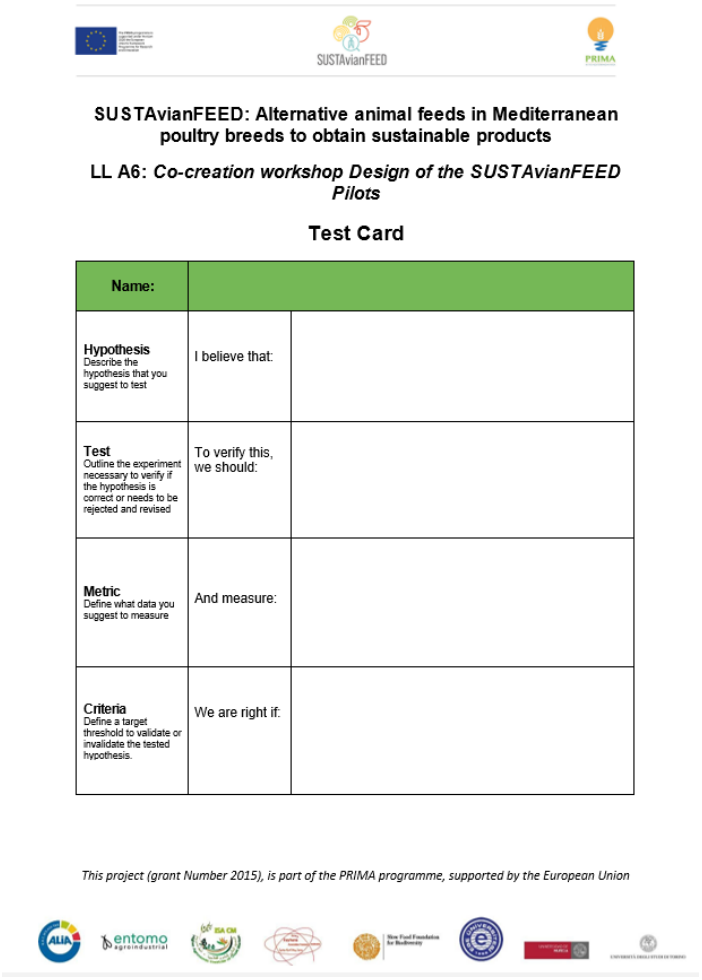
Consisted on asking the participants to elaborate on their own hypothesis/parameters for the pilot.

They had time to structure one hypothesis about the main tasks to be carried out in SUSTAvianFEED Pilots:

- Implementation of pilot activities
- Animal welfare and animal health evaluation
- Product quality and productive traits of bird's evaluation
- Environmental evaluation of pilot activities
- Economic evaluation of pilot activities
- Social evaluation of pilot activities

They were asked to fill the test card, including the following aspects: 1. Description of the idea/hypothesis/assumption; 2. Description of the test/experiment; 3. A way of measuring the result, is the hypothesis valid or invalid? And 4. Set a target threshold.

Only one card per participant was mandatory, but they could complete more than one.



SUSTAvianFEED: Alternative animal feeds in Mediterranean poultry breeds to obtain sustainable products

LL A6: *Co-creation workshop Design of the SUSTAvianFEED Pilots*

Test Card

Name:		
Hypothesis Describe the hypothesis that you suggest to test	I believe that:	
Test Outline the experiment necessary to verify if the hypothesis is correct or needs to be rejected and revised	To verify this, we should:	
Metric Define what data you suggest to measure	And measure:	
Criteria Define a target threshold to validate or invalidate the tested hypothesis.	We are right if:	

This project (grant Number 2015), is part of the PRIMA programme, supported by the European Union

Figure 27. Template test card used for proposed hypothesis for the pilots

Key findings:
Regarding the activity I like, I wish, the interventions of the participants are summarized in Table 8.

Table 8. Summary of participants ideas I like, I wish of SUSTAvianFEED pilots

	What I Like…	What I Wish…
Italy	• The attention paid to the indigenous breeds • The total replacement of soybean meal with other protein sources • The replacement of protein raw materials from plants to animals • The study of alternative protein sources	• A greater attention to the economic component • The socio-economic growth of small producers • That it will be done at a national level • The administration of live larvae • To investigate the effect of different diets on egg quality
Spain	• The goal of adopting a circular economy approach using domestically sourced by-products to reduce imported ingredients, lower carbon footprint, and enhance local productivity, benefiting women in the production chain. • Alternatives to standard production, focusing on local strains and lower dependence on international market prices, with an emphasis on including women in the final production. • The use of native breeds and sustainable raw materials, promoting social aspects like gender equality and empowering women. • Focus on how diets contribute to reducing environmental impact and supporting mixed crop-livestock systems. • Inclusion of alternative ingredients to reduce environmental impact.	• Consider the effect of heat stress on birds in Mediterranean climates, particularly regarding genetic breeds, feeding strategies, and facilities. • Ensure experimental designs are based on prior observation of animal behaviour with different diets and ingredients, adjusting for deficiencies or excesses. • Define the biological value and standardized digestibility of amino acids in raw materials and establish feed formats based on local crops. • Analyse litter from the three production systems to determine nitrogen rates for potential use in agricultural fertilization programs. • Evaluate litter after the experiment for inclusion in fertilization programs.
Turkey	• The use of insect larvae as feed raw material is quite remarkable and important. • The use of local resources • The support of local economy and producers, contribution to rural development. • The evaluation of the environmental impact and economic sustainability	• Efforts for improving the legislation for use of insect larvae in animal nutrition. • More genotypes i.e. males from egg-type chickens could be tested. • In order to support small producers in Turkey, the problem of boutique slaughterhouses in chicken and other poultry species must be resolved in the legislation. • If the project period allows the cultivation of various feeds in rotation, feed cultivation could also be added to this project.

	What I Like…	What I Wish…
Tunisia	• Pilot implementation (scientific basis) • Quality products analysis aspect • Environmental et socioeconomical aspects • The substitution of imported products and insect incorporation in the diets	• Increase the number of rural women participating in the pilot implementation and dissemination of experimental protocol in other governorates other than Sousse to have reliable results. • Try to use different types of insects and the possibility of using a mixed population of chickens. • Have technical-economic sheets and/or leaflets on the use of insects in poultry feed. • Integrate artificial intelligence in the monitoring of KPIs • Integrate the cultural and educational level in the monitoring of KPIs. • More experimental analyses, health status evaluation protocol well studied, technical and economic study well designed. • Reduce the density of animals at the level of the experimental station, increase the number of Replications/diets, resemble as much as possible the conditions of rural terrain. • Pay more attention for marketing which is a pure risk. • Integrate local legumes seeds resistant to water stress e.g. • *Vicia narbonensis L*.

Regarding the Hypothesis developed using test cards, the ideas share by the participants and proposed ways to test them are showed in the following Table 9.

Table 9. Hypothesis share by participants using test cards

Participant	Hypothesis	Test	Metric	Criteria
Participant 1- Italy	Zootechnical and economic sustainability	Raise broilers of indigenous breeds and check zootechnical and economic parameters	Zootechnical yield, organoleptic quality and cost kg / meat	Somehow to evaluate the costs and yields of current chickens
Participant 2- Italy	I am not able, not knowing the project in depth, to propose hypotheses to be verified	I am not able, not knowing the project in depth, to propose hypotheses to be verified	I am not able, not knowing the project in depth, to propose hypotheses to be verified	I am not able, not knowing the project in depth, to propose hypotheses to be verified
Participant 3- Italy	I believe that local slow-growing animals can better utilize alternative ingredients	Comparisons of standard diet with insects	Performance	Feed conversion ratio
Participant 4- Italy	Implication on animal welfare	Production tests	Growth curve - egg production	The response obtained is equal to or greater than the data of the traditional method
Participant 5- Italy	It would be important to find analytical tools to enhance the productions of the local breeds	Apply innovative analytical technologies for the chemical-nutritional characterization of productions	I believe that the goal could be the identification of a new biomarker	We identify new markers / parameters that allow the traceability and certification of the product
Participant 1- Spain	The use of insect meal can eliminate or decrease the amount of soybean meal used in feed.	To carry out tests with several groups, starting with a standard diet with soybean and comparing it with others where the amount of soybean is decreased, and the amount of insect is increased until reaching a diet without soybean and only with insect meal. The diets will be	Production data: -Feed consumption -kg of meat or egg produced -Conversion rates -Cost per kg produced -Sanitary status	We obtained better or at least similar indexes with diets with insect meal and without or with less soybean. We could conclude that if we do not do without, we could reduce the use of soybean meal (imported product, external dependence, deforestation, transportation costs, etc).

Participant	Hypothesis	Test	Metric	Criteria
		supplemented with synthetic amino acids to make them equivalent.		
Participant 2-Spain H1	The new diets may be less digestible and therefore more excrement, translatable into greenhouse gases, but that if the calculation includes the impact by accounting for the impact of the origin of the raw materials, it could be higher.	Quantify separately the emissions dependent on the animal and diet from those dependent on the origin of their production and those related to their transport.	Volume and composition of waste, carbon footprint of raw material production and transport footprint, taking into account that the origin of the protein is mainly the American continent, and of the energy, America and Europe.	Obtain differences of at least 3% of emissions.
Participant 2-Spain H2	Dependence on global markets and quotations can be reduced. Protein sources have long been limited to soybeans, almost exclusively from the U.S. market.	In the design of diets, to maximize the use of those raw materials and by-products that require less transport (from local markets): by-products of the vegetable and animal canning industry, also in cereals (cassava, millet, bakery waste, etc.).	Study of variability in alternative raw materials, of the sanitary risks they may entail as well as the means to reduce them (physicochemical treatments, via feed or water). Elaboration of formulation profiles containing alternative raw materials.	That the cost of production/kg egg is lower over the productive life of the animal, considering different scenarios in the price of raw materials.
Participant 2-Spain H3	Hybridization of local breeds with well-defined strains will improve production efficiency in the absence of control systems over environmental factors relative to current	To carry out crossbreeding in advance, with local strains that are sufficiently well defined genetically and that do not involve a loss of the original breed.	Data-logger of temperature and humidity; recording of productive parameters.	That the total egg laying (in kgs of eggs) of the hybrid batch is 3% higher than the other two during its productive life, which for selected strains is currently 2 years.

Participant	Hypothesis	Test	Metric	Criteria
	commercial strains and local breeds (without hybridization).			
Participant 3-Spain	The animal welfare of the hens in this project could be a determining factor in the profitability of the project; animal welfare reduces costs.	Animal welfare and health and welfare assessment. Although there is a greater awareness of the need to improve animal welfare in the productive stage, it should be noted that, although it is only for a short period of time, these animals are in a production system from birth, so it is important that at least during this time they remain in an acceptable form. Each stage should be defined and classified: Breeding stage 4 weeks. Rearing 4-16 weeks. Pre-laying 17 weeks to laying. Laying 19-20 weeks to 72 weeks.	**<u>Animal welfare indicators</u>** **Physiological indicators:** 1)Hormone levels: cortisol or/and hydrocortisone. 2)Immune levels. 3)Organic imbalances. 4)Morbidity and mortality levels. **Behavioural indicators** 1)Movement patterns. 2)Stereotypies. 3)Reactions to stimuli. **Productive indicators** 1)Laying percentages. 2)Growth rates. 3)Conversion rates.	The assessment of laying duration, egg losses, eggshell hardness, degree of foot pad dermatitis, nail length, average weight, and egg yolk colour, etc., will tell us about animal health and welfare.
Participant 4-Spain	In egg production, it is advisable to determine the carbon footprint (GHG emissions) per dozen eggs or per kg of eggs.	We must determine the kg of CO2 e produced by the different diets in a given period; it is usual to do this for the entire laying period, or in a calendar year, as desired.	It must be controlled: -Kgs of CO2 e -Production of dozens of eggs or kg of eggs.	This is a measurement consistent with a production approach and there is no compliance target. In theory, diets containing less soy (and its derivatives) and fewer ingredients from more distant destinations will generate less GHG emissions and therefore

Participant	Hypothesis	Test	Metric	Criteria
				a lower carbon footprint per dozen or kg of eggs.
Participants 1,3 &4 -Turkey	The genotype number can be increased to get a better information	Males of laying hens		Performance of different strains fed sustainable diets
Participants 2 & 5 -Turkey	Legislation should be studied for the use of insects in animal feed.	Legislation on insect use in the EU should be investigated		Meeting with the Ministry of Agriculture on regulations
Participants 6 & 11 -Turkey	To develop a sustainability criterion	Economic, environmental, and social aspects should be combined to develop a criterion		Sustainability criteria
Participants 7, 8 & 10 -Turkey	Diversity of local alternative ingredients	Test different local ingredients		Adding alternative ingredients such as; mulberry, vetch, and hazelnut pulp to the diets
Participant 8 - Turkey	The antioxidant status of the meat could be changed by the diets	Antioxidant capacity of the meat		MDA concentration in the meat
Participant 10 - Turkey	The production of alternative feed raw materials could increase the sustainability of the production.	The production of alternative feed raw materials could be included.		Produce alternative feed ingredients on a rotational basis

Participant	Hypothesis	Test	Metric	Criteria
Participant 1 - Tunisia	I think that the Incorporation of organic raw materials can Improve the quality of products	Formulate organic and conventional concentrate and evaluate the effect on the quality of meat and eggs	Measure Zootechnical performance and quality parameters	The results are positive (example the omega 3 content, less fat) for Organic products compared to Conventional products
Participant 2 - Tunisia	A comparison with an organic ratio (mainly on The health aspect)	Introduce another treatment in the protocol which Includes an organic formula	Especially health status parameters	Have a standard aligned with existing standards
Participant 3 - Tunisia	Monitoring of NH3 and CO2 parameters	Real-time Measurement and recording	NH3 rate, ambient CO2 rate	Rate <ambient standard
Participant 4 - Tunisia	Test different Alternative feed formulas to Evaluate the water footprint and their effect on growth Performance	Propose two Different diets of Substitutions which do not have anti-nutritional factors, a diet with known Formula and another with unknown Formula and the Farmer can produce it at farm	Growth rate, water footprint, carbon Footprint, product cost and availability	Are there significant differences at the 5% threshold on growth rates, water footprint, carbon footprint
Participant 5 - Tunisia	Hardiness advantage in keeping a mixed population	Compare between breeding a mixed population and breeding a more or less pure strain (quality, disease Tolerance, behaviour)	Measurement of quality and disease tolerance parameters	The hypothesis is invalid if there is no significant difference
Participant 6 - Tunisia	The technical-economic study is valid	Calculate the various charges	Carry out a	To validate the hypothesis, it is

Participant	Hypothesis	Test	Metric	Criteria
		(food, Labour, etc.) Calculate the cost price and estimate The selling price with a margin that guarantees the quoted sustainability of the project	consumer Survey and see the placement of the project with the major shopping centres	Necessary to exceed 5% acceptance of the Sample
Participant 7 - Tunisia	Dissemination of the project by Increasing the number of rural women (gda) in sousse closer to ISA-CM	Communicate with the gdas and discuss the protocol with them (with a very Simple and Appropriate method according to their education level)	Feedback and results from workshops with gdas	If the number of gdas is proportional to the objectives of the project (≥50 individuals)
Participant 8 - Tunisia	We can consider or target the free-range chicken product as Organic	Control and analyse all the production cycle (raw material to final product), Choose organic Sources, use only essential oils	Organic label certification, certification body	Zero antibiotic residue analysis, certification
Participant 9 - Tunisia	Production cost (cost price is Essential to define)	Determine the current cost of the main inputs (cost of chicks, cost of food (raw materials), cost of medication)	Investigation of the prices of the various Inputs and determination of the impact on the cost of meat and eggs	Compare against current market prices for similar products
Participant 10 - Tunisia	Marketing is difficult	You have to contact the people if they are ready to eat the meat of chickens that have consumed larvae	Estimate a Studied selling price and offer consumers	If only 60% react Positively, we can reach 90% easily later

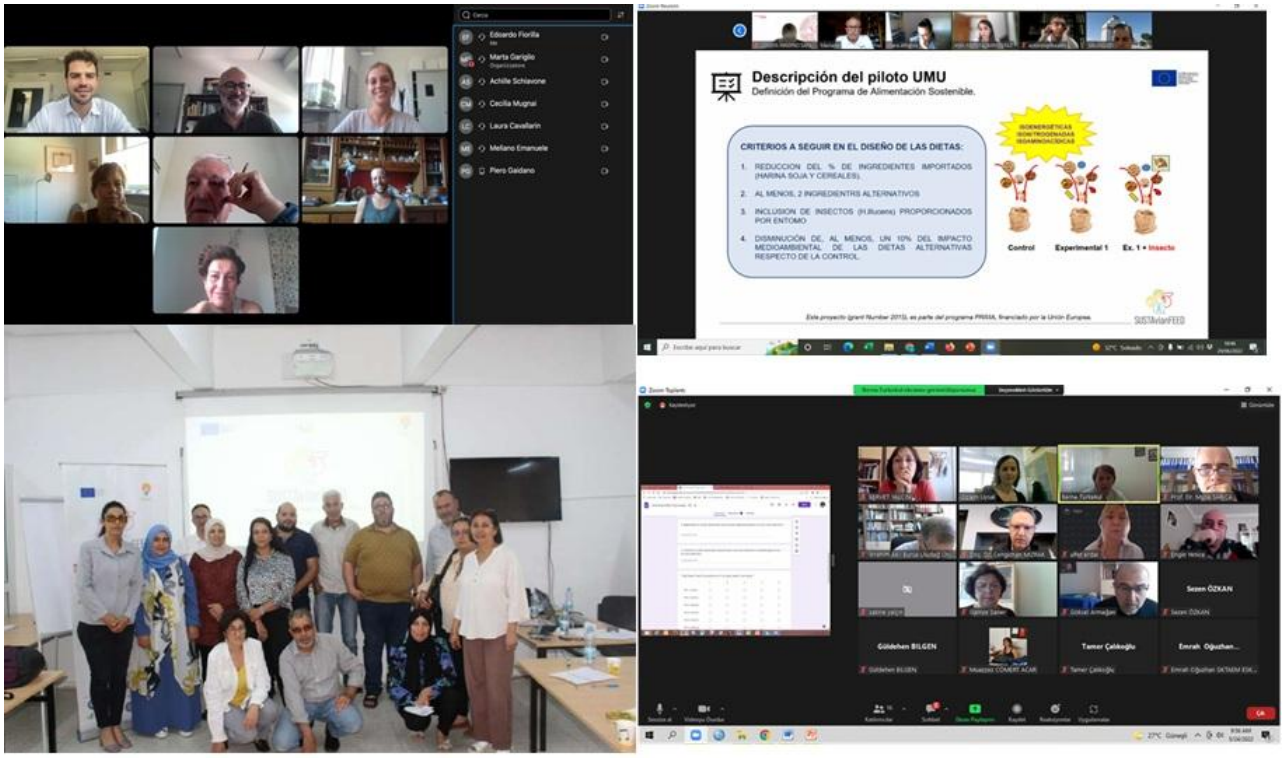


Figure 28. Stakeholders involved in LL A6

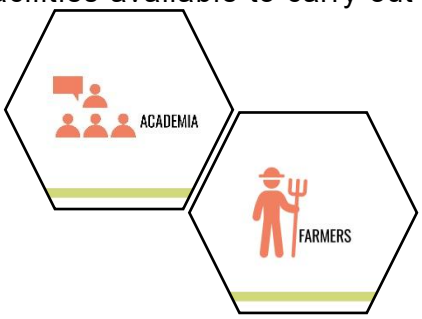
Conclusions:
Across all four regions, KPI 1 and KPI 2 were generally viewed as highly interesting and influential, while KPI 3 was consistently ranked lower in terms of both interest and influence, with Tunisia having the most significant deviation in this regard. KPI 4 was widely appreciated, particularly in Tunisia and Turkey, which showed higher ratings. The economic and sustainability-related KPIs were often ranked higher in Italy and Spain, where environmental awareness appeared to be stronger among participants. However, a consistent trend was the strong interest in finding ways to reduce reliance on traditional ingredients like soybean and the integration of alternative protein sources, especially in regions like Turkey and Spain.

Regarding the hypotheses highlighted during the activity, some were considered interesting by the pilot partners, while others fell outside the scope of the project but could be explored in future research. Proposals such as using the feed conversion ratio and obtaining at least a 3% reduction in emissions by considering different scenarios in raw material prices were incorporated into the pilot design, enhancing the project's overall focus on sustainability and efficiency.

LL A6-2. Co-creation of the SUSTAvianFEED Pilots: Focus groups - Design of the SUSTAvianFEED Pilots

Objectives of the LL activity:

To analyse the context of the farmers and detect the facilities available to carry out the experimental trials.



Task related:
Task. 3.2 Implementation of pilot activities

Actors involved in the LL activities:
Farmers, Academia

Table 10. Participants in LLA6-2

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	0	0	0
Researchers/experts	0	0	2	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	18	0
Private sector. Providers	0	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Jendouba

Developed activities:
1.Semi-structured interviews using questionnaire
2. Focus groups/workshops

Duration:
2 hours

Tools:
Questionnaire, KoboToolbox

Timing:
Project months 16-17 (July-August 2022).

Involved Partners:
RAYHANA, ISA-CM

Description of the activity:
ISA-CM and Rayhana prepared a questionnaire for the farmers. The questionnaire collected data on demographic characteristics, farm infrastructure, and poultry farming practices. It focused on the use of local resources, feed production, and management challenges faced by farmers. Additionally, it evaluates farmers' experience and training in poultry breeding. The survey primarily focused on farms in the Jendouba region, with participants from communes like Fernana, Ghardimaou, and Bousalem.

The members of RAYHANA helped the participants to complete the questionnaire and the results were summarized using KoboToolbox.
This activity complements other presential visits from Rayhana staff to engage farmers from different regions.

Key findings:
The survey covers demographic and farm details, such as the average age of participants (44 years), with a significant proportion (85%) being women. The majority of respondents had primary education (60%), and most farms employed family members, with 75% having family workers.

The farms typically have small operations, with an average of 1.3 workers, and most farm owners do not have the capacity to provide two full-time workers for the duration of the testing phase. Only 10% of participants reported owning mobile phones capable of recording videos. Raising chickens was not the main source of income for most participants (85%), and 60% stated that their revenue from poultry farming does not cover the full production costs.

Regarding farm infrastructure, most farms had chicken barns (90%), but 80% lacked a proper feed store. Parasite issues were reported in 20% of the farms, and 15% of respondents noted that they could not provide a proper freezer or space to butcher chickens for quality monitoring. For egg production, 70% of respondents could monitor the number of eggs daily, with an average of 8.67 clean eggs. However, 85% could not monitor the weight of the eggs regularly.

Farmers indicated some experience in poultry breeding, with 100% reporting at least some level of experience, primarily ranging between 5 to 27 years. However, 70% had no professional training in poultry breeding.

In terms of feed, 45% produced their own feed, while others mixed both on-farm feed and store-bought chicken feed. The main ingredients used included barley, emmer, and vegetables, highlighting the use of local resources in their feeding practices.

Conclusions:
The findings from this Living Lab provided valuable insights into the situation of women farmers and their capacity to host an experimental trial. ISA-CM utilized this information to design protocols tailored to Rayhana's specific context, recognizing that the farmers are not equipped to conduct scientific experiments. However, the protocols were developed to be as close to scientific methods as possible, ensuring that the results could be appropriately evaluated while considering the practical limitations faced by the farmers.

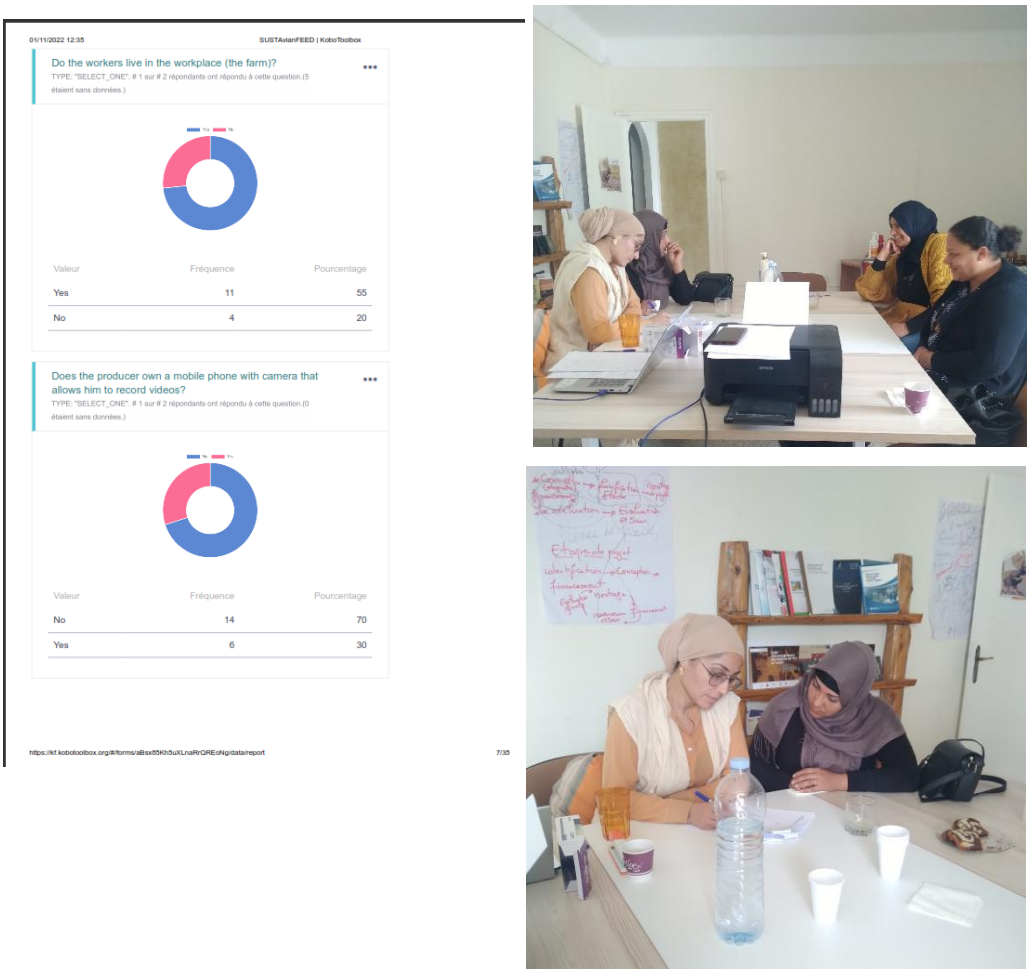


Figure 29. Materials used in LLA6 and activities carried out with rural women

LL A7. Co-creation of the SUSTAvianFEED Pilots: Survey Consumers. RAYHANA

Objectives of the LL activity:
To collect information from the consumers about their attitudes towards sustainable feeding, understanding and acceptance of the use of insects

Task related:
Task. 3.2 Implementation of pilot activities and task 3.7 Social evaluation of pilot activities.

Actors involved in the LL activities:
Consumers

Table 11. Participants in LL7

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	0	0	0
Researchers/experts	0	0	0	0
Private sector. Associations	0	0	0	0

Profile	Spain	Turkey	Tunisia	Italy
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	0	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	120	0

Location:
In-situ (markets) – Rayhana

Developed activities:
Guided survey

Duration:
10-15 minutes

Tools:
Questionnaire-Survey

Timing:
Project months 12-16 (March-July 2022).

Involved Partners:
RAYHANA

Description of the activity:
The Rayhana Association, a partner in the SUSTAvianFEED project, carried out an interesting consumer survey in Tunisia to bring out the opinions and attitudes of visitors or residents of the Jendouba region on the theme of raising and consuming chickens based on an alternative and nature-friendly food model.

The interview period took place between March and April 2022, two months known in Tunisia for hiking and walking as a result of moderate weather and also spring vacations. In particular, this year, April coincided with the month of Ramadan where Tunisians consume more than usual and also look for quality and healthy products.

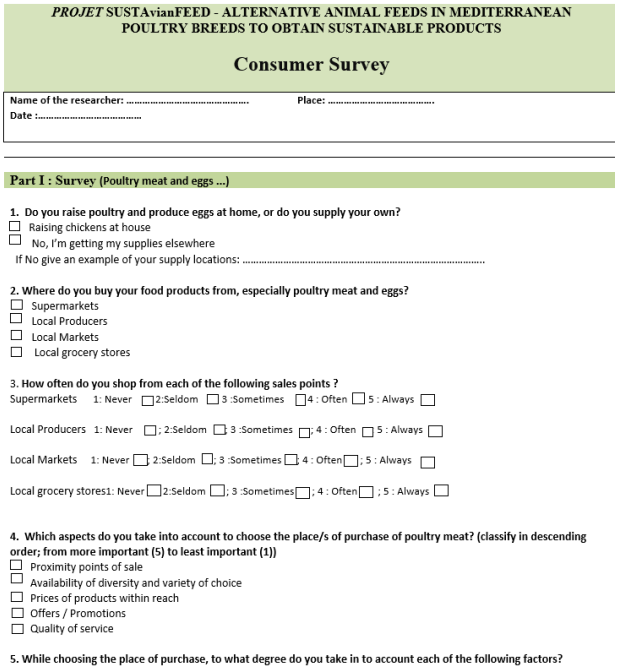
Key findings:

The majority of respondents (80) do not raise poultry at home and purchase from other sources, primarily local markets (60 participants) and supermarkets (30 participants). About 20 people raise poultry and produce eggs themselves.
When choosing poultry products, price is the most important factor, followed by traceability and product quality. Consumers are also influenced by factors like labelling/brand and packaging design. Around 70 participants are particularly concerned with the health quality of poultry products.
A majority of consumers would be willing to pay more for products that are eco-friendly, socially responsible, and environmentally sustainable. About 54 respondents would pay a small premium (up to 10%) for such products, while 50 were not willing to pay more.
Most consumers know very little about how poultry is fed or the sustainability of the current systems. However, a large number of respondents are open to the idea of

feeding poultry with worms and insects, as indicated by 60 people strongly agreeing with this concept.

The majority of respondents are inclined to support local producers, with a preference for locally produced poultry. There is also significant support for social/ethical aspects in production, and a strong interest in products that contribute to women's economic integration and territory development.
Overall, consumers in Jendouba show a strong preference for affordable and quality poultry products, with increasing interest in sustainability, local sourcing, and ethical practices. However, concerns remain regarding the health and sustainability of current systems, with an openness to alternative feeding methods like insects.

Conclusions:
The majority of respondents do not raise poultry at home, with most purchasing from local markets and supermarkets. Price was the most influential factor in their purchasing decisions, followed by product quality and traceability. While most consumers were willing to pay a small premium (up to 10%) for eco-friendly, socially responsible, and environmentally sustainable products, concerns about the cost of such alternatives were evident. Despite limited knowledge about poultry feeding systems, there was a strong openness to the idea of feeding poultry with insects, with a significant number of respondents agreeing to this concept. There was also strong support for local producers and products that contribute to women's economic integration and territory development.
The design and results of this activity serve as both a test and a foundation for the development of a larger-scale consumer survey with 400 respondents per country, which is planned under Task 3.7. This larger survey was carried out in LLA11 and was built upon the insights gathered from the initial survey in Jendouba, allowing for a broader understanding of consumer attitudes towards sustainable poultry feeding and alternative protein sources across the project regions.



PROJET SUSTAvianFEED - ALTERNATIVE ANIMAL FEEDS IN MEDITERRANEAN POULTRY BREEDS TO OBTAIN SUSTAINABLE PRODUCTS

Consumer Survey

Name of the researcher: ..... Place: .....
Date :.....

Part I : Survey (Poultry meat and eggs ...)

1. Do you raise poultry and produce eggs at home, or do you supply your own?
☐ Raising chickens at house
☐ No, I'm getting my supplies elsewhere
If No give an example of your supply locations: .....

2. Where do you buy your food products from, especially poultry meat and eggs?
☐ Supermarkets
☐ Local Producers
☐ Local Markets
☐ Local grocery stores

3. How often do you shop from each of the following sales points ?
Supermarkets 1: Never ☐ 2:Seldom ☐ 3 :Sometimes ☐ 4 : Often ☐ 5 : Always ☐
Local Producers 1: Never ☐ ; 2:Seldom ☐ ; 3 :Sometimes ☐ ; 4 : Often ☐ 5 : Always ☐
Local Markets 1: Never ☐ ; 2:Seldom ☐ ; 3 :Sometimes ☐ ; 4 : Often ☐ ; 5 : Always ☐
Local grocery stores1: Never ☐ 2:Seldom ☐ ; 3 :Sometimes ☐ ; 4 : Often ☐ ; 5 : Always ☐

4. Which aspects do you take into account to choose the place/s of purchase of poultry meat? (classify in descending order; from more important (5) to least important (1))
☐ Proximity points of sale
☐ Availability of diversity and variety of choice
☐ Prices of products within reach
☐ Offers / Promotions
☐ Quality of service

5. While choosing the place of purchase, to what degree do you take in to account each of the following factors?

Figure 30. First consumer survey conducted by Rayhana

4.3 Part 2: SUSTAvianFEED Pilots Implementation

LL A8 & LL A10.SUSTAvianFEED Pilots Implementation: Real-life tasting Event / Real-life internal tasting event

Objectives of the LL activity:
To evaluate the effect of diets on sensory attributes such as appearance, juiciness, flavours, tenderness, and overall liking of the meat/eggs.

Task related:
Task. 3.4 Product quality and productive traits of bird's evaluation

Actors involved in the LL activities:
Staff and students of the faculties. Consumers, when it is feasible.

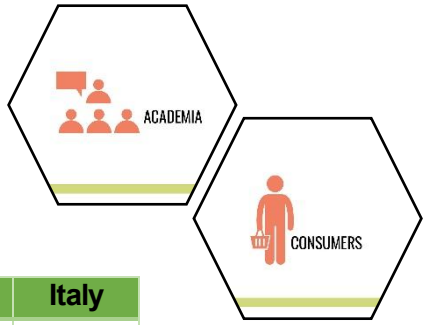


Table 12. Participants in LLA8&A10

Profile	Spain	Turkey	Tunisia	Italy
Academia	2	0	20	0
Researchers/experts	6	6	10	10
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	0	0	0	0
Public Sector	0	0	20	0
Consumers	4	0	30	0

Location:
Partners' premises

Developed activities:
Tasting and short workshop

Duration:
1 day

Tools:
Tasting; Short questionnaire

Involved Partners:
ISA-CM; UMU; EGE; UNITO

Description of the activity:

The activity consisted of a tasting panel of at least six members, and an opportunity to carry out an express workshop. It is important to notice that the explanation about the project came after the tasting is finished. In that way, the information about the samples and the objectives of the study did not affect the results.

- **Preparation of the samples**
  - The samples have to be prepared at similar temperatures/times.
  - In the case of eggs, it is up to each team to provide different egg preparations. However, boiled eggs are recommended.
  - Samples should have a similar shape/size.
  - There has to be a way to differentiate the samples. For example, a blind code is given to each sample.
  - Water should be available to remove the residual flavour from the previous sample

- **Activity**
  - The samples are to be evaluated for appearance, juiciness, flavours, texture, and overall liking. The five-categorical scales (1=do not like, 5=extremely liked) are to be used to indicate liking for all parameters.
  - Panellists are requested to rate the samples on two or three consecutive days or sessions.

- **Workshop**

  -The workshop consists of a brief explanation of the aim of the project and the different diets.
  Then, the participants are asked to propose what they think the results of this activity will be. Provide a sheet with the following table (to be adapted by each partner):

Table 13. Table utilized for LLA8&LLA10 to evaluate the sensory parameters in the tasting

Sensory parameters	Diets		
	Control	ALT1	ALT2
Appearance			
Color			
Flavor			
Juiciness			
Tenderness			
Overall Liking			

Key findings:

The key findings of this activity are included in DLV 3.4.

Conclusions:
The perceptions gathered in this activity align with previous research, indicating that the use of alternative feed ingredients, such as Black Soldier Fly Larvae (BSFL), does not negatively impact the sensory quality of egg products. Consequently, the findings support the safe

integration of alternative dietary ingredients, including BSF larvae, into poultry nutrition without compromising the sensory properties of eggs. This suggests that these alternatives can be effectively incorporated into poultry diets, offering a sustainable and viable solution.

LL A9. SUSTAvianFEED Pilots implementation: Stakeholders Mapping 2

By the first half of the project, teams from the different partners were asked to review the contact list developed during LLA1. The tools and methods used for this activity were the same as in the first phase.

Conclusions:
There were no significant changes to the list, but a revision was conducted to assess which stakeholders had already been engaged. This review aimed to identify new stakeholders to involve in the following activities, ensuring a broader and more diverse participation in subsequent project phases.

LL A11. SUSTAvianFEED Pilots Implementation: Consumers Survey

Objectives of the LL activity:
To analyse consumer acceptance of the products produced in pilot studies and labelled with a sustainability label.

Task related:
Task. 3.7

Actors involved in the LL activities:
Consumers. For each pilot city 400 consumers were surveyed in total, 1600 responses were received

Table 14. Participants in LLA11

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	0	0	0
Researchers/experts	0	0	0	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	0	0	0	0
Public Sector	0	0	0	0
Consumers	400	400	400	400

Location:
Pilot cities: Murcia, Turin, Sousse and Izmir.

Developed activities:
Survey

Duration:
4 months

Timing:

Project month 42 to 45 (September-December 2024).

Involved Partners:
Organized by EGE. Participants: EGE, UNITO, UMU, ISA-CM, ALIA.

Description of the activity:
The survey study was conducted online, in the 4 pilot cities, namely, Murcia in Spain; Turin in Italy; Sousse in Tunisia and İzmir in Türkiye. For practical reasons, only one product was studied in each pilot city. The product choice is based on the pilot production carried out in the respective cities. In Sousse both chicken meat and eggs from laying hens were studied. Considering that chicken meat was examined in three pilot cities (Turin, Sousse, Izmir) and eggs in two pilot cities (Murcia and Sousse), to have equal samples in the survey, consumer acceptance towards eggs was studied in Murcia and Sousse, while attitudes towards meat was studied in Torino and İzmir provinces.
To determine representative samples in each pilot city, statistical data on demographic characteristics of the consumers living in these cities provided by the partner institutions were considered. Finally, survey quotes have been established based on the proportion of consumers in different educational groups in each pilot city

Key findings:
Findings of the study indicated positive attitudes of the consumers in these cities towards sustainable feeding systems. A comparative analysis of consumers revealed that the consumers in Turin and Sousse held more positive attitudes on the use of insect-supplemented feed in poultry production. Regarding the findings on the WTP towards the eco-labelled poultry products developed in the the SUSTAvianFEED project, a greater share of consumers in Turin (compared to İzmir) and Sousse (compared to Murcia) were found to be willing to pay a price premium. Regarding the quantity of the average price premium the consumers were willing to pay, those living in İzmir and Sousse declared to have higher WTPs compared to those in Turin and Murcia.
The use of specific eco-labels that could potentially support sustainable poultry production was considered important by the consumers in all cities signaling animal welfare, natural feed, local production and environmental protection attributes of the products, but the level of importance varied by location.

Conclusions:
Consumers in the Mediterranean show a strong interest in sustainable poultry products, although local differences must be taken into account. To increase consumer acceptance, clear labelling, public communication, and education are crucial. The transition to more sustainable food systems in the region will undoubtedly rely on the collective efforts of consumers. As a result of this survey, a final eco-label was chosen, marking a key step toward promoting sustainable practices.
Further details on this process can be found in **Deliverable 3.7, Part B**.

LL A12. SUSTAvianFEED Pilots Implementation: Workshop on insect farming with woman farmers

Objectives of the LL activity:

1) To explore the possibilities and materials available for BSF production in the region.

2) To train in the production of BSF with low tech facilities.

Task related:
Task. 3.1

Actors involved in the LL activities:
Farmers

Table 15. Participants in LLA12

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	0	0	0
Researchers/experts	0	0	0	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	18	0
Private sector. Providers	0	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Jendouba, Tunisia.

Developed activities:
1. Focus groups/workshops

Duration:
2 weeks

Timing:
Project month 21 (December 2022).

Involved Partners:
RAYHANA; ENTOMO

Description of the activity:
The first phase started with a technical visit by Entomo technical staff to Tunisia, this visit took place in December 2022 from the 13th to the 20th. In this visit they proceeded to visit farms to learn about the possibilities and working conditions, search for nearby materials to be able to build the pilot and training on BSF breeding. The design was implemented with the farmers. Material was also purchased, and the second phase was a training session held with the farmers at Rayhana's facilities. The content of the training was as follows:

- Insects as a business activity
- Benefits of BSF rearing
- Introduction to the production stages
- General preparation of rearing material

Key findings:
The knowledge and recommendations of the population were considered, and material was created for implementation in the area. As a result, the pilot meets the following requirements:

a) The materials used were easy to find locally.
b) The procurement of the materials was inexpensive.
c) The design was simple without the need for complex tools.
d) The design allowed all stages of rearing to be carried out in a single element to simplify the work and reduce it as much as possible.
e) The design compensates for unfavorable climatic conditions at least partially.

Figure 31. Workshop/training with farmers in Rayhana facilities. Picture up shows materials and down farmers during implementation

Conclusions:
Following the evaluation of this larvae production workshop with farmers, which was deemed insufficient in terms of learning outcomes, a proposal for a training and internship at ENTOMO's headquarters was discussed to provide a deeper understanding of the process and to create a simple learning guide for larvae production, as a result, training for two participants, Nacyb Allouchi and Hayet Taboui at the ENTOMO facilities in Cehegín from October 1 to 10, 2023 was planned.

The two participants, familiar with the context and language of the women farmers, attended the training to gain firsthand experience, which they could later use to train others and create materials for the rest of the association members.
The outcomes of the local training and the guidelines are part of **Deliverable 3.1**.

LL A13. SUSTAvianFEED Pilots Implementation: Workshop, Economic evaluation of pilot activities.

Objectives of the LL activity:
To evaluate financial consequences of the proposed production system for farmers.

Task related:
Task. 3.6

Actors involved in the LL activities:
Project Partners internal teams.

Table 16. Participants in LLA13

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	3	2	2
Researchers/experts	2	0	2	0
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	4	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Online / conference room / Partners' premises.

Developed activities:
Guided presentation. Brainstorming.

Duration:
2 hours

Timing: Project month 25 - April 2023.

Involved Partners:
ALL PARTNERS: ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA: ENTOMO; SLOWFOOD.

Description of the activity: According to the Minutes of the 5th Consortium Meeting held from 18-19 January 2023, an Internal LLA meeting is scheduled for April 28 between 9:30 and 11:30 (CET) to share the results of the economic evaluation of the EGE's pilot study.

Conclusions:
In addition to the necessity of sensitivity analysis and scenario-based evaluation highlighted during the meeting, another key recommendation was to further investigate the economic feasibility of BSF-based diets by incorporating updated market prices. It was also suggested to expand the scope of the analysis by applying the revised protocol and economic evaluation template across pilot partners for comparability and consistency. This would allow better assessment of the impact of fluctuating feed ingredient prices particularly BSF larvae on the overall cost-effectiveness of alternative poultry diets.

4.4 Part 3: SUSTAvianFEED Marke Validation: Eco-Label

The Market Validation Eco-Label process includes a series of activities aimed at designing and validating an eco-label for the project. It started with internal workshops to define the eco-label, followed by interviews with both public and private stakeholders to gather insights on its design. Co-creative workshops in the different countries were then conducted to collaboratively design the eco-label. Then 3 final designs were texted in social media and an online pool was conducted to further gauge public opinion and reach a wider audience, the public choose a final design that was assessed in the costumer survey to collect broader feedback (Task 3.7). This comprehensive approach ensures the eco-label is well-defined, validated, and ready for market introduction.

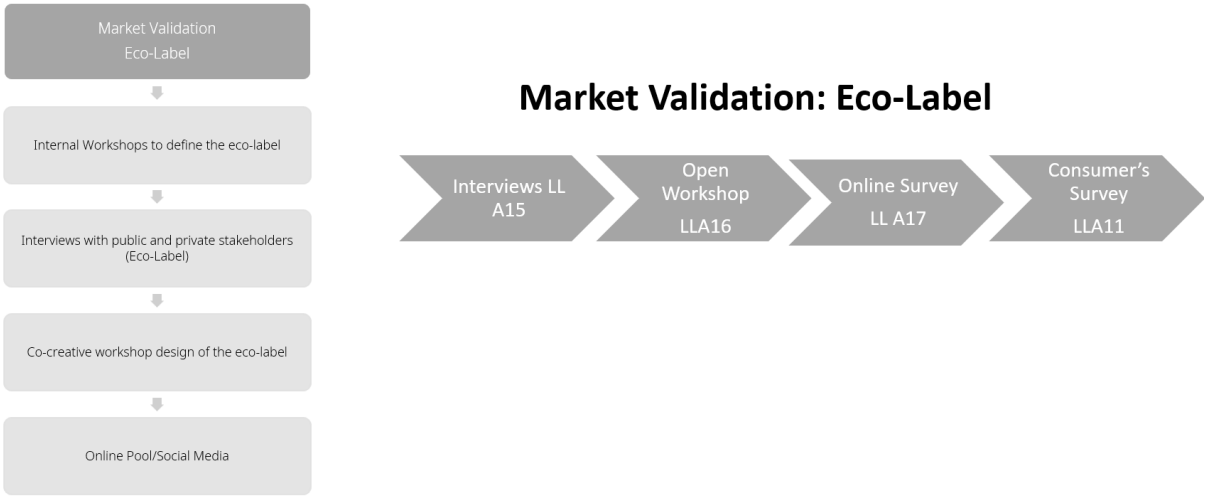
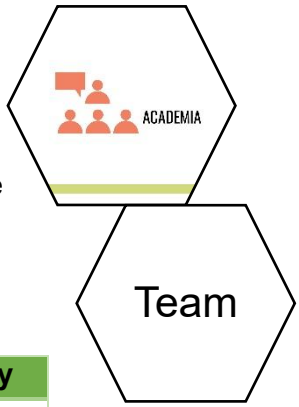


Figure 32. Eco-label design process and activities

LL A14. Market Validation, Eco-Label: Internal Workshops

Objectives of the LL activity:
1) To present existing advances and case studies about product labelling.
2) To share experience, advances and local state of each partner region regarding eco-label related initiatives.

Task related:
Task. 3.5, Task 3.7, Task 4.3 and Task 5.3



Actors involved in the LL activities:
Project partners internal team (academia, associations and private companies).

Table 17. Participants in LLA14

Profile	Spain	Turkey	Tunisia	Italy
Academia	5	2	3	2
Researchers/experts	2	0	2	2
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	3	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Online and conference room (Murcia).

Developed activities:
Focus groups/workshops

Duration:
Two sessions of 2 hours (1 online and 1 presential).

Tools:
Mentimeter

Timing:
Project months 16 and 22 (July 22 and January 2023).

Involved Partners:
Prepared by ALIA. Assistants: ALL PARTNERS: ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA: ENTOMO; SLOWFOOD.

Description of the activity:
Part 1:
Presentation about the state of different initiatives and examples of labels in Europe was conducted by ALIA. Including:

- Food labelling regulation in European Union.
- Food Labelling Information System (FLIS).
- Typologies and formats of FOP nutrition labelling schemes implemented/proposed/announced at Members States' and UK level.
- Report from the commission to the European Parliament and the council regarding the use of additional forms of expression and presentation of the nutrition declaration.

- Handbook on Food Labelling to Protect Consumers.
- Existing EU Labels (EU quality standards, Energy labels, Fish and food labelling, Chemical labelling)
- Examples (EU Organic Logo, EU Ecolabel, Nutri-score, H2020 CIRC4LIFE)

Part 2:
Poll with participants, with some questions to set the basis of the label. Key themes:

1. What do we want to include in the label? Only environmental aspects? Also social…?
2. Contribution to existing initiatives and not creating a new one from the scratch
3. A scale and not YES/NO
4. Mandatory or volunteer?
5. Other…

Key findings:
During LL A14. Market Validation, Eco-Label: Internal Workshop, some insights and open questions were explained to participants. In addition, a live survey was conducted to get feedback from the consortium. These questions were:

1. What do we want to include in the label? Only environmental aspects? Also social?

The possibility of including also social aspects in the eco-label was developed.

2. Contribution to existing initiatives and not creating a new one from the Scratch

It was agreed that during next set of activities it will be important to contribute to existing initiatives and not create another label. In this sense, the project consortium will study existing cases and European and national policies to contribute with.

3. A scale or YES/NO certification?

A scale was validated as the best way to proceed to enable a sustainability rating. So, we will not look for YES/NO certifications but a way to support consumers in their choices and the label should become a tool to compare the sustainability of products.

4. Mandatory or volunteer?

A volunteer label was agreed as the most optimal way for the purpose of the project.

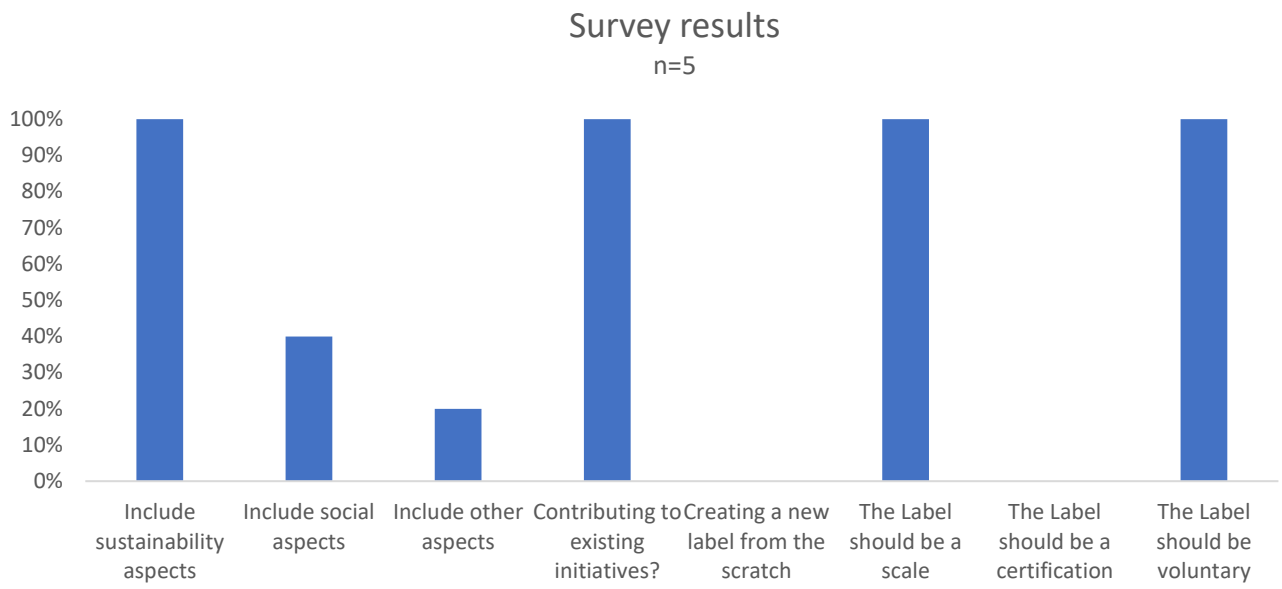


Figure 33. Results of the internal survey: aspects to be included in the eco-label

Part 3: After a round of activities in their own countries (LL A15), partners meet in person, Alia organize a Workshop in Murcia to share experiences to design 3 final versions of the label.

The key findings were:

1. Associations to push the government for eco-labelling.
2. Farmers that need extra support (subsidies) to motivate them.
3. Regulations needed, implementing normative and laws that force sustainability to companies should be a priority.
4. The label should be volunteer and not difficult to be used
5. There are already lots of EU flags, so we should not confuse people.
6. We should not include complex numbers (even not numbers)

Aspects to be included in the label:

1. Social aspects: fair salary, gender equality, fair trade, benefits for the community.
2. Circularity and sustainability information: km0 materials, insects, preserving biodiversity, protect against deforestation.
3. Animal welfare aspects.
4. Health aspects.
5. QR code to have access to more information about products' characteristics.

Conclusions:

Participants agreed that the eco-label should include both environmental and social aspects, with a clear emphasis on contributing to existing labeling initiatives rather than creating a new one from scratch. The consensus was to develop a scale-based label, rather than a simple YES/NO certification, to help consumers make informed choices by comparing the sustainability of products. A voluntary label was considered the most suitable approach for the project's objectives.

Further discussions highlighted the need for governmental support through regulations and subsidies to encourage farmers to adopt sustainable practices. Partners emphasized that the label should not be overly complex, and it should avoid

using numbers or overly intricate symbols to prevent consumer confusion, especially since there are already many EU flags. The eco-label should cover aspects such as social responsibility, circularity, animal welfare, and health, with the inclusion of a QR code for consumers to access detailed information. This comprehensive approach will guide the development of a label that is easy to use, transparent, and effective in promoting sustainable poultry practices across the participating regions.

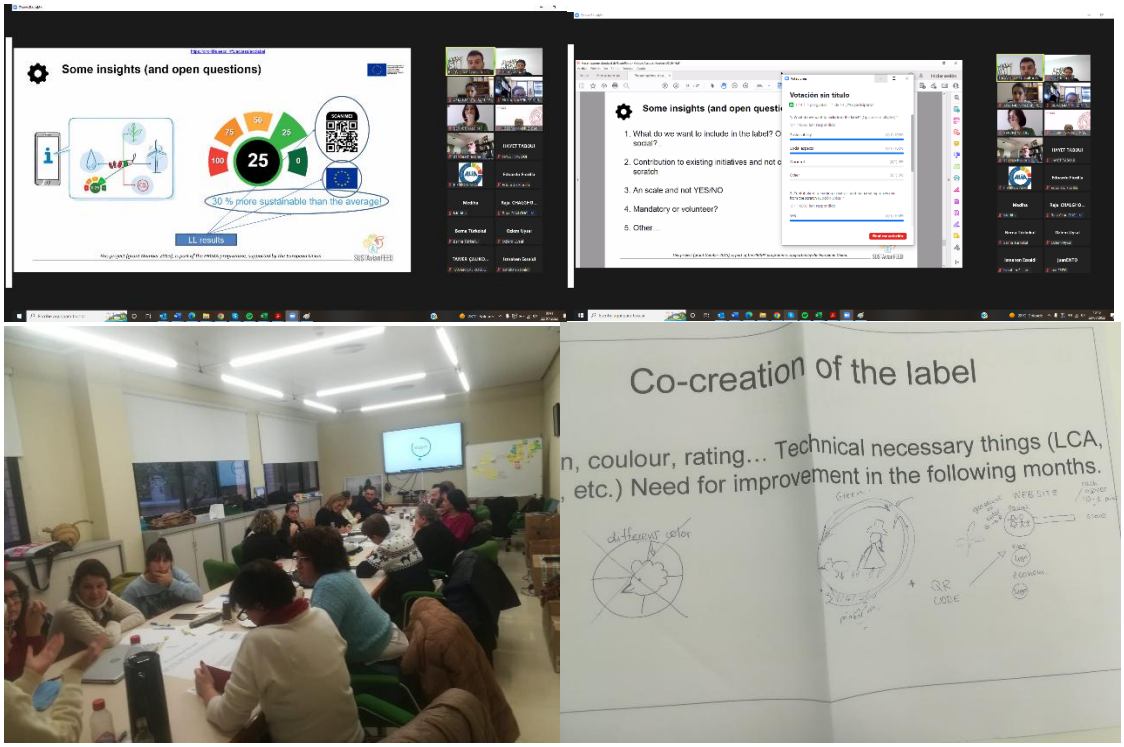


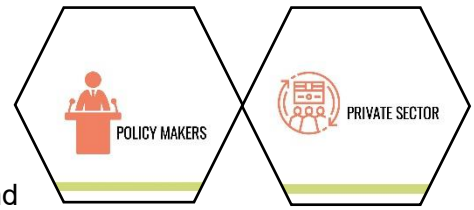
Figure 34. Internal workshops about eco-label

LL A15. Market Validation, Eco-Label: Interviews with local/regional/national/international experts
LL A16. Market Validation, Eco-Label: Co-creative Workshop Design of the SUSTAvianFEED Label

Objectives of the LL activity:

1) To collect Useful information for the design of the eco-label
2) To understand the existing situation of the eco-label developing
3) To test the facts and KPI information and indicators that are well-valued from the end-users
4) To share and validate results of the investigation process.

Task related:
Task. 3.5, Task 3.7, Task 4.3 and Task 5.3



Actors involved in the LL activities:
•Members of the quadruple helix (consumers, supply chain members, decision makers, and academia). Professionals and experts in eco-label and food labelling in academia, private sector and public-sector.

Table 18.Participants in LLA15 & LLA16

Profile	Spain	Turkey	Tunisia	Italy
Academia	7	5	5	2
Researchers/experts	3	7	4	2
Private sector. Associations	5	1	0	1
Private sector. Smallholders and producers	3	4	25	0
Private sector. Providers	2	3	1	1
Public Sector	0	4	9	0
Consumers	4	0	0	0

Location:
Online/ Partners' premises

Developed activities:

Semi-structured Interviews /focus group.

Duration:
30 minutes to one hour per interview
2 hours for workshops

Tools:
Questionary proposed by Alia. Dotmocracy. Idea Dashboard.

Timing:
Project months 18 to 20 (September to November 2022) and 21-26 (December 2022 – May 2023).

Involved Partners:
ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA; SLOW FOOD

Description of the activity:

Brief explanation regarding the objectives of the task and the kind of sustainable label we were looking for. Use of supporting material.

• Questions:
1. Please tell us about existing initiatives from your region/country or the EU, which you think are useful and you considered as good practices.

2. Which are the main existing obstacles in your region for the development of the eco-label?
3. Which institutions are in charge of the eco-label development in your area of scope?
4. Do you think new eco-labels should include environmental aspects or social ones? 1 to 5, where 1 means not agree and 5 is strongly agree
1 to 5
Environmental aspects
Social aspects
What are examples of social aspects that may be included?
5. Which are the most relevant policies it should be considered for the creation of a sustainable label?
6. Do you know if there are some policies looking for the standardization of a sustainable label?
7. Should an eco-label be mandatory or volunteer?
Mandatory
Volunteer
8. Which content should an eco-label include? Please answer yes/no and why.

Aspect YES/NO
Colour.
Rating.
Numbers.
Other:
9. Do you think there is any disadvantage or for the development of eco-label? (as lobbys, etc.)
10. How to make a standardization feasible? Is there any activity or contact with organizations which must be made for our purpose? Which should be the next one to be contacted?

Key findings:

Table 19. Summary of findings of LLA15 & LLA16

Country	Summary of findings
Spain	• Environmental aspects the most important, but also given lots of importance to the social aspects. • Colour to be included. 60% of agreement regarding rating and just 25% about including numbers. • Volunteer label.
Italy	• Major importance to environmental and social aspects. • Eco-label should be volunteer. • Colour is a must, rating also important, numbers not recommendable. • Experts emphasize the importance of credibility and trust in ecolabeling. For labels to be effective, they must be based on rigorous and independent criteria. • Complexity of products and services, harmonization of standards internationally, and consumer awareness. However,

Country	Summary of findings
	they stress the importance of continuously improving ecolabeling systems, addressing these challenges, and developing more comprehensive and accurate criteria. • Development of targeted awareness campaigns to educate consumers about the significance of ecolabeling and its connection to environmental and social responsibility. • Importance of engaging policymakers and industry associations to advocate for favorable policies and regulations supporting ecolabeling initiatives. • Participants emphasized the need for support mechanisms, such as funding programs, training, and technical assistance, to assist SMEs in implementing ecolabeling practices.
Tunisia	• Major importance to environmental, but also importance of social aspects. • Eco-label should be volunteer. • Colour is a must, rating also important, numbers not approved. Social aspects: • Promoting producer/farmer and consumer health and safety (One Health concept ,..) • Reinforcing equitable distribution of incomes (Fair Trade concept, etc.) • Guaranteeing sustainable incomes for farmers and minimum salary for workers (Circular Economy concept, etc.) • Promoting local traditions and Cultural aspects, • Contributing to the development of local community (Product's Origin) • Banning minors working • Fighting discrimination based on age, ethnic or social origin, gender or disability • Supporting the workers' rights to vacation and fixing maximum daily working time • Communicating information about diseases caused by pollution • Promoting resilience of the population to climate change • Sustainability of commercial relations Relevant concepts: • Defining the concept of the sustainable development and its principles • Initiating the development this concept • Conducting an analysis of the regulatory approaches, standardization, certification and labelling through existing tools. • Overviewing the existing initiatives. • Implementing gradually the created standard. • Ensuring the deployment of alignment and compliance with global standardization policies and the regulatory framework • Creation of an eco-labelling committee to guarantee that the eco label Regulation is implemented correctly on the national level and complies with global standardization policies. • Reviewing all applications and selecting new product groups to be developed accordingly

Country	Summary of findings
Turkey	• Major importance to environmental, but also importance of social aspects. • Eco-label should be volunteer. • Colour is a must, rating also important, numbers not recommendable. • Agreement of including a QR code, a logo for credibility and some symbols. • The climate-related label systems or environmentally friendly systems, such as A, B, C, D, and E in France can be an example. • Companies have to prepare economically, environmentally, and socially demonstrable projects with social standards. Economically, a purchase price of 10% above the traditional product price is required. • The re-generative organic certification is stated to have a combination of organic and social standards. • The stakeholders were also aware of the vulnerabilities or criticized aspects of the existing labels and the systems behind them. For example, organic production is known to be lacking both in terms of environmental aspects such as water and energy use, soil nutrition, and in terms of social aspects. They also remind us that there are serious discussions about auditing organic, GMO-free certificates.

Conclusions:

Across the participating regions, there was a strong consensus on the importance of environmental aspects, with many respondents also emphasizing the inclusion of social factors in the eco-label design. Experts from Spain, Italy, Tunisia, and Turkey agreed that the label should be voluntary rather than mandatory, highlighting the need for flexibility and consumer choice. The use of colour was considered essential, while ratings were favored by most, but numbers were generally rejected due to potential complexity and confusion.

In terms of social aspects, participants highlighted various important elements, including fair trade, worker rights, and community development, as crucial to the eco-label. Tunisia participants, in particular, emphasized the concept of One Health, promoting the health and safety of both producers and consumers. Furthermore, there was strong support for integrating a QR code to provide consumers with easy access to detailed product information. In Turkey, experts cited examples such as the climate-related label systems in France as useful models. Participants also identified challenges in existing labeling systems, stressing the importance of credibility and consumer awareness. They advocated for targeted awareness campaigns to educate consumers about the significance of the eco-label and its connection to sustainability. Moving forward, the consortium will focus on contributing to existing initiatives and building on these findings to finalize the SUSTAvianFEED eco-label.

Figure 35. Activities carried out in LLA15 & LLA16and stakeholders involved

LL A17. Market Validation, Eco-Label: Online Pool for SUSTAvianFEED Label

Objectives of the LL activity:

1) To validate SUSTAvianFEED Label Design with general public.

Task related:
Task. 3.5, Task 3.7, Task 4.3 and Task 5.3

Actors involved in the LL activities:
Consumers and general public.
More than 90 answers.

Table 20.Participants in LLA17

Profile	Spain	Turkey	Tunisia	Italy
Academia	10	4	1	3
Researchers/experts	4	2	0	1
Private sector. Associations	1	0	0	0
Private sector. Smallholders and producers	1	2	0	1
Private sector. Providers	0	0	0	1
Public Sector	3	1	0	1
Consumers	36	9	4	7

Location:
Online

Developed activities:

Semi-structured Interviews /focus group.

Duration:
60 days

Tools:
Social Media

Timing:
Project months 31 to 33 (October-December 2023)

Involved Partners:
ALIA; SLOW FOOD

Description of the activity:
The aim of the survey was let participants choose between 3 different designs, to have only one final label.

Online survey
Link https://forms.office.com/e/KfD4y9yXVX
The online link was disseminated through various channels, not only strictly related to the project (Facebook, Linkedin, website) but also of individual partners. Among them, Slow Food released the survey in its November international newsletter, sent to more than 90,000 contacts.

Offline survey
Partners disseminated the survey dedicated to the different ecolabel proposals on various occasions, including Alia during SEPOR2023 event and Slow Food during PPilow project partner meetings and the Italian Presidia producers' meeting.

Research platform
Shared on the Survey Circle platform. It is a platform that over 85,000 Survey Managers and teams have used for their online surveys and online experiments. With more than 2 million study participations from 100+ countries, Survey Circle is the largest community for mutual support in online research. Shared also in the LinkedIn Group.

Figure 36. Proposal tested in LLA17

Key findings:

The label presenting the dashboard was the most liked and voted for among the 3 proposals
On a scale of 1 (little) to 5 (a lot), the graphics were rated as clear and simple.

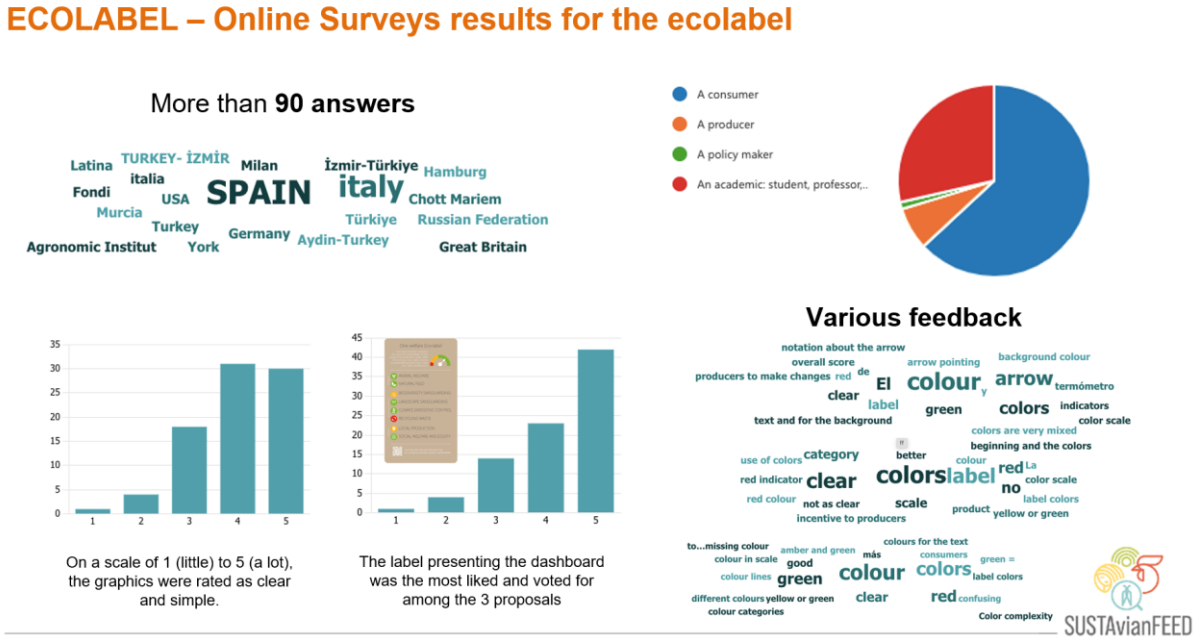


Figure 37. Results of the online survey shared by Slow Food

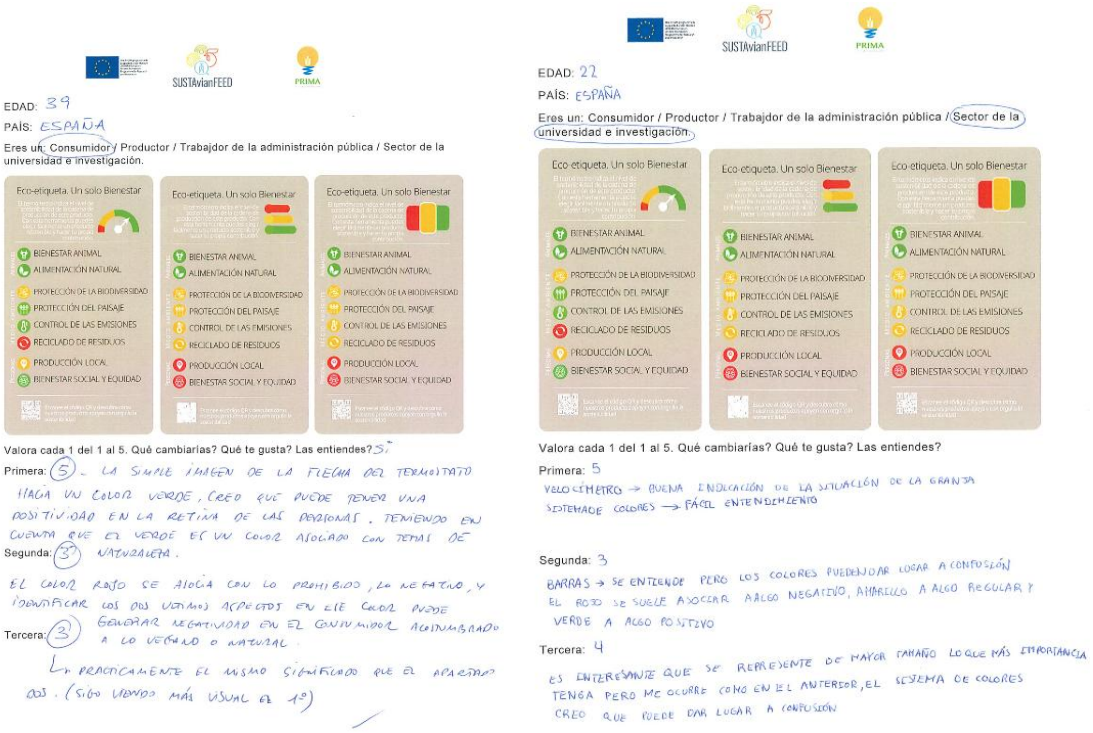


Figure 38. Examples of answers to the offline survey conducted by Alia in SEPOR

Conclusions:
The online survey conducted as part of LL A17 provided valuable feedback on three proposed eco-label designs. The survey, which gathered over 90 responses from various regions, confirmed a clear preference for the label featuring a dashboard design, which was the most liked and voted for among the three options. The respondents rated the graphics of the label as clear and simple, with most giving it high marks on a scale from 1 (little) to 5 (a lot). This feedback indicates that consumers and stakeholders find a straightforward, visually appealing design crucial for the eco-label's success.
Moving forward, this feedback helped deciding the final SUSTAvianFEED eco-label design.

4.5 Part 4: SUSTAvianFEED Market Validation: Business Model

The Market Validation: Business Model process includes a series of activities designed to test and validate the business model. The process begins with analysing consumer behaviour at the marketplace, followed by phone interviews to understand market demand and preferences. Afterward, a co-creative workshop is held to define potential business models, which is followed by a final workshop to refine the model based on stakeholder input. The process is built around continuous feedback and refinement to ensure the business model is aligned with consumer expectations and market realities.

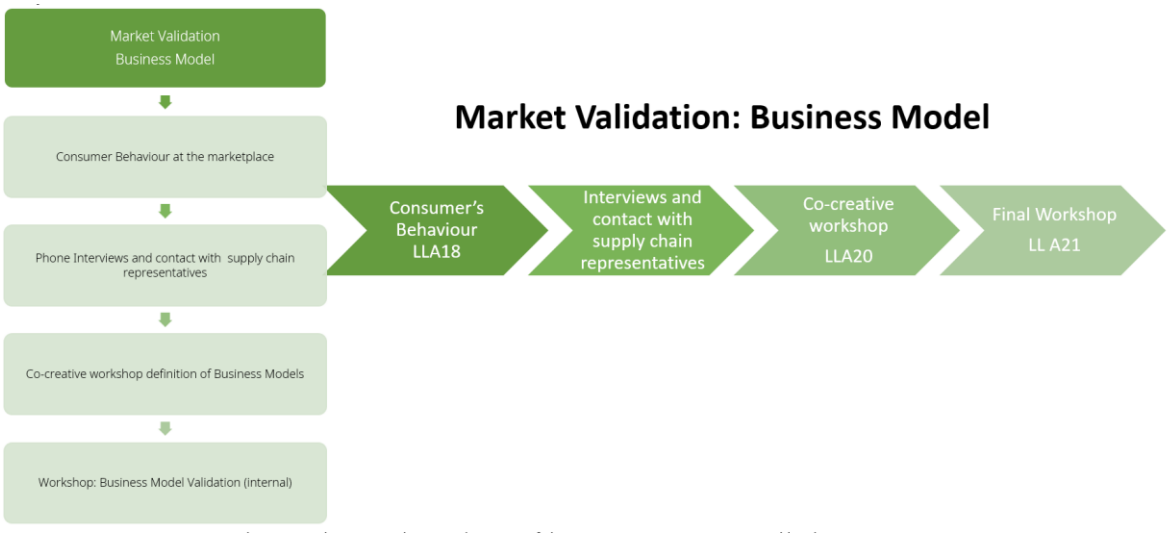


Figure 39. Market validation process and activities

LL A18. Market Validation, Business Model and Eco-Label: Consumer behaviour at the marketplace

Partners were encouraged to bring examples of products materials to their activities and conferences, taking the opportunity to test the reactions of the consumers.

Target group: Participants in fairs and activities, especially consumers.
Location: Public markets, trade fairs.
Involved Partners: ALL.

Conclusions:
LL A18 provided an opportunity to directly engage with consumers and test their reactions to the SUSTAvianFEED eco-label in real-world settings such as public markets and trade fairs. Partners were encouraged to bring examples of product materials, allowing them to observe firsthand how consumers responded to the eco-label placement on products. This direct interaction with consumers provided valuable insights into their perceptions and acceptance of the label.

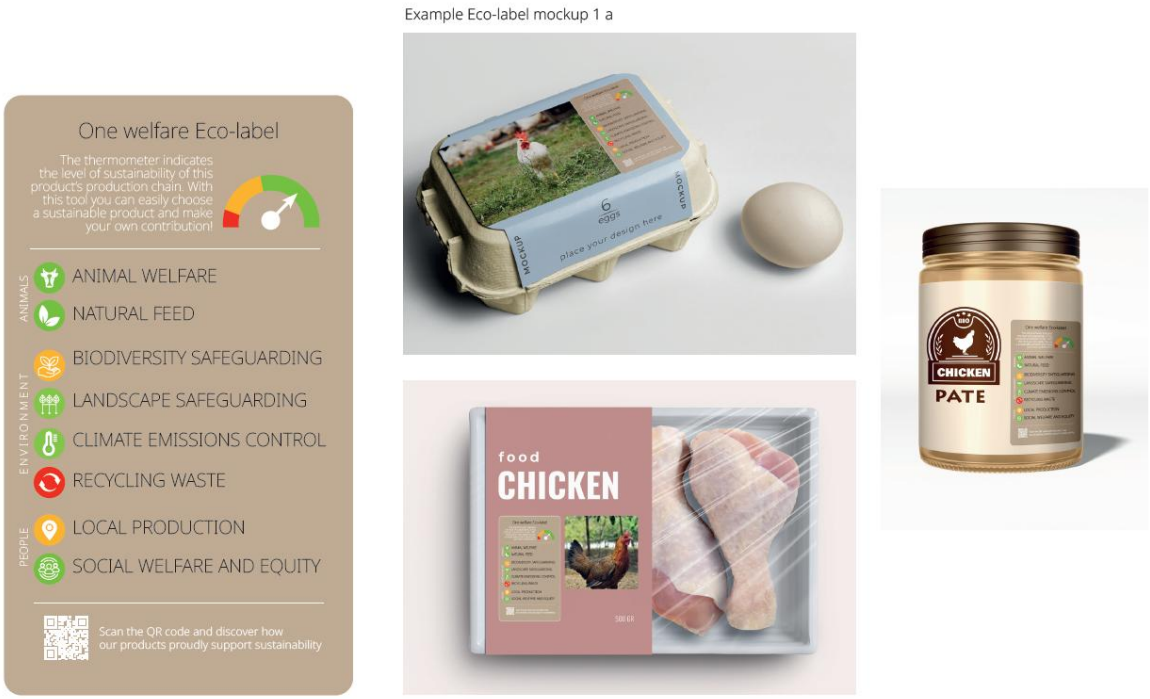
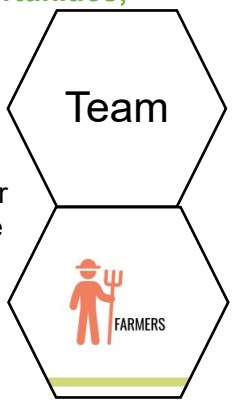


Figure 40. Examples on how the label would be placed in the products

LL A19. Market Validation, Business Model: Workshop: Detecting Opportunities, empowerment of rural women through farming activities



Objectives of the LL activity:

A workshop with women farmers and the consortium partners in the subject of the impact of the project in the new ways/ methods of poultry feeding in local family's economy, the rapprochement of visions and perspectives of common work between scientific research and field needs through concrete testimonies of women farmer benefit from the project in order to make suggestion and recommendation for the sustainability of this process. This workshop was followed by a field visit to four pilots.

Task related:

Task. 3.2 and Task 3.7

Actors involved in the LL activities:

Women farmers' beneficiary of the project and project partners internal teams.

Table 21. Participants in LLA19

Profile	Spain	Turkey	Tunisia	Italy
Academia	0	2	1	2
Researchers/experts	2	0	4	1
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	6	0
Private sector. Providers	2	0	0	0

Profile	Spain	Turkey	Tunisia	Italy
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Tabarka, Tunisia

Duration:
One day

Timing:
Project month 32 (November 2023)

Involved Partners:
Organized by Rayhana, Participants: ALL

Description of the activity:
The project team contacted the women farmers who joined the Rayhana pilot and presented them with the objectives of the workshop. The women's select six participants to represent them on the workshop and four pilots to be visited by the consortium project.

Three works groups

Group 1: The impact of the project in and the new ways of poultry feeding in your locality, family economy.

Group 2: The project and women farmers' empowerment, motivation, change women's reality, improve skills, take decision.

Group 3: Sustainability of the project results and the roles of each partners and stakeholders.

Key findings:
<u>Group1:</u>
The impact of the project in the new ways/ methods of poultry feeding in local family's economy:
Due to the high prices of the regular feeds, the project helps reducing the expenses of production.
Productivity:

- Reduction in deaths
- Reduction in diseases through enhancing the chickens immunity (OMEGA 3)
- Variety of food
- Regular feeds
- Dried worms

Speed the productivity process; shorten the production time.
Increase in feed consumption (problem)

<u>Group 2:</u>
Women Farmer's empowerment motivations, change women's reality, improve skills, take decision

- Before the project, they used to work on the agriculture, as there were no guaranteed daily job opportunities or income.

- The first meeting with the association was through its members.

"*This project helped us to come out from night to light. This project has given me confidence in the future; I feel less tired and have more time to rest. I am financially responsible for the family. I have become more aware of my economic and social rights. It is a new experience and a new opportunity for me*". Saida testimony (Saida Mezni is one of the women farmer beneficiaries of the SUSTAvianFEED project.
"*This project helped indirectly to secure or guarantees income that assists me and my family in covering expenses, such as those related to my disabled daughter".* Fatma testimony (Fatma is one of the women farmer beneficiaries of the SUSTAvianFEED project.

Difficulties:
- The protocol implementation.
- BMC: Business Model Canvas

Groupe 3:
1. Sustainability of the project results and the role of each partner and stakeholder:

Poultry management
- Provide guidelines for poultry feeding/Guidelines for small holders insect and poultry feeding/provide booklets for management of chickens and health issues
- Provide many examples of poultry diets with different ingredient's combination/diversification of protein sources and less dependence of imported raw materials
- Quality, techniques and methods for poultry feeding

Animal welfare improvement
- Physical tools/objects for animal welfare improvement
- Make clear the connection between production and welfare
- Practical advice for bird's protection (diseases…etc.)

Alliances, networking and market opportunity
- To be part of a network and share experiences to improve and also to share the practices from the project
- To engage and interact with national, EU, North African policy bodies
- Exchange experiences with small poultry farmers in Italy (Terra Madre), Turkish and Spanish NGO
- To join a common consortium (formal or informal) to advocate together for their interest

Create alliances to join forces and promote their activities: New market opportunities, alliance with local restaurants /to promote eggs and meat on the market/ improve awareness about the quality of eggs and meat produced by the local producers; good prices!
Is the eco-label useful beyond the project scope?

2. Sustainability of the project results and the role of women farmers

- Machine to produce poultry feeding
- Automatic incubator

- Guide box and training session about diseases
- Ways/methods to recycle chickens' droppings (organic fertilizers)
- Marketing: collective shop/virtual space to commercialize products
- Advanced equipment for poultry farming (temperature scale for chickens…etc.) to measure the temperature inside the chicken coop.

Conclusions:
The LL A19 workshop with women farmers in Tunisia highlighted the positive impact of the SUSTAvianFEED project on both sustainable poultry feeding and women's empowerment. Participants noted reduced feed costs and improvements in productivity, including reduced mortality and disease incidence, though challenges like increased feed consumption were identified. The project also significantly empowered women, increasing their economic independence and awareness of rights, with many women becoming financially responsible for their families. However, protocol implementation and understanding the Business Model Canvas (BMC) were recognized as areas for improvement. The workshop further emphasized the need for guidelines, practical tools for poultry management, and networking opportunities, including collaborations with local restaurants to promote local poultry products. The discussion also highlighted the importance of ensuring the eco-label's sustainability beyond the project scope, particularly for market visibility and consumer trust.

Figure 41. Interactions during LLA19

LL A20. Market Validation, Business Model: Co-creative Workshop Design of the SUSTAvianFEED Business Model

Objectives of the LL activity:

1) - To introduce the Circular Economy Workshop and its objectives.
2) - To highlight the importance of circular economy principles in agriculture.
3) - To provide insights into the SUSTAvianFEED project and its role in promoting sustainable agricultural practices.
4) - To engage stakeholders in discussions about the future of sustainable agriculture and the potential for circular economy practices.

Task related:
Task. 4.3

Actors involved in the LL activities:
Small-scale farmers and young individuals interested in starting agricultural ventures, although the participation from other quadruple helix members was also appreciated.

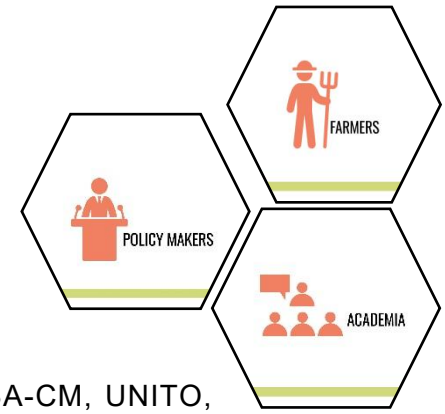
Table 22. Participants in LLA20

Profile	Spain	Turkey	Tunisia	Italy
Academia	2	3	7	0
Researchers/experts	2	5	10	0
Private sector. Associations	0	1	4	0
Private sector. Smallholders and producers	13	2	4	13
Private sector. Providers	0	1	2	0
Public Sector	0	10	4	0
Consumers				

Location:
Conference rooms at partners premises.

Duration:
3 hours

Timing:
Project months 38 to 46 (May 2024-January 2025).



Involved Partners:
Leading by ENTOMO. Participants: ALIA, ENTOMO, EGE, ISA-CM, UNITO, RAYHANA

Tools:
Circular Economy Business Model Canvas

Description of the activity:

General guidelines were provided, but the approach of the partners was different. The key element was the use of the Circular Economy Business Model Canvas. An

example for the most complete process, here is included the detailed description of the activity carried out by ISA-CM, that was divided into two different sessions:

A workshop organized by ISA-CM on June, 20th 2024 on CEBM. The main objective of this session was to provide an in-depth understanding of the principles of the circular economy, as well as its benefits, challenges and opportunities. Circular economy and key concepts and principles were defined (reducing waste, keeping resources in circulation for as long as possible and minimize environmental impact). Design for Durability, Modularity, Recovery loops, Resource Efficiency, Benefits of CE including: Environmental and Economical aspects were detailed. The session included visual presentations, explanatory videos and interactive discussions to engage participants and facilitate understanding of the concepts. Participants organized into three groups. Each tasked with identifying and selecting types of waste that could be recovered within a circular economy framework. The groups analyzed different categories of waste—such as organic, plastic, and metal—while exploring both the recovery opportunities and the potential challenges involved. Their discussions were guided by key principles: minimizing production costs, safeguarding the environment, and ensuring the sustainable use of available resources.

The types of waste were identified by the groups included: i) waste generated by a chicken farm, ii) waste from a horticultural, operation and iii) waste produced by mills and the agri-food sector.

Participants suggested methods of Innovative Recycling, Waste Valorization Techniques for transforming waste into value-added products strategies of Waste Reduction.

Participants evokated the necessary criteria to be considered viable within a circular economy framework:

- Environmental Impact: Assessment of the ecological impact of the idea.
- Economic Viability: Analysis of the costs and benefits associated with implementing the idea.
- Social Acceptability: Consideration of social aspects and stakeholder receptiveness.

Challenges encountered during the implementation of the ideas, as well as the opportunities presented by the proposed projects were discussed. Participants identified potential obstacles and possible solutions to overcome them.

After each presentation, a feedback session was held. Participants discussed the strengths and areas for improvement of the presented CEBMCs. The discussions allowed for exploration of:

- Innovation and Creativity: The innovative aspects of the models and how they address the challenges of the circular economy.
- Viability and Implementation: The practical aspects of implementing the proposed models, including potential challenges and resource requirements.

On October, 14 2024 ENTOMO with ISA-CM tested in a workshop the robustness of the different designed CEBMs in June, 2024.

Key findings:

Table 23.Summary of findings of LLA20

Country	Summary of findings
Spain	Two CEBM were developed where the insects were used not only for the nutritional value but also for other biotechnological properties as enzymes production. Assistants were very conscient about the need of feeding chickens in more sustainable way, starting for alternative nutrition. The assistants knew the local breed “Gallina Marciana” and preferred to feed them with insects. Most interesting CEBM was to treat vegetables with insects and then use the insects to feed the chickens
Italy	The workshop at University of Turin is a step toward promoting circular economy practices in agriculture. It offers small-scale farmers and aspiring entrepreneurs a comprehensive understanding of how to integrate these principles into their operations. By providing valuable knowledge, practical skills, and a supportive network, the workshop aims to foster a community of practice that champions sustainable agriculture. Participants will leave the workshop equipped with the tools and confidence to implement circular economy practices, enhancing the sustainability and profitability of their farming ventures. This will not only benefit their individual operations but also contribute to broader environmental and economic goals, creating a more resilient and sustainable agricultural sector. The SUSTAvianFEED project, through this workshop and other initiatives, is committed to advancing sustainable agriculture by empowering farmers with the knowledge and resources they need to succeed in a rapidly changing world. By embracing the principles of the circular economy, farmers can build more resilient and prosperous futures for themselves and their communities.
Tunisia	• Three CEBM were created and all of them were looking feasible at a good extend • One CEBM included the use of microalgae to recycle the waste and then feeding the larvae, as larvae can feed on the algae product without the need of drying it, increasing in that way the sustainability. • Cereal dependent by product(bread) could be interesting but could go to feed chickens directly as well. • East Tunisia, because the abundance of companies and by product, has a lot of potential to apply a CEBM based food by products and olive pomace. The workshop allowed successfully participants to gain a deeper understanding of and apply the principles of the circular economy. Their active cooperation and creativity demonstrated were particularly noteworthy. The exchanges enriched the learning experience and strengthened participants' ability to implement innovative and sustainable solutions in their future projects. Feedback from

Country	Summary of findings
	participants was overwhelmingly positive, highlighting the usefulness of the practical sessions and discussions. The skills acquired are expected to support the integration of circular economy practices into future agricultural and agri-food projects. In the second workshop organized by ENTOMO and ISA-CM, the robustness of the different designed CEBMs was tested. The first CEBM based including microalgae showed the highest robustness since it was more resilient, adaptable, and long-term viable in delivering both economic value and environmental sustainability, even in the face of challenges and uncertainties. It Minimized resource dependency by reusing, recycling, and recovering materials. It was Less vulnerable to price volatility or supply chain disruptions of raw materials and finally Encourages local sourcing and shorter supply chains.
Turkey	• Participants reached a consensus on the importance of integrating circular economy practices into poultry farming. They showed strong interest in reducing waste through innovative recycling and reuse techniques. • There were diverging views on the implementation challenges. Some participants discussed the potential for cost reduction with alternative diets to commercial soybean-based diet, while others expressed concerns about the initial investment costs and scalability. Additionally, there was debate on regulatory challenges and consumer acceptance of poultry products derived from chickens fed alternative diets. • Several innovative business model approaches were developed. Group 1 focused on using Black Soldier Fly (BSF) larvae as an alternative feed source for poultry to reduce feed costs and waste. Group 2 worked on utilizing food waste from supermarket chains to cultivate BSF larvae for poultry diets and nitrogen-rich fertilizers. Group 3 proposed converting olive mill wastewater and pomace into bioenergy and animal feed additives. Group 4 developed a sustainable production model using jojoba cultivation on non-arable lands, integrating renewable energy production. • Some unexpected insights emerged from the discussions. Participants expressed a willingness to develop pilot projects to test the feasibility of their business models. Additionally, there was a strong demand for further capacity-building activities focusing on practical implementation and policy support. The workshop successfully introduced participants to sustainable poultry feed alternatives and the principles of circular economy. The business models developed showcased innovative approaches to waste management, cost reduction, and environmental sustainability. Additionally, participants gained hands-on experience in creating viable business models that integrate sustainability principles

Conclusions:

The co-creative workshop on the SUSTAvianFEED business model successfully engaged participants in applying circular economy principles to poultry farming, focusing on sustainability and innovation. In Spain, participants developed two business models that incorporated insects not only for their nutritional value but also for their biotechnological properties, such as enzyme production. Participants showed a strong interest in alternative feeding methods, particularly using insects for local breeds like the Gallina Marciana. In Italy, the workshop served as an important step toward fostering a community that promotes sustainable agriculture, equipping farmers with the tools and confidence to implement circular economy practices in their operations. In Tunisia, participants developed three business models, including the use of microalgae for recycling waste and feeding larvae, demonstrating the high potential for using by-products in East Tunisia. The microalgae-based model proved the most robust during testing, being economically viable and environmentally sustainable.

In Turkey, participants showed strong interest in integrating circular economy practices, particularly focusing on innovative waste recycling and the use of Black Soldier Fly (BSF) larvae as an alternative poultry feed. Although there were concerns regarding initial investment costs and regulatory challenges, the group developed several innovative business models, such as using supermarket food waste for BSF larvae cultivation and converting olive mill wastewater into bioenergy. The workshops facilitated valuable discussions on practical implementation, policy support, and capacity-building, leading to the proposal of pilot projects to test the feasibility of these models. Overall, the workshops successfully provided participants with the knowledge and hands-on experience needed to integrate sustainability principles into business models, while offering viable solutions for reducing waste and costs in poultry farming.

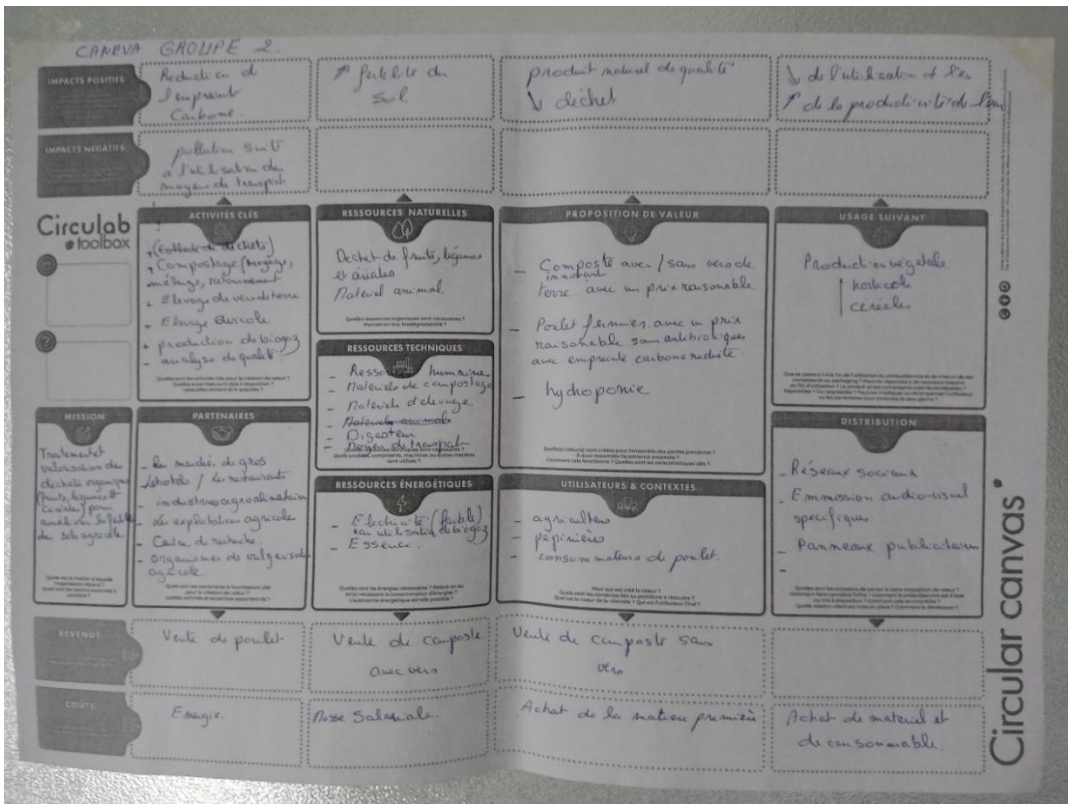


Figure 42. Example of CEBM Canvas used by ISA-CM

Figure 43. CEBM workshops and stakeholders involved

Key note: On the 21st of June, Naouel Jabbes on-behalf of ISA-CM was interviewed by the governmental regional Radio of Monastir and presented the SUSTAvianFEED project and the activity of the CEBM.
The link to the podcast of Naouel Jabbes' appearance on Radio Monastir after the CEBM workshop is :
https://www.facebook.com/share/v/p98B925Zf58z3M3V/?mibextid=oFDknk

LL A21. Market Validation, Business Model: Final workshop: SUSTAvianFEED Business Model validation

Team

Objectives of the LL activity:

1) To share business development main learnings
2) To develop the final version of Business Models
3) To get useful insights developing guidelines for Circular Economy Business Models

Task related:
Task 4.3

Actors involved in the LL activities:
Project Partners internal teams.

Table 24. Participants in LLA21

Profile	Spain	Turkey	Tunisia	Italy
Academia	2	2	1	2
Researchers/experts	2	0	2	1
Private sector. Associations	0	0	0	0
Private sector. Smallholders and producers	0	0	0	0
Private sector. Providers	5	0	0	0
Public Sector	0	0	0	0
Consumers	0	0	0	0

Location:
Lorca, Murcia

Developed activities:

Workshop

Duration:
2 hours

Tools:
Brainstorming, Mentimeter, Triple Layer Business Model Canvas

Timing:
Project months 47 (February 2024)

Involved Partners:
Prepared by ALIA and ENTOMO. Assistants: ALL PARTNERS: ALIA; ISA-CM; UMU; EGE; UNITO; RAYHANA: ENTOMO; SLOWFOOD.

Description of the activity:

The first step was to share the results from the different countries/workshops carried out in the previous LL activity.
Second, the Robustness check for the different countries in collaboration with partners.
Third, Let's make a final business canvas, including a free discussion on the following topics:

- Do you think that Social Aspects are considered by business and consumers in this sector/ in your country?
    - Which ones?
- Do you think that Environmental Aspects are considered by business and consumers in this sector/ in your country?
    - Which ones?

Key findings:
Robustness check made during the workshop with partners, more details can be found in deliverable 4.3.

Figure 44. Results of Robustness MADE by partners in LLA21

Risk factors	Turkey	Italy	Tunisia	Spain
International conflicts	2	1	3	1
sustainability	3	1	2	1
Climate change	1	1	1	1
Subsidies	2	1	3	1
National strategy				
International Logistic	1	2	3	2
Consumer habits	1	2	3	2
Legislative barriers	1	3	1	3
Workforce	1	3	2	3
Artificial inteligence	1	1	1	1

Figure 45. Project partners in LLA21

Conclusions:

The final workshop for SUSTAvianFEED Business Model validation successfully brought together project partners to share key learnings from previous workshops and refine the business models developed across the regions. Participants reviewed the robustness of the business models, with a focus on their feasibility in light of

various risk factors. The Triple Layer Business Model Canvas was used to discuss critical topics, including the social and environmental aspects of the poultry industry in each country. Participants were encouraged to reflect on the role these aspects play in business decisions and consumer behavior, leading to a deeper understanding of the broader impact of sustainability in the poultry sector.

Key findings from the robustness check highlighted some common concerns across countries, such as consumer habits, legislative barriers, and the availability of subsidies, which were seen as critical to the success of the proposed business models. Additionally, issues like international conflicts and climate change were recognized as risks but were rated less critical. The workshop emphasized that social and environmental aspects are gaining importance in the industry, with participants acknowledging that these factors should be integrated more effectively into both the business models and consumer decision-making. Moving forward, these insights will inform the final business models and guidelines for circular economy practices (Deliverable 4.3), ensuring that the solutions are adaptable and resilient to both local and global challenges.

Conclusions

In summary, the Living Lab activities carried out in the framework of the SUSTAvianFEED project have highlighted key insights into the development and testing of sustainable poultry feed programmes.

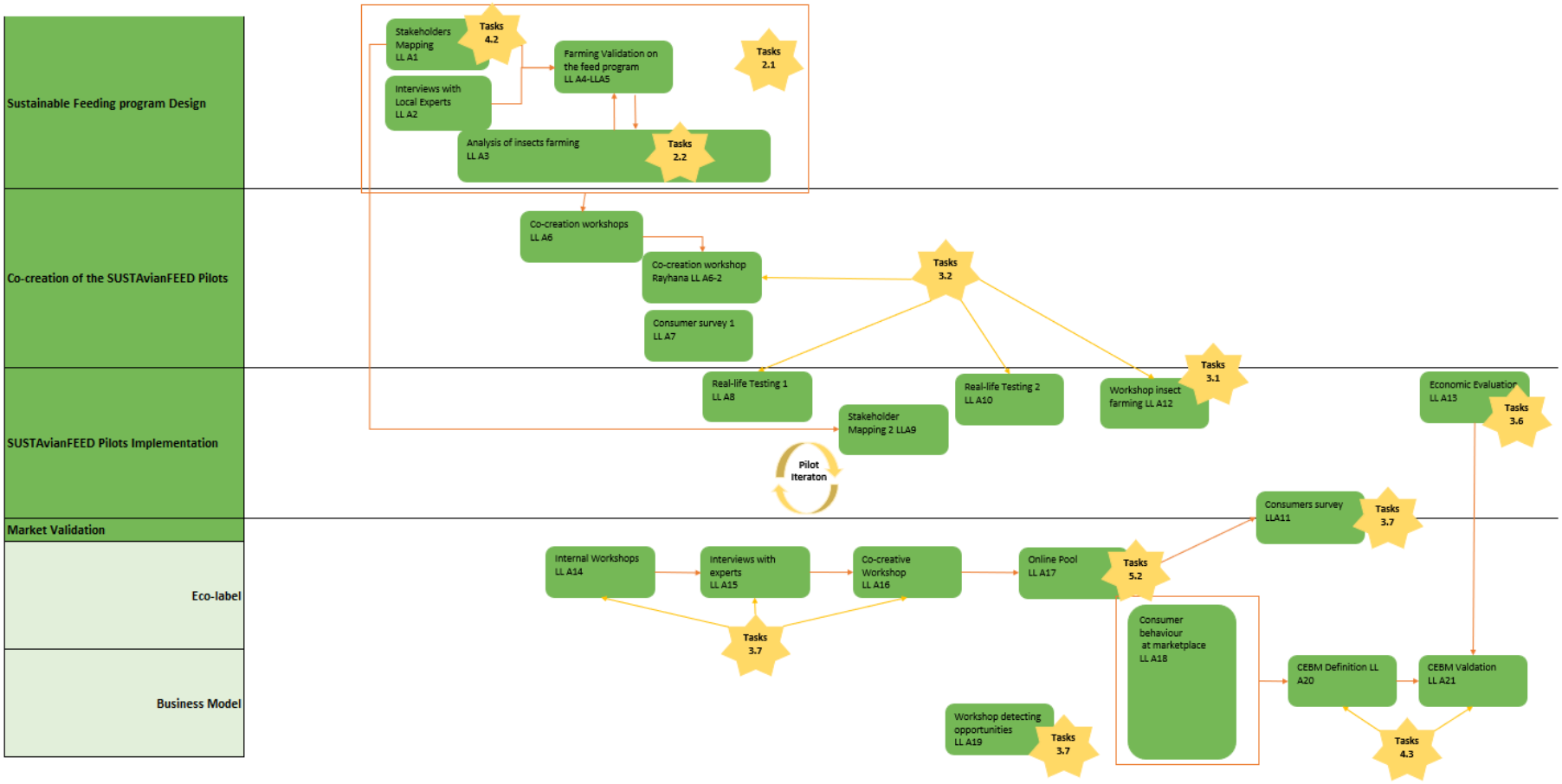
It is essential to emphasize that long-duration, Living Lab-based projects require adaptive management and flexibility. This includes being open to adjusting plans based on stakeholder's feedback and the continuous analysis of results. This adaptive approach must be incorporated early in the project design, as blending traditional linear models with the Living Lab approach can lead to challenges during execution. The real-life environments where the activities were carried out, combined with stakeholder engagement, created unique opportunities for innovation. Furthermore, the success of the project is closely linked to the effectiveness of the innovation network that supports the Living Lab activities, especially when the activities are close-related to social aspects as engagement of rural women.

It is recommended that the Living Lab process should be assessed as a comprehensive approach, where multiple research methods can be combined to achieve satisfactory outcomes. Co-creation activities, in particular, were regarded as one of the most valuable aspects of the project, allowing stakeholders to design solutions that are directly informed by customer needs and market demands, while also fostering innovative collaboration among different actors in the development process. This approach is vital for transitioning towards circular economy-based business ecosystems.

Table 25. List of participants across all the Living Labs in SUSTAvianFEED

Profile	Spain	Turkey	Tunisia	Italy	Total
Academia	34	38	47	14	133
Researchers/experts	25	23	36	19	103
Private sector. Associations	6	4	4	1	15
Private sector. Smallholders and producers	18	8	77	14	117
Private sector. Providers	24	23	6	4	57
Public Sector	3	15	38	2	58
Consumers	444	409	554	407	1814
Total	**554**	**520**	**762**	**461**	**2297**

Appendix 1- Overall Process



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SUSTAvianFEED Project Deliverables and Activity Reports.