National workshop report on actor perspectives on behavioural drivers, agency and behaviour change in agroecological transformation

WP5.2. Participatory Timeline in Tunisia

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1. Background and objective

In 2022, the OneCGIAR, in partnership with a wide range of national and international partners, launched an Agroecology Initiative to foster agroecological transition in eight countries, including Tunisia.

This Initiative is structured around five components (WPs), i.e.:

1. Creating 'living landscapes' as the core places for the co-creation and co-implementation of the innovations with actors.
2. Establishing evidence-based agroecological assessments.
3. Co-developing inclusive business models and financing strategies.
4. Strengthening the policy and institutional enabling environment.
5. Understanding and influencing agency and behaviour change.

As part of the WP5 work plan, it is proposed to capitalize on the experience and knowledge generated during past and current agroecology-related initiatives in Tunisia as well as on current global research and action agendas to identify critical behavioural changes that have transformational potential to support an agroecological transition in the Living Landscapes.

As a starting point, a desk review has been conducted through an inventory and quick review of past and current initiatives supplemented with key informant interviews with stakeholders involved in these initiatives (Lestrelin et al., 2022). From this review, the research team built a draft timeline highlighting key events affecting the agency and the behaviour changes of the agents involved in the agroecological transformation.

The objectives of the present report were to:

1. Revise and validate the provisional chronological timeline of key events and actors that have affected the agroecological transformation in Tunisia in the previous 20 years.
2. Identify whether and how the key events (i.e., external interventions or internal changes) affected agency, behaviour change, and various actors' representation/inclusion/participation.
3. Identify key entry points and considerations regarding agency, behaviour change, and collective decision-making that need to accompany agroecological transitions.
4. Identify indicators that can be used to monitor changes in agency and behaviour both during and beyond the Initiative.

The overall goal of the present report is to establish the baseline and evolving status of the agency and behaviour change of the food system actors, focusing on the mixed crop-livestock systems in the northwestern part of Tunisia.

2. Methodological approaches

2.1. Preliminary historical timeline

A historical timeline was developed (in 2022) from three approaches: 1) a literature review of past national and international projects and interventions ("initiatives") over the last 30 years (Lestrelin et al., 2022[1]); 2) qualitative interviews with key informants (usually projects coordinators) from five selected initiatives from the sample in point 1, focusing on the behaviours that the Initiative (project or intervention) sought to change, the different activities implemented by the initiative for that aim, as well as the vision of the informant on the successes and failures of the Initiative (See Lestrelin et al.., 2022, Appendix A3); and 3) regular research meeting groups to draw a preliminary historical timeline.

The first reviewing activity encompassed 31 information sources and identified 26 initiatives implemented from 1990 to now. This review allowed us to identify a remarkable diversity of intervention approaches observed since the mid-2010s. This diversification encompasses a shift from primarily focusing on technical support and capacity building for farmers to covering a broader range of strategies such as value chains, multi-stakeholder platforms, and, more recently, credit and financial facilities. Due to this progressive change of interventions by adding new activities, actors, etc., each Initiative's set of AE principles has evolved. Recycling, input reduction, soil health, and synergy have remained significant since the early 2000s. However, connectivity and animal health were poorly addressed. Recently, increased attention has been paid to principles such as fairness, co-creation of knowledge, land and natural resource governance, participation, and social values and diet. This trend further reflects a broader understanding of the interconnectedness between agriculture, society, and the environment.

The key informant interviews conducted for eight initiatives (CLCA, PROSOL, Mind the Gap, IAAA, PACTE, ADAPT, PADAC, and PAD-I[2] detailed in Appendix A3) allowed us to identify the specific interventions (or project activities) aiming at changing the behaviour of targeted beneficiaries. These interviews included project/program coordinators at the central level and knowledgeable (national and regional) technical staff for specific initiatives. Alongside the exploration of targeted behavioural changes, two particular questions were utilized. The first question aimed to investigate how the design and governance of the initiatives have evolved in response to identified gaps and failures. The second question focused on understanding how the intervention mechanisms have been understood and implemented by the technical staff at the local level.

The review and key informant interviews were the basis for elaborating a preliminary historical timeline based on four layers: (i) "What changes?", i.e., the main activities, (ii) "for what?" reflecting the AE principles that these activities mobilized, (iii) "Who?", i.e., the actors involved, and (iv) "on which external forces" to distinguish the national policies and international paradigms that influence national and international interventions. The preliminary chronological timeline resulted from three participatory workshops with national and international researchers involved in the Agroecology Initiative in the Tunisian living landscape.

In summary, these three research workshops allowed us to elaborate a preliminary historical timeline that has been shared, discussed, and validated during a national workshop organized in July 2023, which was open to a larger audience and gave the timeline more accuracy and legitimacy. When agreeing on the activities, actors, and changes, it has been possible to identify the main changes in behaviour over the past years. The main findings of this workshop have been shared with farmers' organizations and their members through two focus groups organized in August 2024 in Hamman Badhia and Kesra. An online consultation was then conducted to get the feedback from a wide range of stakeholders involved in the Tunisian living landscape.

[1] Guillaume Lestrelin, Rahma Jaouadi. (30/12/2022). Inventory of agroecology-related initiatives in Tunisia (1999–2022). Beirut, Lebanon: International Center for Agricultural Research in the Dry Areas (ICARDA). https://hdl.handle.net/20.500.11766/67950

[2] Conservation Agriculture Development Support Project (PADAC-II) (2007-2022) ; Promotion of Sustainable Agriculture and Rural Development in Tunisia, Phase-II (PAD-I) (2013-2016); Innovations for Agriculture and Agrifood (IAAA) (2015-2025) ; Use of conservation agriculture in crop-livestock systems in the drylands for enhanced water use efficiency, soil fertility and productivity (CLCA-II) (2018-2022); Climate change adaptation program for vulnerable rural territories of Tunisia (PACTE) (2018-2024); Soil Protection and Rehabilitation of Degraded Soil for Food Security (ProSol) (2019-2025); Support for Sustainable Development in the Agriculture and Artisanal Fisheries sector in Tunisia (ADAPT) (2020-2028)

2.2. The participatory timeline workshop for understanding the behaviour changes in the past and present (2023).

ICARDA and national partners involved in the WP4 and WP5 of the AE Initiative conceived and organized a national workshop in Tunis to discuss and enrich the preliminary timeline developed from the review activity (output 5.1).

The workshop was opened to all the key persons involved in the past AE initiatives analyzed during the in-depth review of R4D projects and interventions over the last 30 years, with priority given to those previously interviewed. Out of the 25 invited persons, 23 attended the workshop (See Annex A2).

The participants were from the Tunisian Institution of Agricultural Research and Higher Education (IRESA), the Bureau of Livestock and Pastures (Office de l'Elevage et des Pâturages), the French Agricultural Research Centre for International Development (CIRAD), as well as from other development initiatives like the GIZ ProSol Program, currently operating in Tunisia. We also invited three experts and researchers not acting in the Agroecology Initiative who have long and recognized experience in Tunisia's rural transformation or agricultural policies.

The workshop was organized over a half day from 9:00 am to 2:00 pm.

The agenda was structured in three sessions (Annex A1):

1. Review, discuss, and amend the participatory timeline (issued from the in-depth analysis of past initiatives) and better characterize the change of behaviour along the timeline (plenary session);
2. Identify the main drivers behind the historical behavioural changes identified along the timeline while focusing on external and internal factors (plenary session);
3. Contextualize and refine these behavioural changes for the case of two agroecological transitions (one for livestock feed self-sufficiency and another for local/artisanal food products, two pathways determined in line with the priorities of the CGIAR Agroecology initiative) and identify the factors/barriers, modalities of intervention, and capacity of actors to induce the changes along both transition pathways (working group session; 2 groups)

The first plenary session presented how the preliminary historical timeline has been elaborated and the main pieces of evidence. Then, the group discussed the different phases of the proposed timeline based on their experience and knowledge.

The session on understanding changes aimed at identifying and characterizing collectively the factors and actions that have facilitated the transition of farmers' roles in R4D projects across different categories over the past three decades. The proposal focused on identifying critical external factors, referred to as "drivers," that promoted these changes (such as training programs, cooperative networks, policy frameworks or funding support through initiatives or projects) and key internal factors that enacted behaviour changes at the individual level (such as physical assets, knowledge, openness to learning, or market consideration). These external drivers and internal factors constituted the foundation for analyzing the forces influencing behaviour changes.

In the last step, participants were divided into two working groups to explore the main obstacles, pertaining to e.g. organisational structures, institutionnal processes and livelihood assets, and possible intervention levers for engaging different types of farmers in two agroecological transition pathways identified in the ALL. Group-1 (G1) focused on the national self-sufficiency of the feed value chains, while Group-2 (G2) addressed the enhancement of marketing local products and commodities (such as fig, olive oil, or honey).

2.3. Validation of the participatory timeline with a larger panel of stakeholders

2.3.1. Focus groups organizations for the validation of the participatory timeline (farmers' consultation)

The research team organized two focus groups withfarmer organizations (FOs) members in August 2024 to discuss and validate the participatory timeline and the main drivers of behaviour changes among farmers.

Two FOs were selected according to their involvement in the two selected transition pathways in the Tunisian ALL, i.e., the national self-sufficiency of the feed value chains and the enhancement of marketing local products and commodities. The two FOs are Hamman Badhia for olive oil and Kesra for fig, olive and honey; the two FOs also have small ruminants and beekeeping.

The focus groups were organized in three consecutive sessions:

1. To present the work and analysis on the participatory timeline and the description of the "farmers-behaviour types" identified along the timeline;

2. Identify the characteristics of each farmer-behaviour type along the timeline and what have been the main factors explaining the change of behaviour;

3. Identify the main interventions along the identified agroecological transitions, i.e., fodder self-sufficiency and marketing agricultural products, that have been perceived by farmers as determinants to boost some behaviour changes towards the type of "knowledge co-sharing".

Table 1. Description of the composition of the focus groups in the two farmers' organizations

	Hamman Biadha	Kesra
Participants	12 participants (+2 co animators)	6 participants (+2 co animators) + some external visitors intervened during the focus group
Profile of participants	10 are farmers (all men); 1 agricultural worker; 1 agricultural ingeneer	6 farmers with various personal experiences in agrotourism, animation ('maison de la culture' at Kesra), investigation on local variety such as "Gadhoum" (all men)
Main farming activities	Cereals (wheat, barley, oat) and leguminous (feverole) Tree plantation: olive and almonds Small ruminants	Focus on tree plantations: Figs, olives Honey production

Photo 1. Focus groups in Hamman Badhia sud (left) and Kesra (Right) with a total of 18 farmers (reports Houssem Baiki, 2024)

2.3.2. Online validation of the participatory timeline

An online validation was launched in August 2024 among all the stakeholders that have been involved in at least one activity of the Tunisian Living lab. This online validation aimed to get feedback from a wider range of actors in the living landscape, specifically on perceptions of different types of farmers (described in the next section) and the drivers and barriers for agroecological transition. This activity used a Google Forms questionnaire (see Annex A4) to collect data for analysis.

In total, after two weeks, among the 400 stakeholders who have received the email invitation to fill out the questionnaire, 40 answered with a full filled questionnaire. 50% are from public research, 35% from organisms of development, 12.5% from association and NGO and less than 1% from the administration (Ministry of Agriculture or regional representatives of the Ministry). Over the 40 answers, 45% are women.

The questionnaire was structured in 3 parts: 1) the presentation of the Agroecology Initiative and the objective of the present questionnaire; 2) respondents' recognition (or not) of the different "farm behaviour types" in Tunisia, and 3) the main drivers and barriers to moving to the ideal type for an agroecological transformation, i.e., the type designed as 'co-creator of knowledge.' 4) the key qualities of each farmer type and the % makeup of farmers of each type in the zone of action.

3. Developing a typology of farmers and their agency in agroecological transition

3.1. A preliminary timeline developed with the Tunisian Aei team

Based on the review of past and present initiatives, the research group identified four phases in the timeline.

In the late 1990s and early 2000s, agroecology-related initiatives were strongly influenced by a "technology transfer" perspective, with research and extension agents providing technical training and support to farmer "leaders", setting up experimental and demonstration sites on model farms, and providing equipment adapted to the targeted innovations. We, therefore, speak *of 'farmers benefiting from innovations*.

The early 2010s saw the emergence of initiatives inspired by an agricultural entrepreneurship perspective. Emblematic activities included the organization of agricultural business schools, the establishment of value chain forums, and the promotion of farmer-to-business contracts and public-private partnerships. Economic diversification and equity emerged as important principles during this period. The expected behavioural model associated with these initiatives can be conceptualized as that *of 'agricultural entrepreneurs connected to the market'*.

From the end of the 2010s, new modalities of intervention and new activities began to emerge, inspired by a knowledge economy perspective. Knowledge hubs or multi-stakeholder platforms have been set up (involving farmers, extension workers, researchers, policymakers...) to undertake co-design and co-experimentation activities, and some initiatives have started to engage in digital solutions for farm advisory and management. Participation and co-creation of knowledge emerged as key principles in related initiatives. The behavioural pattern expected of beneficiaries can be conceptualized as *'farmers as co-creators of knowledge and innovation'*.

From the late 2010s to present, emerging initiatives demonstrated another shift towards a more liberal economic perspective. This manifests in innovative calls for proposals integrating social and ecological selection criteria (e.g. inclusion of women and youth, contribution to animal welfare, waste reduction, etc.) and co-financing mechanisms combining project grants and bank credit solutions for individual farmers and SMEs. The behavioural model expected of the target beneficiaries can be conceptualized as *'agricultural entrepreneurs competing to access public financing for innovation'*.

From this analysis, a timeline was constructed, starting from the main activities (actions) and the beneficiaries (actors) over the last 30 years. From this first set of activities in each period, we identified the external forces from the national context (mainly national policies) and international context (called 'paradigms') that guided the national and international principles in research and development projects.

Figure 1 presents the preliminary timeline introduced and shared during the first national workshop in July 2023.

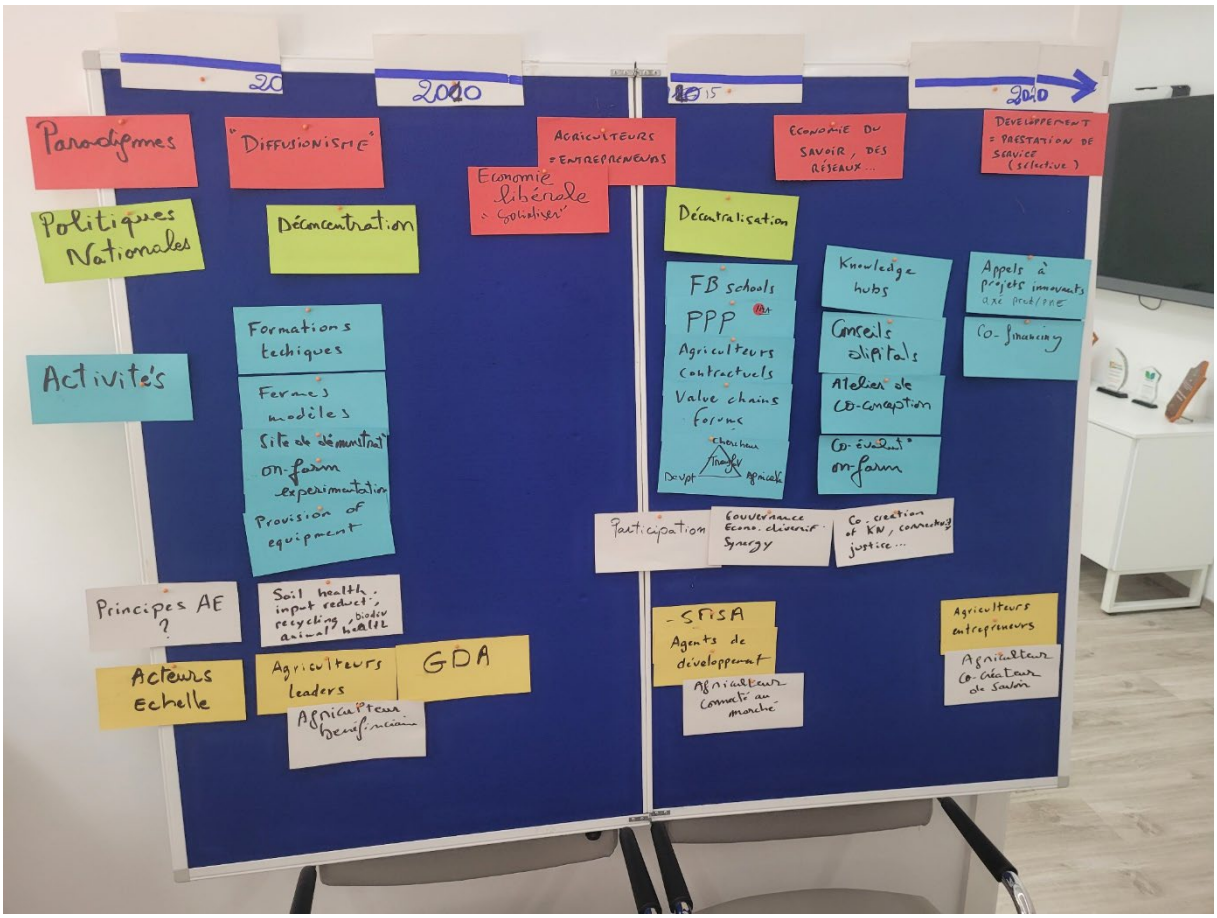


Figure 1. Preliminary timeline issued from WP5.1 activity (Working research groups from April to June 2023)

3.2. Discussion and validation of the timeline during the national workshop (July 2023)

The timeline presented in Figure 1 was discussed and enriched by the description of the main actors involved at each main period of the timeline during the national workshop.

Over the period 1990-2010, the participants discussed the strong involvement of large farmers who were considered “influential farmers” or “leaders” or even models for the neighbouring farmers (Type 1). A prominent example was the PADAC project, which focused on developing conservation agriculture. The project prioritized partnerships with large farmers because of their ability to take risks due to their physical assets. Moreover, these farmers were also considered better educated and experienced. At that time, a new form of cooperative started, the “Groupements de Développement agricoles” (GDA), which were highly dependent on local agricultural administration.

Since 2010, the social landscape has diversified with the development of Sociétés Mutuelles de Services Agricoles (SMSAs). These SMSAs allowed small and medium farmers to integrate into business activities and be collectively supported by development agents. This cooperative movement for business models responded to the ambitions of national and international projects oriented toward markets and economic valorization. The type of farmers involved in SMSAs oriented their decisions toward the market and, as such, are named “farmers connected to markets” (Type 2).

In the mid-2010s, an offshoot of Type 2, "entrepreneurs in competition to access credit," emerged (Type 3), driven by business development and the resulting demand for credit access.

Very recently, and linked with the growth of social movements and a solidarity economy based on principles of justice and co-creation of knowledge, we see the emergence of a new category of actors called the “co-creators of knowledge” (Type 4). The

participants agreed that Type 4 could include the three preceding farmer types (i.e., 'leaders', 'farmers connected to markets' and/or 'entrepreneurs in competition to access credit') once they become active stakeholders in the development process.

So, in the timeline validated by the group and presented in Figure 2, evolving approaches to behaviour change were mainly shaped by changing actor involvement and implementation approaches of the national and international projects, widely inspired by the dominant paradigms at the time.

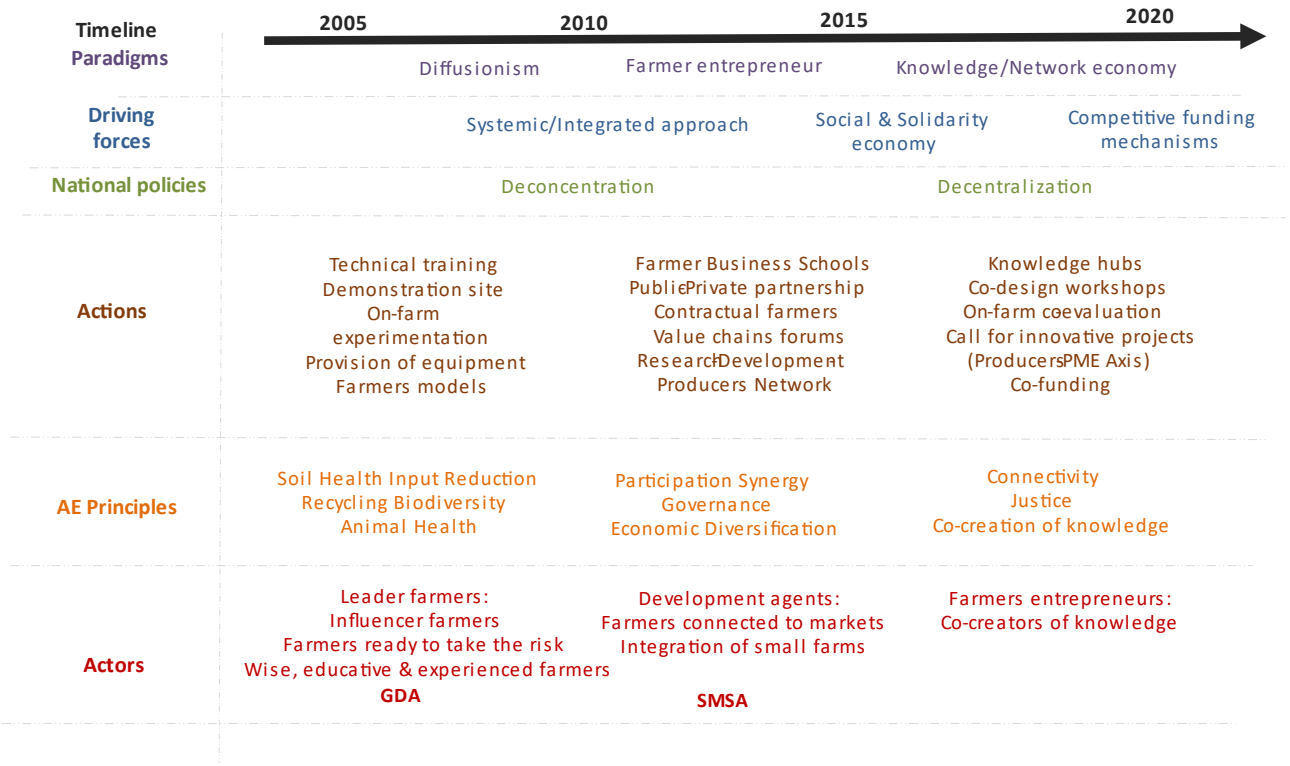


Figure 2. The validated timeline, including actor involvement (Result from the national workshop, July 2023)

3.3. Validation of the timeline and characterization of the farm types along the timeline with farmers (August 2024)

The historical timeline validated during the national workshop was shared with the FOs' members during the two focus groups.

At Hamman Biadha, participants shared their experiences about the first type (type 1). They explained that, during the first period, it was difficult for most farmers to engage in the innovation process, mainly due to their limited resources (farmers' cultivated area ranged from 1 to 2 hectares maximum, and they raised mainly local cattle breeds). The limited resources, joined with poor infrastructure (such as roads), impeded their participation in markets. Consequently, their products were frequently sold through intermediaries that offered low prices, reducing their profit margins. This helps explain why projects or initiatives focused on the "leader farmers" (type 1), who have the physical and social resources to test and adopt innovative practices.

Regarding the second type of farmers connected to market, that of the farmers called 'entrepreneurs' (type 2), all the participants recognized the critical role of the 'Mutual Agricultural Service Companies' (SMSAs) in developing this kind of behaviour. These structures have increased revenues and introduced machinery to the region, improving efficiency and productivity. Some farmers added: " *Thanks to financing mechanisms, the farmer is now connected to markets, allowing him to connect with many actors, improve his knowledge, seek alternative sources of financing and negotiate directly with financial institutions.* ». Other farmers mentioned the existence of formal contracts between them and milk collection centres or different factories around the commune, such as those specializing in tomato processing. The SMSAs or formal contracts with the Hamman Badhia FO enable farmers to secure part of their income and to plan their production better. Another farmer highlighted the impact of the Internet and Smartphones on opening up to the outside world. With these tools, he has built relationships with farmers in Morocco, with whom he regularly exchanges information and agricultural innovations. These exchanges enriched his knowledge and allowed him to explore new practices and make the farmer an entrepreneur.

Regarding the third type, "entrepreneur in competition to access credit" (Type 3), the discussions highlighted the importance of networking (with factories, SMSAs, banks, and microfinance companies) as a trigger for this change toward investment. In addition, access to credit, mainly through microfinance programmes such as Enda (a micro-credit institution that supports small agricultural projects), has been crucial in supporting farmers' investments and growth.

Finally, the fourth type of farmer (Type 4) was described as a farmer who stands out for his willingness to participate actively in workshops and meetings. Type 4 farmers who act as 'co-creators of knowledge', are getting involved in discussions and seeking to influence agricultural practices and policies.

At Kesra, one participant noted that "*the farmer in Kesra went through this development without being fully aware of it*". Another farmer added that "*some farmers may have evolved, but in his case, he is still a small farmer without being able to take the steps to other categories*". Another farmer noted that several obstacles, including financial ones, hinder the change of behaviour of Kesra farmers. Another farmer added that "*some farmers have never left the region, and that the exchange of experiences is crucial to improve their thinking*". He also stressed the importance of soft skills in negotiating with banks and financing organizations. He concluded that most of the farmers in Kesra have remained stagnant due to lack of physical and financial resources. So, collectively, farmers insisted on adding the question of access to subsidies to the timeline. For them, the evolution from one type to another is mainly driven by access to subsidies and funds. Moreover, the investment allowing them to be considered as "entrepreneurs" concerns only a minority of farmers in their commune. These two points were added to the participatory timeline validated by farmers (Figure 3).

Items	2005	2010	2015	2020
Who?	Farmers leaders, beneficiaries of innovation. Link to GDA	Farmer entrepreneurs connected to the market link to SMSA	Agricultural entrepreneurs in competition for credit access	Farmers co-creators of knowledge and innovation
How?	Beneficiary of equipment and technical training. Owns plot pilots for school training.	Develop partnerships between public and private sectors; contextualization; Farmers integrated in value chains (or business models)		Participation to workshops and collective dynamics in projects and brainstorming to adapt innovations
Modes of interventions	Influencers: the role of disseminating the information by farmer leaders following their experience.	Creation of a channel of communication for participatory dynamics	Develop micro-credit access; adapt subsidies to small-scale farms.	Local workshops; launch project with impact assessment; search of funds through the social and solidarity economy (decentralization)
Which principles?	Role of protection and respect of the animal health and soil. Biodiversity preservation with minimum input use and recycling actions	Governance and participation. Diversification of agricultural activities		Network creation Equity promotion Knowledge dissemination

Figure 3. Final participatory timeline

3.4. Validation of the timeline Through the online consultation (August-September 2024)

From their experience, all the stakeholders that participated in the online consultation recognized the type 1 of "leaders" who are qualified as 'educated', 'motivated', 'innovant', and 'collaborative' farmers, although the majority of farmers are considered as only beneficiaries of innovation. The beneficiaries represent the majority of farmers characterized by the lack of assets, limited land or animal stock, low educational level or knowledge of traditional and safe (or prudent) practices.

85% of the respondents recognized the type 2 of entrepreneurs. According to 60% of respondents, this type represents a minority (less than 5% of farmers in their zone of action); 28% of respondents estimated the proportion of farmers between 5 and 25% and 12% of respondents around 50% of the farmers. The farmers in type 2 are considered as medium to large farms, with usually a non-farm livelihood activity. They are well-educated and relatively integrated into the market economy and society. They are qualified as 'responsible', 'dynamic', 'curious', 'modern', and even 'ambitious'.

82.5% of the respondents also recognize the third type of "entrepreneur in competition to access credit". According to 72% of the respondents, they represent less than 5% of the farmer population in their zone of action (although 20% estimate their proportion to be less than 25% and 8% estimate Type 3 to make up around 50% of the farmers). This category can include both small and medium-to-large farms. Their common points are their willingness and interest in the new business model and the risk acceptance/preference. They usually have a high level of education and have mastered the keys of communication and funding systems. Their leading quality is their active cooperation with researchers.

Only almost 80% of the respondents recognized that type 4 qualified as co-creators of knowledge. According to 60% of respondents, the type 4 represents less than 5% in the zone of action; however, 30% estimate their representation to be around 50% of farmers and 10% estimate it to be around 25%. The farmers in type 4 are qualified as "wealthy", "open-mind", 'curious', 'passionated', and 'collaborative'. It is not a matter of education but more of engagement and shared interest in environmental challenges.

From the oneline consultation, the four types of farmers are well recognized but they represent a minority of farmers less than 5% for each category.

4. Understanding of the mechanisms that induce the change in actors' behaviours

To address and understand the change in actors' behaviour (here considered as the adoption of behaviour proper to each farm type defined in the timeline), we proposed to identify the main drivers (push/pull), explaining the reasons for the entrance of farmer in one type to another one considering that the four types reflect behaviours changes needed along the agroecological pathways.

4.1. Identify the main drivers favouring the behaviour changes during the national workshop (July 2023)

In this second step, participants were invited to fill out a post-it to characterize the main drivers/factors that supported the emergence of each actor profile corresponding to the four farmer types (see section 3). Figure 4 shows that the emergence of a new category is highly based on social and political changes, from the patrimonial model of the '90s (significant physical asset, with education and open mind) to the marketing-oriented model of the 2000s (with new consumers' demand) and most recently to the networking and self-expression model from 2010s (widely inspired by cultural change).

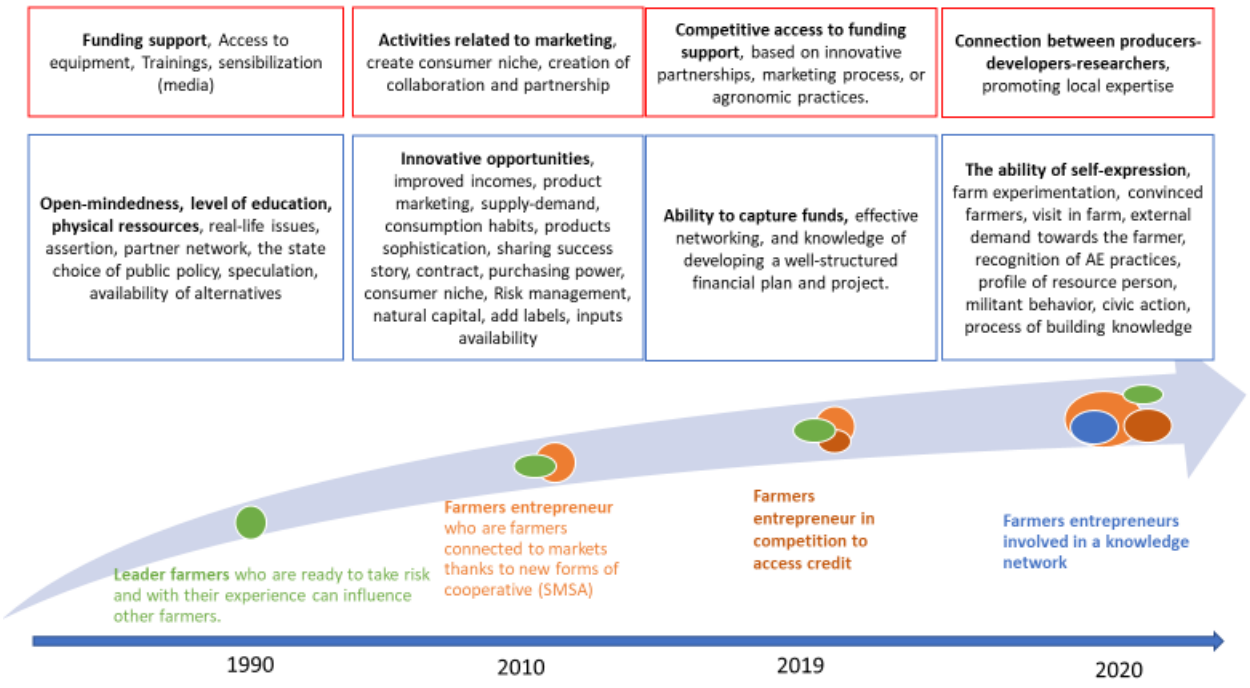


Figure 4. Internal and external factors that induce the emergence of each category (Blue boxes refer to internal factors of behavioural change; red boxes refer to external actions that favour these changes).

4.2. The main drivers of behaviour changes from farmers' perspectives (Focus groups, August 2024)

From the farmers' perspectives, the main challenges of behaviour change in the 90s toward more sustainable transition pathways (considering the principles of the agroecological frame) were the low productivity and the lack of infrastructure (mainly roads). In addition, as in Hamman Badhia, farmers mentioned being highly dependent on intermediaries to sell their products, with low prices to enhance income and investment. In Kesra, farmers pointed out the lack of technical information and dissemination of information despite the efforts of extension services. Two farmers from Kesra explained: " *We are very traditional farmers. We know it is important to have an identity and remain attached to our customs. Still, we have not evolved or followed the agricultural advances because of the relief of our region (mountainous with difficult access to machines). Therefore, we have not expanded our olive or fig tree plantations, and the number of trees remains unchanged.* » In addition, all farmers described the majority as reluctant to trade with other farmers, remaining traditional and stagnant, with no capacity for innovation.

For farmers in Hamman Badhia, the key factors that allowed farmers to move to an entrepreneurship behaviour have been: 1) First, the development of roads that have facilitated access to markets; 2) the introduction by ODESYPANO of the "Tarentaise" cattle breed, which played a decisive role, accompanied by an awareness of the advantages of this new breed; 3) the development of financing mechanisms, in particular through institutions such as the BNA (Banque National Agricole), and 4) Awareness-raising days to supervise and support farmers in their development. Conversely, in Kesra, the key drivers of change have been the difficulties linked to the stagnation of production and income, which have pushed farmers to change their practices and mindset.

According to farmers, "Entrepreneurial farmers" (type 2) started to diversify their activities, including planting olive and almond trees with intercropping, which made it possible to increase yields without increasing the area farmed. Thanks to the funding provided by the associations (SMSA) and the experience gained in marketing, income from milk production or local products has increased. This diversification of crops and the intensification of their activities through market orientation allowed them to grow economically. In Hamman Badhia, for the farmers considered in type 2, the number of cattle would have increased to 10 heads of sheep and five heads of cattle. This change of structure has created a need for labour, thus promoting the creation of jobs at the local level. In addition, during this period, fodder and concentrate became more accessible thanks to the emergence of new suppliers. The opening up to international markets during the 2000s, mainly through the export of olive oil, has also encouraged these farmers to seek financing, whether from the State or the private sector. Access to credit, mainly through microfinance (such as Enda), has triggered entrepreneurs to invest. In Kesra, farmers also stressed that type 2, an "entrepreneurial farmer, " encompasses the category of farmers who accept change and have a long-term view of their farm activities. This type of farmer seeks to expand the size of the farm by increasing the cultivated areas and diversifying the crop system. As also mentioned in Hamman Badhia, these farmers have created jobs by employing the workforce available in the local market, thus contributing to the local economy. In addition, the farmers have positioned themselves dominantly in the market thanks to the quality or quantity of their products, aiming to improve their competitiveness. They do not hesitate to invest in new agricultural techniques, machinery or modern practices to optimize production and meet the market demand.

Regarding the factors triggering the transition from type 2 to type 3 with access to financing mechanisms, farmers stressed the importance of the emergence of relationships and collaborations between neighbours and other farmers. This network facilitates the exchange of information and the dissemination of new agricultural practices. Imitating the practices observed by other farmers is also a key factor. By seeing their peers' concrete results, some farmers have been encouraged to replicate the innovations on their farms to improve their productivity.

Type 3 of farmer entrepreneurs competing for access to public and private financing for innovation represents a stage where the farmers, thanks to their accumulated experience, can simultaneously manage several activities: arboriculture, livestock and cereal farming. Type 3 also relies on innovative practices and does not hesitate to experiment with new techniques or technologies to improve productivity. By testing innovative approaches, this type manages to optimize productivity while meeting the demands of the modern market. For that, they have taken advantage of microcredits, such as those offered by INDA, to develop their farms further. In Kesra, farmers also point out that the farm 'type 3' can also go beyond local markets to find marketing channels abroad, seeking to diversify its outlets and maximize economic opportunities through exports. This farmer type can create solid financial credibility and build trusting relationships with various stakeholders, whether they are financial partners, suppliers, or customers. It relies on these relationships to strengthen the value chain of a product, thus helping to establish a network of mutual trust between the actors involved.

The transition to "Type 4" of co-creators of knowledge was then facilitated by several factors, including active participation in awareness days in their region. These farmers have also tested innovations, such as mixing fodder crops or intercropping, such as olive trees with peas or fodder crops. The exchange with research institutes and knowledge transfer allowed them to explore agroecological techniques, such as compost production. Another driver is the increasing access to smartphones, which greatly facilitated the flow of information between farmers and the access to updated information, whether on new agricultural practices or market opportunities. New digital tools such as the Internet and smartphones allow access. In Kesra, the farmers mentioned

that thanks to the latest digital tools, they frequently hear the term "organic" in the conversations in the neighbourhood, on the Internet, or television. The access to the information made them aware that organic farming is a viable and potentially successful option in Kesra and pushes them to consider new environmentally friendly practices, aligning with the growing demand for organic products.

For the farmers involved in the focus groups, type 4 represents the farmers that become critical actors in creating and sharing knowledge thanks to the increase in awareness-raising days organized by the regional or national development & research institutes (like OEP, ODESYPANO and INRAT). Some examples have been given, such as the manufacture of compost, the recovery of pruning residues and the trials of new fodder crops. In Hamman Badhia, one farmer stressed the importance of improving relations between neighbours and promoting the exchange of information and sharing experiences, especially to move forward together. This expresses the need for a new transition, where innovation and knowledge are shared not only between R&D and farmers but also between farmers.

Table 2 recaps the main drivers that push the farmers from one type to another one.

Table 2. The main drivers that emerged from the discussions with farmers in the two communities (Focus groups In Hamman Biadha & Kesra, August 2024)

Transition	Hamman Biadha	Kesra
From traditional farms to 'Type 2. Entrepreneur' connected to market	1) Development of roads that have facilitated access to markets. 2) Introduction of innovation (e.g. the "Tarentaise" cattle breed in Hamman Biadha) 3) Financing mechanisms, in particular through institutions such as the Agricultural National Bank (BNA), and 4) Awareness-raising days to supervise and support farmers in their development.	1) Low productivity and low incomes have pushed farmers to change their practices and mindset. 2) Access to state subsidies. "One mentioned that due to the lack of agricultural services, some farmers move to another place to practice olive growing in a more favorable environment." 3) External barriers: challenging topography and and remoteness
Type 2 to type 3. Farmer connected to market with access to finance	1) Role of the 'Mutual Agricultural Service Companies' (SMSAs) in networking (with factories, SMSAs, banks, microfinance companies) 2) Access to materials/mechanization 3) Emergence of formal contracts	1) They accept change and have a long-term view of their farm activities. 2) Creation of jobs at the local level (recognition)
Type 3. Farmer entrepreneur (credible for credit access) to type 4.	1) Awareness-raising days 2) Ready to test experiments/innovations 3) Financing mechanisms, 4) The emergence of relationships and collaborations between neighbors and other farmers=> facilitates the exchange of information and the dissemination of new agricultural practices.	1) Impact of the Internet and Smartphones 2) Media (TV) 3) Experience Barrier: low communication with extension service

Across Kesra and Hammam Biadha, several commonalities emerge in barriers and levers shaping agricultural development. In both regions, knowledge gaps limit progress due to poor communication between farmers, extension services, and researchers affecting the adoption of improved practices. Economic barriers such as insufficient access to credit and restrictive subsidy mechanisms constrain farmers, compounded by inflation and rising costs. Both regions face environmental challenges, including severe water scarcity that limits crop diversification and productivity. Widely, poor infrastructure, such as inadequate transportation and storage facilities, exacerbates these challenges.

Across the region, agricultural organizations, such as SMSA or GDA, play a crucial role in fostering resilience and collaboration among farmers. Access to scientific research and successful pilot initiatives, such as forage mixtures and improved drying techniques for figs, demonstrate the potential for scaling sustainable practices. Local markets offer economic opportunities, while awareness-raising and knowledge-sharing events promote the adoption of innovative methods. These shared barriers and levers highlight the need for integrated solutions that address systemic issues while empowering local stakeholders.

4.3. Non-farmer stakeholders' perspectives on the main drivers of behavior changes

In the online consultation with non-farmer stakeholders (August-September 2024), the main descriptive characteristics given to the type 4 farmers are 'education', 'open-mind', 'innovation-mind' and 'motivation', which favor the innovation adoption. The social environment linked to farm organizations would also be an essential factor in behavior change toward knowledge sharing.

The main barriers to the adoption of this behavior of co-creator and sharing of knowledge would be the lack of information/communication, environmental conditions, and the lack of financial resources. For that, the respondents evoked harsh environmental conditions (due to drought, low precipitation, and soil degradation) and a lack of vision and finance for public programs to support the changes. The problems of dialogue, organization and collaboration between actors are also mentioned.

So, two pre-requisites are well mentioned to understand the barriers of behavior changes: (i) the recognition of the fragility of the environment in interaction with the interest and respect of the community, and (ii) the involvement and attachment of farmers to the community and the local organizations. The various non-farmer stakeholders point out the factors of technical and financial resources, then the training and information access to favor the change of behavior of farmers. These three elements are completely in line with the barrier and enabling factors reported by farmers (part 4.2).

5. How do we induce changes toward agroecological transitions?

The third and last step proposed exploring the barriers and enablers along two impact pathways from the Vision to Action exercise to understand the mechanisms of behaviour change toward agroecological transitions.

5.1. Results from the national workshop in July 2023

The national workshop divided participants into two sub-groups to examine key behavioral changes needed to support an agroecological transition. The two groups focused on distinct objectives: Group 1 (G1) addressed the national self-sufficiency of feed value chains, while Group 2 (G2) focused on enhancing the marketing of local products and commodities, such as figs, olive oil, and honey.

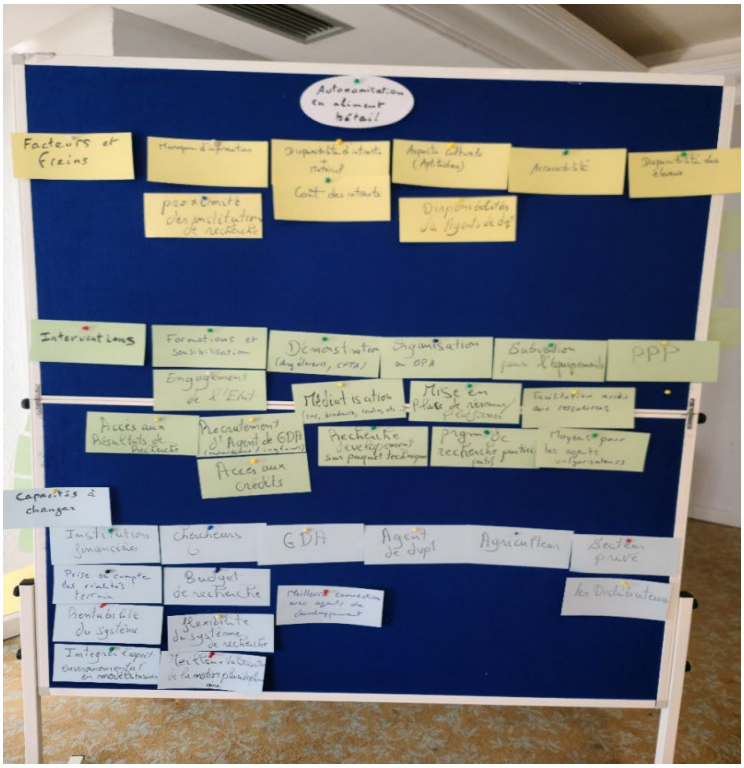
In each sub-group, the discussions and exchanges were organized around three questions:

1. What barriers and enablers influence the changes about achieving agroecological transition in the two targe value chains to support an agroecological transition?
2. What are the interventions to support the changes? and
3. What are the capacities of actors to change, considering internal factors like physical, financial, or social assets?

The primary aim of these group sessions was to extrapolate factors that could influence behavior change now and in the future to advance the two agroecological transition pathways.

From the materials collected during the national workshop (Appendix B and photo 2), we proposed to use the principles of the Triangle of Future representation to identify plausible changes of behavior in each agroecological transition (Figures 5 & 6). In these two figures, the barriers are represented in the "weight of history based on barriers" and the existing modalities of the interventions with capacities in the "push the present." The Plausible future are derived by adding new modalities of interventions proposed by the two sub-groups.

(a) Working group session (G1) on the agency factors to pull the future toward the recognition and valorisation of local products (@ICARDA)



(b) Working group session (G2) on the agency factors to pull the future toward a high autonoy of feed value chains (@ICARDA)

Photo 2. Restitution of the working group session during the national workshop (a and b)

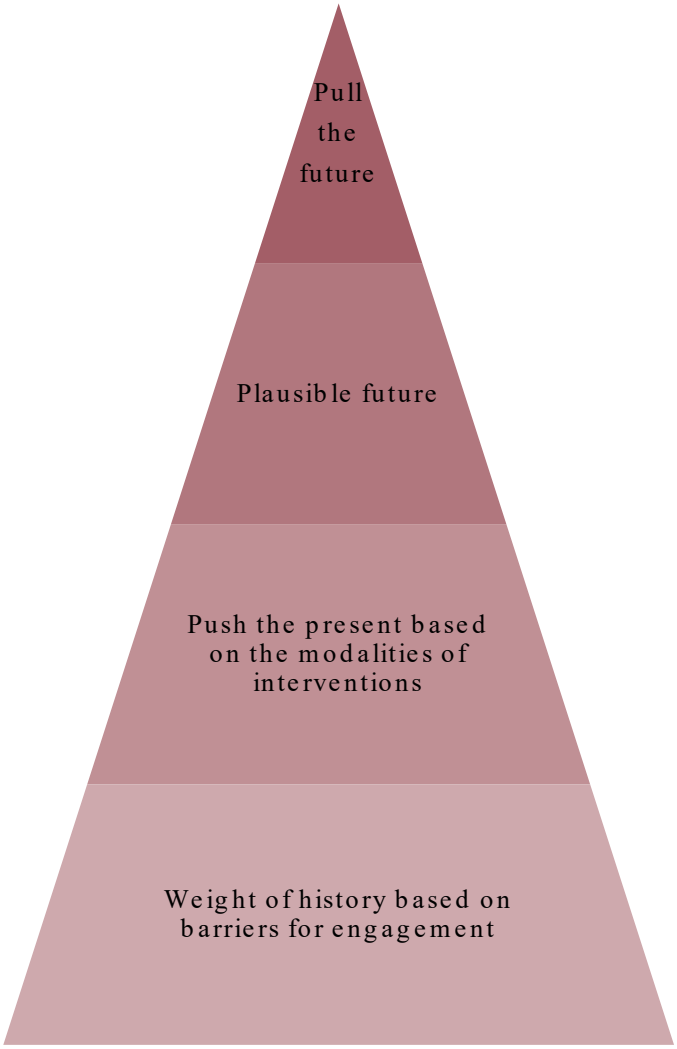


Figure 5. Representation of the capacities of actors to change to answer to a desired future related to the valorisation and recognition of local products

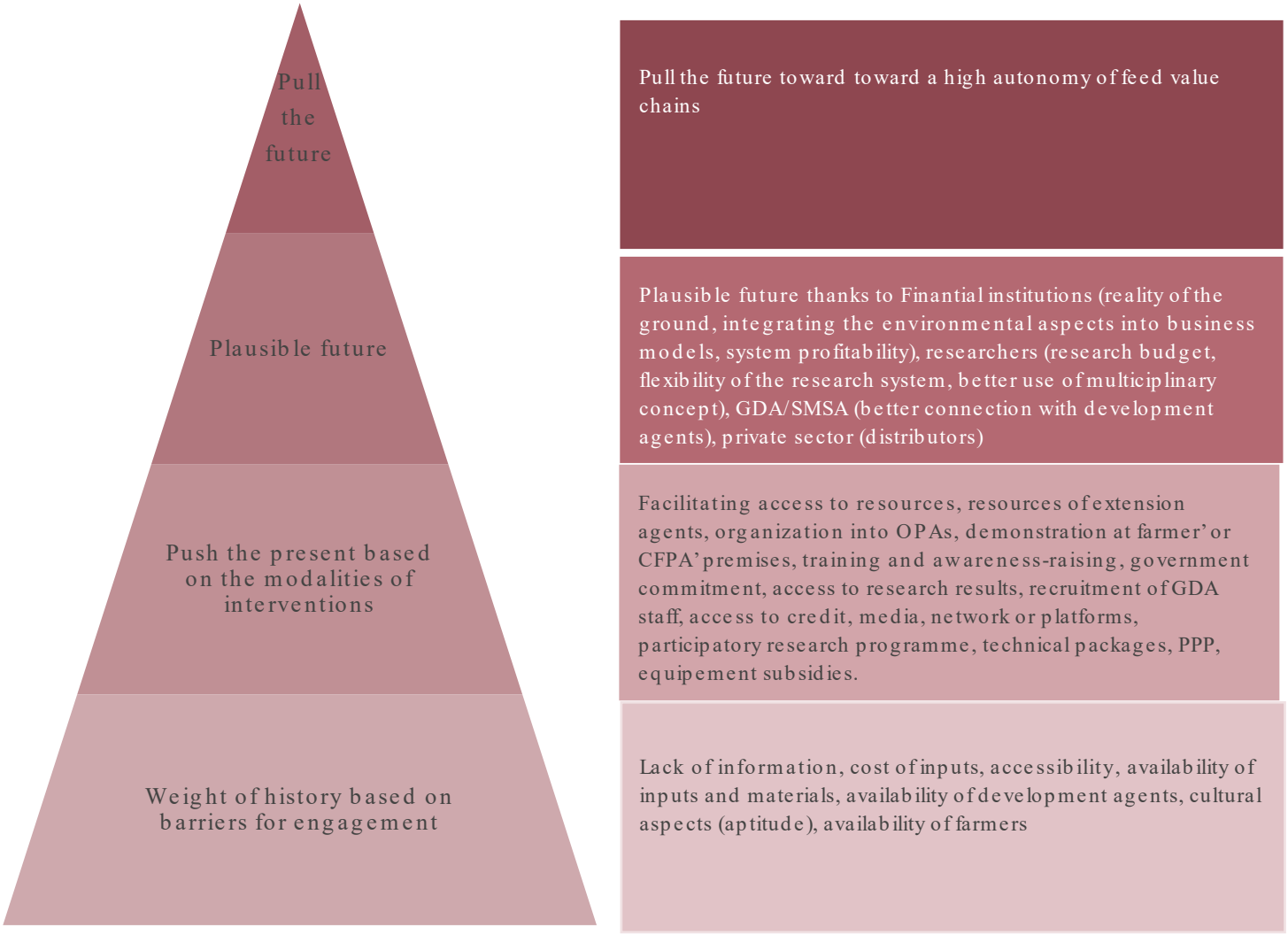


Figure 6. Representation of the capacities of actors to change to answer to a desired future related to the self-sufficiency of feed value chains

We can see similar barriers in the two cases, i.e., the lack of information and infrastructure for accessibility that constitute limiting factors for the two pathways. For G1, people insisted on the lack of expertise and Initiative, although G2 mentioned the cultural aspects as the main barriers. Access to funds/credit, awareness, training, and networking through OPA or decentralized cooperatives are the main pushing factors to condition the change.

Despite these shared challenges, the strategies to mobilize actors and organizations varied between the two pathways. For G1, the emphasis was on public services and support for the animal feed value chain. In contrast, G2 proposed innovation platforms and partnerships, explicitly focusing on involving women farmers in enhancing the marketing of local products. Both groups recognized the significance of developing business models that include environmental opportunities and fostering flexible partnerships with and between researchers and developers to synergize capacities toward the desired change.

5.2. Discussions with farmers around the barriers and enablers related to two agroecological pathways

5.2.1. What are the main factors that can push toward self-sufficiency in forage production?

In Hamman Badhia, farmers underlined four significant factors to support the path to greater forage self-sufficiency:

1. Importance of forage mixtures: Farmers emphasized using mixtures with oats and sulla to strengthen forage self-sufficiency.
2. Intercropping between olive trees: Planting other crops between rows of olive trees is crucial for better surface management, providing shade for roots and reducing water evaporation.
3. Storage infrastructure: The construction of barns and storage buildings is essential to maintain the quality of straw and hay.
4. Access to agricultural machinery: The availability of machinery, such as grinders, would allow farmers to recycle farm residues, such as pruning wood, to produce fodder.

In Kesra, farmers highlighted several key points:

1. Access to water: They say the region lacks water resources, mainly due to climate change, which is worsening the situation. There are no dams or wells and no 'PPI'. Actions to store water or create a PPI could be a good solution for managing stormwater.
2. Provision of quality seeds: farmers insist on the importance of seed availability adapted to the region's climate and the soil's nature.
3. Strengthening the SMSA: It is essential to enhance the existing SMSA by adding equipment (tractors, dryers, etc.) to help farmers optimize their farming activities.
4. Improvement of infrastructure: Farmers mentioned the development of agricultural tracks to facilitate machines' access to the plots. Some still farm their land with animals, such as 'mules'.
5. Strengthening livestock: Those who do not own plots speak of the creation of rangelands, beekeeping, and the planting of honey plants, practices adapted to the region, and generating income.

Figure 7 reports the importance of each driver according to the number of farmers (vote).

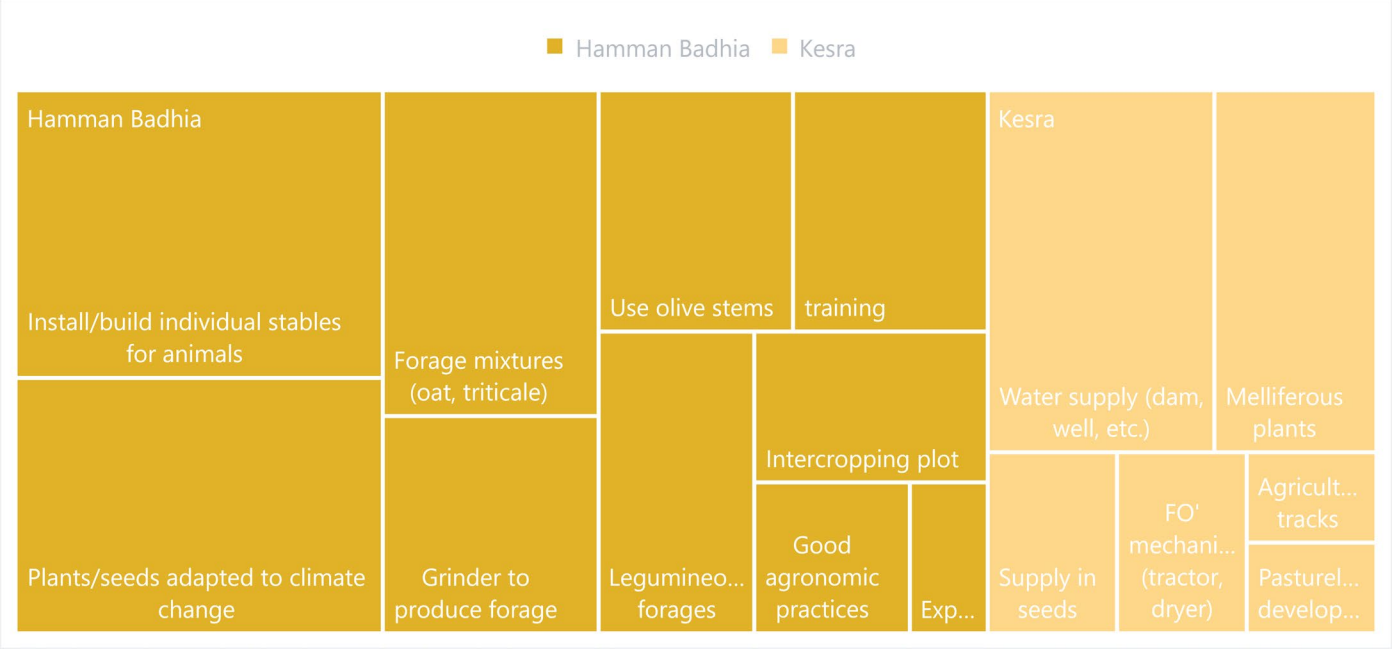


Figure 7. Importance of the drivers towards an enhancement of feed autonomy based of the farmers' vote

5.2.2. What are the main factors that can push toward the development and enhancement of local product value chain paths?

Related to the valorization of local products, the main drivers discussed by farmers in Hamman Badhia are: 1) The importance of replacing chemical inputs with compost to produce high-quality organic food, thus ensuring better sales at higher prices than conventional; 2) Some farmers mentioned using social media to promote their local products through adequate training in digital marketing (online); 3) Others emphasized the importance of packaging, including quality testing and labelling, to add value to their products; 4) Finally, relations between farmers, intermediaries and consumers should be organized, as the farmers believe that the difference between the direct farm selling price and the consumers' price on the market is too significant.

As in Hamman Badhia, farmers in Kesra insist on converting to organic farming and certification, as a good quality organic product can sell for a higher price than conventional. One farmer also mentions planting carob trees, which could generate an annual income of up to 1400 dinars. For that, farmers emphasized the importance of marketing and advertising training to better market their products, creating a direct link with the consumer without intermediaries. The idea of creating a local point of sale was suggested to sell products and increase revenues. In addition, farmers emphasize the need to process figs to give them more value and guarantee a better income.

Figure 8 reports the importance of drivers to enhance the valorization of local products based on the farmers' vote.

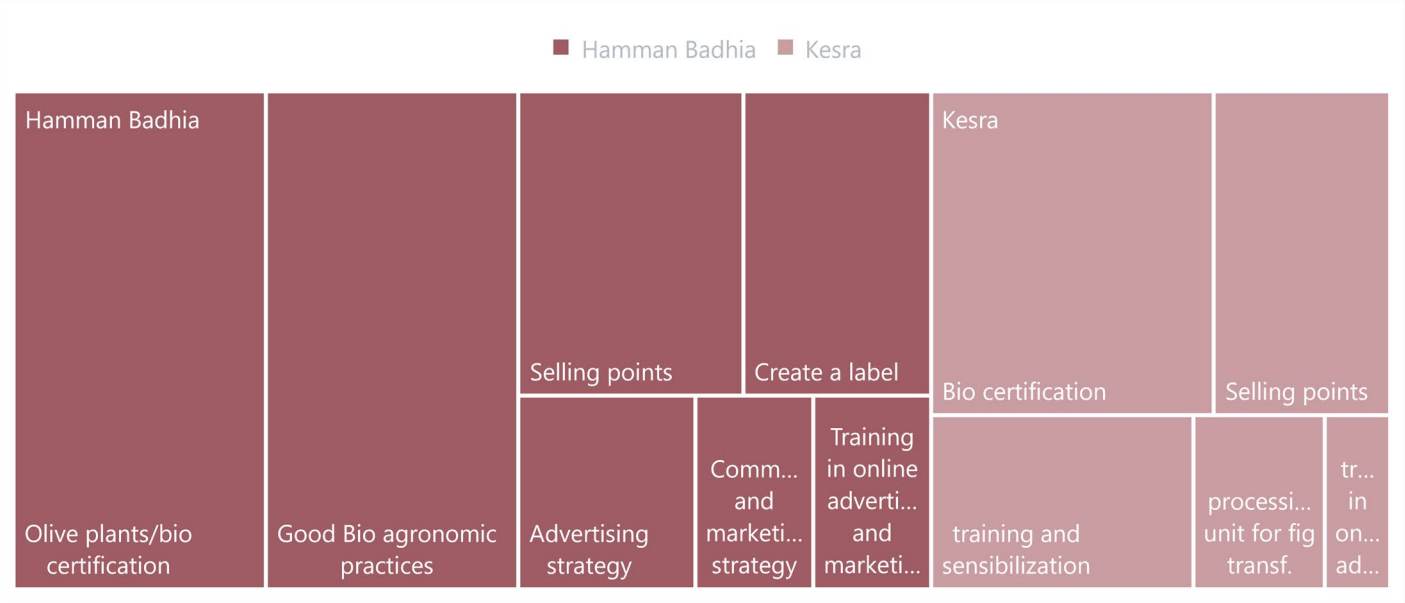


Figure 8. Importance of the drivers to enhance the valorization of local products based on the farmers' vote

A discussion with farmers regarding organic farming took place after this session, and they proposed (more detailed) actions to facilitate the conversion to this mode of production. Notably, farmers stressed the importance of accompaniment, extension, and support from the State and administrative agents to make this transition successful. This support could include awareness days and regular and permanent workshops.

Secondly, farmers consider organic certification the most essential action, as it would improve the quality of the local products and guarantee their sale, given that Tunisian consumers are increasingly looking for organic products. They also consider it crucial to have some local point of sale, where farmers could sell their products directly without waiting days or weeks, thus avoiding spoilage.

Finally, farmers strongly believe in the importance of training. They want to learn more about marketing, sales, and certification to improve their skills and results.

5.3. The barriers and enablers related to two agroecological pathways viewed by the non-farmer stakeholders in the Tunisian ALL

5.3.1. What are the main factors that can push a forage self-sufficiency path?

Prioritizing capacity building through training and direct financial support is crucial for fostering the adoption of fodder self-sufficiency. Additionally, pilot projects and establishing partnerships can enhance producers' engagement. Lastly, promoting local knowledge and providing logistical support are complementary yet vital factors in ensuring farmers' long-term commitment to these innovative practices.

Table 3. The main drivers for behavior changes and their degree of importance (online consultation; 40 respondents)

Very important	**Training and awareness:** Provide hands-on training and workshops on forage production and conservation techniques. **Financial and material support:** subsidies for seeds or agricultural equipment such as seeders or mowers. Encourage the use of certified seeds by providing specific financial aid. **Water management:** mobilizing existing water resources for irrigation of fodder crops. Implement water conservation projects such as constructing small dams or efficient irrigation systems. **Access to land ownership:** Helping farmers obtain land title to the land they farm for forage crops. **Personalized support and follow-up:** provide ongoing technical support and personalized advice, such as regular visits from technicians to assess the progress of the crops and propose specific improvements.
Medium important	**Support for pilot projects and experiments:** installation of demonstration plots on farmers' farms and monitoring them throughout the production cycle. For example, it demonstrates the benefits of forage legumes in improving soil fertility and animal performance. **Crop diversification:** Promoting the integration of forage crops into existing production systems. Introduce forage crop blends, such as legume and grass combinations, to improve forage resilience and quality. **Strengthening sharing networks:** creating discussion groups or farmers' clubs around fodder self-sufficiency. These groups can serve as platforms for exchanging experiences and good practices. **Support for access to finance:** offer technical and administrative support to facilitate access to lines of credit for purchasing seeds or equipment, for example, by negotiating advantageous conditions with seed companies. **Skills building:** train farmers on fodder conservation techniques, such as drying or silage, and on managing production cycles.
Low important	**Self-production of fodder seeds:** encouraging farmers to produce their fodder seeds. Provide training on seed harvesting, selection, and storage techniques. **Enhancement of local knowledge and traditional practices:** Promote traditional agricultural practices that promote fodder self-sufficiency, such as crop rotation and livestock integration into the cropping system. **Financial and technical support:** offer logistical support for purchasing agricultural equipment and developing storage infrastructure. For example, subsidize the construction of silos or granaries for fodder. **Improving knowledge:** Organizing workshops on valorising forages in animal feed, for example, optimising feed rations to reduce feed costs. **Creation of field demonstrations:** Implement concrete demonstrations of innovative techniques, such as establishing summer forage crops or using cropping systems under cover to maximize forage production.

Crossing the main factors from non-farmer stakeholders and farmers reveals some common factors around financial and material support. However, farmers insist on other infrastructures, such as storage or livestock equipment (forage grinders or animal stables), and non-farmer stakeholders emphasize agronomic material (such as seeds).

5.3.2. What are the main factors that can push toward the development of local product value chains viewed by non-farmer stakeholders in the Tunisian ALL

The primary factors supporting the commercialization of local products are organizational, focusing on networking and logistics. Respondents emphasized the importance of creating certifications to assure consumers of product quality. Eco-labels and advertising rank third in significance, contributing to the visibility and appeal of these products. So, improved collaboration within the supply chain and efficient distribution are seen as critical to market success, while branding initiatives like certifications help build consumer trust.

Table 4. The main drivers for behaviour changes and their degree of importance (online consultation; 40 respondents)

Degree of importance	Main drivers
Very important	**Network creation**: networks to promote cooperation, the sharing of experiences and the pooling of resources. **Create short circuits and direct sales platforms: S**et up direct sales channels between producers and consumers to reduce intermediaries and increase farmers' incomes. **Optimize logistics and transportation**: Implement logistics solutions to transport fresh produce and reduce waste efficiently. **Promote local products via the media**: launch communication campaigns to increase the visibility of local products among the general public. **Regulate markets for agricultural products**: establish standards and rules to protect local producers from unfair competition. **Financing and grants**: providing financial support to producers to invest in innovative technologies
Medium important	**Encourage collaborations and partnerships** between producers, public institutions, and private actors to strengthen local value chains. **Develop marketing channels for local products:** set up and strengthen short circuits to sell directly to consumers, while minimizing the number of intermediaries. **Support for agricultural groups:** encourage the formation of groups to benefit from collective financing and better negotiation conditions with buyers. **Creation of local labels and certifications:** develop labels to certify the quality and authenticity of local products to differentiate themselves on the market. **Organization of local fairs and events:** Create events to exhibit local products, attract consumers' attention and strengthen distribution networks.
Low important	**Coaching and technical support:** supporting farmers with training and ongoing support by offering subsidies and technical assistance for the development of new techniques **ISO certification and eco-labelling:** encouraging the certification of products according to ecological standards to improve their value in the market. **Marketing: fairs, social media, advertisements:** develop marketing campaigns to raise consumer awareness about the benefits of local products. **Online sales:** support producers in the creation of online stores and the use of digital marketing tools. **Providing a transport circuit:** Improving transport infrastructure to facilitate access to markets for products.

Crossing the main drivers of farmers and non-farmer stakeholders shows that farmers raised in priority the issues of agronomic practices in link with the use of bio-fertilizers and marketing strategies although non-farmer stakeholders pointed out the factors of networking and logistics along the value chain.

6. Discussion and conclusion

6.1. Timeline elaboration and validation

The timeline construction and validation reveal four critical changes over the last 30 years:

1. 1990-2010: Influence of Leader Farmers (Type 1): Large, influential farmers were pivotal due to their risk-taking ability based on their social, physical and financial assets. They partnered with national projects like the PADAC project, which focused on conservation agriculture, and were models or inspirations for neighbouring farmers. The emergence of *Groupements de Développement Agricole* (GDA), cooperative-like organisations heavily dependent on the agricultural administration, also marked this period.
2. 2010: Development of the ***Sociétés Mutuelles de Services Agricoles*** (SMSA): The formation of SMSAs enabled small and medium farmers to participate in business activities, marking a shift towards economic valorization through market-oriented projects. The farmers involved and active in the SMSA became known as "farmers connected to markets" (Type 2).
3. Mid-2010s: Emergence of Entrepreneurs able to access credit (Type 3): A new class of entrepreneurial farmers emerged, driven by access to credit and a focus on business growth. They actively sought new business models and partnerships, motivated by market and financial opportunities.
4. Recent Years: Co-creators of Knowledge (Type 4): Linked to social and solidarity economy movements, a new group of farmers began co-creating knowledge. These farmers played a central role in shaping agricultural practices and policies through collaboration with researchers and a diversity of other stakeholders.

During the national workshop, participants enriched the timeline by identifying critical factors and type of agents in each phase, confirming that behaviour changes were influenced by evolving partnerships and international project dynamics. Farmers validated the timeline by sharing their challenges, such as low productivity and marketing barriers at the farm level, and the role of SMSAs in transforming their farm operations. They highlighted technology's role in knowledge sharing and entrepreneurship. However, they also noted financial barriers and the importance of experience exchange for development. They emphasized the need for subsidies and identified themselves as traditional farmers, unable to progress without access to new resources and funds. The non-farmer stakeholders involved in the online consultation recognized the different changes reported in the past 30 years and the four types of farmers, even if they considered that most farmers are simple beneficiaries, thus not included in the proposed typology. Type 2 ('entrepreneurs') and Type 3 ('entrepreneurs in competition to access credit') were seen as minority groups, while Type 4 (co-creators of knowledge) represented a small but engaged subset of the farming population.

The various consultations with farmers and non-farm stakeholders in the Tunisian ALL illustrate the emergence of new farmer behaviour profiles in response to evolving partnerships, changing economic models, and shifting social dynamics. This transformation of profiles reflects how farmers adapt to new opportunities and challenges within the agricultural landscape, influencing their practices, decision-making processes, and interactions within their communities and markets. However, results show that this behaviour transformation is mainly boosted by external factors, even if the internal resources often condition the capacity to change.

The mechanisms driving behaviour change, as identified through workshops, focus groups, and online consultations, underscore several key drivers. Historical shifts—from patrimonial models to market-oriented approaches and eventually to self-expression models—have been influenced by evolving social and political trends, which dominant paradigms have inspired. These transitions or shifts reflect how broader societal changes shape individuals' and communities' motivations, priorities, and actions, influencing how they engage with economic, cultural, and environmental challenges.

However, farmers' and non-farmers stakeholders stress other significant factors. Farmers emphasized infrastructure development, such as road improvements or water infrastructure, financial resources (microcredit) access, and innovations like new cattle breeds. For them, networking and contracts through local agricultural organizations helped increase market access and job creation. Technological adoption, such as intercropping and digital tools, fostered productivity and sustainability. Collaboration among farmers and external influence from research institutes facilitated knowledge exchange and experimentation, especially with agroecological practices that are the main focus of the changes.

On the other hand, non-farmer stakeholders underscored the importance of education, community involvement, and environmental awareness as key factors in driving change. The main barriers included limited financial resources and communication gaps. So, for them, behavioural change was driven by a mix of financial support, access to markets, education, and openness to innovation.

So we can highlight the contrast between what farmers describe as barriers/challenges (including infrastructure, environment, and access to finance) and what non-farmer stakeholders identified (mostly awareness and community motivation).

6.2. How to induce behaviour changes towards agroecological transitions?

Two agroecological pathways were explored during the July 2023 national workshop to identify the drivers and barriers of behaviour changes toward agroecological transitions in Tunisia. These pathways focus on 1) achieving self-sufficiency in feed value chains and 2) enhancing the marketing of local products (like figs, olive oil, and honey). The working group sessions aimed at identifying the main barriers and enablers, the prior intervention modalities, and the need for actor capacities.

The most cited barriers for feed self-sufficiency (G1) include a lack of expertise and infrastructure. The primary drivers for change include access to funds, training, and support from public services. Emphasis was given to promoting technology such as forage mixtures (e.g., oats and sulla), intercropping, storage infrastructure, and machinery availability. In regions like Kesra, water access and quality seeds are highly mentioned, along with infrastructure improvements like building agricultural tracks.

For local product marketing (G2), cultural aspects were considered the primary barriers. Drivers for change include innovation platforms, partnerships (particularly engaging women farmers), compost use for organic farming, digital marketing training, and improving packaging and labelling to boost value. Farmers in both regions emphasized the need for better marketing skills, knowledge and organization for direct sales, organic certification (procedure) or development product branding.

Table 5. Summary of the main enablers and barriers of behavior chains along two agroecological pathways, i.e., feed self-sufficiency and local product marketing

Stakeholders' Categories	Researcher & development and public partners at the national level		Farmers	
Agroecological paths	Group 1: Strength the self-sufficiency of the feed value chain	Group 2: Improve Marketing of local products	Group 1: Strength the self-sufficiency of the feed value chain	Group 2: Improve Marketing of local products
Barriers	Lack of information and insufficient extension services Market value Insufficient feed availability on the market	Lack of information No specific market value for local products Lack of awareness of hand-made products Weak networking	Technological access (seeds multiplication, forage mixture, intercropping, mechanization) Lack of infrastructure (water & roads, storage)	Technological access (use of organic fertilizers) Equipment for transformation and conservation (dryer for figs, packaging) Lack of infrastructure (water, roads
Strategies to mobilize actors and organizations	Strength the human and financial resources of the public services (extension service and equipment) Reinforce the capacity of local cooperatives (GDA, SMSA) in terms of training, governance and access to resources	Create innovation platforms and partnerships with a specific focus on involving women farmers.	Training and days of awareness on good agronomic practices; Demo plots & experiments	Bio certification (label) Selling points Communication and marketing strategy
	Develop business models that include environmental opportunities, as well as fostering flexible partnerships with and between researchers and developers to synergize capacities towards the desired change.			

Across both pathways, enabling factors like financial and material support, pilot projects, training, and more robust networks (e.g., cooperatives and partnerships) appear as crucial. These factors allow farmers to move from subsistence and traditional to entrepreneurial behaviours, aligning with the principles of connection of agroecological transitions. Additionally, integrating environmental opportunities and fostering flexible alliances between researchers, developers, and local actors were identified as key strategies for successful agroecological transitions. So the progression to Type 4 ('Co-creators of Knowledge') highlights the importance of collaborative learning and participatory approaches, which are also essential for agroecological transitions.

6.3. Key findings on behaviour change analysis based on the guidance proposed in Output 5.2

(i) What key events advanced the agroecological transition? Which actors were most engaged, and what did they do?

Key events that advanced the agroecological transition included the shift from "technology transfer" in the 1990s, where large farmers and cooperatives adopted model innovations, to an "entrepreneurial" approach in the 2010s that emphasized market connections and economic equity. In the late 2010s, multi-stakeholder platforms emerged, fostering knowledge-sharing solutions and setting the stage for farmers as "co-creators of knowledge."

The most engaged actors included influential farmers, SMSAs, and cooperatives (GDA), who facilitated market integration, networking, and technological adoption. Recent initiatives have promoted ecological and social criteria, involving SMEs, NGOs, government actors and individual farmers in competitive innovation and co-financing.

More specifically, the timeline validation sessions identified various internal and external drivers of change tailored to each farmer type (or profile):

Infrastructure and Market Access - Roads, digital connectivity, and SMSAs facilitated farmers' transition to Types 2 and 3, improving access to markets and financial resources.

Networks and Relationships - Collaborations with neighbours, SMSAs, and banks supporting innovation and knowledge-sharing are essential to promote behavioural changes toward Types 3 and 4.

Financial Support - Access to credit through microfinance (e.g., Enda) was crucial for Types 2 and 3 to scale and invest.

Training and Awareness-Raising - Workshops and field schools encouraged experimentation and information dissemination, essential for Type 4's collaborative knowledge creation.

(ii) What key events impeded the agroecological transition? Which actors were most engaged and what did they do?

From the late 1990s to the early 2000s, the focus was on a top-down "technology transfer" approach led by research and extension agents working with large, well-established farmers. This limited inclusivity, as smaller farmers who faced barriers such as limited resources and low productivity.

In the early 2010s, cooperative structures like *Sociétés Mutuelles de Services Agricoles* (SMSAs) or *Groupements de développement agricole* (GDA) attempted to integrate smaller farmers. Yet, financial constraints remained, with only a fraction accessing needed machinery or market expansion credit.

From the late 2010s onward, attempts to foster knowledge-sharing platforms encountered further challenges due to inadequate infrastructure and limited funding support. Additionally, smaller farmers in remote areas struggled due to lacking technical knowledge, financial resources, and connectivity with cooperatives.

However, from the non-farmer stakeholders, most farmers remain out of the behaviour-changing process. The main reasons advanced by farmers are the lack of physical and financial capacities or the distance to the farm organizations. In the current national context of economic restriction, networking through GDA and SMSA appears to be a vital option to attract initiative and benefit of support (knowledge or even financial support).

(iii) Which actors had the most agency across the timeline of events? In what ways was their agency evidenced? What was their involvement in decision-making? Did they participate in collective agency? (For example, farm cooperatives voicing their needs to policy makers, coalitions across actor groups responding to an event, etc.) Did they change any behaviours?

Large farmers and cooperative organizations demonstrated significant agency across different phases of Tunisia's agroecological transition timeline. In the late 1990s and early 2000s, large farmers, called "leaders," were primary agents in technology transfer, adopting innovations on model farms to inspire neighbouring farmers. As the focus shifted in the early 2010s, small and medium farms were able to diversify under an entrepreneurial model with *Sociétés Mutuelles de Services Agricoles* (SMSAs) fostering market-oriented behaviours. By the late 2010s, knowledge hubs emerged, with farmers and stakeholders engaging in co-creation and decision-making, emphasizing shared innovation and sustainability. These farmers could be leaders or entrepreneurs, as defined in the type 1 to 3 , or new small-scale farms that join the FOs. Throughout these shifts, SMSAs and other cooperatives actively advocated for farmer needs, enhancing collective agency by creating networks for financial support, favoring market access, and increased resilience through diversification and collective actions. This collective involvement promoted behaviour changes toward market integration, sustainable practices, and direct engagement with policymakers. Farmer's later involvement in knowledge co-creation marked a substantial gain in agency as international and national organizations granted them more power to define the agenda for innovation. It is what it is observed in the projects like CLCA, PACTE, or the more recent Agroecology Initiative.

(iv) What actors had the least agency during the timeline? How was this evidenced? Did they attempt to join or build collective agency? Did they change any behaviours?

Small-scale farmers, particularly in remote areas, had the least agency throughout the timeline. From the late 1990s to the early 2000s, the influential farmers received the most support due to their ability to handle risks and access resources, positioning them as "model" farmers under technology-transfer initiatives. Small farmers, however, struggled with low productivity, poor infrastructure, and limited access to resources, leaving them dependent on intermediaries and cut off from markets.

In the 2000s, these small farmers were invited to join cooperative structures like the *Groupements de Développement Agricoles* (GDAs) and later the *Sociétés Mutuelles de Services Agricoles* (SMSAs) in view to enhance their collective bargaining power and market integration. However, despite these efforts, many continued to face several issues, such as limited access to financing and restrictive subsidy policies, preventing full participation in the agroecological innovation process. While some adopted minor changes in crop diversity and engagement with knowledge-sharing, most remained stagnant, constrained by geographical and financial limitations and then their agency.

(v) What emerged as key enablers or challenges (i.e., key drivers) of agency and/or behaviour for each actor group? Did the drivers differ across groups, especially when comparing the actors with the most and least agency?

Key enablers and challenges driving agency and behavioural changes varied significantly among farmer groups, particularly between those with more and less agency. For influential "leader" farmers (Type 1), access to physical assets, risk capacity, and partnerships in early technology-transfer initiatives were the main drivers, allowing them to adopt new practices with minimal risks. In contrast, small-scale farmers faced limited access to infrastructure and credit, often depending on intermediaries, which restricted market access and their transition to other farmer types.

For Type 2 "entrepreneurial" farmers, market connectivity and support from *Sociétés Mutuelles de Services Agricoles* (SMSAs) enabled better productivity and diversified income sources. Access to financing and formal contracts bolstered their competitive edge and market integration. However, challenges like regional isolation continued to limit the large majority of the small farmers.

For Type 3, the availability of microfinance options and collaboration with other stakeholders enabled further growth and market expansion, but only for those able to leverage solid networks and higher-risk investments.

Type 4 farmers, as "co-creators of knowledge," found support through collaborative projects, , digital tools, and knowledge exchange platforms, facilitating their adoption of agroecological practices. However, the least empowered farmers, especially in remote areas, struggled due to logistical constraints, poor infrastructure, and limited access to resources and information, reinforcing disparities in the agency across groups. The non-farmer stakeholders also evoked harsh environmental conditions (due to drought, low precipitation, and soil degradation) and a lack of vision and finance for public programs to support the changes at a larger scale. They also mentioned the problems of dialogue, organization, and collaboration between actors that call for a more foresight analysis involving all stakeholders to achieve changes.

(vi) For the actor groups represented in the timeline, describe their role in decision-making (representation, inclusion, participation) and their relative agency at the initiative baseline (current status or time of ALL establishment).

The participatory timeline captures various actor groups' evolving roles in decision-making and agency. During the 1990s to 2000s, large "leader" farmers with physical assets were the prominent model farmers for innovation and changes due to their close connections with agricultural extension and research programs, enabling them to adopt innovations and influence neighbouring farms. However, most smallholders remained marginalized, with limited agency or resource access.

In the early 2010s, "entrepreneurial" farmers emerged, gaining representation and decision-making power on product markets through market-oriented SMSAs (Mutual Agricultural Service Companies) facilitating connections to market actors. This period saw increased inclusivity as SMSAs integrated small and medium farmers into business networks, fostering a collective agency around economic valorization.

From the late 2010s onward, multi-stakeholder platforms further democratized decision-making, promoting farmer participation in co-designing knowledge with researchers and policymakers. This shift allowed "co-creators of knowledge" to emerge, actively shaping agricultural practices through innovation. The agency has expanded. Still, smallholder representation remains limited, with access to financial mechanisms and technical resources primarily concentrated among better-connected, larger farmers.

(vii) Are there any findings that contrast or provide new insights into the initiatives studied in activity 1?

More than providing new insights regarding the outputs of the literature review in Output 5.1, the participatory timeline, which was organized in three events with various stakeholders, evidences some significant drivers of behavioural changes.

Notably, this participatory timeline underscores the shift toward participatory and collaborative models, where smallholders and mid-size farmers play active roles in knowledge-sharing platforms, highlighting the importance of inclusivity. These later initiatives stress how social equity and sustainable practices can create a more democratic decision-making process and a more outstanding farmer agency.

Additionally, newer initiatives consider environmental and social impacts, suggesting an ongoing evolution toward models that balance economic and ecological considerations, reflecting an adaptive response to past program limitations.

(viii) What implications do the findings have for the ALL objectives and/or Theory of Change? Were any assumptions confirmed or contradicted? How should the assumptions, objectives, and Theory of Change be adjusted in light of these findings?

The findings indicate the need for refined approaches within the Agroecology Initiative's (ALL) objectives and Theory of Change. Key implications include:

Inclusion and Participatory Decision-making: The timeline validation revealed that behaviour change was more achievable in collaborative settings, highlighting the importance of multi-stakeholder platforms that include farmers as active participants and co-creators. Adjustments should focus on more inclusive engagement and representation, especially in regard to young and women.

Differentiated Support and Tailored Interventions: Findings show varied farmer types, each with capacities and limitations. ALL should consider differentiated support based on farmer typologies, from technology transfer to knowledge co-creation, both wholly linked. Suppose the emphasis on co-creation and participatory approaches is central to fostering agency and behaviour change, particularly for small-scale farms. In that case, there is a need to incorporate differentiated pathways tailored to farmer typologies, recognizing the varied capacities, resources, and barriers faced by small-scale, entrepreneurial, and co-creator farmers.

Infrastructure and Financial Access as Critical Drivers: Infrastructure improvements and access to credit were pivotal in enabling transitions toward entrepreneurial behaviour, suggesting ALL needed to bolster financial pathways and physical infrastructure support, especially for small-scale farmers that tend to be marginalized from access, as part of its strategic objectives.

Emphasis on Knowledge-sharing and Capacity Building: Both local farmers and external actors identified a need for ongoing training, technical assistance, and digital tools, notably to support the transition toward sustainable practices. ALL objectives should expand to institutionalize knowledge-sharing networks by reinforcing partnerships with research institutions, NGOs and private-public actors. Farmers also stressed the importance of improving relationships between neighbours to promote the exchange of information and share of experiences,

Environmental Sustainability and Resilience: Given the feedback from farmers regarding environmental concerns, especially about soil degradation, objectives should more explicitly integrate sustainability practices, potentially including organic certifications and localized ecological and environmental indicators in relation to soil health.

Enhanced Role of Local Governance: Findings also underscore the critical role of local agricultural organizations (like SMSAs or GDAs) in fostering collective agency, suggesting ALL could expand its Theory of Change to reinforce these structures as transmission belts for farmer empowerment and resilience.

These adjustments can enhance ALL's support mechanisms, aligning more closely with community needs and the dynamic pathways toward agroecological transformation.

(ix) Did any institutions or interactions among actors emerge as particularly influential? For whom were they influential and in what way? For example, did they influence certain actors' agency or behaviours? Were there any reports of conflict or power asymmetries across actor groups? What recommendations do you provide to ALL operations, inclusion, interactions, etc. based on these findings?

Institutions like Sociétés Mutuelles de Services Agricoles (SMSAs) and various national workshops were instrumental, especially in co-creating knowledge and fostering market integration. Nowadays, SMSAs and other collaborative platforms continue to be influential, although barriers like poor infrastructure, limited financial resources, and inadequate extension services still restrain smallholder agency and engagement.

Key recommendations for improving agency and behaviour change across groups include:

- Strengthen local cooperatives and networks to ensure widespread representation and market connectivity. These cooperatives could also become as hubs for training or financial intermediation?
- Increase funding avenues and subsidies/incentives for smallholders, particularly for sustainable and agroecological practices.
- Expand participatory workshops at local, regional and national levels to enhance inclusive decision-making, directly involving small and medium farmers.
- Co-develop (co-design and co-implement) targeted training in agroecological techniques and digital literacy, enhancing capacity building. Up to the new AEi, training activities are designed based on the demands of the multi-stakeholders involved in the living landscape. However, their implementation was mainly designed by research and development agencies. And few of them have been opened to all stakeholders.
- Improve infrastructure, especially in remote areas, for consistent market access and better resource utilization for small-scale and remote farmers.

Future initiatives can foster a more equitable agroecological transition by addressing these areas, with a stronger focus on collective agency and sustainable practices across Tunisia's agricultural landscape.

(x) Based on the ALL objectives and the new insights on actor group agency and behaviours, whose agency, in regards to what, is of most interest to monitor for change during the initiative?

To monitor behavioural changes in the initiative, the agency of "type 4" actors—farmers as co-creators of knowledge—is most interesting. Their role encompasses adopting innovative practices, engaging in knowledge-sharing platforms, and testing eco-friendly agricultural methods. This group demonstrates a readiness to collaborate actively, pushing agroecological practices and market-oriented product development. Monitoring this group in terms of adoption of agroecological practices and adherence to agroecological principles will reveal how innovations and knowledge-sharing facilitate broader changes across the agricultural community, detecting in particular shifts toward sustainable practices, organic certification, and market access. They are crucial for understanding the impact of participatory models and community-led innovation in transitioning to agroecology.

7. Annexe

A1. National Workshop Program for the participatory timeline

Timing	Contents
9:00-10:30	Etape 1. Discuss, revise and validate the draft timeline elaborated by the AE-Iteam
10:30-10;45	Break
10:45-12:00	Etape2 (Plénière) Rapid appraisal of the relative distribution of different 'farmer types' identified as 1. 'beneficiaries'; 2. 'connected to market', 3. 'co-creators' (give a % or range of importance of farmers in each class) (Step 2a.) How have specific events and interventions (factors) induced behaviour changes? (Step 2b) Weight/rank the main factors that have induced behavior changes? (Step 2c)
12:00-12:15	Break
12:15-13:10	Etape 3. Working groups (2 groups) Dissect the most important behavior change factors identified: - What are the mechanisms involved? (Step 3a. Gouvernance) - What are the key actors involved in the mechanisms? (Step 3b. Agency) - What are the key behavior changes generated? (Step 3c. Behaviour) - What is the capacity of actors to promote this change? (Step 3 d. Validation)
13:10-13:40	Restitution Closure
13:40-14:30	Lunch
	Swimming pool/beach view

A2. Participants to the national workshop, July 2023

Nos	Organization	First name	Family name	Position	Contact email
1	INAT	Nadhira	Benaissa	Professor (soil science)	benaissanadhira@gmail.com
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4	OEP	Emna	Ouerghi	Responsable régional	
5	GIZ	Feriel	boujedi	Expert junior technique	feriel.boujedi@giz.de
6	CIRAD	Guillaume	Lestrelin	Chercheur	guillaume.lestrelin@cirad.fr
7	n.a.	Aadnen	Aabd rabou	Agriculteur leader	
8	AVFA	Sondos	Derbel	Sous-directeur des formations AVFA	sondosderbel@gmail.com
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18	IRESA/INRAT	Hatem	Cheikh Mhamed		
20	Expert	Ali	Abaab	National consultant, Professor	
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25	ESA	Mohammed	Abdelhalim	ESA Mograne	

A3. Brief presentation of the initiatives' desk review

Table A3. A brief review of the past and present initiatives extracted from Lestrelin et al. 2022

	1	2	3	4	5	6	7
Name of Initiative	Conservation Agriculture Development Support Project (PADAC-II)	Promotion of Sustainable Agriculture and Rural Development in Tunisia, Phase-II (PAD-I)	Innovations for Agriculture and Agrifood (IAAA)	Use of conservation agriculture in crop-livestock systems in the drylands for enhanced water use efficiency, soil fertility and productivity (CLCA-II)	Climate change adaptation program for vulnerable rural territories of Tunisia (PACTE)	Soil Protection and Rehabilitation of Degraded Soil for Food Security (ProSol)	Support for Sustainable Development in the Agriculture and Artisanal Fisheries sector in Tunisia (ADAPT)
Type of Initiative	R&D project	Development program	Development project	R&D project	R&D program	Development project	Development program
Goal and objectives	Promoting the integration of soil health perspectives in farmers' decision making processes through on-farm experimentations of crop rotations and biomass management practices	Supporting the sustainable development of local value chains, integrating aspects of sustainable development into training, extension and accompanying measures for small scale farmers and contributing to the elaboration of a national strategy for sustainable development	Promoting a business-oriented mindset among small scale farmers and supporting the development of more sustainable, profitable (dairy and potato) value chains	Designing and piloting integrated crop-livestock management solutions based on conservation agriculture principles and strengthen interactions between producers, experts and researchers to improve agricultural production and limit its environmental impacts	Integrating AE co-design and co-evaluation activities into a broader territorial planning process to enhance dialogue between farmers, agricultural services and researchers and promote innovative practices based on crop rotation, inter-cropping, limited tillage and improved biomass management	Protecting and rehabilitating soils and improving food security through (1) financial and technical support of field-based initiatives and (2) advocacy and capacity strengthening at the central and regional levels	Supporting food system actors' shift towards more resilient production, marketing and consumption practices and services through the setting up of financial and credit mechanisms
Location	Northwest and central Tunisia	Northwest and central Tunisia	Northwest and central Tunisia	Latin America & North Africa, with activities Northwest and central Tunisia	Northwest and central Tunisia	Northwest and central Tunisia	Nationwide, with cereal component in Northwest Tunisia
Years of implementation	2007-2012	2013-2016	2015-2025	2018-2022	2018-2024	2019-2025	2020-2028
Ag system(s) targeted	Medium to large scale	Small and medium scale tree-based	Small scale potato and	Small scale crop-livestock systems	Small scale crop-livestock systems	Small and medium scale	Small and medium scale cereal farming,

	cereal farming	and livestock systems	dairy farming systems			crop-livestock systems	aquaculture and fisheries
AE principles supported	Recycling Input reduction Soil health Synergy	Recycling Input reduction Soil health Biodiversity Economic diversification Social values and diets Fairness Land & NR governance	Recycling Input reduction Soil health Animal health Biodiversity Synergy Economic diversification Social values and diets Fairness Land & NR governance	Recycling Input reduction Soil health Animal health Biodiversity Synergy Economic diversification Co-creation of knowledge Fairness Land & NR governance Participation	Recycling Input reduction Soil health Biodiversity Synergy Economic diversification Co-creation of knowledge Fairness Land & NR governance Participation	Recycling Input reduction Soil health Animal health Biodiversity Synergy Economic diversification Co-creation of knowledge Social values and diets Fairness Connectivity Land & NR governance Participation	Recycling Input reduction Soil health Biodiversity Economic diversification Social values and diets Fairness Land & NR governance
Most important innovation(s)	Model farms Farmer field schools and networking Facilitated access to adapted equipment	Dialogue among value chain actors Facilitated access to adapted equipment	Farmer-to-business contracts Value chain forums Various technical innovations	"Knowledge hubs" involving farmers, extension agents, private sector and researchers Co-design and introduction of forage seeds mixes and small machinery	Farmer field schools and networking Co-conception workshops with farmers and agricultural services (facilitated by researchers)	Multi-stakeholder sensitization and dialogue Trainings on communication about soil degradation and conservation	Calls for innovative proposals by farmers and value chain actors Financing mechanisms involving collectors
Target beneficiaries	Large/medium scale farmers	Small/medium scale farmers Farmer associations Small and medium enterprises	Small scale farmers Small and medium enterprises	Small/medium scale farmers	Small scale farmers	Agricultural service officers Small/medium scale farmers Farmer associations Small and medium enterprises	Small/medium scale farmers Farmer associations Small and medium enterprises
Number of target beneficiaries	40-60	800+	15,400	3,000	20+	n.a.	10,000
Marginalized groups targeted	None	Women and youth	Women and youth	Women and youth	Women and youth	n.a.	None

A4. Questionnaire for the non-farmer stakeholder consultation

WP5. Changement de comportement

Aujourd'hui, la recherche et l'innovation pour des systèmes alimentaires durables et résilients au changement climatique est cruciale mais complexe. L'Initiative « agroécologie » a pour objectif de démontrer l'applicabilité –et promouvoir l'investissement et l'adoption –de l'agroécologie par les acteurs du système alimentaire, y compris les petits agriculteurs. Pour cela, l'Initiative cherche à travailler avec les agriculteurs et acteurs du système alimentaire pour veiller à ce que l'agriculture exploite les biens et services de la nature tout en minimisant les impacts négatifs sur l'environnement et favorisant l'amélioration de la co-création de connaissances et des relations inclusives entre les acteurs du système alimentaire. Pour faciliter le co-apprentissage et le co-développement, l'Initiative d'agroécologie a mis en place un réseau de Living Labs agroécologiques (ALLs) dans huit pays : Burkina Faso, Inde, Kenya, Laos, le Pérou, le Sénégal, la Tunisie et le Zimbabwe.

Afin de mieux caractériser le contexte de mise en œuvre de ces living labs, un inventaire des projets et programmes passés et en cours a été réalisé pour identifier les différentes approches d'accompagnement à la transition agroécologique mises en œuvre dans les huit pays et, notamment, caractériser les attendus de ces initiatives en termes de changement de comportement des acteurs des filières agricoles. Dans le cas tunisien, ces travaux ont mis en exergue trois grands types de théories du changement dans lesquelles les producteurs sont considérés alternativement comme des « bénéficiaires d'innovations », des « entrepreneurs agricoles », ou des « co-créateurs de savoirs et d'innovations ».

L'objectif de cette consultation est double :

1. Dans un premier temps, évaluer la pertinence de cette typologie de théories du changement et éventuellement de mieux spécifier les différentes théories identifiées ;
2. Dans un second temps, spécifier les éventuels traits distinctifs d'agriculteurs « co-créateurs de savoirs et d'innovations » et identifier les freins et leviers à l'adoption de ce comportement par les producteurs tunisiens.

Identification

A quel domaine appartient votre institut ou organisme de rattachement : /___/

1. Producteur/communauté/ association de producteur ; 2. Recherche publique ; 3. Organisme de développement ; 4. Association, ONG ; 5. Secteur privé ; 6. Autres. Préciser /_____/

Quel est votre domaine d'intervention ?code : /__/ autres /_____/ (préciser))

1. Chercheur ; 2. Ingénieur ; 3. Vétérinaire ; 4. Vulgarisateur ; 5. Consultant ; 6. transformateur ; 7. Commerçants ; 8. Formateur ; 9. Autres…

Partie 1. Validation de la typologie de théories du changement et des types d'agriculteurs associés

1.1. Les projets de recherche et développement de la fin des années 90 et début 2000 semblent très influencées par une perspective de « transfert de technologie » avec des acteurs de la recherche qui développent des innovations comme les nouvelles variétés de semence, les mélanges fourragers, les machines agricoles, etc et qui s'appuient sur des agents de vulgarisation pour assurer la diffusion de ces innovations, la formation technique et l'appui à des « leaders » paysans, la mise en place de sites d'expérimentation et de démonstration sur des fermes modèles, et la fourniture d'équipements adaptés aux innovations ciblées. On parle dès lors *d'agriculteurs bénéficiaires des innovations*.

Selon votre expérience, reconnaissez-vous ce type de projets ? OUI /___/ NON /___/

Selon vous, « ***les agriculteurs bénéficiaires des innovations*** » représentent approximativement quelle proportion d'agriculteurs dans votre communauté ?

1. Marginal (moins de 5%)

2. Une minorité (moins de d'un quart 25%), /_____/,

3. La moitié (50%) ou

4. Une majorité (plus de 75%) /____/

D'après vos connaissances et votre point de vue, quelles sont les principales caractéristiques de ce type d'agriculteur ?

Caractéristique 1 : ……. ;

Caractéristique 2 : …… ;

Caractéristique 3 : ……

1.2. Le début des années 2010 voit émerger des projets inspirés par une perspective économique. Parmi les activités mises en œuvre par ces projets, citons l'organisation d'écoles de commerce agricole, la mise en place de réseaux sur les chaînes de valeur (avec tous les acteurs comme les fournisseurs d'intrants, les agriculteurs, les transformateurs et les commerçants) et la promotion de contrats entre agriculteurs et entreprises et des partenariats public-privé. Diversifier les sources de revenus et la redistribution des bénéfices sont vus comme des principes importants au cours de cette période. Ces projets ont visé de rendre les agriculteurs parties prenantes du fonctionnement des chaines de valeur et faire des bénéfices.

Selon votre expérience, reconnaissez-vous ce type de projets ? OUI /___/ NON /___/

Selon vous, « ***les entrepreneurs agricoles*** » représentent approximativement quelle proportion d'agriculteurs dans votre communauté ?

1. Marginal (moins de 5%)

2. Une minorité (moins de d'un quart 25%), /_____/,

3. La moitié (50%) ou

4. Une majorité (plus de 75%) /____/

D'après vos connaissances et votre point de vue, quelles sont les principales caractéristiques de ce type d'agriculteur ?

Caractéristique 1 : ..... ;

Caractéristique 2 : ..... ;

Caractéristique 3 : .....

1.3. À partir de la fin des années 2010, de nouvelles façons de travailler avec les agriculteurs et de nouvelles activités ont commencé à émerger, pour renforcer la connaissance de tous les acteurs. Des groupes de connaissances ou des plateformes multi-acteurs ont été mis en place (impliquant des agriculteurs, des agents de vulgarisation, des acteurs des filières, des chercheurs, des décideurs politiques...) pour entreprendre des activités de co-conception et de co-expérimentation (développer des expérimentations ensemble – agriculteurs avec les développeurs et chercheurs_, et certaines projets ont commencé à s'engager dans des solutions numériques , les TIC (SMS, application, etc) pour le conseil et la gestion des exploitations agricoles. La participation et la co-création de connaissances sont apparues comme des principes clés dans les projets de développement. Ces projets donnent plus d'importance aux agriculteurs pour développer les innovations ensemble avec les chercheurs et les développeurs.

Selon votre expérience, reconnaissez-vous ce type de projets ? OUI /___/ NON /___/

Selon vous, « ***les agriculteurs co-créateurs de savoirs et d'innovations*** » représentent approximativement quelle proportion d'agriculteurs dans votre communauté ?

1. Marginal (moins de 5%)

2. Une minorité (moins de d'un quart 25%), /_____/,

3. La moitié (50%) ou

4. Une majorité (plus de 75%) /____/

D'après vos connaissances et votre point de vue, quelles sont les principales caractéristiques de ce type d'agriculteur ?

Caractéristique 1 : ..... ;

Caractéristique 2 : ..... ;

Caractéristique 3 : .....

Caractéristique n .....

1.4. Les nouveaux projets suggèrent un autre changement vers une perspective économique sociale et écologique. Ces projets ont des critères de sélection sociaux et écologiques (ex : inclusion des femmes et des jeunes, contribution au bien-être animal, réduction des déchets, etc.) et des mécanismes de cofinancement mêlant subventions de projets et solutions de crédit bancaire pour les agriculteurs individuels et les PME (petits et moyens entreprises). Ces projets considèrent les agriculteurs comme entrepreneurs agricoles qui ont besoin d'appui du financement public et privé (subvention, micro-crédits, dons) de l'innovation

Selon votre expérience, reconnaissez-vous ce type de projets ? OUI /___/ NON /___/

Selon vous, « ***les entrepreneurs agricoles en concurrence pour accéder au financement public et privé de l'innovation*** » représentent approximativement quelle proportion d'agriculteurs dans votre communauté ?

1. Marginal (moins de 5%)

2. Une minorité (moins de d'un quart 25%), /_____/,

3. La moitié (50%) ou

4. Une majorité (plus de 75%) /____/

D'après vos connaissances et votre point de vue, quelles sont les principales caractéristiques de ce type d'agriculteur ?

Caractéristique 1 : ..... ;

Caractéristique 2 : ..... ;

Caractéristique 3 : .....

Caractéristique n .....

Partie 2. Facteurs moteurs et limitants dans la co-création de savoirs et d'innovations

L'Initiative Agroécologie souhaite mettre l'accent sur l'appui à l'émergence d'agriculteurs co-créateurs de savoirs et d'innovations, les agriculteurs qui collaborent avec la recherche et le développement pour développer les innovations.

I) Selon votre expérience, quels sont les principaux atouts ou caractéristiques des agriculteurs engagés dans ce processus qui les distinguent des autres ? Citer 3 principales caractéristiques

Caractéristiques du producteur	Caractéristiques du contexte/environnement
a. /_____/	a. /_____/
b. /_____/	b. /_____/
c. /_____/	c. /_____/

II) Quels sont les principaux facteurs ou points qui limitent la co-création de savoirs et d'innovations par les agriculteurs ? (Par ordre d'importance)

Facteur lié au producteur	Facteur lié au contexte/environnement
1. /_____/	1. /_____/
2. /_____/	2. /_____/
3. /_____/	3. /_____/

Voyez-vous d'autres facteurs limitants majeurs : /_____/

III) Quels sont les avantages les plus souvent cités par les agriculteurs pour justifier leur participation à la co-création de savoirs et d'innovations (par d'ordre d'importance)?

Facteur 1. /_____/

Facteur 2 : /_____/

Facteur 3 : /_____/

A5. Preliminary list of agency indicators

Table A5. Proposition of agency indicator(s) (related to table 2.6 in the WP5 guideline)

Indicator name	Description	Actor group(s) of focus	Action/ activity/ agency component of focus	Metric	Disaggre-gation	Method (data collection & calculation) (If a WP2 HOLPA indicator name it here)
FO involvement	Adherent or beneficiaries in FO	SMSA GDA	Agency component: participation	Number of adherents and beneficiaries in each FO	Yes (men/women)	HOLPA 10 Participation
Women leadership	Women in position of leadership in the FO	SMSA GDA	Agency: women leadership	Score of women involvement in the leadership position in FOs	no	HOLPA 10. paricipation
Farmer participation in land and natural resource management		ALL	Agency component: participation	Degree of participation to activities and meeting related to resource management	Yes (men/women)	HOLPA 9. governance
Farm empowerment at community level	Power and freedom to act at the local level	ALL	Agency component: empowerment	Scoring of agreement	Yes (men/women)	HOLPA 5. Personal factors
Farmers connected to market actors	Interaction of farmers with food traders	ALL	Market agency	Interaction with food traders	Yes (men/women)	HOLPA: Knowledge co creation module
Market oriented farmer	Capacity of valorization of agricultural products on the market	ALL	Market valorization	% sales more than 50% for crops and livestock	Yes (men/women)	HOLPA 19
Knowledge co creation	Interaction with researchers, NGO and extension workers	ALL	Knowledge hub in the ALL	Times of interactions with researchers, NGO and extension services	Yes (men/women)	HOLPA: Knowledge co creation module
From FO to farm community	Interaction of farmers with other (pairs)	ALL	Local social network	Times of interactions with other farmers	Yes (men/women)	HOLPA: Knowledge co creation module
Farm connectivity and resilience	Degree of connectivity to other entities in case of shocks	ALL	Agency: social and institutional network	Number of type of connections that can be used in case of shocks	Yes (men/women)	HOLPA. resilience

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