agromix

Handbook of collaborative design to solve sticky problems in agriculture

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Introduction

This handbook was developed within the Horizon 2020 project AGROMIX to support facilitators in the participatory co-design of new agricultural products, processes or systems, a bottom up approach to provide solutions to challenges affecting and influenced by different stakeholders. Co-design is recognised as a valuable approach to achieve change, however practical guidelines for this approach and application in the agricultural sector remain limited. The goal of this handbook is to make co-design more accessible and provide users with a step by step approach to developing new solutions in collaboration with multiple stakeholders. The approach was applied within 12 pilot projects in the development of new agricultural products, more attractive products, the design of resilient landscapes, farmer networks, regenerative production systems, carbon farming systems, agroecological mixed farming, silvopastoral agroforestry and supply chain development. Though their challenges and solutions are all different they have all applied the same design approach. Their experiences and advice have supported the development of this handbook. The design approach built upon the Reflexive Interactive Design approach (Bos et al., 2009) which has been adapted based on user needs. We have called the approach 6D; Determine, Direct, Dream & Define, Discover, Design and Develop. In the coming pages we will share the practical implementation of this approach with tools and tips from users.

Users of this handbook

This handbook has been developed for the initiators and facilitators of the design process to help guide you in this process. So if you are working towards the development of a new product, network, production method, farming system, or sustainability goal, this handbook can be useful for you.

Contents

01 Determine

The key outcomes of the first phase of 6D are to determine if co-design is a suitable approach, who should be on your team and which stakeholders may be interested in taking part in the co-design process.

What is co-design & why we use it

Co-design is an approach to design in which multiple participants work together to reach a design through learning from each other and making collective decisions as a group to determine the scope, challenges and solutions together. It is a bottom up, democratic approach to designing solutions founded on participation. The potential added value of this approach is that collaboration with stakeholders can support the more rapid adoption of more effective and equitable solutions.

When to use co-design?

Some developments in agriculture and food systems are not easily solved at an individual level and are best achieved in collaboration with others. This is especially so when attempting to make changes at a system level as this will have noticeable effects on others and the optimal result is subjective. In this case different groups can have different competing, or complementary, goals which will support or hinder development. Consider developing more mixed systems in agriculture, this has implications for the producer, landscape, local citizens, local government, distribution, retail and may also be hindered by rules and regulations. In this situation it can be valuable to work together to develop solutions that everyone supports and will facilitate the implementation of. This can also lead to novel ideas and solutions which were not possible as an individual. This leads to the question; how can we do this effectively? Which is why we wrote this handbook.

How to co-design with 6D

The handbook provides a step by step guide to the co-design process; **1 Determine, 2 Direct, 3 Dream & Define, 4 Discover, 5 Design, 6 Develop** (see **Figure 1**). For each step we share key potential outcomes, tools and tips to achieve them, as well as recommendations for planning and organising sessions. This is intended to be a short guide to provide inspiration, so feel free to adapt this because real life is not linear.

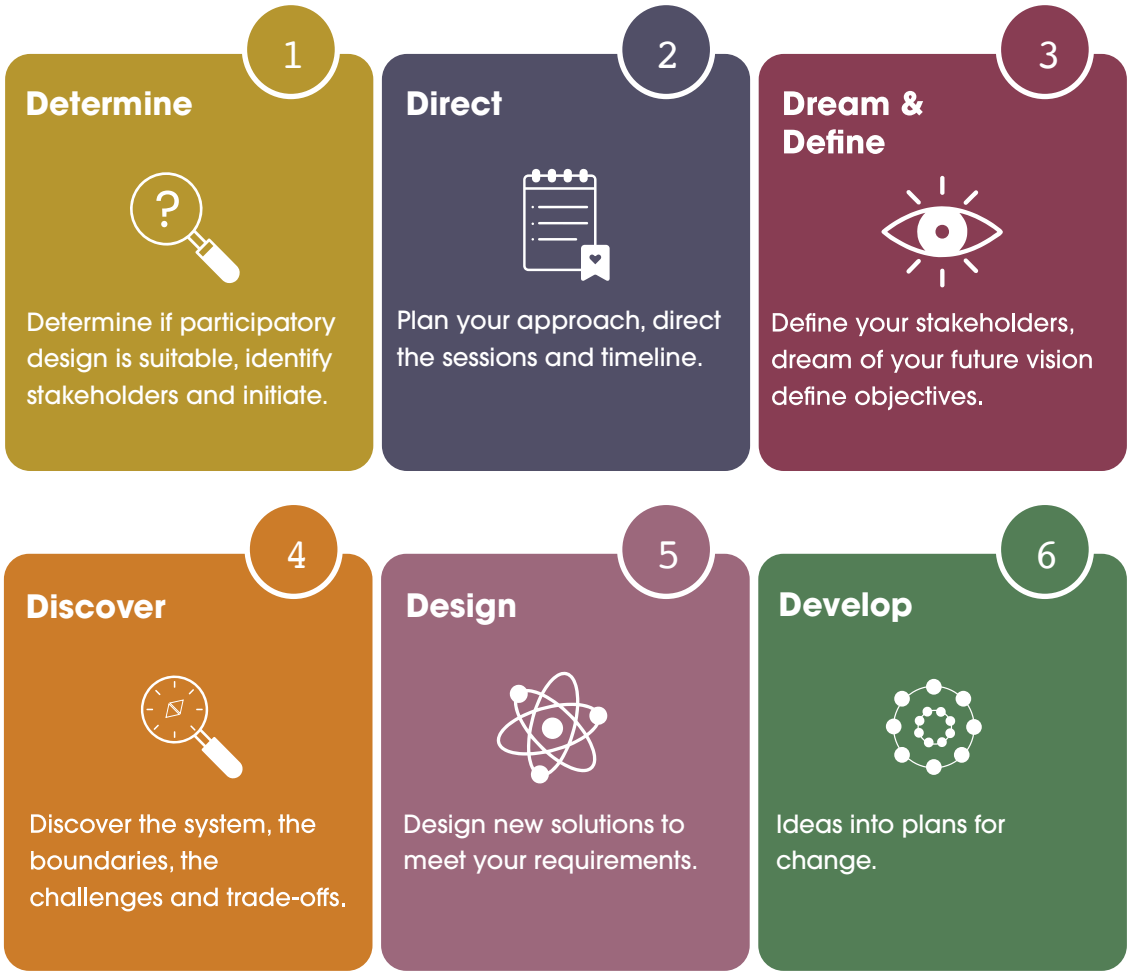


Figure 1. The 6D collaborative design steps

Initiate

It often begins with an initial idea and an initiator, the person or group, that would like to initiate a change and has an idea of the outcome they would like to achieve. These can be as diverse as making a landscape resilient to climate change to creating a new farm product from scratch. The first step is to have identified a broad challenge, or tentative goal, that is clear enough to discuss and attract the engagement of stakeholders. Write this down and make this first draft no longer than one A4 page to begin with. This forms the basis round which to build up the team and get the process moving. If you have the skill set you can do this yourself. Otherwise it can be valuable to bring in a dedicated facilitator, or multiple facilitators when working on a larger project.

Select and build a team

The composition of the team will significantly influence the success of the co-design process. We recommend a team that has at least one local project ambassador (someone who is familiar with the challenge and context such as a local farmer, NGO or business) and at least one facilitator (someone able to bridge the differences between stakeholders and bring them together in the problem solving process). Ideally a team of 3-4+ is better as people may leave. Be sure to choose the right people for the task, including 1) fantastic group facilitation capabilities 2) multiple skill sets and backgrounds 3) the skills of both internal (project facilitator and ambassador) and external stakeholders. Keep in mind that experts on specific issues can also be hired in temporarily rather than sit in the core team, and you can build upon the skills of existing organisations and projects working on the challenge. The team is responsible for managing the development, planning activities and organising finances. But aim to share responsibilities with the group to encourage ownership.

Identify stakeholders

Make an initial scan of all the stakeholders who have a vested interest in the outcome of the project. They may be affected positively or negatively in any solution to the challenge, this is often called stakeholder mapping (see Figure 2). These can be stakeholders who are both directly, or indirectly impacted so cast a wide net to begin with, as there could be interested stakeholders that you didn't think of yourself. Use multiple channels to reach novel stakeholders including direct contact, working groups, social media, local groups, NGOs, existing projects and such to ensure that diverse interests and perspectives are considered.

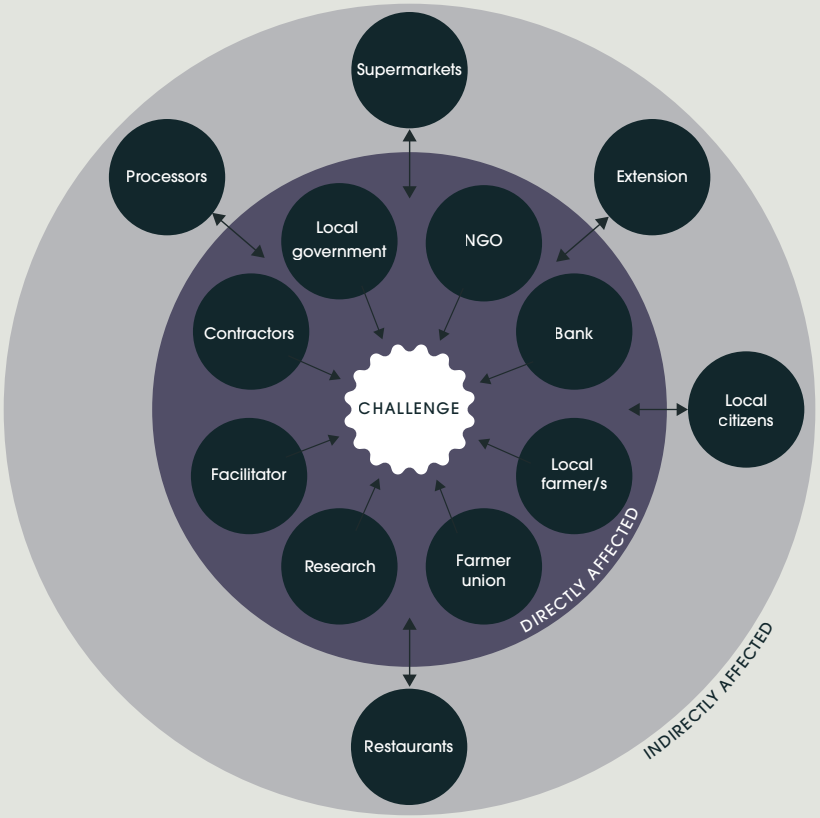


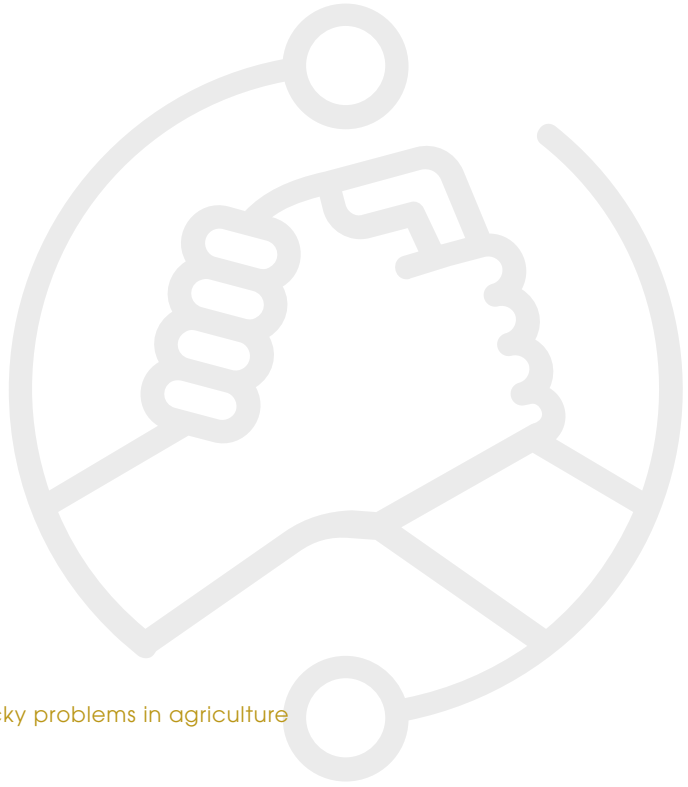
Figure 2. An example of stakeholder mapping from the pilots showing the first exploration of stakeholders directly and indirectly connected to the challenge. We placed the challenges in the center and explored which stakeholders were directly or indirectly affected by these challenges and organised them into this diagram. Do you see any similarities with stakeholders in your project?

02 Direct

Any project requires planning, this can be done as a team exercise or as a collaborative action with the direct stakeholder group to help build the project ownership by stakeholders and also ensure that they are aware of the resources, constraints and timeline that also determine the project. Key outcomes include: an action plan and preparation for the first sessions.

Dynamic Action Planning

This is the process of defining and setting out specific actions along a timeline to achieve a goal. The Action plan enables the success of the initiative by providing clear accountability and an appreciation of the resources necessary to achieve the different actions, as well as supporting decision making and also the division of tasks. A first version on the action plan can be developed prior to meeting other stakeholders to plan the initial engagement and this should be revised and added to as the project develops and the first workshop sessions have taken place. A simple approach is shown on the next page.



FACILITATION: ACTION PLANNING

This can be done as a small team, or with the whole group. Start off by setting up a board as shown in figure 3, this can be printed, on a digital board or using flip-overs and can be drawn on directly, or the group can add sticky notes.

Goal	What goal are you contributing to with this action?
Action	What action are you planning?
Date	When will the action take place?
Action lead & team	Who is responsible? Who takes part?
Relations	What are the links with other activities inside or outside the project?
Expected results	What results are you expecting or hoping for?
Optional Extras depending on the project:	
Resources	What is needed to complete this action?
Progress	What is the progress of this action?
Opportunities & risks	What opportunities and risks can be expected?
Completion	When do we consider the action to be completed?

Tip: What sort of actions you can consider:

• Analyse stakeholders • Vision development • System analysis • Develop partnerships • Collaboration sessions • Knowledge; acquisition, generation, sharing	• Designing • Prototyping and testing • Branding & Communication • Advocacy and lobbying • Monitoring and evaluation

Tips:

• Plan enough time for the process, not just for preparation of the sessions and activities but also time for informal exchanges during physical meetings, as this is where relationships and ideas are developed.	• Consider constraints such as the growing season, farmers are busy during this time so try to ensure the activities take place when they can participate

"Here we used a digital note board to make our first action plan. We started with the objectives and used this to fill in the activities, involvement, who would take the lead in achieving the result and when we expected this by. By doing this together we gained a good understanding of what we wished to achieve together and also what we could expect from each other during the process. This initial action plan gave us a good outline for starting activities in the pilot and many of the activities were carried out as planned. We would recommend this approach to others when starting out, and also to review and refine this based on the project needs and as the project develops."

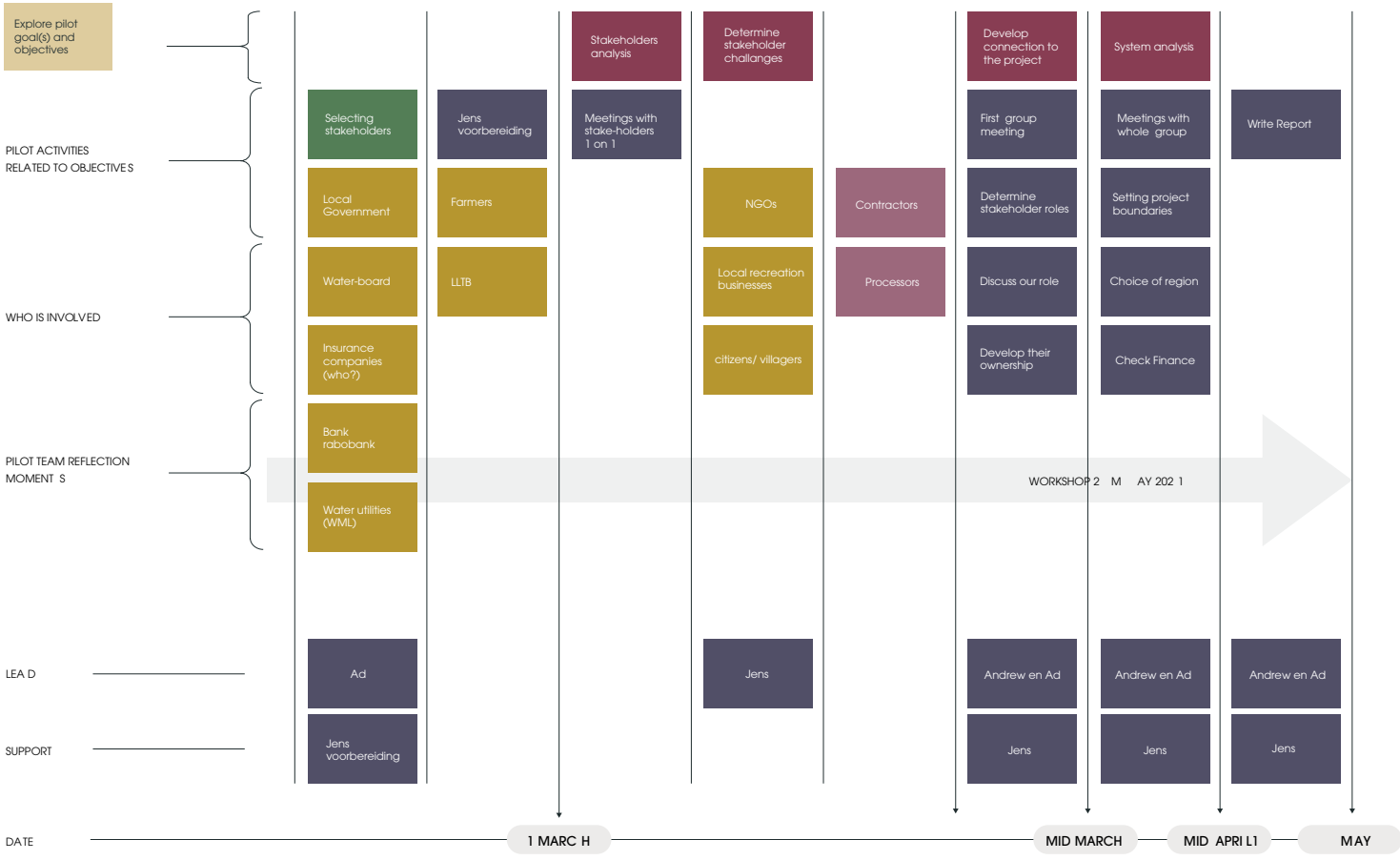


Figure 3. An example of action planning from the early phase of a pilot project developing a climate resilient landscape.

The planning shown in Figure 4 reflects the 6D themes with workshops (WS) as key milestones during the process, consider:
WS1 Dream and define, WS2 Discover, WS3 Design, WS4 Develop. Often these workshops will require at least half a day to a day to achieve progress with stakeholders.

1. Kick off, action planning.
2. Explore the idea or challenge with stakeholders, such as in one-on-one meetings to determine interest.
3. WS1 Dream and define- session/s goal is to get to know each other, define the challenge and create a vision.
4. WS2 Discover – session/s goal is to explore and determine the scope, system and challenges further.
5. 5 & 10, Reflect & refine – throughout the process.
6. WS3 Design – session/s goal is to create different solutions and explore what this will mean to different stakeholders in addition to refinement and selection of a few key solutions.
7. Throughout the process, visits by inspirational experts, field trips and networking are recommended.
8. WS4 Develop – session/s goal is the assessment and development of chosen design solutions.
9. Development of prototypes, pitch & refined proposals.

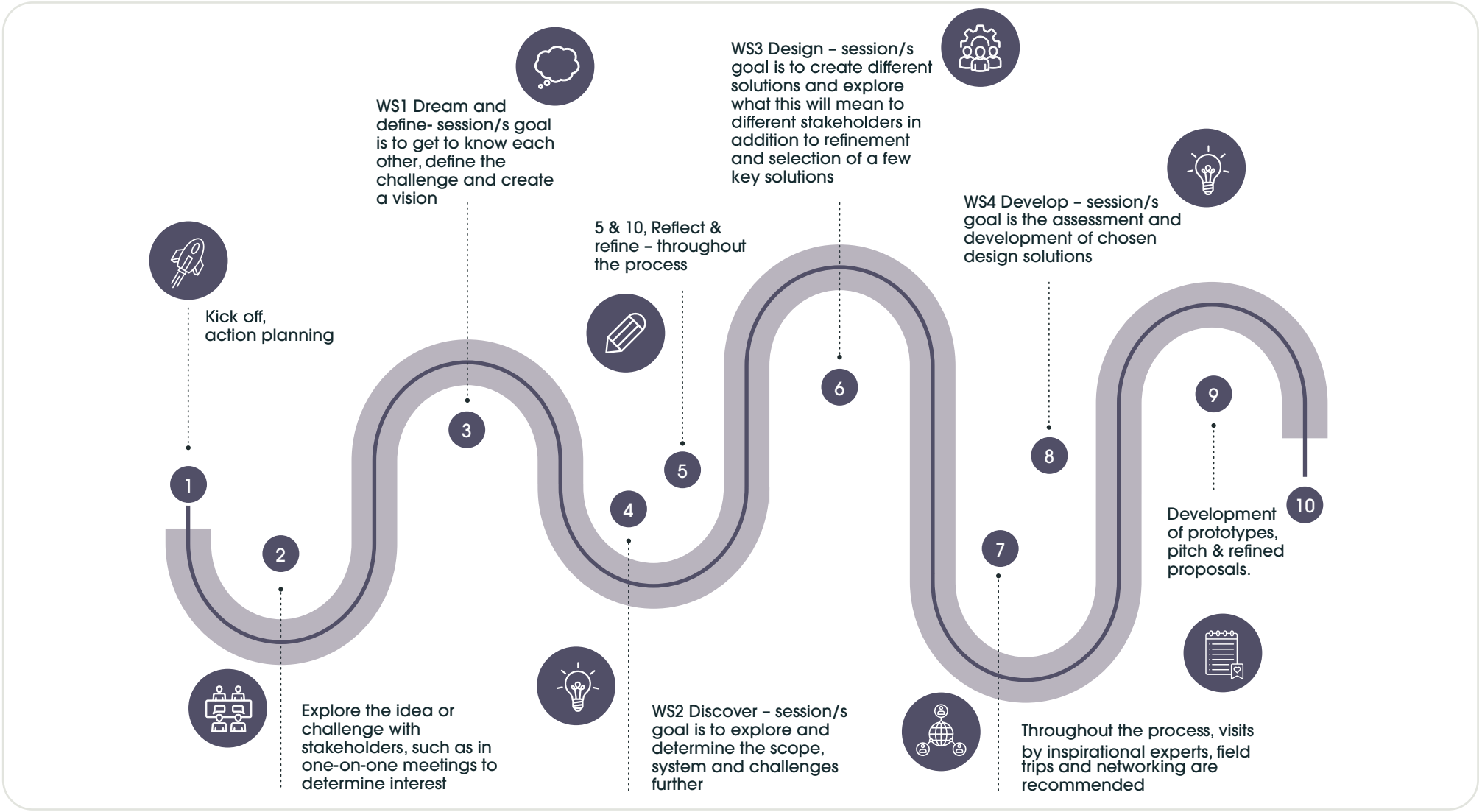


Figure 4. Here is an example of how the 6D process looked in practice for some of the pilot projects in AGROMIX.

Planning Successful Workshop Sessions

Carry out good preparation for each of the workshop sessions; WS1 Dream and define, WS2 Discover, WS3 Design, WS4 Develop, to ensure the goals of the sessions are fulfilled and participants leave feeling that it was worth it. We recommend that informal moments are planned into the sessions to allow for socialising and relationship building. Below is an example template for preparing a workshop session with stakeholders. These essentials should all be covered during the preparation: what is the goal, expected results, discussion points, location, date, time, participants, preparation steps, methods, logistics, and a play by play of the workshop session including moments to socialise.

WORKSHOP PLANNING FOR PILOT	
Goal: The goal is to further refine a limited number of ideas that have been suggested for the pilot	
Planning Version: Concept 1 – 29 Sept 2022 Location: Gemeenschaps Huis Ransdaal	 Date: 24 Nov 2022 Time: 1230-1630 (1230-1315 lunch, 1315-1630 workshop, 1615-1630 drinks)
Desired result of the workshop: • Collective choice of ideas & development of solutions • Some solutions are further designed	 • The next steps and planning are clear • The participants a motivated and wish to take part further
Participants and role: Graphic designer (for drawing images), local expert (inspire the group)	
Invited participants: See excel file	
Preparation work: Necessary preparation for the meeting:	

WHAT	WHO	WHEN	COMPLETED
Reserve a the meeting place	Ad	10 Oct	Yes
Arrange catering	Ad	10 Oct	
Flipcharts, markers, painter's tape, post-its	Daniel	24 Nov	Yes
Remind participants and send practical info	Ad	17 Nov	
Invite and inform experts - Rainmaker, Brigitte	Ad	ASAP	
A0, make prints of cards	Daniël	1 November	Y

SESSION PLAN				
Time	**Point and goal**	**Questions and contents**	**Process, methods and materials**	**Who**
12.00	Arrival of the team Organise the room and tools ready before participants arrive		Room setting, projector, flip chart, markers. Lunch, Drinks, etc Cards and posters on the wall	Ad, Andrew, Daniel
12.30	Participants arrive + lunch People have time to settle into the meeting.		Lunch	Via Ad
13.00	Welcome participants Participants know what we are going to do this afternoon	Review of previous meeting Programme of afternoon Participants know each other (making round) attention for guest speakers	Presentation Make photos	Ad Andrew -
13.20	Presentation by expert			Caspar
13.35	All the additional steps and sessions>			

Figure 5. An example plan for preparing a workshop session.

03_Dream & define

The key outcomes of dream and define phase are: 1) stakeholder engagement, 2) stakeholder analysis, 3) vision and goal development.

Why involve stakeholders?

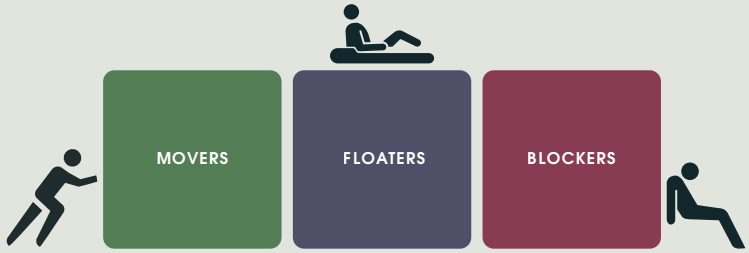
All designs have positive and negative elements and will affect stakeholders in a multitude of foreseen and unforeseen ways. By designing with stakeholders we work towards shared; needs, requirements, ideas, understanding, knowledge, appreciation, risks and utility that ultimately support the balancing of different interests. Stakeholders will ultimately determine the success or failure of the project and their support of the design.

Engage

A good way to start is with short one on one meetings with different stakeholders, who have been identified during the stakeholder mapping. In these meetings it is important to gain understanding of; 1) their perspective and position on the change, 2) their interests, 3) challenges and 4) who they think the most important stakeholders are for achieving the change. Finally 5) if they would like to be take part in the developing solutions. For further tips we recommend the publication: Influence without Power, Stakeholder management in practice.

Stakeholder analysis

Having conducted the interviews and gained a good understanding of the stakeholders' perspective, interests and challenges the next step is to explore what this can mean for the achievement of the desired change. This can be represented in a number of ways, such as movers, floaters and blockers (see below) or in an interest and influence diagram (see next page). These help to determine how we engage with and gain participation from these stakeholders.



Stakeholders may be blockers, movers or floaters. Blockers are generally opposed to any changes, movers actively want to change things and floaters are undecided. Here you can see a very short version of this showing the stakeholder, the expected impact from them, their attitude and their interest & challenges.

STAKEHOLDER	IMPACT	ATTITUDE			INTEREST/ CHALLANGE/REMARK
		Blocker	Mover	Floater	
Farmer			X		Can lead to a more diversified income and a more harmonious ecosystem. However, the workability of the land is becoming harder and in some cases hampered.
Inhabitants	Low			X	This can lead to a higher liveability in the area.
Local government	High			X	This can lead to higher liveability in the area and a more attractive landscape for tourists.
Waterboard	High		X		We appreciate better water management in the area, but the waterboard is not working in the research area yet.
Insurance companies	High			X	If flooding is prevented people may no longer buy insurance, but the damage costs from flooding also cost us a great deal of money.
Bank	Medium		X		Improves the image of the bank which can lead to higher sales. However, there are also risks that can lead to losses of the bank.
Nature organisations	Medium			X	We support higher biodiversity in the area.
Processors	Low		X		The positive image for advertising material could increase sales, however the potential of reduced production and a less uniform product is of concern to us.
Contractors	Low	X			The operations could become more diversified and the operation period increases. It is not feisable to work or make machinery investments for very small areas.

Table 1. An example stakeholder portfolio providing an overview of stakeholders attitudes and interests

Facilitation: **Interest and influence diagram for stakeholder management**

Write down all the stakeholders that are relevant to the project on sticky notes and make a diagram with high to low influence and negative to positive interest. Discuss the position of the different stakeholders with your team and place them on the diagram showing who to regularly engage, actively consult, keep informed or maintain interest.

Example from the pilots

"This example shows the different stakeholders from our pilot. This approach helped us to see all the different stakeholders, their interests and to determine who to engage with for further development of the project. The farmers could have been placed multiple times to represent different farmers and their interests and influence."

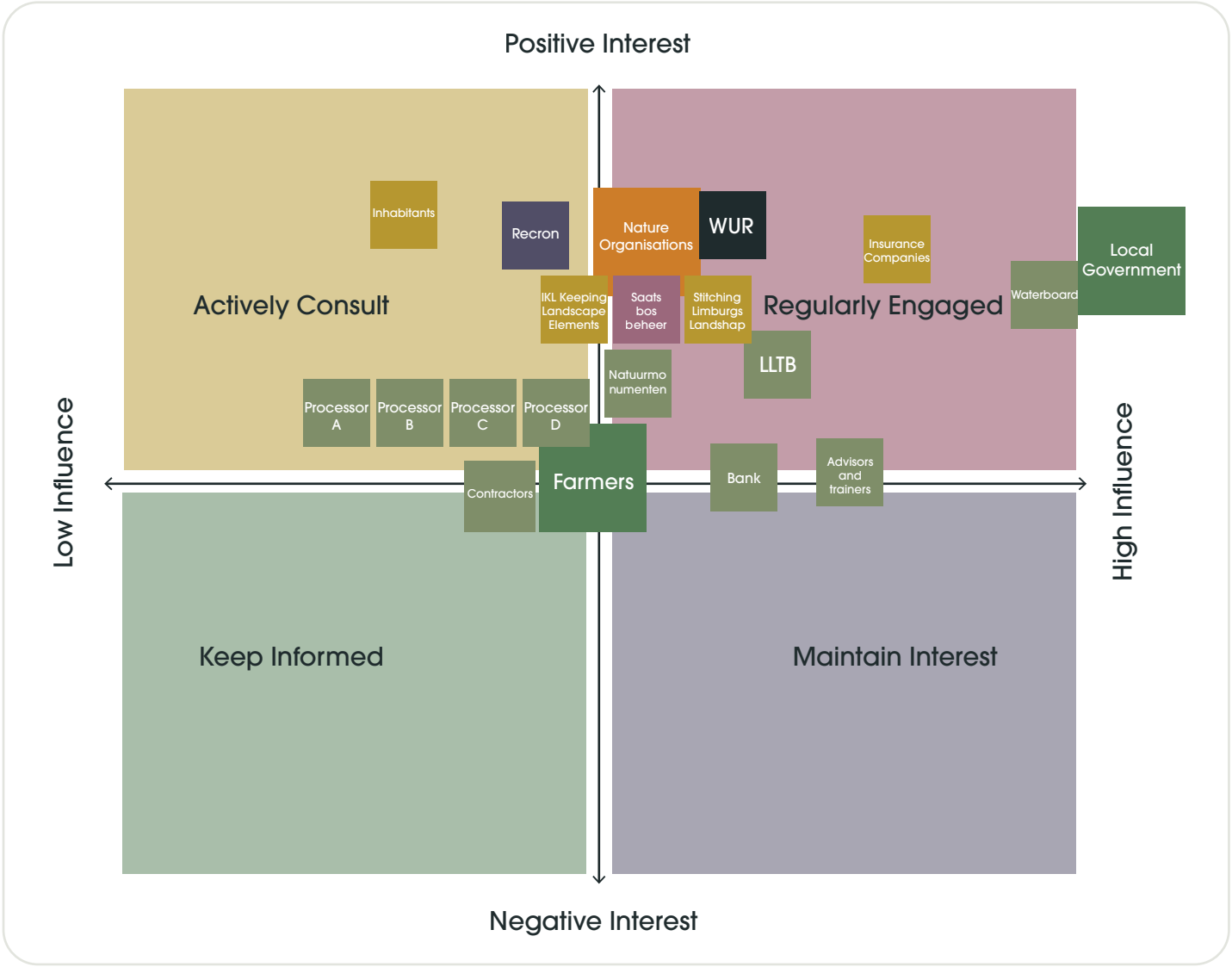


Figure 6. An example of the interest and influence diagram for stakeholder management from one of the pilots

Invite

Having had the first meetings with stakeholders and completed the stakeholder analysis (see **Table 1 and Figure 6**) it is time to determine who to invite to take part in the co-design process. See above on who and how to involve them. Once the stakeholder analysis is complete it is good to make a mailing list for all the participants with name, organisation, email, phone number and interests and invite them to take part. Make sure you comply with applicable data protection regulations.

Manage and Engage

Stakeholder management concerns the identification, engagement and participation of those interested in the project outcomes. This takes place for the duration of the project and is essential if the solution is to be truly co-designed. There are numerous ways to support stakeholder involvement, ultimately it is important to keep stakeholders 1) consulted, ask for their participation in the process. 2) involved, in the ideas, decisions and responsibility of the project 3) informed, of the process and developments 4) appreciated, that their contribution and input matters. Over the long term this helps to develop ownership of the project.

The workshop sessions for dream and define should bring the stakeholder group together in a collective goal, define the scope of the development and inspire them to do things differently. The intensity and duration should be appropriate to the scale of the project, a half day, or a day should be sufficient for the first session.

Unify the group

Bringing different stakeholders together to work on a common challenge is as much about social connections as it is about solving a technical challenge. It is essential to create an environment for collaboration. Kick off the starting session with an activity to break the ice and get people talking to each other and working together. There are many different options for this, a good way to start is with a Round Robin (everyone introduces themselves) followed by more personal interactions such as Speed Dating, or sharing a meal (see next page).

Introduce & review

Introduce; the initial challenge to be co-designed, what the ideas behind the meeting are, what has been discussed with stakeholders so far, what their interests and desires are and ask what they would like to get out of the workshop session? As a group, discuss the project stakeholders that have joined. Ask the group if we have the right people here? And do they think we can go forward to the next steps with this group?

Address expectations

Expectation management and what is possible within the scope of the project should be clear to all stakeholders. Is the initiative a conceptual exercise, do we intend to come to a proposal that we submit to funders or a bank, or do we expect to realise implementation? This will not only guide the process but also influence the commitment and choices of different stakeholders.

Facilitation: Speed Dating

Goal: deeper introduction of the group

Steps: Every participant is given a number 1, or 2. 1s form a circle, and 2s pair with them to form a circle around them. Participants have 3 minutes to introduce themselves to each other with, name, background, desire for the session, hobbies etc. Once 3 minutes is up the outer circle moves clockwise, and the inner circle stays still. Repeat until all pairs have met each other.

"This was a great method to directly address any tensions or grievances among participants and helped to build relationships within the group that facilitated the sharing of different perspectives, knowledge and experiences. This laid the groundwork for the team feeling and spurred the creativity and reflection of participants throughout the process."

Facilitation: Food Connection

Goal: informal connectivity of the group

Steps: Provide a meal to begin, or end the session. Consider breakfast, lunch or dinner for the whole group. Take one hour to give people sufficient time to get to know each other.

"A meal provided a very good means by which the farmers and the team could learn informally from each other. The informal nature of the workshop helped create a sense of community and encouraged connections and interaction between the group. We believe that food can serve as a powerful social connector, bridging the gap between academics and farmers through pragmatic learning, direct interaction, and the application of research insights to real-world agricultural challenges."

Why develop a vision statement?

Coming to a shared vision statement is integral for the success of the initiative. The vision statement provides direction and purpose for the group, guides decisions and evaluation, can be used to inspire the group to achieve something new and motivate others to collaborate with the group to achieve its vision. For these reasons it is good to take time for this.

What should the vision statement include?

Your vision statement should capture long term developments and articulate the desired future state. It should capture the values and desires of the group in a few sentences. What the vision captures will depend on the desired outcomes of the project, this can be: economic, political, social, agronomic, environmental, behavioural. The expectation should be that the vision is long after the completion of the project and thus should remain relevant over time.

How to come to a vision as a group?

It is critical to get the whole group engaged in developing the vision. To achieve this it can be valuable to have both group and individual exercises and facilitate the engagement of the group members. Consider using flip charts, whiteboards, sticky notes or interactive digital presentation tools for drawing, digital sticky notes and mind maps to record the different ideas. Ask questions such as; `what does your desirable future farm/product/network/landscape look like?' or `what is your dream for development in the year 2050?'

Facilitation: World Café **Goal:** gain input and ideas

Develop questions together with the group, create a café setting with tables and chairs. Each table has a specific question. Participants are split between the different tables and spend 15-20 minutes per table. One person per table notes down all the important points, and one person remains at the table to host the next group the rest of the group goes from table to table.

Questions: What do you find most important to achieve? What is your purpose? What is your own short vision statement?

Example: from Serbia

Sharing experience between different stakeholders provided the opportunity to learn about existed frameworks; legislative, advisory support, specific problems related to production in natural conditions and possible solutions.

Facilitation: storytelling **Goal:** gain input and ideas

Provide each member of the group with something to write on, this can be with sticky notes or digitally. Ask the group to imagine they are seeing the results achieved in 30 years' time. Ask them to describe what they see and write it down.

- Ask them to be specific and describe how they feel about it
- Once completed bring the visions together with similar themes
- Share them as a group and discuss them
- What are the common themes and desires
- What do people think of other peoples visions

Refining the vision

Once all the ideas, themes and priorities for the vison have been developed it is time to bring it together. What are the recurring themes from the different groups? Propose a few shared vision statements, or ask the group to propose some. Test with the group which ones are supported and which ones are not, in order to to refine the statement to ensure it is supported by the whole group. Take some time for this and make sure that the group agrees to a vision before moving forward.

Formulate goals

While the vision provides the long term inspirational purpose, the goals provide clear objectives that can be achieved within the scope of the project duration. These goals should further clarify the focus of the developments and aid in the assessment of whether the actions carried out will achieve the desired results. A similar process can be followed as for the vision, however the descriptions should be more defined. We recommend making the goals SMART: Specific, Measurable, Attainable, Relevant, Time bound. Goals will also support the development of the brief of requirements described later in this handbook.

Agreeing goals as a group

A project may have multiple different goals and as such there can be key goals and sub goals. We recommend coming to a decision on the importance of different goals as a group. This supports the prioritisation of resources, helps to focus the design approach and is essential for evaluating solutions.

Example: vision development

"To set a goal and vision for the farm we began with discussions between the farmer, the pilot facilitator and the ambassador. This was an important first step for the farm-scale redesign as ultimately, the farmer was at the heart of the process. In common with much of Europe is this area of Portugal the farming is heavily reliant on government support, and the farmer found that this sometimes led to perverse management practices to ensure eligibility for government payments. The farmer envisioned a farm as a resilient system independent from subsidies. Interpreting this initial vision as a more attainable shorter-term goal, the pilot team developed the pathway to reach the vision through introducing a productive AND profitable function to the farm. The Vision and Goal were then presented by the farmer to the pilot group at the first workshop, which generated a lively debate. As local farmers themselves, the group were initially skeptical about the vision, questioning its viability. Subsequently, through understanding that the vision acts as an inspiration to guide the redesign, they all agreed that this was certainly something to work towards, to ensure a robust farming community that is resilient to external factors such as policy changes or the effects of war or pandemics. The goal was seen as a clear objective to frame the redesign in the short term and helped to focus the brainstorming of challenges facing the achievement of the goal."

Figure 7. Developing a vision with different stakeholders

04 Discover

The key outcomes of the discovery workshop sessions are; 1) scope and boundary setting, 2) the system analysis, 3) clarity regarding opportunities and barriers.

Boundary setting

Before carrying out a system analysis it is important to consider what is within the scope and limits of the project. What will be included and what will be excluded? The system boundaries clearly define which elements and interactions within a system will be included in the design process (see below: setting the boundary). Is your system at field level, farm level, landscape level, regional level or national level? This is often partially defined within the goals, however the exact identification and agreement of them with all the stakeholders is important.

System analysis

The next step is to undertake the system analysis. This helps users to visualise the whole system and see the relationships between the different components of this system. This can support the identification of challenges and opportunities in addition to broadening the perspective of the participants (see next page). This is possible for various different systems whether it is a farming system, a network, or a supply chain. Of importance is to ensure that the different components of the system are clear as well as the relationships between them. This can include the risks and opportunities in these relationships.

Facilitation: setting the boundary

Goal: Create a collective understanding what is within the scope of the project

Action: Determine with the group: what is within the scope of the project and what is excluded? This should consider the different elements of the food system (see next page) from production to consumption and from social to ecological elements.

Additionally, if working on a landscape development defining the specific project location is also important. Which areas are included? Why? Why not?

Tip: This can also be revised later.

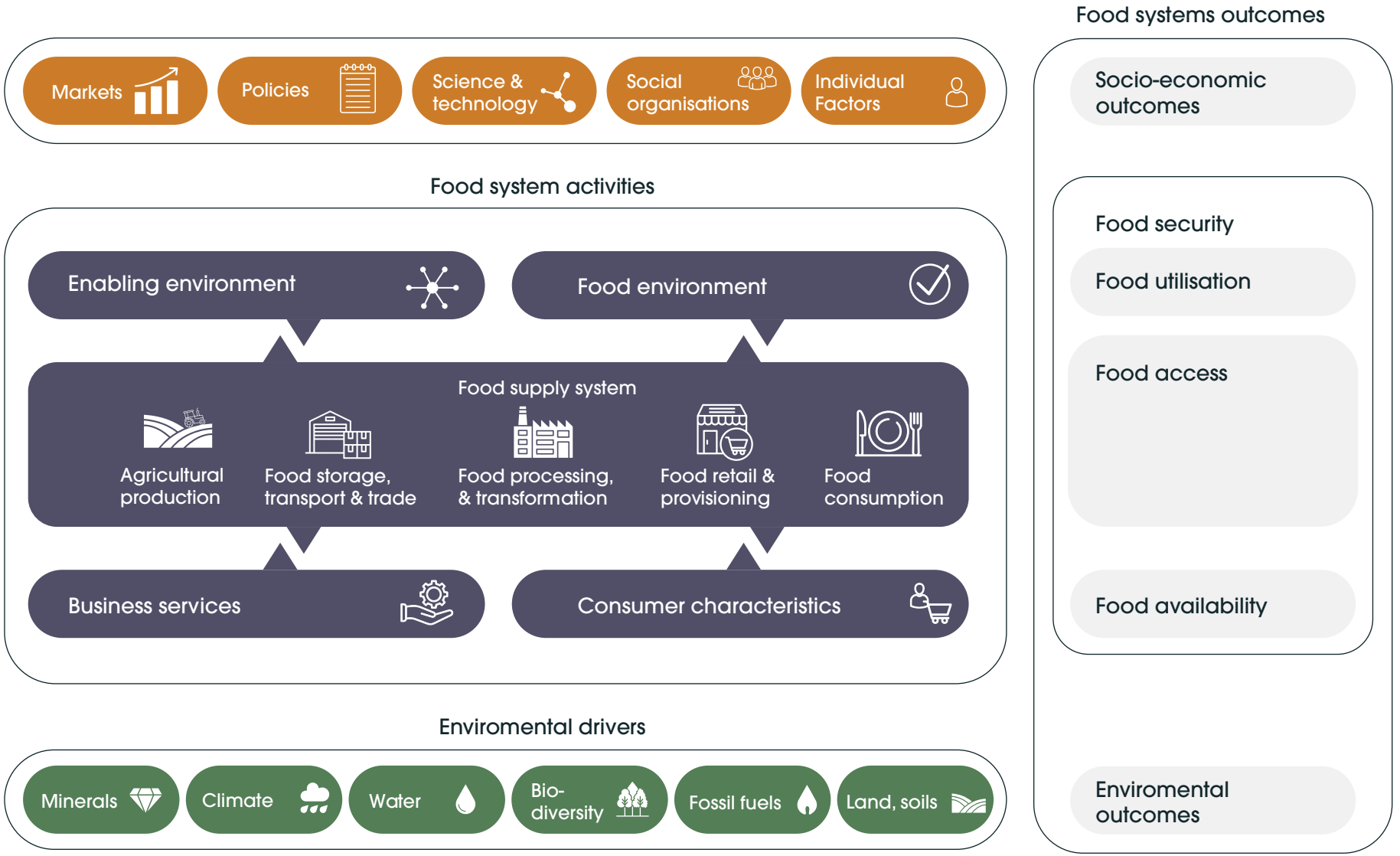


Figure 8. The food systems framework is useful to provide an overview of different elements to consider for the system analysis and setting the boundary of the project (adapted from Van Berkum et al., 2018)

Facilitation: System Analysis

Goal: Create a collective understanding of the system

Action:

1. Use sticky notes or a digital board to describe all the components of the system.
2. Analyse and draws the relationships between different components.
3. Go further by exploring the environmental, economic, and social components.

Experience from practice:

The system analysis was very enlightening for our pilot and is, in our opinion, an essential step within a change process: who are the actors and how do they interact? The pilot team prepared the analysis after several meetings at the farm, and discussed and fine-tuned it with the farmer afterwards. By visualizing the different processes and relating them to each other, the whole picture became clear. It also made it possible to present the system to others in an organized way, to work on manageable parts of this system and to see at a glance what might be affected by any particular change. The system analysis was also helpful to identify weaknesses and opportunities within the system, and on this basis two themes were selected for the co-design workshops

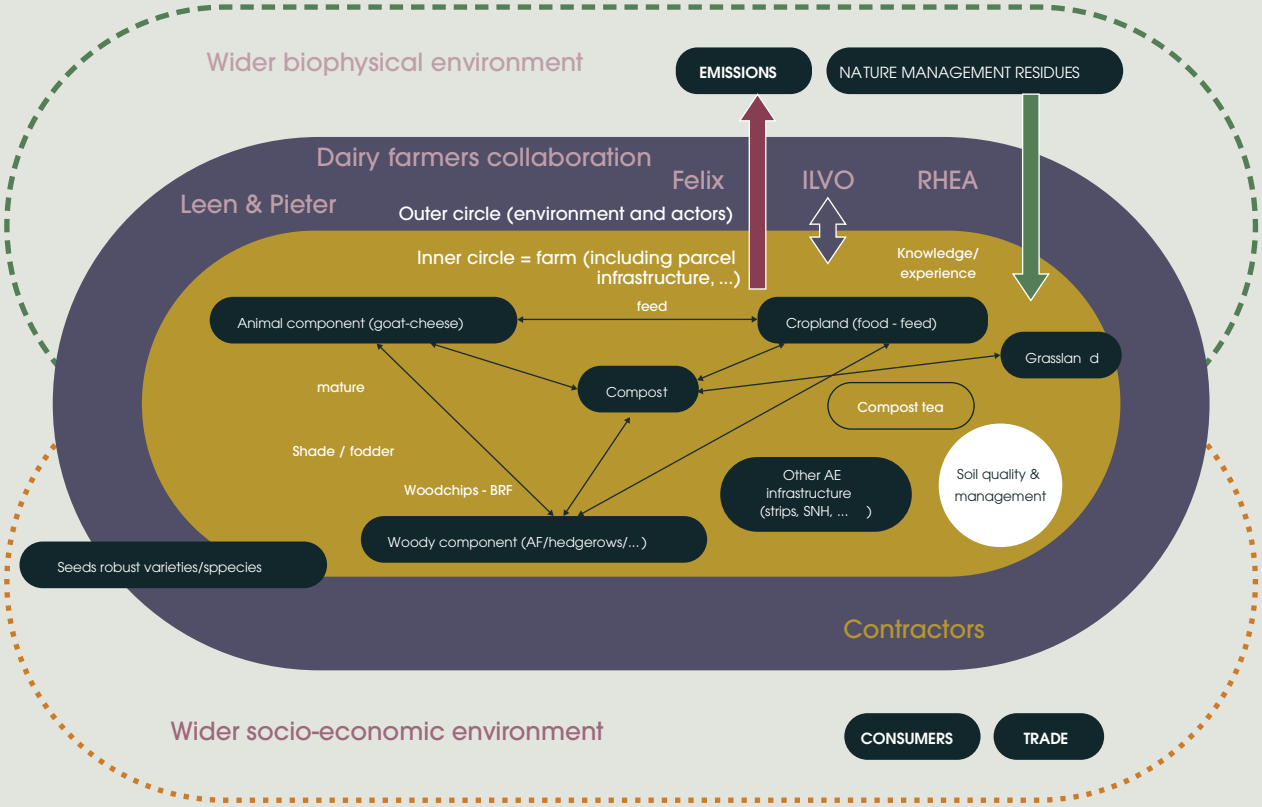
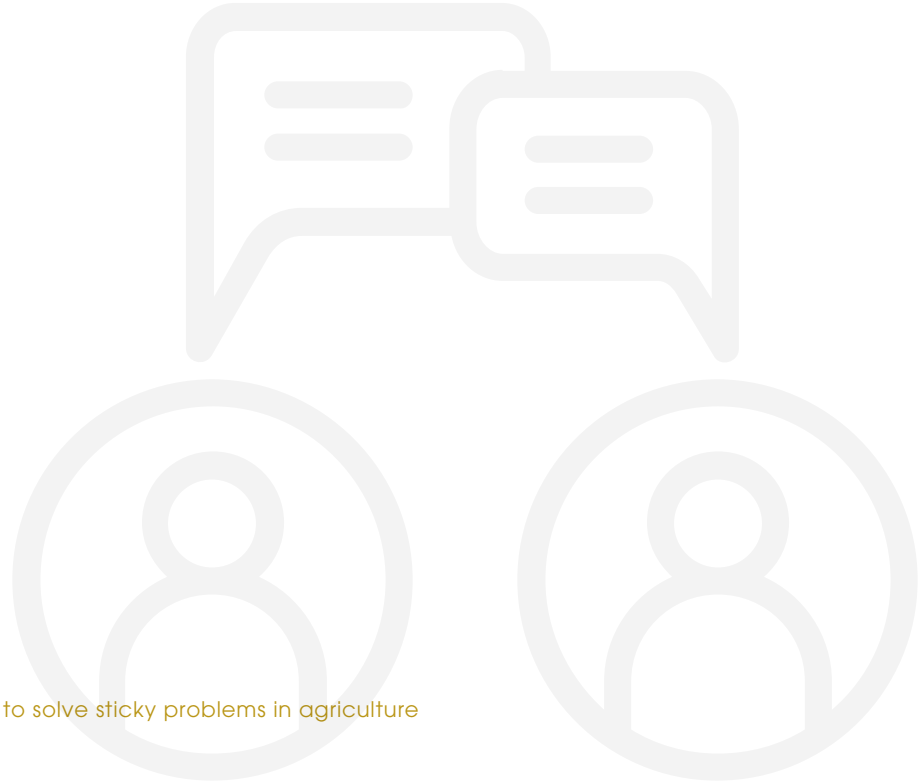


Figure 9. An example of a system analysis from the Belgian pilot in AGROMIX

Causal analysis

Another valuable approach to assessing the underlying causes of a particular problem is causal analysis. This can be a valuable complementary approach to the system analysis as this goes more into detail to understand the underlying root causes and consequences of the current situation. This further supports the development of a good design and action plan that genuinely works towards addressing the root causes and challenges that prevent the realisation of the vision.

The approach also supports consensus building between stakeholders and the achievement of a shared understanding of the situation. Furthermore, the causation tree can also be developed into solutions, where the negative outcomes are transformed into positive solutions by addressing the root cause. This supports the identification of different actions that can be undertaken to achieve a positive outcome. The same approach can also be used to support reflection and evaluation of proposed solutions.



Facilitation: Causation tree

Goal: Create a collective understanding of the root causes of the problems & Consequences

Using sticky notes on the flipchart, or a digital board

Action:

1. Clearly define the problem you want to analyse
2. Identify the causes that lead to this problem and consequences that are influenced by this problem
3. Consider confounding effects, that may influence the outcome,
4. Identify the most important, or key root causes
5. Retain this for the design phase to develop new ideas and strategies.

Where a development is working on several different problems the causal analysis should be completed for each of these different problems.

These causation trees can also be turned into a solution trees by changing causes for the problem tree such as "deforestation" and "lack of investment", into "reforestation" and "increased investment". This provides guidance for desirable solutions during the design sessions.

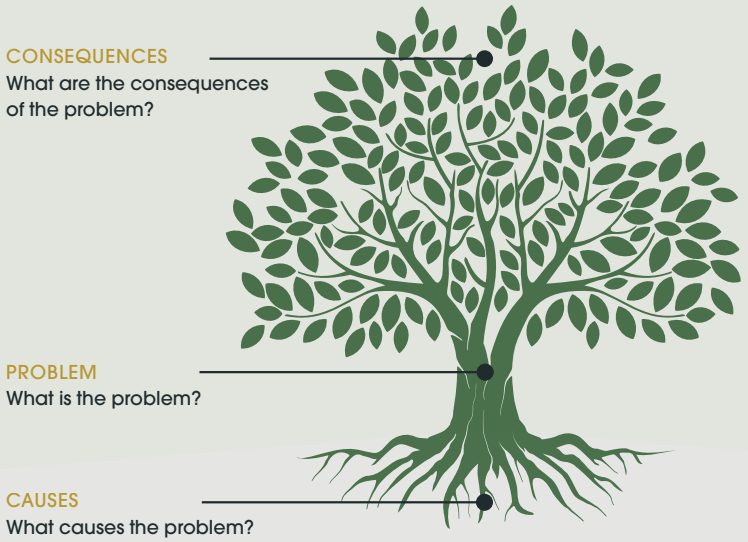


Figure 10. The causation tree used to help understand root causes of a problem and the consequences of this can lead to.

The system and causal analysis are effective at identifying the challenges of the current situation. Further exploration of these challenges to highlight the key challenges can also be valuable. Furthermore, there can be trade-offs between these which make it difficult to address one challenge without adversely affecting another. These trade-offs can be a key barrier to system change so we recommend highlighting these key trade-offs and exploring them as a group.

Key Challenges

Review the challenges identified as a group during the causation analysis. Discuss with the group which challenges are most relevant to address in the system re-design to reach the pilot goal. Evaluate the feasibility of addressing these challenges within the resources of the project and priorities of the stakeholder. Document these assessments and choices.

Trade-offs and interdependencies

Exploring trade-offs is relevant for developing viable solutions to different goals that are acceptable to different stakeholders that may value these trade-offs differently. Some of the trade-offs experienced within the AGROMIX project were: cropping area vs environmental impact, short term vs long term, social equity vs economic viability, recreational value vs habitat value. Showing which trade-offs are relevant for the project can be valuable during the design phase when exploring what sort of innovations can achieve the desired change.

Experience from a pilot: Fuzzy cognitive maps

"We used fuzzy cognitive mapping (FCM) to explore the perceptions of 26 sheep farmers in the Maremma Region, Italy, regarding soil erosion and the adoption of soil conservation measures with the aim of capturing the complex relationships among various different contributing elements. Farmers were guided through the process of creating cognitive maps, starting with a central focus on soil erosion. They were asked to identify factors influencing soil erosion, considering agronomic, managerial, environmental, political, and cultural aspects. Farmers then explained how these factors interacted, with relationships depicted using arrows of varying directions and colors. The strength of each relationship was assessed by assigning weights ranging from -5 to +5. The interview process allowed farmers to add variables to the map and continued until they had no further additions, ensuring the final output accurately represented their ideas. On average, each map took approximately 45 minutes to complete.

Overall we found FCM to be a valuable tool for uncovering and showing intricate relationships among a complex web of factors and making fuzzy ideas explicit. This provided valuable insights for developing new solutions."

Facilitation: First hand experience

Goal: Create a collective understanding of the root causes of the problems/ challenges

Using immersion in the challenge, for this visits as a group are valuable

Action:

1. Clearly define the challenge that you would like to gain further knowledge of
2. Identify how this could best be explored during an excursion
3. Consider letting one of the stakeholders lead the excursion,
4. During the excursion make notes of the most important discussion points
5. Retain this for the design phase to develop new ideas and strategies

Where multiple stakeholders and challenges are involved it can be valuable to carry out multiple group excursions to explore different topics together.

Result: Expanded understanding of the challenges.

05 Design

Key outcomes: 1) Design requirements are clear to all stakeholders, 2) ideas have been generated, discussed and assessed with the group, 3) a limited number of ideas with the most potential have been selected for further development.

Design requirements

This is simply what is required to fulfil the goals of the design and should clearly define what the new design should achieve. These should be formulated as clearly as possible and show which criteria the design should fulfil, ideally quantitatively and for which stakeholder (see below). The design requirements are important because they 1) show what the designs need to fulfil 2) show critical requirements of different stakeholders 3) allow the assessment of solutions during the design process 4) allows the evaluation of solutions with respect to stakeholder needs.

Example: Brief of requirements

For every design the requirements will be different. Where the project goal is a resilient agricultural landscape, the functions may be similar to those shown below whereas when the goal is to improve the sales of a product the requirements may include: visibility, availability, desirability & functionality. Start by writing what is required and in successive rounds with the group try to make the requirement as specific as possible.

N.	ASPECT	WHAT IS REQUIRED? WHAT SHOULD THE DESIGN ACHIEVE?	DESIRED BY STAKEHOLDER	RANK
1	Climate resilience	Minimize the risk of flooding – maximum 1 in 100 years that homes are flooded	Local government & citizens	1
2	Climate resilience	Reduce soil erosion – 20% reduction in soil erosion	Local government & citizens	3
3	Biodiversity	Support existing biodiversity, flora and fauna and functional agrobiodiversity – 5% more habitat	NGO	
4	Biodiversity	Support the connectivity of habitats in the landscape – 10% more connected	NGO	
5	Business	Farm income should improve (lower costs or improved sales) - 2.5% growth in farmer income	Farmers	2
6	Business	Tourism should be managed effectively	Farmers	
7	Business	Create opportunities for alternative income sources	Local business	
8	Business	Any changes should not rely on subsidies for continuity	Farmers	
9	Business	Support stable crop yields	Farmers	

Key functions of the design

By this point the team should have a good appreciation of the needs of different stakeholders, the goals, the challenges and have developed the design requirements. Fulfilling these design requirements can be achieved in a multitude of ways, however in order to develop innovative solutions it can be helpful to break down the requirements into key functions that the design should fulfil.

Facilitation: Functions

Functions are what the design should realise to achieve the goal. These are often related to the design requirements but developed further. See the table for a simplified example.

To do this with your team:

- Make a diagram with the functions in the rows
- Add existing and novel options to fulfil functions (brainstorm) under option 1, option 2, etc, during a brainstorm
- Explore the combination of different options from the chart into design concepts
- These should fulfil all the functions desired to provide a solution to the problem

The benefits of this approach is that it allows the creation of different concepts and scenarios that can be evaluated with the group to explore if it succeeds in achieving the brief of requirements. It also supports the development of novel ideas that that the group may not have initially considered.

FUNCTIONS	OPTION 1	OPTION 2	OPTION 3	OPTION ...
Water storage	On vegetation	In the soil	In ponds and lakes	
Water distribution	With canals	With swales	With pipes	
Business opportunities	Tourism	New crops	Quarry	

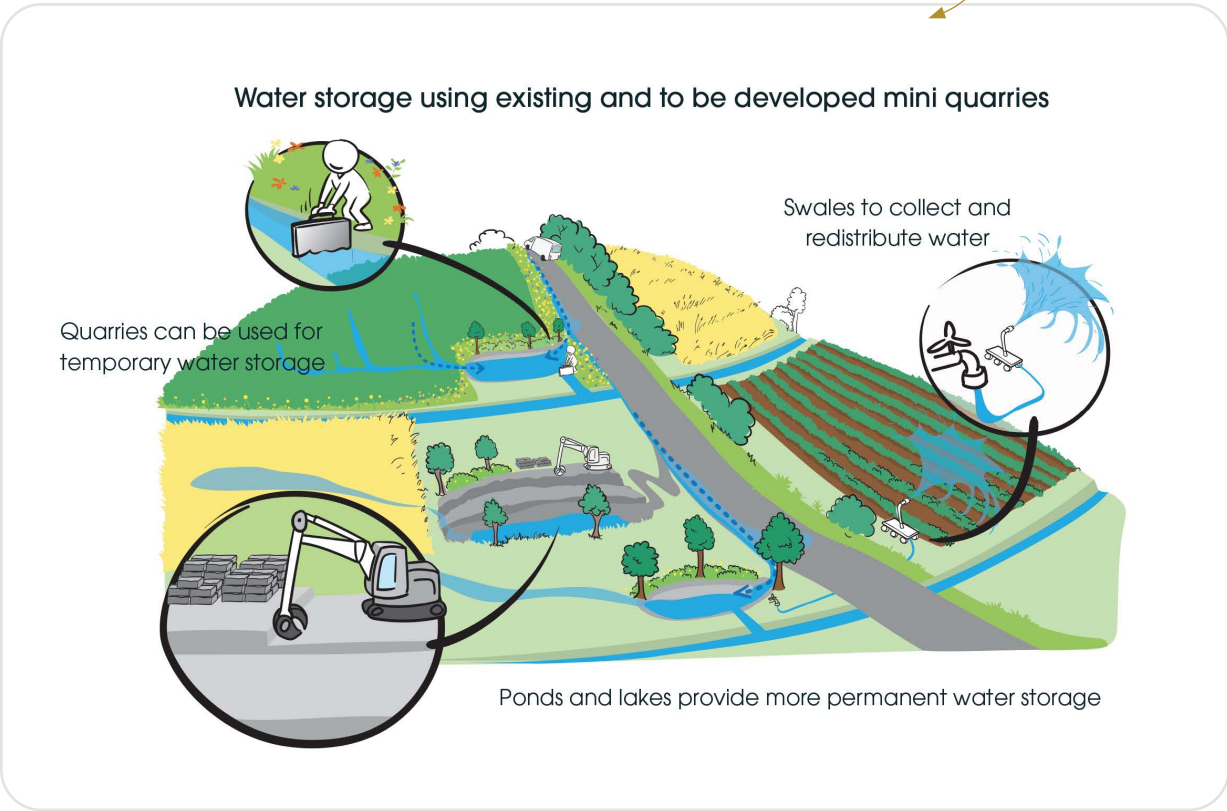


Figure 11 An example of how functions can be used to develop new solutions for a design.

Ensure that you plan sufficient time for the design phase and take the opportunity to invite guest experts and do field visits as a group. There are hundreds of different tools, methods and tips for developing ideas with a group. We share a few here and recommend exploring different approaches on some of the websites shown in the appendix to get some inspiration.

Ground Rules

Innovation requires thinking outside the box. It requires the freedom to suggest unusual ideas that may not currently be possible, but could be made possible through technical, social or policy changes and innovations. Because of this, ideas should not be evaluated directly and it should be clear to participants that all ideas are acceptable. Facilitators should address participants who show criticism of innovative ideas at this stage and encourage them to be open minded and explore different ideas.

Idea Generation

In its most simple form group idea generation is about asking the question "How can we" solve this problem? Or how can we achieve this desire? In some cases this can already lead to innovative solutions. For more complex challenges it can be valuable to carry out a more structured approach based on fulfilling design functions as mentioned previously.

Facilitation: the wow, now, how approach to idea development

Experience from practice:

"Having set the goal and vision and identified the challenges to reaching the goal in the previous workshop, the Portuguese pilot group brainstormed solutions to overcome the challenges. They were encouraged to explore all possibilities, without the constraints of 'would it work here'. Members worked independently, adding their ideas on post-it notes to a whiteboard. After the brainstorming session, as a group, each idea was discussed and allocated to the 'Now, Wow, How' framework. In this framework, 'Now' solutions are those which are common and feasible, i.e. the easiest to implement, while 'Wow' solutions describe original ideas that are also feasible. The 'How' solutions are 'out of the box' ideas that are both original and not (yet) feasible. This classification of solutions was a useful exercise to share ideas, experiences and knowledge; sometimes, a 'Wow' idea for one person would be a 'Now' solution for another who was more familiar with the practice, and able to share their experiences. Through this process, we were able to identify which of the many options, as a group, we wanted to explore further."

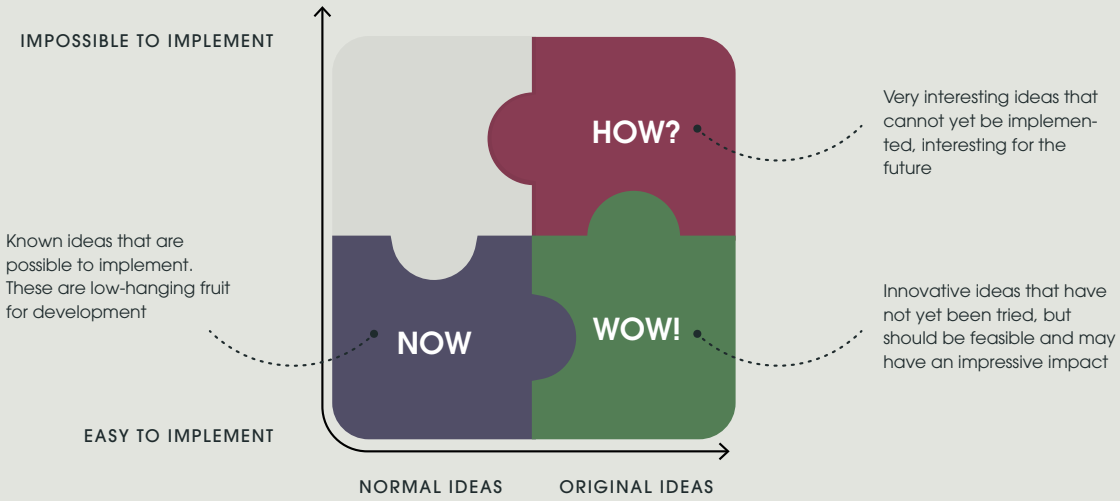


Figure 12. The wow, now, how idea framework.

Facilitation: Artists

"During the co-design process for Blue Pig Farm, we engaged with an illustrator to facilitate the workshop. We chose an illustrator most adapted to the objective, who could listening effectively and summarise ideas. We prepared this workshop with the illustrator: it was important to train them in farm production and practices before the workshop and inform them of the project and its objective. During the session the illustrators role was to draw the stakeholders' discussion and co-design ideas developed during the session. He was placed in front of the stakeholders, next to the facilitator. In this way, everyone could see the drawing process and interact with him. At the end of the day, the artist presented his drawing and permitted the final exchange about the conclusion of the co-design workshop. The experience was a great success, facilitator and stakeholders were really satisfied by the method and the final map. It encouraged creativity and the free flow of ideas from participants while also organising and summarising the discussions. To stay efficient and attractive for stakeholders, we recommend using this method only in specific workshops."

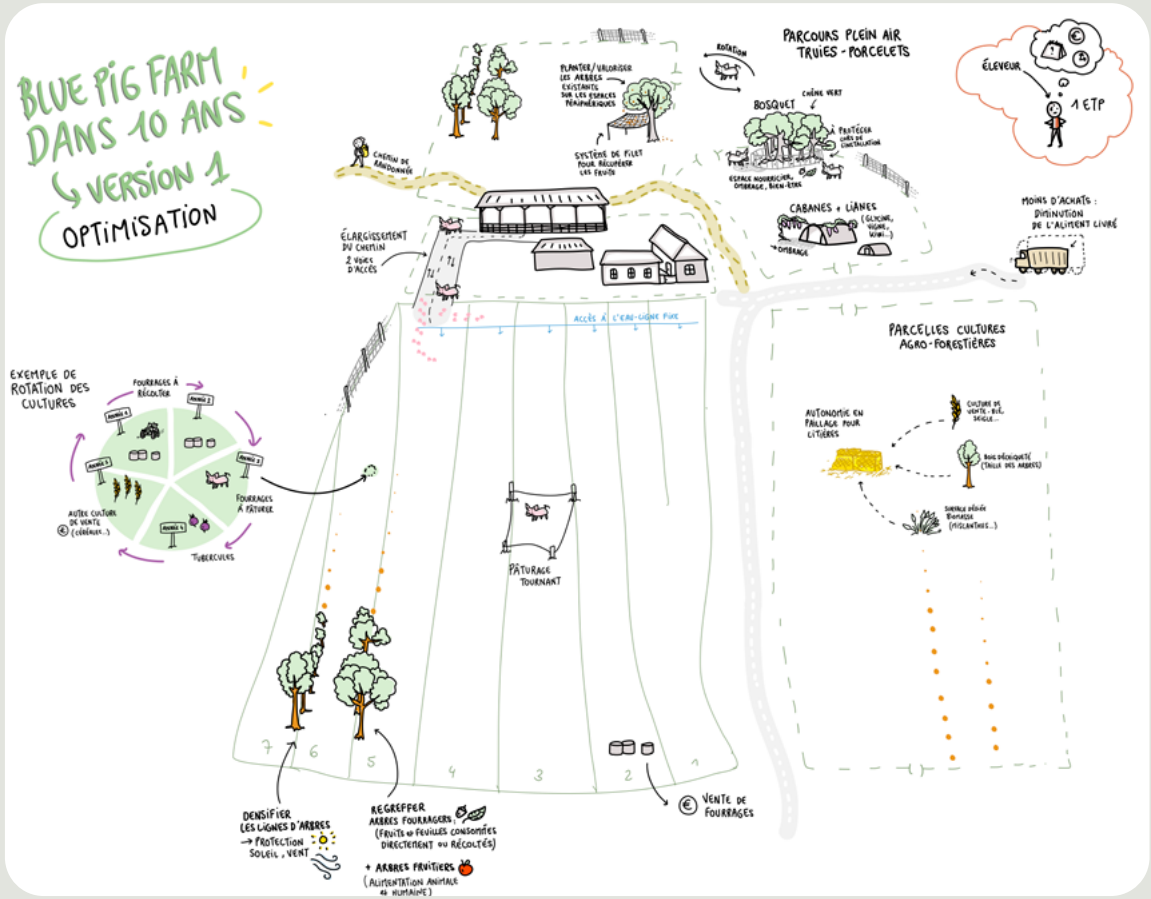


Figure 13. An example of using artists to visualise new ideas during the design process from Blue pig farm.

Evaluate concepts

Evaluate the consequences of proposed design concepts based on the design requirements. This can be done by scoring the different solutions for different design requirements with the group and seeing which solutions achieve the highest scores. In some cases this leads to agreement of a best solutions, however where there is discussion on the optimal way forward, additional evaluation steps may be valuable for narrowing down choices. Additional criteria such as resource requirements, risks, strengths, weaknesses and overall feasibility can be used to narrow down the options further.

Decision making

When working with multiple stakeholders with different goals and priorities, coming to agreement on the best approach with everyone can be tricky. The process of working together to come to solutions generally helps the group come to consensus about the best solution. However, in some cases a stakeholder may oppose the changes for valid and reasonable concerns. Further discussions may not resolve this in which case voting or other decision making strategies may be employed such as a Decision matrix, Pareto analysis, Force field analysis, Six thinking hats and Scenario exploration.

Facilitation: Clustering and prioritizing **Goal:** Prioritise solutions

Action:

- Go through the list of the proposed solutions with the group
- Use a format such as a mindmap to cluster solutions
- Give each cluster a title (and a caption)
- Choose which priorities you wish to make, per cluster or for individual solutions?
- Give participants a number of stickers so they can vote. This may be done openly, or secretly if people may vote strategically.
- Tally up the votes and discuss the results as a group
- This may be repeated to reduce the number of solutions further to a manageable number for more intensive discussion and exploration.

Experience from practice:

"With so many ideas put forward by the Portuguese pilot group, an important following step was to first cluster, and then prioritise the ideas. This was done through a goal tree, where similar solutions addressing a common challenge or theme were grouped, and then developed into a hierarchy. Through this process, we found that most ideas focused on either providing solutions to address water security (through improving water retention, adding water storage infrastructure, or increasing water input and distribution) or on increasing the adaptive capacity of the farm by diversification (by developing new income streams, policy and support mechanisms or by adaptations to the existing system). By combining the 'Now/Wow/How' classification in the resulting trees, it was then possible to highlight which themes the most feasible solutions addressed, or where the development of original ideas might be possible. For the Portuguese team, it was clear that improving water security through increasing water storage and retention would be feasible e.g. through working with hydrology engineers, while more interesting farm developments to diversify the farm would benefit from wider input from the pilot members, so this was decided as the focus for the co-design."

06 Develop

The design phase should have delivered two important results, firstly a limited number of promising designs and secondly a group of people who support these designs and would like to put them into practice. Supporting the realisation of these design in practice is the next step. Key outcomes of the development phase may include: 1) a technical design proposal, 2) an implementation plan, 3) anchoring of the idea in practice.

Technical design proposal or pitch

The final proposal should include detailed specifications, technical drawings, plans for social change, lobbying, a business plan, and any other activities agreed upon by the group. This should provide clear directions for communicating the design to others and taking further steps towards implementing the design in practice. It is important to make designs visually appealing for further communication in order to obtain buy in from others who can influence the feasibility of implementation such as banks, civil servants and retailers.

So now what?

Despite having a great design, realising this in practice can still be subject to an number of challenges and barriers that limit the adoption or feasibility for implementation. It is good to identify these with the group and propose interventions to make the design more feasible in practice. Often these can be related to technological, social or institutional barriers. Consider a design that is not proven in practice so a bank will not finance it. Or a design that a farmer has never seen, or heard about, so does not believe it is possible to implement, or a design that is fantastic, but currently illegal because it does not fit with current regulations, or is punished through the loss of subsidies making it less attractive. At this stage there are a number of approaches to consider to overcome these challenges. This is often called anchoring.

Anchoring in practice

Anchoring is about establishing a new design in practice, it is about supporting the realisation of designs by building technological, social and institutional support. This involves building technological knowledge and understanding of the innovation, social support for the innovation, and institutional support in the form of rules, regulations and subsidies, each of these plays a role in the success of the design. The goal of anchoring is to ensure the durability and sustainability of the innovation over the long term by influencing these elements to create an enabling environment for the design.

Prototyping and testing

Designs can be explored further to define or quantify their needs and impact. This can be done conceptually, digitally or with prototypes to test the suitability and feasibility of different solutions in practice and the results that they deliver. This can also include bringing in developers, or advisors, to assess if what has been designed is technically, legally, or financially possible to implement and ensuring that the designs are assessed to any industry benchmarks or standards. This feedback can lead to further refinements in design, or highlight the need for additional actions to achieve the design in practice. Furthermore, demonstrating proof of concept on a smaller scale can be used to support further investment, interest by others, and can also be used to induce policy changes.

Changing the playing field

Is about creating new market opportunities or removing barriers to an idea by changing the playing field. Here we mainly consider rules and regulations that determine what is legal and what is eligible for subsidies. When designing new systems such as Agroforestry on farmland this can come with significant limitations, is it forest or agriculture? Is it eligible for CAP subsidies or not? Can the trees be removed later, or not? Such challenges can be addressed through strategic research, partnerships and communication with the government. Though such changes can take time, they can substantially impact the feasibility of the new design in practice. This may also require a stronger network to influence the government, or social pressure from citizens which can also actively encouraged.

Expanding the network

To realise the final designs a broad group of stakeholders should have been active participants in the design process. In the ideal scenario these stakeholders should be highly motivated to fulfil the design in practice and will make efforts to achieve this. Sometimes, even if this is the case, there could be stakeholders who were missed who could improve the opportunities for implementation. Re-exploring the stakeholder and system analysis can help to identify further stakeholders who are interested in supporting the idea. Activities should be initiated to inform them of the designs and explore their interest in supporting them.

Gaining hearts and minds

Influencing the beliefs of people regarding what is possible and what is desirable can be an important step before the uptake of a design is achieved. In many cases this is supported by good communication with the sector and proof of the design concept as a prototype, or at a practical working scale. If these have been achieved they should be actively utilised to gain the support of leaders and influencers in the sector who can recognise the benefit of the new design and communicate its value to others.

Example interventions: rebranding Pecorino cheese

"We didn't expect this solution, however during the first on-site workshop the need emerged to develop a new marketing image for selling the Pecorino cheese. During discussions it was evident that the current image failed to capture the innovative nature of the cheese, and the opportunity to create branding capable of linking the final consumer to the environmental and social sustainability values of the product became apparent.

The re-branding activity was conducted in collaboration with a design university involving a class of master's degree students. We conducted sessions with them including presentations and tastings to inform them of the characteristics of the product; the Pecorino Toscano DOP cheese, the actors, and the supply chain.

Subsequently, the students were divided into five groups and, through a contest, developed five re-branding proposals to improve the communication of the products qualities, linking it more strongly to the territory of origin and the values of environmental and social sustainability. The five proposals not only focused on re-conceptualizing a new brand but also on creating social advertising campaigns, on-site activities such as farm aperitifs, in addition to developing food and wine suggestions. These developments aimed to reconnect the consumer to the producer, showcasing the latter's ability to generate essential ecosystem services for society.

The proposals were highly appreciated by all actors involved in the co-design pilot, especially by retailers who positively evaluated the modernization of graphics, the consistency of the re-branding campaign, and the improved ability of the brand to 'speak' of a unique territory and a high-quality product."

Figure 14. Examples of the re-branded Pecorino Toscano DOP cheese with a more modern and sustainable look.

Example interventions: Turning a weed into a product; My Rockrose essential oils

"Curralões farm covers 240 ha near Mértola in Baixo Alentejo, in south-east Portugal. In the last 15 years, the average rainfall has dropped to 273mm, and as elsewhere, climate change impacts are a concern with drought a frequent issue in recent years. Farming in the area is heavily reliant on subsidies and in chasing such subventions, land management practices in the region are often antagonistic to the need to increase resilience to climate change. For example, to maintain eligibility for CAP subsidies, the shrub understorey of the farm's 160 ha pine nut orchard must be controlled and it is common practice in the region to use an offset disc harrow every four to five years to clear the shrub; as well as being costly for farmers, harrowing destroys soil structure, releases soil carbon, exposes soil to evaporation and leads to soil erosion, either by water or wind.

Our group recognised an urgent need to develop a new approach to land management on the farm, with the dual aims of reducing reliance on subsidies and increasing resilience to climate change. Through this co-design process, a new approach to shrub management has been developed and implemented. The dominant shrub species, "rockrose" (Cistus ladanifer L.) is an aromatic shrub, producing a highly valuable, although low yielding (~0.01-0.05%) essential oil (EO) and hydrolate with interesting properties for cosmetics and pharmaceutical industries. At the same time such industries are seeking raw ingredients with sustainable labels. We recognised the opportunity to turn this "weed" into a new product and support soil health.

This design is expected to increase farm productivity and income (sale of EO, hydrolate and the maintenance of direct payments), and improve soil health (reduce cultivation, addition of organic matter via post-distilled biomass) and biodiversity (above and belowground). However, there are several challenges to overcome to unlock the potential of this shrub as a resilient and adapted crop to this environment; CAP regulations currently classify rockrose as a weed to be controlled, rather than a crop, and the development of new products and markets also require the development of new skills for the farmer. An important next step in the development process will be to address these issues and lobby for the re-classification of Rockrose as a crop."

Figure 15. The production, harvesting and development of essential oils from Rockrose.

Celebrate

Take time both during the process and upon completion to celebrate, congratulate and appreciate what has been achieved.

07 Appendix and Links

References:

Reflexive innovative design approach. Bos, A. P., Koerkamp, P. G., Gosselink, J. M. J., & Bokma, S. (2009). Reflexive interactive design and its application in a project on sustainable dairy husbandry systems. Outlook on Agriculture, 38(2), 137-145.

Food systems: Van Berkum, S., Dengerink, J., & Ruben, R. (2018). The food systems approach: sustainable solutions for a sufficient supply of healthy food (No. 2018-064). Wageningen Economic Research.

Further reading:

- Design guide for on farm demonstrations ↗
- Stakeholder management in practice ↗
- The MSP Guide Designing and facilitating effective multi-stakeholder partnerships ↗
- The co create handbook for creative professionals ↗
- Capacity building handbook and mentoring report ↗

Useful tools:

- SessionLab
  A Better Way to Design Workshops
- Miro
  For mindmaps and workboards try
- Mentimeter
  Interactive presentation software

To learn more about the Agromix project click on the logo:

agromix

08 Attributions

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