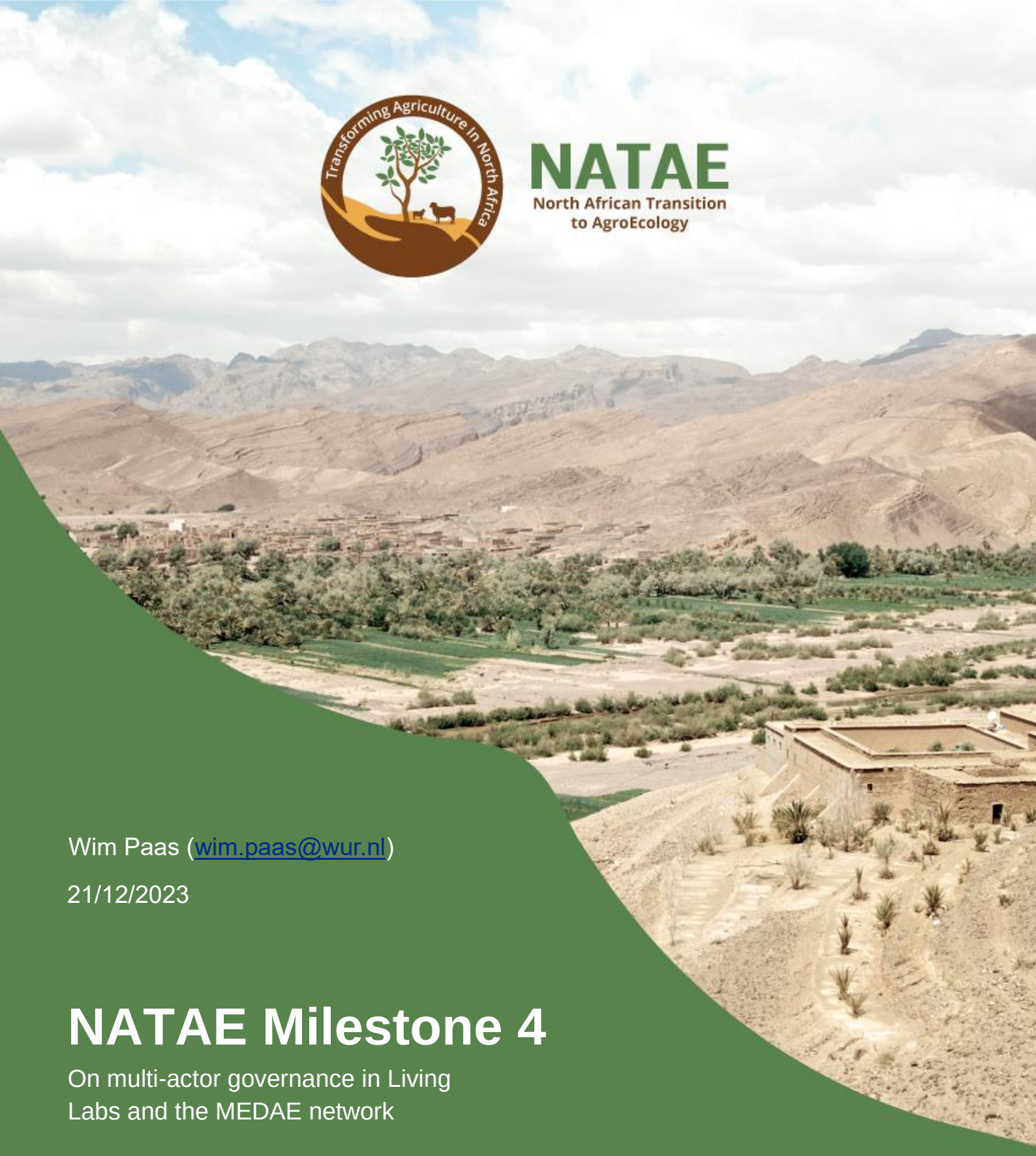

NATAE
North African Transition to AgroEcology

Wim Paas (wim.paas@wur.nl)

21/12/2023

NATAE Milestone 4

On multi-actor governance in Living Labs and the MEDAE network

www.natae-agroecology.eu

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Main Author (Name and Short Org. Name)	Wim Paas
Other Authors (Name and Short Org. Name)	Marion Comptour (CARI), Ali Daoudi (ENSA), Mélanie Requier-Desjardins, Elen Lemaitre-Curri, Souad Benmoussa (CARI), Ghizlane Echchgedda (ENAM), Georgios Kleftodimos (IAMM), Fouad Rachidi (ENAM), Cheikh Sidya-Fall (GRDR), Inès Zouari (INAT), Hatem Belhouchette (IAMM), Gerrie Van de Ven (WUR), Pytrik Reidsma (WUR)
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Contents

Glossary

Abbreviation	Full form
AEP	Agroecological practice
LL	Living Lab
MEDAE	MEDiterranean network for AgroEcology
MoC	Memorandum of Cooperation
PGS	Participatory Guarantee System
TD	Territorial Diagnosis
WP	Work Package

Concept Category	Concept	Explanation
Living Lab methodology	NATAE Living Lab	Self-organized places of structural exchange between food system actors on the identification and testing of combinations of agroecological practices while working towards a joint vision for and implementation of an agroecological transition. A preliminary social and geographical delineation is provided in this document.
	Food system actors	Actors active in agricultural production (e.g., farmers) and/or the food value chain (e.g., consumers) and/or the formal institutions (e.g., local governments) that play a decisive role in agricultural and value chain activities.
	Stakeholder group	A group of LL actors with similar stakes and perspectives regarding the food system. Relevant stakeholder groups will be identified in each LL independently.

	LL-representative board	Group of about 10 persons that represent the different relevant stakeholder groups in regular meetings regarding the governance of the LL.
	LL-leader	NATAE partner organization that has been assigned with organizing and monitoring the LL process and reporting on its activities.
Stakeholder activities	Data collection survey	Data collection through implementing a (semi-) structured questionnaire with individuals. A questionnaire can be answered in an interview or in written form.
	Expert interviews	(Semi-)structured conversations with experts to gather data and insights that are mainly qualitative in nature. What is considered an expert depends on the specific topic that is studied. Experts can belong to a specific stakeholder group or be actors outside the LL.
	Focus group discussion	Discussions with 5-10 representatives of a specific stakeholder group.
	Stakeholder workshop	Workshop for which members of all relevant stakeholder groups are invited to participate. Sometimes only specific stakeholders may be targeted (e.g., in farmer workshops)
	LL representative board workshop	Workshop for which only LL representative board members are invited
Systems thinking	Systems thinking theory	The main idea in systems thinking theory is that a system as a whole (with its interrelations between sub-parts) has a different behaviour than can be assumed based on the study of its isolated sub-parts alone. Systems thinking thus requires an interdisciplinary approach. Important in systems thinking is the identification of a system boundary, the main components (e.g. social, economic, technical) at different levels (e.g. field and farms for a farming system), the main relations between components, the inputs/inflows entering the system, and outputs/ouflows leaving the system.
	Farm level	Farm level refers to the land and resources at the disposal of an individual farmer or farm household. Any AEP interfering with the land and resources of a single farm that only require the single decision making of an individual farmer or farm household could be considered as being implemented at farm level.
	LL-level	LL-level refers to the land and resources at the direct or indirect disposal of multiple LL-actors, i.e. any level above the farm level within the LL-boundaries. Any AEP interfering with the land or resources within the LL-boundaries, requiring the decision-making of multiple LL-actors can be considered as being implemented at LL-level.

Executive Summary

This Milestone report describes the setting-up of NATAE Living Labs (LLs) and MEDAE (MEDiterranean network for AgroEcology). LL are set up in five out of six LL areas and participation in LL-activities is generally good. The sixth LL is catching up well after a delay due to administrative issues beyond the influence of NATAE consortium members. Activities implemented so far are a territorial diagnosis and a launch event for the LL.

Territorial diagnosis:

Activities in the living labs started with territorial diagnoses (Daoudi A., 2023; T4.2). The territorial diagnosis in each LL enabled the characterization of the socio-economic and natural contexts, the identification of existing agroecological practices and production systems and to some extent an identification of main value chains related to agriculture in the LLs.

Territorial diagnoses on agroecological transition have allowed to enlighten common realities of agroecology across LLs, even though empirical works in LLs differed in the tools and methods applied due to the various disciplines mobilized: statistics, qualitative interviews, agronomics, agroeconomics, socioeconomics etc.). The first synthesis of results (Appendix A) across LL reveals that the socio-economic and natural contexts in North Africa are severely constraining agricultural production in general and are determinant also to some of the observed agroecological options or agroecological practices combinations assumed to be context specific.

The predominance of small production systems is found throughout the whole sites, as well as the combination of self-subsistence crops and commercial crops and catling in the farms' diversification strategies. Poverty is an obstacle to any change towards agroecological production without public support.

The report sheds light on different categorizations of listed agroecological practices that were found in the LLs, and on their functional uses, such as reducing risks and production costs, in the LLs. Although no organisational nor social agroecological practices were clearly identified, the existing professional organisations in the LLs have generally joined the LL Launches.

LL-Launches:

The setting up of the Living Labs consisted of a representative board meeting and a Living Lab launch. Selection of representative board members in each LL was based on outcomes of the territorial diagnosis. The LL-launches, that were organized for all LL-actors, included presentations, formal discussions and a field visit. The LL-launches revealed certain issues regarding the governance of LL and the selection of agroecological practices (AEP). To ensure an integrated assessment of AEPs and an agroecological transition in all LL, consortium members still need to reach a common understanding on the definition and delineation of the systems at stake in the LL. Multiple options for AEP at farm level[1] have been proposed

[1] Farm level refers to the land and resources at the disposal of an individual farmer or farm household. Any AEP interfering with the land and resources of a single farm that only require the single decision making of an individual farmer or farm household could be considered as being implemented at farm level.

by stakeholders that still need to be connected using a system's perspective. Common themes across all LL are AEP related to water use efficiency, soil fertility and crop diversity. AEP related to pest (and weed) control were mentioned in four LL. The challenge in future participatory activities is to prioritize those AEP at farm level and tailor them to specific farm types. In four LL, AEP at value chain level were identified regarding the valorisation of agroecological products and short circuit markets. These AEP were only generally defined and only concerned the two specific value chains studied in the context of NATAE. A challenge, yet to be addressed by LL-actors, is to identify LL-level[2] AEP that specifically support the implementation of farm-level AEPs. To collectively work on the identification of specific and complementary AEP, an in-person meeting with LL- and RL-leaders in the context of WP2 and WP4 is proposed. Participatory activities in the context of T4.4 and T4.5 will guide LL-actors in prioritizing AEPs at farm level and including AEPs at LL-level. The development of a farm typology (T2.1, T4.2) will enable tailoring these AEP to specific farm types. LL roadmaps for an agroecological transition (Milestone 5; May 2024) will be updated using results from these tasks.

MEDAE:

The dynamic of the MEDiterranean multi-actor network on AgroEcology (MEDAE) has been launched on 4th July 2023. All NATAE partners were invited to a meeting to discuss the objectives and operating mode of MEDAE, on the basis of a preliminary scenario drew up thanks to the result of a questionnaire and a benchmarking on functioning of existing international networks. Following the MEDAE launching event and the discussions, guidelines have been elaborated, presenting main objectives of the network, its membership, its governance, its activities, its economic model and the preferred methods of communication. By bringing together stakeholders from different types of institutions, disciplines, backgrounds and scales, the MEDAE network aims to bridge the gap between contexts, policies, local, national and international knowledge, and empirical and scientific know-how. It will stimulate exchanges and give a strong, unified voice to all stakeholders committed to the agroecological transition in the Mediterranean.

The first main activity has been the organization of five webinars on topics that relate to the five main types of farming systems that are represented by the LLs. These webinars have been very successful, with participation between 40 to 155 participants, and a total of 415 participants.

Regarding the network, organisation, organization members will be represented by a focal point and will be grouped into 4 boards. The MEDAE network will have a non-formal existence, at least during the first few years.MEDAE's operating mode will be reviewed in 2025, after two years of network activity. Adjustments may be made and tested in the last year of the NATAE project (2026), so that the operating mode is solid and approved when the NATAE project (and the funding dedicated to the network in this context) comes to an end.

[2] LL-level refers to the land and resources at the direct or indirect disposal of multiple LL-actors, i.e. any level above the farm level within the LL-boundaries. Any AEP interfering with the land or resources within the LL-boundaries, requiring the decision-making of multiple LL-actors can be considered as being implemented at LL-level.

Chapter 1

Introduction

Chapter 1 - Introduction

This Milestone provides an overview of the multi-actor governance structures put in place in the context of the NATAE-project. Goal of this milestone is to: (1) create an overview of actions taken and methodologies implemented so far relating to stakeholder identification and engagement, (2) synthesize results and working documents so far, (3) present preliminary roadmaps including identified agroecological practices (AEP) that would support an agroecological transition, (4) reflect on issues and next steps regarding Living Lab (LL) governance and the identification of AEP in the context of the NATAE-project.

Chapter 2 starts with providing an overview of the steps taken and methodologies implemented for setting up multi-actor Living Labs in each LL-area. These methodologies include a territorial diagnosis and the launching of the Living Labs. The territorial diagnosis concentrated around the characterization of the production systems and the identification of stakeholders in each LL. Based on the stakeholder identification from the territorial diagnosis, LL-leaders: (1) formed a representative board in which all relevant stakeholder groups were represented, and (2) organized a launching event in consultation with the representative board. Chapter 2 also provides an update on the process of setting- up a Mediterranean community of knowledge and capacity building (MEDAE network) and its activities.

Chapter 3 provides first results on characterizing the production systems and identifying relevant stakeholders and AEPs based on the territorial diagnosis. A synthesis of results from the territorial diagnosis is presented in sub-section 3.1. A synthesis of results from the activities around the Living Lab launches is presented in sub-section 3.2. Taking stock of both the territorial diagnosis and the launching events, LL-leaders created preliminary roadmaps for their Living Lab regarding its governance and promising AEP-combinations (Section 3.3; for a quick overview of potentially interesting AEP(-combinations) in each LL see section 3.3.7). Section 3.4 provides a summary of the guidelines to set up the MEDAE-network. It details the different types of events in which specific subjects will be discussed.

Chapter 4 discusses the points of attention and next steps regarding the governance of LLs and the MEDAE-network, including the potential for integration and participation of LLs in the MEDAE-network (sub-section 4.1). Sub-section 4.2 discusses next steps regarding the validation of AEP and their integration in to LL-specific roadmaps. These steps are linked to the different NATAE Work Packages (WPs). Considering the governance and validation of a priority list of AEPs in each LL, sub-section 4.3 provides a monitoring matrix with all-important decision-making moments from the start of the NATAE project in LL areas until summer 2024.

Chapter 2

Methodology

Chapter 2 – Methodology

The methodologies described in this milestone (Ms4) are applied to five or six NATAE Living Labs (Table 1).

Table 1. Overview of NATAE Living Labs and their abbreviations as used in this document.

Farming system	Country	Region	Locality	Abbreviation
Peri-urban	Mauritania (MR)	Nouakchott	PK17	PK17-MR
Peri-urban	Morocco (MA)	Meknes	Ouislane	Ouislane-MA
Mountainous	Morocco (MA)	Boulemane	Skoura M'Daz	Skoura-MA
Oasis	Algeria (DZ)	Laghouat	Laghouat and El Assafia	Laghouat-DZ
Cereal plains	Tunisia (TN)	Siliana	-	Siliana-TN
Irrigated plains	Egypt (EG)	Luxor	El-Boghdady and El-Zanaqatah	El-Boghdady-EG

2.1 Territorial diagnosis

The territorial diagnosis aims to assess the agroecological situation in the LL territories and their development prospects. The specific objectives of this diagnosis are to identify agro-ecological practices in the studied territory, understand their role in the functioning of agricultural production systems, and comprehend the rationale behind farmers adopting these practices.

In addition to identifying agroecological practices, the diagnosis is expected to enable an analysis of ongoing agricultural dynamics in each LL territory. This facilitates an understanding of the choices made by stakeholders regarding agroecological practices. In this context, the identification and understanding of the perception of local actors, especially farmers, are crucial and influence the choice of the overall methodological approach. The proposed diagnosis follows a comprehensive and process-oriented approach that considers the perception of actors. It focuses on the process of transforming agricultural practices in the context of the broader dynamic process in the socio-ecological system of the LL.

The implementation of the territorial diagnosis unfolds in four stages (Figure 1) that can be addressed in an iterative process. At each stage, specific objectives related to the research subject are addressed. After defining a conceptual framework (Stage 1), the territorial diagnosis is focused on characterizing the production systems in which they are adopted (Stage 2), identifying agroecological practices (Stage 3), and characterizing the value chains in which these production systems are integrated (Stage 4). Special attention is given to identifying internal and external factors determining the adoption of agroecological practices by farmers and their overall rationale. While working on Stage 2 and 4 (Figure 1), researchers also identify important local stakeholder groups based on their influence on and interest in an agroecological transition process.

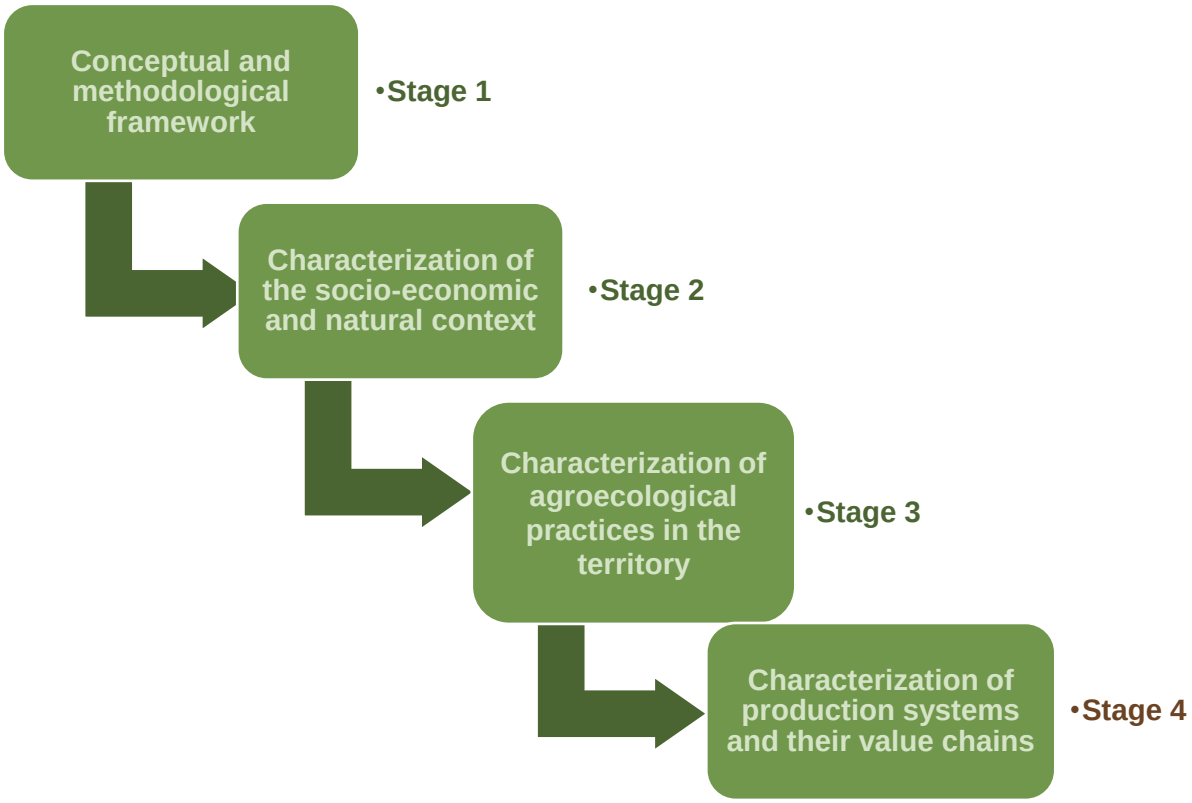

Figure 1. Overview of the four stages in the territorial diagnosis.

The territorial diagnostics were conducted in five out of six NATAE Living Labs (LL)[3]. These studies were conducted as part of end-of-studies projects by master's students recruited by NATAE. Except for Laghouat-DZ, where the territorial diagnostics were conducted by a local NGO.

To ensure a degree of coherence among these studies and guarantee the comparability of their results, a reference methodological approach was proposed to guide territorial diagnostics. The structure and key methodological choices outlined in this guide were presented and discussed during the project's launch workshop held in Bari from April 24 to 26, 2023. An online training workshop was organized, on May 12 and June 1, for the benefit of master's students who had to carry out the territorial diagnosis in the LL areas and the first results were presented during a second workshop in the 11 and the 12 October 2023 (Appendix B).

In the end, the five diagnostics were conducted using methodological approaches adapted for each LL based on the existing knowledge of the territory and the priorities set by each LL-team. As a consequence, the diagnostics in Skoura-MA and El-Boghdady-EG were more oriented towards constructing typologies of production systems. For the other three (Laghouat-DZ, -MR, and Ouislane-MA), the study primarily focused on identifying agroecological practices and characterizing production systems. For PK17, due to the reduced size

[3] The sixth study, which focuses on the cereal plain of Siliana (Tunisia), did not take place due to logistical reasons. A report on the characterization of the plain, the dominant production systems, and their agroecological practices is currently being prepared by the local LL team.

of all cultivation plots in the area related to water constraints, one main and single production system was assessed with the GRDR team, combining a wide variety of crops and vegetables on small and joint parcels.

All investigations have relied on multiple information and data collections through the use of focus groups, workshops and individual interviews and questionnaires, that have allowed to characterize common constraints to the practice of agriculture and of AE in particular throughout the sites. Water and climate change constraints, that are core issues for North Africa production systems, were used as a starting point to reach the information on farms specific practices, and changes in the practices and production choices. In all the diagnoses methodologies / interviews and questionnaire structures aimed at AEP combination identification (Calabrese et al., 2023. D1.1). Classifications of driving production constraints, production systems and attitudes towards agroecology are based on own elaborations supported by information from different methodologies: interviews with key expert people or local stakeholders and /or statistics. More information on methodological approaches in each LL can be found in LL-reports that are available on request.

2.2 Living Lab Launch

The methodology to set-up and launch the Living Labs was discussed within NATAE consortium on multiple occasions (online in March 2023; in person in April 2023; via mail in February until June 2023). The LL-launch is a two-step procedure: first establish a representative board and then organize the actual launch with a broader participation.

A first try-out took place in the peri-urban LL in Mauritania (PK17-MR) on 19 and 21 September. Subsequently, this try-out was evaluated with LL-leaders of the other LLs in an online exchange activity on 26 September 2023. Small adaptations were made regarding the procedures and activities. Reporting per LL was supported by a reporting protocol.

Representative board meetings and a launching event were organized in five out of six NATAE LLs in September and October 2023 (Table 2 and Table 3). The launching event was prepared by LL-leaders during the first LL representative board meeting. For Siliana-TN, the launch is foreseen for December 2023 or January 2024.

Table 2. Overview of representative board meetings dates and participation. People present from LL-leader organizations are not included in the overview.

Living Lab	Date board meeting	Participation					
		Research	Farmers	NGOs	Administration	Business	Other
PK17-MR	19/09/2023	0	4	3	5	0	0
Ouislane-MA	03/10/2023*	1	2	1	3	0	0
Skoura-MA	03/10/2023*	1	5	1	8	0	0
Laghouat-DZ	21/10/2023	0	5	1	1	1	1
Siliana-TN	Tbd	NA	NA	NA	NA	NA	NA
El-Boghdady-EG	29/09/2023	0	2	2	1	0	1

*The representative board meetings in Maroc were merged as multiple board members participate in both Living Labs.

The LL representative board consists, to date, of 6-12 people that each represent a specific stakeholder group in the LL. Farmers in the LL representative board represented different farm types. During the representative board meeting, board members:

- Conducted an ice-breaking activity (optionally with a photo-voice[4] exercise).
- Presented themselves.
- Discussed their roles in the LL.
- Discussed and agreed on a code of good conduct.
- Conducted a systems thinking[5] exercise based on the oasis-model[6] or comparable approach.
- Planned a transect walk as part of the agenda for the launching event.

Table 3. Overview of LL-launch dates and participation.

Living Lab	Date launch	Participation					
		Research	Farmers	NGOs	Government	Business	Other
PK17-MR	21/09/2023	0	30	10	3	0	0
Ouislane-MA	04/10/2023	1	20	1	3	0	0
Skoura-MA	05/10/2023	0	9	0	4	0	0
Laghouat-DZ	26/10/2023	0	16	4	6	1	2
Siliana-TN	Tbd	NA	NA	NA	NA	NA	NA
El-Boghdady-EG	30/09/2023	0	20	4	3	2	2

For the Living Lab launch, the LL representative board, farmers and other stakeholders were invited. 20 to 50 people participated in this event (Table 3). During the Living lab launch event, the following topics were addressed:

- Introduction to NATAE, agroecology and Living Labs
- Presentation of the LL representative board
- Transect walk[7] plus discussion on production constraints and agroecological options
- Presentation of preliminary results from the territorial diagnosis
- Presentation of selected value chains to be studied in NATAE
- Gauging the support for experimentation on AEP combinations

2.3 MEDAE

The guidelines of MEDAE (MEDiterranean multi-actor network on AgroEcology) were drawn up in stages over the course of 2023 (Figure 2), using two main methods:

[4] In a photo-voice exercise, participants are given the opportunity to present their view on a certain matter, supported by a photo, drawing or object that represents their perspective.
[5] The main idea in systems thinking is that a system as a whole (with its interrelations between sub-parts) has a different behaviour than can be assumed based on the study of its isolated parts alone. Systems thinking thus requires an interdisciplinary approach. Important in systems thinking is the identification of a system boundary, main components (e.g. social, economic, technical), main relations between components, inputs/inflows entering the system, and outputs/ouflows leaving the system.
[6] The oasis-model exercise elicits knowledge from stakeholders on the events, trends/patterns, underlying structure and mental models in their system.
[7] In a transect walk, local stakeholders walk along a planned trajectory and stop at 3-5 points to observe and to discuss on what they notice in the field.

1. Critical analysis of existing networks

CARI conducted a benchmarking of several existing networks which purpose is entirely or partly concerned with agroecology, and which act at different scales. We analyzed the functioning of these networks: their membership, governance, level of integration, communication tools, and activities. We also relied on studies summarizing the functioning of international networks and on CARI's expertise in network coordination for MEDAE.

2. An interactive and collaborative process

The development of the MEDAE guidelines was based on a multi-stage collaborative process, during which the members of the NATAE consortium were able to present their expectations and visions for the MEDAE network.

First, a questionnaire was distributed in May 2023 to identify NATAE consortium members' experience with networks and their expectations for MEDAE (desired objectives, nature of membership, governance system, etc.). The questionnaire was completed by 26 people from 17 (out of 22) of NATAE's partner institutions.

A preliminary set up for MEDAE was then developed, presented and discussed by the consortium at the MEDAE network launch day on July 4, 2023. This videoconference meeting was attended by 29 people, representing 17 partner institutions, and highlighting the commitment and interest of NATAE partners for the MEDAE network. The discussions and proposals enabled to draft the guidelines and share them with the consortium in September, 2023.

MEDAE's operating mode will be reviewed in 2025, after two years of network activity (Figure 2). Adjustments may be made and tested in the last year of the NATAE project (2026), so that the operating mode is solid and approved when the NATAE project (and the funding dedicated to the network in this context) comes to an end.

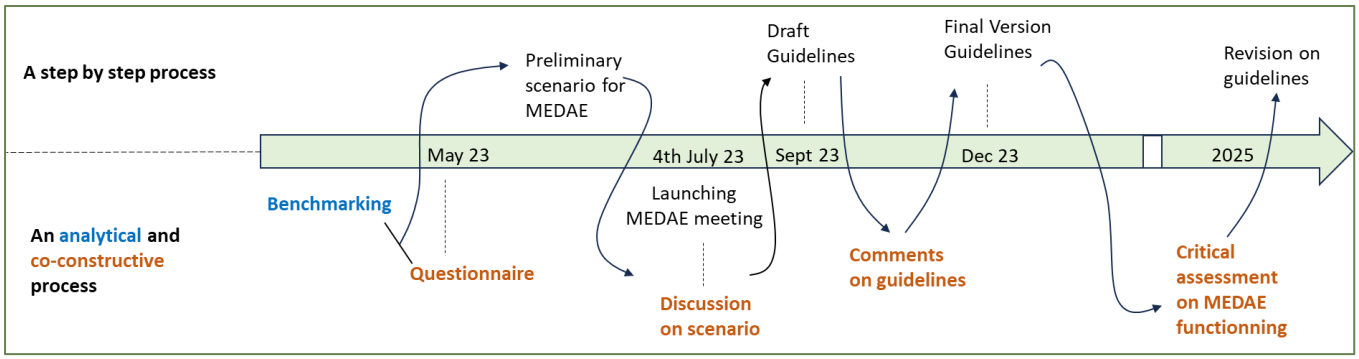

Figure 2. MEDAE guidelines development method.

Chapter 3

Results and preliminary reflections

Chapter 3 – Results and preliminary reflections

3.1 Territorial diagnosis

3.1.1. The socio-economic and natural context of NATAE LL

The NATAE LL represent the diversity of North African agroecosystems (Table 4). The climatic parameter alone determines one of the key characteristics of agriculture in these zones: rainfed vs irrigated. In semi-arid plains and mountains, precipitation favors widespread rainfed agriculture (crop production and livestock), but productivity is correlated with precipitation and its variability. In these same zones, the presence of perennial (springs, aquifers) or seasonal (wadis) water sources allows for localized irrigated agriculture.

In the arid zones, only extensive and transhumant livestock farming is normally possible. The cultivation of crops is only feasible in these zones around water sources (rivers, wadis, underground aquifers). Depending on water resource availability, agriculture in arid zones may be spatially limited (traditional oases) or extensive (new development areas).

Within each of these major climatic zones, a diversity of biophysical (microclimate, topography, hydrogeology, etc.), socio-economic (population density, urbanization, standard of living, availability of non-agricultural jobs, etc.), and political (land use planning, infrastructure, land policy, agricultural subsidies, access to credit, etc.) situations determine the diversity of agricultures that can develop. It is, therefore, essential to consider regional context elements that affect the nature of production systems (physical environment, socio-economic factors, etc.) and define the boundaries of what is possible for farmers.

Table 4. Overview of important aspects for agriculture in the six NATAE LL.

Aspect	NATAELiving Labs				
	Laghouat-DZ	**PK17-MR Nouakchott**	**Ouislane-MA**	**Skoura-MA**	**El-Boghdady-EG**
Climate	Arid	Arid	Semi-arid	Semi-arid	Arid
Arable land (ha)	12 322	3500	NA	3853	NA
Water supply (source)	Irrigated (aquifer)	Irrigated (treated urban waste water)	Irrigated(well, waste water) + rain-fed	Rainfed + irrigated (well and stream)	Irrigated (Nil)
Number of farmers in LL area	950	570	NA	1500	NA
Dominant crops	Fruit trees, vegetables, cereals, fodder crops	Vegetables, some fruit trees	Olive trees, cereals, vegetables, other (fruit) trees, fodder crops.	Olive trees, cereals, vegetables, other (fruit) trees	Wheat, maize, sorghum, alfalfa and sugarcane

Agricultural production systems vary significantly from one site to another.

Structural differences (average farm size, means of production such as agricultural equipment, buildings, and other productive investments) can be explained by various factors, including:

- **Land tenure**. Two main land tenure configurations can be distinguished. The first is observed in Laghouat-DZ and PK17-MR, where land belongs to the state. Access to this public land is through state allocation (Laghouat-DZ, PK17-MR) or informal private appropriation (PK17-MR), with or without subsequent regularization. In Laghouat-DZ, the land allocated by the state for development varies from a few hectares to a few dozen hectares; however, the technical and economic capacities of farmers seem to be the limiting factor.
- In the second configuration, land is mainly privately owned and can be directly operated by the owners (Skoura-MA, El-Boghdady-EG) or leased indirectly to farmers (Ouislane-MA). Insecurity of land access for the latter can be a significant constraint, especially heightened by urban pressure on Ouislane Valley lands.
- **Water access constraints**. Except for El-Boghdady-EG, and to a lesser extent Laghouat-DZ, water scarcity is a major constraint in all other sites. In PK17-MR, water scarcity limits the cultivated areas to a maximum of a few thousand square meters per operator. In Skoura-MA, irrigated lands are the exception, with rainfed agriculture being dominant. As for Ouislane-MA, water scarcity leads to the use of untreated wastewater by some farmers, or a combination of irrigated and rainfed crops.
- **Urban pressure**. Except for the primarily rural site of Skoura-MA, the other four LL are more or less integrated into the urban areas of significant cities (Louxor with 1.3 million inhabitants; Nouakchott with 900 thousand inhabitants; Meknès with 600 thousand inhabitants; Laghouat with 250 thousand inhabitants). Agricultural dynamics in these sites are strongly influenced by the economic and spatial dynamics of these cities. While cities offer opportunities for agriculture (proximity to markets), they exacerbate pressure on productive resources (land, water, labor).
- **Weakness of professional organizations**. Farmers in the studied sites are generally not well integrated into dynamic professional organizations (professional associations, cooperatives) that could create opportunities and help overcome structural constraints. With the exception of Ouislane-MA and Skoura-MA, where some farmers are part of olive oil extraction cooperatives, organized collective action does not appear to be a strong point in the studied sites.
- **Unstructured Agricultural Markets**. Agricultural markets in the region are generally unstructured; the distribution of agricultural products typically occurs through a complex distribution system consisting of short, long, and medium-length channels. With the exception of wheat trade, controlled by the states, and that of agricultural products destined for processing industries (sugar, milk, oil, canned tomatoes, etc.), the distribution channels for agricultural products are highly fragmented, comprised of numerous traders and intermediaries (wholesale collectors, wholesalers, retailers). Production standards and traceability of the origin of agricultural products are impossible in this market configuration. External appearance is the primary indicator of quality. Products derived from agroecology must be sold through dedicated, yet-to-be-established channels, making their development challenging.
- **Insufficient targeted public policies**. Agricultural policies have varying degrees of importance in each of the five LL. Targeted actions are absent for all categories of farmers. In Morocco, peri-urban agriculture is insufficiently integrated into agricultural development aid programs outlined

by public policies (Morocco's Green Plan and the Green Generation plan). In Egypt, public centers responsible for agricultural extension have conducted significant campaigns on climate change adaptation options (new varieties of maize, windbreak installation, etc.), but similar efforts for reducing the use of chemical inputs are not observed. In Laghouat-DZ, the allocation of public lands for development is not accompanied by the dissemination of sustainable technical models. Farmers in PK17-MR receive very little public assistance, apart from assistance provided within the context of international cooperation projects.

The functioning of agricultural production systems reflects the trade-offs farmers make to achieve their goals under the constraints imposed by their structure and the economic environment. Technical choices (crop selection, livestock choices, and their management practices) often reflect the accessible compromises between farmers' goals and constraints. The results of diagnostic studies also highlight the difficulties farmers face in accessing credit, inputs, and labor on top of the previously mentioned constraints. Furthermore, environmental constraints limit the possibilities for agricultural intensification (in terms of the extensive use of chemical inputs and agricultural equipment) in the majority of the sites.

3.1.2. Agricultural production systems

Despite the diversity in agroecological and socioeconomic contexts among the studied territories, the identified production systems share numerous commonalities in their structure and functioning. They all operate in highly constrained environments. The primary characteristics of the farms studied in various sites can be summarized as follows.

- **Dominance of small-scale farms.** The majority of farms in the five studied territories are small (< 2 ha) to medium-sized (< 5 ha). Larger farms (>10 ha) are rare in these territories (Skoura-MA, Laghouat-DZ, El-Boghdady-EG), and very small farms (< 1 ha) are predominant in PK17-MR.
- **Polyculture-livestock farming.** With the exception of PK17-MR, where most farms specialize in horticultural crops, the majority of farms in other sites combine polyculture and livestock farming. Irrigated farms in El-Boghdady-EG all cultivate winter cereals (wheat) and summer cereals (corn or sorghum), in addition to forage crops (alfalfa), sugarcane and livestock. This is also the case for most farms in Ouislane-MR, which combine rain-fed cereals with irrigated horticultural crops and small-scale livestock farming. Generally, horticulture is present wherever there is water, except in El-Boghdady-EG.
- **Low level of input intensification.** Except for farms in El-Boghdady-EG and those in the development areas in Laghouat-DZ, most farms in other sites are characterized by low input intensity, meaning limited use of industrial agricultural equipment, improved seeds, chemical fertilizers, herbicides, and pesticides. In some farms, especially in Ouislane-MA and PK17-MR, production systems can be highly intensive in terms of labor. The use of self-supplied inputs (farm-saved seeds, forages, etc.) and manual labor is common.

- **Variability in production and agricultural Income.** Rain-fed agricultural systems (Skoura-MA and Ouislane-MA) are characterized by high production variability and, consequently, variability in agricultural incomes. Income variability also characterizes farms producing horticultural crops because of market price volatility (Laghouat-DZ, PK17-MR, Ouislane-MA). Livestock in all these farms (with horticultural crops) constitutes a relatively stable source of income.
- **Importance of off-farm labour.** The owners of small and medium-sized farms are mostly engaged in multiple activities (Ouislane-MA, PK17-MR, and Skoura-MA). They work as agricultural wage laborers or in other sectors. The off-farm activities of farm owners indicate low agricultural incomes and a low level of investment in the labor required to operate the farm.
- **Importance of self-consumption for some farms.** For small and medium-sized farms, self-consumption is a significant component of the household economy. It also influences the choice of crops.
- **Direct and indirect sales.** Commercial practices of farms vary considerably depending on production volumes and the occupation of the farm owner. When production volumes are low, direct sales (at the village market or at the farm) are preferred. Others prefer to sell their harvest to small collecting traders or wholesalers when volumes are higher.
- **Diversity in farmer profiles.** Farmers in the studied territories do not all have a typical professional trajectory (family helper/agricultural worker – sharecropper/farmer). In PK17-MR and Laghouat-DZ, urban-origin operators are not uncommon. Generally, their experience capital is low, and their technical expertise is also limited.

From these characteristics and beyond this diversity, some common features emerge in the dominant agricultural production systems in the studied territories. These features relate to the land size, wealth status, intensification potential and the balance between subsistence- or market-orientation of farms. We hypothesize that all these emergent features can potentially influence decision making regarding the adoption of AEP. Food self-sufficiency for the household food security, for instance, is an important feature in most LL areas because it leads to crop diversification, which is considered as an AEP. By contrast, the level of poverty is a constraint to AEP adoption as any change may be a risk in the vulnerable North African context (e.g. climatic risks in arid and semi-arid zones). Based on the observed combinations of these features in farms in the LL, we hypothesize the dominance of the following farm types:

- **Medium-sized farms with limited intensification potential.** These farms, represented by Skoura-MA and potentially observed in the cereal plains of Siliana-TN, have limited intensification potential due to structural natural constraints (lack of irrigation water and precipitation variability). Given that climate is the most determining factor in agricultural production in this type of system, the objective of farm managers could be formulated as "stabilize agricultural income by cost control". The use of practices that could be considered agro-ecological could hence be justified by an economic calculation focused on cost control.
- **Medium-sized farms with intensification potential** (Laghouat-DZ, Ouislane-MA, El-Boghdady-EG). These farms generally have reliable access to irrigation water, allowing them to engage in a capitalist intensification process of their agricultural production. In the short term, they are more

influenced by market price fluctuations than by climate change. The rationality of farm owners could be formulated around the following objective: "optimize income through reasoned intensification." The choice of crops and technical practices is designed to reduce market-related risks. This rationality translates into a strategy that involves: 1) diversification of crops, introducing a crop with a stable market (cereals) in addition to lucrative crops (horticulture and arboriculture), and 2) reducing the use of certain costly inputs with low impact (real or presumed) on production.

- **Small-scale farms oriented toward the market.** Despite their small size, these farms have intensification potential, especially through irrigation. They are found in El-Boghdady-EG, Ouislane-MA, PK17-MR, and Skoura-MA. Faced with constraints related to the size of their plots and financial difficulties, the objective of farm owners in this category could be "increasing production and income within the limits of available resources." Limited resources dictate specific technical choices, such as the use of self-produced seeds, restricting the use of chemical fertilizers and pesticides, and manual weeding.
- **Small-scale farms oriented toward self-consumption.** These are subsistence family farms that generate few surpluses for the market. They are identified in Ouislane-MA and Skoura-MA and to a lesser extent in PK17-MR. The objective assigned to these farms is to contribute to household food supply at the lowest possible cost. The use of purchased inputs is kept to a minimum, and the mobilization of free local resources is favored.

Agricultural production systems in the territories of the LL are subject to significant natural and socioeconomic constraints. In this context, the adoption of agricultural practices that align with the principles of agroecology is probably more aligned with a logic of adaptation to constraints than a deliberate choice to revise their agricultural model in a perspective of environmental preservation, protection of their health and that of consumers, or the promotion of socially equitable practices.

3.1.3 Agroecological practices

The diagnostics have allowed the identification of a significant list of agricultural practices that can be assimilated to agroecology based on its principles (Figure 3). These practices, expressed in generic terms in Figure 3, can manifest on the ground through a multitude of locally highly contextualized variants. They are also linked to AE more generic elements and dimensions (derived from the elements and principles by the FAO (2018) and the HLPE (2019)).

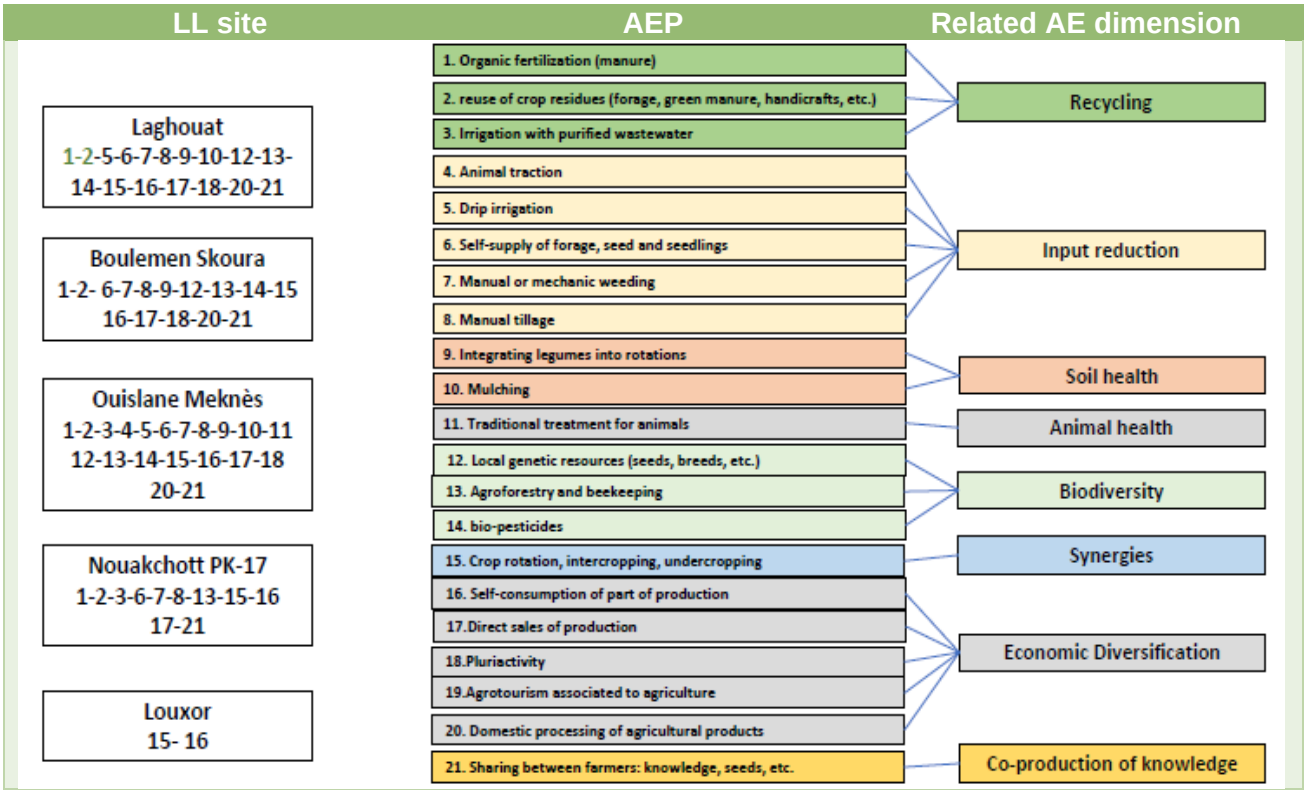

Figure 3. Overview of agroecological practoices observed in the LL during the territorial diagnosis. Numbers per LL in the left column indicate which agroecological practices in the middle column were observed.

The agroecological practices identified during the territorial diagnostics in the five study sites reflect different dynamics. As an attempt to be more specific in the categorization of AEP and their combinations, the observed practices were inventoried and categorized according to criteria such as: anteriority of the practices (history), endogenously induced agroecology in reaction to change, introduction of AEP from outside the area.

AEP identified during the TD were categorized according to 2 main perspectives:

- Historical focusing on external / internal-endogenous AEP in reference to the source of knowledge and to the sociopolitical dimensions
- Functional uses of observed practices

From the historical perspective, AEP are allocated to three categories regarding their origin and the rationale that determined their adoption.

- **Heritage agroecology.** Oasis areas where ancestral knowledge and practices persist represent an agroecology of heritage. These practices have historically accumulated in an environment with multiple constraints. Some of these constraints now find modern solutions outside this traditional framework, disrupting the coherence of the entire oasis system. Oases, once considered an exemplary agroecological model, are no longer viable socially (low social acceptability due to manual labor and hardship) and economically (low profitability and competitiveness), even though they remain ecologically valuable.

- **Endogenously induced agroecology.** Actors' recent adaptations to economic (insecure land tenure, difficulty accessing chemical inputs), and technical constraints (small plot sizes limiting mechanization and automation; lack of access to water or insufficient access, absence of agricultural advice, etc.). Faced with these constraints, producers adapt their agricultural practices with the resources and skills at their disposal. Not all of these makeshift solutions are efficient and effective; the selection of the best practices occurs progressively through trial and elimination. This process may generate adapted models, but are they resilient to all challenges (economic, social, and natural)?
- **Exogenously induced agroecology.** This case is observed in El-Boghdady-EG, where new practices are introduced by NGOs and the government in response to the difficulties faced by local farmers. This involves the introduction of organic agriculture and the adoption of practices to adapt to climate change (e.g., using trees as windbreaks, introducing maize varieties resistant to high temperatures).
- **Agroecology of Conviction.** This configuration has not been documented in the diagnostic studies (political dimensions was not in the focus of the diagnoses, this is more WP6 activity on-going), although it may exist among certain stakeholders in the studied territories. However, its existence is likely to be marginal.

From a more functional perspective over the observed AEP, it appeared that the many observed AE practices on the ground relates to their multifunctionality target: primary production is their usually main aim target, but they foster at the same time several ecosystems' services: regulation (improved water cycle, reduced heat, biological control, improved soil fertility), sociocultural (landscape, typical products), biodiversity (diversification). As previously said, these practices can be for food only, but they also contribute to a more global AE pictures as they are often combined, and they may shape some "agroecological infrastructures" at farm level, and even at territorial level.

In the end, very few studies addressed the notion of AEP combinations, and when it was the case, the identified combinations were mostly related to agronomic and agroeconomic dimensions, and implemented at farm level. Still, these observed AEP combinations show how they are related one to the other in order to limit both the climatic and economic risks on the farm production level.

3.2 Living Lab launch

In this sub-section, the results from a first representative board meeting and the LL-launch are synthesized. Reports from individual LL on these stakeholder activities are available on request.

3.2.1 Participation, consent forms and code of conduct

Participation in the representative board and LL-launch was generally good. Facilitators made sure all participants could provide their input. It was clear to board members what was expected from them. In each LL, LL-leaders prepared a code of conduct based on the suggestions as provided in the LL-guidelines. After some discussions the code of good conduct was accepted with (Laghouat-DZ) or without (PK17-MR, Ousilane-MA,

Skoura-MA, El-Boghdady-EG) adaptations. In PK17-MR and El-Boghdady-EG, participants prioritized/highlighted rules for good conduct, but also indicated that all proposed rules were acceptable. In Laghouat-DZ, participants indicated the need for an additional rule of good conduct regarding feedback on results and the final evaluation of the project. The photo-voice exercise was only conducted in Laghouat-DZ and provided interesting perspectives on the LL area, leading to rich discussions among board members early on during the meeting. In Ouislane-MA and Skoura-MA, all board members were given the opportunity to express their perceived links and roles in the development of the LL. In PK17-MR, presentation of board members was done very quickly due to time-constraints.

3.2.2 Systems thinking exercise

The systems thinking exercise (oasis-model or comparable approach) was difficult, but in the end a global picture could be reached in all LL. Representative board members could easily identify issues related to events, patterns and structural factors, but didn't necessarily make a distinction between them. In Ouislane-MA, Skoura-MA and Laghouat-DZ this was already anticipated, and LL-leaders decided therefore to replace the oasis-model with a problem tree analysis, which seems more intuitively comprehensible for participants. In a problem tree analysis, the starting point are the visible events, after which problems are defined. In a next step, the underlying causes are identified and, finally, potential solutions are discussed. The downside of this approach is that the distinction between short- medium- and long-term decision making is lost and the focus is shifted eventually towards solutions, which may distract from thoroughly describing and understanding the system. However, solutions brought forward by participants in a problem tree analysis may as well shine light on the functioning and perceived dynamics of the system. Mental models[8] were left largely unaddressed in most LL, but are very important in understanding the system. Further description and understanding of the system, including mental models of different stakeholder groups, will be addressed in T4.4. In T4.4 the importance of different agroecological system functions, indicators and goals towards the future will be discussed.

Overall, the challenges surrounding the oasis-model indicate the need for developing a common understanding on systems thinking in general. Bringing in the notion of short, medium- and long-term decision making seems too advanced at this stage of the project, but could be an end goal regarding strengthening systems thinking capacities in LL. Systems thinking requires an interdisciplinary approach, which implies that LL-teams and the NATAE consortium have to work collectively and share disciplinary perspectives. Such a colective effort would support better appropriation of methods such as the oasis-model. On the other hand, the representative board represents stakeholders with different backgrounds that help to get a complete picture of the situation, as was for instance observed in Laghouat-DZ. Working on a common understanding of the systems at stake in each LL with transdisciplinary methods, and subsequently targetting a more complete appropriation of systems thinking tools will be key in capitalizing and bringing together the different stakeholder views in a systems perspective.

[8] Mental models are (correct or incorrect) ideas and convictions about reality that shape the thinking and decision making of actors.

3.2.3 Transect walk

A pre-defined transect walk was proposed by LL-leaders and accepted by the representative board. The stopping points and content of the transect walk were subsequently co-organized with the representative board in all LL (see Figure 4 for an example from Skoura-MA). In all LL, farmers in collaboration with the LL-leader took the lead in explaining the local situation during the transect walk. They were also very active in responding to questions from other stakeholders. The transect walks supported a good participation and input from all participants on AEPs. It also allowed for informal exchanges between different stakeholders. In PK17-MR, for instance, it was the first time that certain officials visited the terrain and asked questions to farmers in the field. In Skoura-MA, participants expressed their appreciation and willingness to organize transect walks in the future.

Figure 4: Transect walk in the community of Skoura (MA), at the village of Tadout

The transect walk may have biased stakeholder input on AEPs, as stakeholders may have focussed on what they observed during the transect walk (this was for instance observed in Laghouat-DZ, where participants focused on what they just had seen on the three farms that they visited), but this risk was also limited due to previous workshops on this AEP in the LL during the diagnosis period.

AEPs mentioned after the transect walk, addressed events, patterns and structural factors relevant in the LL (see oasis model). In PK17-MR and Laghouat-DZ, for instance, compost and manure for improved soil fertility addressed the structural soil poverty (long-term strategy), where the phytosanitary treatments based on local and natural products addressed events of pests & diseases (short-term). In Laghouat-DZ, also the mental models of local actors were considered by the proposed AEPs, e.g. investment in professional skills and promotion of entrepreneurship. In all LL, AEP were mentioned that addressed production constraints regarding water availability, soil quality and presence of pests and diseases. Mentioned AEP, such as improved crop

rotations (mentioned in all LL), were mostly at field and farm level. Given the large share of farmers participating during the LL-launch, this was something to be expected. The representative board will have to be involved to put forward AEPs at LL-level.

The AEPs discussed during the transect walk, matched with the outcomes of the territorial diagnosis in all LL. Participants in all LL showed a keen interest in participating in experiments on the proposed AEP.

3.2.4 Selection of value chains

In Laghouat-DZ, the value chains proposed for further study were discussed and validated at the LL launch day. In Skoura-MA, the olive oil value chain was an obvious choice as it contributes to over 80% of household incomes. However, the significance of aromatic and medicinal plants as a crucial income generating activity for women was debated. Eventually this value chain was accepted because of this and because collective action (women-led cooperative) is already existing for this value chain, while the proposed alternatives (dairy and honey) were less significant in terms of production levels in the area. In Ouislane-MA, vegetables and fruit trees were confirmed as the most important value chains. There was some discussion on dairy as an alternative value chain, but production levels were considered too low.

In the case of PK17-MR, farmers proposed a different selection (bulb onion and potatoe) to the selection recommended by the representative board and the teritorial diagnosis (spring onion and tomatoe). The information acquired from farmers (bottom-up approach) is useful, but the final decision making should be wider supported, including top-down approaches. In NATAE, LL-leaders, in consultation with the representative board, are in the position to carefully combine different sources of knowledge to get to a joint decision at representative board level, i.e. beyond the individual farm level. This, amongst others, concerns the value chains for further study. In PK17-MR, the LL-leader in consultation with the representative board made a final selection after the LL-launch, favouring bulb onion (also farmer's choice during the LL launch) and turnip (a new value chain proposed by GRDR). In El-Boghdady-EG, stakeholder perceptions were used to make a preliminary selection of the sugarcane and cereal value chain, but no definite decision was made as further study in the context of T3.2 is still needed. As the sugarcane value chain is completely state-owned, it doesn not seem to fit with the local and terroitorial approach of the NATAE LL.

3.3 Preliminary roadmaps

Taking stock of TD and LL launch results, LL-leaders constructed preliminary roadmaps for governing their LL and selecting promising AEPs (sub-sections 3.3.1-3.3.6). As the roadmaps are preliminary, they are generally descriptive without giving much direction. Regarding the governance, roadmaps are generally reflecting the general Living Lab guidelines (D4.1), i.e. no specific adaptations at LL-level are foreseen. The selection of promising AEPs is generally presented as an inventory of individual AEPs with little coherence that could provide a specific direction for experimentation. Subsequent actions are needed to make the roadmaps useful tools to direct the LL, and fully account for the concept of "optimal combination of AEPs" which is central in NATAE. Sub-section 3.3.7 provides a synthesis and overview of all promising AEPs per LL.

3.3.1 PK17-MR

Governance of the LL

The peri-urban Living Lab of PK-17 in Nouakchott is coordinated by Groupe de Recherche et de Réalisation pour le Développement Rural (GRDR). A representative board with all stakeholder groups involved in the implementation of the project, was created. The board is made up of local, administrative authorities, the Nouakchott Region, the technical extension services of agriculture ministry, national and international NGOs which work on agroecology, representatives of the different types of agriculture in the area of PK-17 (an area allocated to retired soldiers, an area developed by the Nouakchott Region and an area illegally managed by farmers) and the LL-leader. The representative board includes members of the stakeholder groups known in Mauritania for their activities related to agriculture, food security and agroecology.

The frequency of LL representative board workshops is approximately three times a year, at least until the end of the project in 2026 in the GRDR office in Nouakchott. These workshops generally last one day and invitation letters for representative board meetings are sent two weeks in advance to the members. The objective of those meetings is to discuss agroecology beyond the farm level, in relation to social, economic, environmental and institutional aspects. The board has an essential role in discussing, validating and scheduling the main NATAE activities and is also involved in organizing them (workshops, training, studies, field visits, monitoring, etc.).

The project activities planned are first discussed between those responsible for the different Work Packages in the NATAE projects and the GRDR. This is required to frame the planned activities and support them with arguments, before they are discussed and validated by the representative board. Board members are responsible for reporting on the planned activities to their stakeholder group.

All NATAE activities will be supported and monitored by the GRDR's Monitoring-Evaluation-Accountability-Learning department. The activities will be implemented by the LL coordinator of PK-17 who, depending on the needs of the implementation, will be supported by members of the GRDR staff and/or external people.

Selection of AEPs

Based on the preliminary results of the territorial diagnosis and the PK-17 LL launch, the agroecological practices identified as the most promising are those related to efficient water management; improvement of soil fertility; use of compost and manure; phytosanitary treatments based on natural products; crop rotation and association; agroforestry and other agroecological infrastructures are also to be considered. Those AEPs aim to remove production constraints faced by the farmers.

About twenty farmers will be supported, until the end of the project, in the experimentation and evaluation of AEPs in vegetable production. The AEPs will be tested in plots using the farmer field school method. The GRDR, with the support of the representative board, mediates between farmers and other actors concerned (State, administrative and local authorities, projects, donors, Société National D'Eau (SNDE), technical agricultural services, Nouakchott Region) to gain access to land, water and quality inputs by farmers. The farmers who trade their own products directly to consumers are supported in promoting AE products at potential growth markets (niche market, institutional markets, school canteens and initiation of a weekly market of agroecological products).

The GRDR will share intermediate and final results to influence decision-makers at the LL-level and beyond. This will be enabled by a monitoring system, whose observations can be used to evaluate AEPs during the project cycle. The GRDR's interventions will focus on all domains of sustainability: environment and climate change, health and nutrition, economy, society and culture, governance.

Discussions on the pre-selected value chains have started. During the launch of the LL-PK17 attention focused on bulb onion and potato. A meeting of the representative board has been held on 7 November for a final decision. In this meeting GRDR proposed turnips as value chain and the representative board agreed with that. Turnips are widely produced and consumed as a replacement for potatoes which are difficult to produce, and hence rarely grown in Nouakchott.

3.3.2 Ouislane-MA

Governance of the LL

The living Lab of Ouislane, Meknes is coordinated by École Nationale d'Agriculture de Meknès (ENA Meknès). One of the first activities was the establishment of the representative board of the LL. The board consists of representatives from two government agencies (Directions Provinciales de l'Agriculture (DPA), the provincial representative of the Ministry of Agriculture, and the local office of the Office Natiuonal du Conseil Agricole (ONCA), the extension branch of the Ministry of Agriculture), the Urban agency, a local NGO that could be reactivated, a research institution (ENA Meknès) and farmers. A total of 7 members have been identified to sit in the boards for the duration of the project.

All representatives showed interest in the project goals and expressed their willingness to contribute actively in the implementation phases of the project.

Any activity to be proposed to the board of representatives needs to be discussed and validated by the leader of the respective Work Package (WP), after which the LL-leader can adapt activities to local conditions. Moreover, all planned activities need to be validated and prioritized by farmers needs and approved by the board of representatives. The board members will meet three times a year to discuss, validate and plan the activities to implement in the LL. The meetings will be held on-site in the LL and last two to three hours depending on the agenda.

The meeting should be called for and facilitated by the LL leader who has the responsibility to foresee and coordinate all the work and activities implemented in the LL. The board members will be notified for the meeting at least one week before the scheduled date.

Selection of AEPs

The Territorial Diagnosis (TD) performed in the Ouislane LL came up with a list of agricultural practices the farmers are implementing in their production systems. These practices have been related to agroecological principles of the High Level Panel of Experts on Food Security and Nutrition (HLPE) and were classified according to their frequency within the farmers sample addressed. Based on this, the most promising agroecological practices (AEP) identified are: organic fertilization, crop diversification through crop association and rotation, agroforestry, efficient use of water, biological weed and pest control for plant protection. These practices will be disseminated and adapted at the farm level. At the LL scale, it will be important to introduce

some short circuit marketing tools such as the agroecological “basket”, “Pick up your own”, direct delivery to restaurants and schools, and specialized shops.

Based on the TD, four main production systems were identified (vegetable production, fruit trees production, vegetable and livestock, fruit trees and livestock). AEP combinations targeting the improvement of the efficiency and the resilience of the systems in place will be tailored to each production systems identified as part of the experimental trials. Four farmers per production system will be identified and supported till the end of the project.

These experimental trials shall address the main constraints identified in the LL through the TD for more sustainable production systems. However, the land tenure and ownership and their impacts on investment at the farm level can be addressed through meeting and workshops where decision and policy makers will be invited.

The marketing of the LL produce associated with agroecological practices, will be addressed as a pilot experiment addressing the economic diversification. The local and/or regional representative of the Ministry of agriculture will be included in this endeavour to facilitate any policy reforms in the future. The local NGO can also be approached and supported to coordinate the establishment of other income generating activities such as agrotourism associated with the agroecological farming in the LL.

Addressing the major identified constraints to production systems based on agroecology principles will pave the way for a smooth agroecological transition that should be pursued after the lifetime of NATAE and lead the way to a more climate change resilient food system.

3.3.3 Skoura-MA

Governance of the LL

The mountaineous Living Lab of Sekoura M’Daz (Boulemane), is coordinated by ENA Meknes (ENAM). One of the initial tasks involved creating the representative board of all stakeholder groups involved in the implementation of the project in the Living Lab. This board comprises representatives from two government agencies (DPA, the provincial representative of the Ministry of Agriculture, and the local office of ONCA, the extension branch of the Ministry of Agriculture), the chamber of agriculture, elected officials from the municipality, a local NGO (Women cooperative and producers association), a research institution (ENA Meknes), and farmers. A total of eight members have been identified to serve on the board throughout the project's duration. All representatives have demonstrated interest in the project goals and expressed their willingness to actively contribute during the implementation phases. Any proposed activity for the board of representatives must undergo discussion and validation.

The LL representative council workshops will take place approximately three times a year, to discuss, validate, and plan activities for implementation in the Living Lab. These meetings will take place on-site in the Living Lab for a single day. The LL leader is responsible for sending invitation letters to representative board members two weeks before the scheduled date. The LL leader should also call and facilitate the meetings and coordinate all work and activities within the Living Lab. The activities planned as part of the project are first discussed between those responsible for the different Work Packages. The board committee not only validates proposed activities

but also actively participates in their organization, covering workshops, training sessions, studies, field visits, monitoring, and other related initiatives.

Selection of AEPs

Drawing from the initial findings of the territorial diagnosis achieved in the Sekoura M'daz LL and from the Living Lab launch workshop, a list of promising AEP has been identified. These practices (AEP) include effective water resource management, enhanced organic soil fertilization, crop association and rotation, agroforestry (fruit trees associated to medicinal and aromatic plants), crop diversification and integrated pest control for plant protection. These practices will be introduced/adapted at the farm level. The farmer field school method will be employed to test those AEPs production systems in designated plots. The identified AEPs are designed to address the production challenges experienced by farmers in their fields.

Combinations of AEPs will be customized for each identified production system during the experimental trials, with the aim of enhancing the efficiency and resilience of existing systems. Special attention will be given to the women's cooperative, which will start cultivating aromatic and medicinal plants such as saffron, lavender, sage, origanum and rosemary. The introduction of these aromatic and medicinal plants in association with existing production systems will be an innovation in the area. The existing women's cooperative will also receive support for the valorization of these aromatic and medicinal plants they will produce. Between four to five producers per production system will be selected and provided with guidance until the project's completion. Subsequently, there will be a focus on assisting these farmer-traders in promoting agroecological products within specific growth markets, including niche markets, and the initiation of a weekly market for agroecological products. The promotion of LL produce, linked to agrotourism and grounded in agroecological practices, will be explored through a pilot experiment aimed at fostering economic diversification. The value chains selected during the workshop for the launch of the LL of Sekoura M'Daz are olive, as it is the most dominant fruit tree, and aromatic and medicinal plants, as these are crucial income-generating activities for the women in the area. More attention will be given to these two value chains to consistently incorporate them into the selected combinations of agroecological practices in this LL.

3.3.4 Laghouat-DZ

Governance of the LL

The oasis Living Lab in Laghouat (Algeria) is coordinated by the CARI association in conjunction with a local association, El Argoub, which is responsible for running and coordinating activities on the ground.

A representative board was set up at the start of the project. It's members include nine farmers (arable farmers and sheep breeders), technical agricultural services ('Direction des Services Agricoles' and Chamber of Agriculture), a university lecturer, and stakeholders of the value chain (manager of an oil mill). Representative board members were selected on the basis of their representativeness of the various agricultural stakeholders in Laghouat, their in-depth knowledge of the field and the issues at stake, and their motivation to act in favour of the agro-ecological transition.

Meetings of the representative board will be held on a regular basis (once every two months), but can be more regular depending on the project's activities and needs: territorial diagnosis, Living Lab launch day, typology validation, etc.

The activities planned for the project are first discussed by the coordination team (CARI and El Argoub). The representative board meets at the initiative of the coordination team when their opinion, expertise or validation is important for the project's activities. In addition, the representative board wants to be kept regularly informed on the project's progress, and reports are planned at each major stage of the project (results of farm surveys, value chain surveys, experiments, etc.).

The selection of AEPs

Based on the preliminary results of the territorial diagnosis and the LL launch workshop, the agroecological practices identified as the most promising include: rational water management, improving soil fertility, the use of manure (for compost, which is still absent or very little used, as appropriate equipment is needed), the fight against pests and diseases with phytosanitary treatments based on natural products, and the practice of crop and livestock rotation and association.

In terms of value chains and the food system, a number of agroecological practices linked to short circuits, processing and adding value to by-products, and exchanges of knowledge are also present. The project may help to support certain value chains where difficulties have been identified in connection with the processing, storage and sale of products, and to step up the exchange and co-construction of knowledge between the various stakeholders.

The two value chains identified for analysis are dates and olive oil. This choice was validated by the representative board.

3.3.5 Siliana-TN

Governance of the LL

Based on the territorial diagnosis, potential representative board members for the cereal plains LL Siliana-TN will be identified and contacted. A first representative board meeting is foreseen in February 2024. In the last four years, drought lead to partial or complete crop failures in Siliana-TN. For this reason, local stakeholders may lack enthusiasm for engaging in living lab dialogues, but may also consider them as sources of innovative solutions for the challenges they are facing. Multi-stakeholder activities conducted in other LL may be adapted to this particular situation.

Selection of AEPs

A preliminary selection of AEP will be based on the territorial diagnosis and the LL-launch. Experimentation and demonstration may start before all local stakeholders are consulted, as is done in other LL. The extensive experience of Institut National Agronomique de Tunisie (INAT) and Institute National des Grandes Cultures (INGC; involved in T4.5 experimentation and demonstration) in the region and their existing relationships with local partners allows for such a deviation.

3.3.6 El-Boghdady-EG

Governance of the LL

The irrigated plains Living Lab in El-Boghdady, Luxor, is coordinated by the CIHEAM-IAMM. A board with representatives from all stakeholder groups involved in the implementation, has been established. This representative board comprises local and administrative authorities, the University of Aswan, extension services, national and international NGOs working on agroecology, representatives of different types of agriculture in the Luxor area. The representative board will meet approximately 2-3 times per year at a convenient location in Luxor or online to discuss combinations of AEP aiming to address the complex socio-economic, environmental, and institutional issues of the examined area. The representative board is responsible for validating planned activities and is also involved in their organization (workshops, training, studies, field visits, monitoring, etc.). Planned activities within the project are discussed in advance between the responsible parties in various work packages and the CIHEAM-IAMM.

Selection of AEPs

Following the territorial diagnosis and the launch of the LL, identified AEPs included: long-rotation, soil moisturizing conservation practices, adoption of salinity-resistant varieties, and raised bed cultivation.

Around twenty farmers will be supported until the project's completion to experiment and assess AEP in their production systems. The identified AEPs aim to address production constraints faced by farmers in their fields as well as to address their socio-economic and institutional issues. Following this, support will be provided to these farmers to gain access to new markets or to better capitalize the existing value chains.

The CIHEAM-IAMM together with the representative board will facilitate the interactions among the different stakeholders involved. Moreover, CIHEAM-IAMM will be responsible to provide interim and final results and reports regarding the progress of AEP adoption as well as to monitoring the implemented activities.

Discussions on the preselected value chains have begun. During the LL launch workshop, sugarcane and cereals were proposed by the stakeholders. However, the final selection will be performed with the launch of Task 3.2 in Egypt by the end of 2023 or early 2024.

3.3.7 Overview and synthesis of AEP in the NATAE LL

Based on the preliminary roadmaps, a diverse set of AEP at farm level are identified in each LL (Table 5). In all LL, there are AEP at farm level related to improving water use efficiency, soil fertility and crop diversity. For improving water use efficiency, it is not always clear yet, which specific options are needed (PK17-MR, Ouislane-MA, Skoura-MA, Lagouat-DZ). In El-Boghdady-EG, the adoption of salinity tolerant varieties of surgarcane and cereals are mentioned. Adoption of such varieties would provide water-saving irrigation options for farmers. In El-Boghdady-EG, also soil moisturizing conservation practices and raised bedding of crops are proposed to improve water use efficiency. These relate also to improved soil fertility and dealing with slopy land, respectively. In all other LL, application of manure and compost are proposed to improve soil fertility, but this

will also affect water use efficiency. Improving crop diversity is addressed by adapted (longer) rotations (all LL) and crop associations (all LL, except LL-Boghdady-EG). In Skoura-MA, agroforestry was specifically mentioned as an AEP to build associations between fruit trees and medicinal plants. Pest control was mentioned in four LL: phytosanitary treatments based on local and natural products (PK17-MR and Laghouat-DZ), biological weed and pest control (Ouislane-MA), integrated pest management (Skoura-EG).

AEP at the value chain level were mentioned in four LL: promotion of agroecological products in growth markets (PK17-MR, Skoura-MA, Laghouat-DZ) and short circuits markets (Ouislane-MA, Laghouat-DZ). These proposed AEP address the specific value chains identified for further study in the context of WP3, but they do not support directly the implementation of a specific AEP mentioned at farm level (Table 5). This observation requires specific reflection on the concept of AEP combinations and its implementation in the LL.

Preliminary ideas on which actors should be involved for each proposed AEP are proposed in all LL. Regarding the indicators to use, Ouislane-MA and Skoura-MA propose indicators related to the adoption rate of AEP in terms of number of famers and area. All AEP at farm level are proposed to be studied in a farmer field school experiment. For the AEP at value chain level, no specific option for experimentation or demonstration is mentioned yet. (Table 5)

Table 5. Overview of AEPs per LL.

LL	AEP	Level (field, farm, farming system, value chain)	Which specific value chain(s) is/are targeted by the AEP?	Which actors are involved directly?	Which indicators will be used?*	What type of experimentation is needed to test the AEP?
PK17-MR	Efficient water management	Farm	All	Farmers, …	…	Farmer field school experiment
	Improve soil fertility; use of manure & compost	Farm	All	Farmers, …	…	Farmer field school experiment
	Phytosanitary treatments based on local, natural products	Farm	All	Farmers, …	…	Farmer field school experiment
	Crop rotation and association	Farm	All	Farmers	…	Farmer field school experiment
	Promotion of AE products at the level of certain growth markets	Value chain	Bulb onion and turnip	Farmers, intermediaries, retailers, canteen, etc.	…	Cf. Memorandum of Cooperation
	Agroecological infrastructure against sand winds such as trees edges (agroforestry)	Farm and LL levels	To be determined, if relevant	Farmers,	...	Farmer field school experiment
Ouislane-MA	Organic fertilization,	field, farm	Vegetable	Farmers	Number of farmers using organic fertilization Number of farmers transiting to organic fertilization	Farmer field school experiment
	Crop diversification through crop association and rotation,	field, farm	Vegetable	Farmers	Number of farmers practicing crop association/rotation Number of farmers transiting to practicing crop association/rotation Area (ha) using crop association/rotation	Farmer field school experiment
	Agroforestry,	field, farm	Vegetable	Farmers	Number of farmers practicing agroforestry Number of farmers transiting to agroforestry	Farmer field school experiment

					Area with agroforestry (ha)	
					This table continues on the next page	
Ouislane-MA	Efficient use of water,	field, farm	Vegetable	Farmers	Number of farmers using efficient irrigation Number of farmers transiting to efficient irrigation	Farmer field school experiment
	Biological weed and pest control for plant protection	field, farm	Vegetable	Farmers	Number of farmers using biological weed and pest control Number of farmers transiting to biological weed and pest control	Farmer field school experiment
	Short circuits marketing	Value chain	Vegetable	Farmers, NGO	Number of farmers accessing short circuit marketing Volume of goods (in kg) marketed through short circuit Number of agroecological products supply contract linking LL farmers to individual or collective (hotels, school…) consumers	Cf Memorandum of Cooperation
Skoura-MA	Organic fertilization,	field, farm,	Olive and fruits trees orchard	Farmers	Number of farmers using organic fertilization Number of farmers transiting to organic fertilization	Farmer field school experiment
	Organic fertilization,	field, farm,	Aromatic and medicinal plants (saffron, lavender, sage, origanum and rosemary)	Farmers Women cooperative	Number of farmers using organic fertilization Number of farmers transiting to organic fertilization	Farmer field school experiment
	Crop diversification through crop association and rotation,	field, farm,	Olive and other fruit trees, legumes cereals and aromatic and medicinal plants	Farmers Women cooperative	Number of farmers practicing crop association/rotation Number of farmers transiting to practicing crop association/rotation Area (ha) using crop association/rotation	Farmer field school experiment
					This table continues on the next page	

Skoura-MA	Agroforestry (fruit trees associated to medicinal and aromatic plants)	field, farm,	Olive or other fruit trees, legumes cereals and aromatic and medicinal plants	Farmers and Women cooperative	Number of farmers practicing agroforestry Number of farmers transiting to agroforestry Area with agroforestry (ha)	Farmer field school experiment
	Efficient use of water	field, farm,	Olive or other fruit trees, legumes cereals and aromatic and medicinal plants	Farmers and Women cooperative	Number of farmers using efficient water management techniques	Farmer field school experiment
	Integrated pest control for plant protection	field, farm,	Olive or other fruit trees, legumes cereals and aromatic and medicinal plants	Farmers and Women cooperative	Number of farmers using natural or biological pest control methods Number of farmers transiting to integrated pest-control	Farmer field school experiment
	Promotion of AE products at the level of certain growth markets	Value chain	Olive oil Aromatic and medicinal plants	Farmers, retailers, niche markets, etc.	Number of farmers/women accessing niche market Volume of goods (in kg) marketed through short circuit	Cf. Memorandum of Cooperation
Laghouat-DZ	Efficient water management	Farm	All	Farmers, …	…	Farmer field school experiment Training Acquisition of specific equipment (remote-controlled sensors)
	Improve soil fertility; use of manure & compost	Farm	All	Farmers, …	…	Farmer field school experiment Acquisition of specific composting equipment (shredder)

This table continues on the next page

Laghouat-DZ	Phytosanitary treatments based on local, natural products	Farm	All	Farmers, …	…	Farmer field school experiment
	Crop rotation and association	Farm	All		…	Farmer field school experiment
	Promotion of AE products at the level of certain growth markets	Value chain	Dates and olive oils	Farmers, transformers, oil factory, consumers…	…	Cf. Memorandum of Cooperation ...
El-Boghdady-EG	Long-rotation	Farm	Sugarcane/cereals (to be confirmed)	Farmers, government, NGOs, extension services	….	Farmer field school experiment
	Soil moisturizing conservation practices	Farm	Sugarcane/cereals (to be confirmed)	Farmers, government, NGOs, extension services	…	Farmer field school experiment
	Adoption of salinity-resistant varieties,	Farm	Sugarcane/cereals (to be confirmed)	Farmers, government, NGOs, extension services	….	Farmer field school experiment
	Raised bed cultivation	Farm	Sugarcane/cereals (to be confirmed)	Farmers, government, NGOs, extension services	……	Farmer field school experiment

*By the time of writing this milestone report, the selection of indicators will be based on the choice of researchers involved. Indicators could relate to the adoption and performance of AEP. This issue will be addressed under sub-section 4.2.

3.4 MEDAE network

3.4.1 Objectives and focus zone

The MEDAE network has three main objectives :

- Stimulate collaboration and projects between different stakeholders working to develop agroecology in the Mediterranean
- Promote the exchange of information, knowledge, solutions and experience between network members
- Represent Mediterranean agroecology stakeholders at international level and develop political advocacy in favour of agroecology.

The network focuses on regions of the Mediterranean basin that share common agricultural characteristics (representative Mediterranean crops), common environmental constraints (drought, exacerbated climate change, etc.) and similar socio-economic challenges (population growth, urbanization, land pressure, etc.). The network will be gradually structured in at least two phases. MEDAE will initially focus on agroecology in countries hosting Living Labs and Replication Labs (Mauritania, Morocco, Algeria, Tunisia, Egypt, South Africa). Activities will then be extended to at least the other countries around the Mediterranean (North Africa, Southern Europe, Middle East).

3.4.2 Membership

Network's members have no restrictions on their physical location as long as they are interested in agroecology in the Mediterranean. Members are organizations represented by focal points and may have several participants. MEDAE members are grouped into four boards: Board A "Technical, education and research institutes "; Board B "Development and experience-sharing organizations"; Board C "Local stakeholders"; Board D "Political organizations and individual experts". To join the network, members will need to endorse of the network's framework documents (operating principles, shared principles of agroecology, benefits and commitment of members) and appoint a focal point. The network's ambition to reach 70 members by the end of 2026 requires an active process of 'recruiting' new members.

3.4.3 Governance

MEDAE will remain an informal network with a steering committee, host and coordinating organization and an annual meeting.

Steering committee: Only members of board A, B and C take part in steering and decision-making processes. Maximum 3 representatives per board (A, B and C) will be elected by their peers to be in the steering committee, with geographical representativeness and gender parity. steering committee is elected for 3 years. Representatives will meet at least every 4 months and are in charge to monitor MEDAE activities and ensure they are in line with the network's strategic plan; to validate the budget; and to examine and validate membership applications.

Host and coordinating organizations : The network is hosted by a long-term host organization, responsible for its administrative and financial management. A coordinating organization (which may rotate every 3 years) will be in charge of leading and coordinating the network's activities.

Annual meeting : An annual meeting will be organized with all MEDAE members to review the past year's activities and present the strategy for the coming year

3.4.4 Activities

A minimum of two working groups will be set up in the first year: Membership WG and Advocacy WG. Other WGs may be set up: communication, exchange of practices, fundings.

Some activities will be organised at the initiative of the working groups and other cross-cutting activities will be organised by the coordinator.

The first main activity has been the organization of five webinars on topics that relate to the five main types of farming systems that are represented by the LLs. These webinars have been very successful, with participation between 40 to 155 participants, and a total of 415 participants (and more than 1100 registrations), (Table 6).

Table 6: Attendance to the 5 MEDAE webinars (autumn 2023)

Date	Topic	Registered	Participants
24/10	How to enhance the role of women in **mountain agroforestry** systems in North Africa ?	74	40
09/11	How can we promote the development and marketing of agro-ecological products in **peri-urban areas** ?	241	98
23/11	Between traditional and scientific knowledge, how can we improve the resilience of **peri-oasis systems ?**	143	62
07/12	Climate change: a catalyst for the agro-ecological transition of **cereal crops** in North Africa ?	451	155
14/12	The agro-ecological transition as seen by stakeholders in the field: between challenges and achievements. The case of the **irrigated valley** of Luxor, Egypt.	202	61

3.4.5 Communication and economic model

The network will communicate in French and English. Tools for internal and external communication for MEDAE will be set up in the following months, including mailing lists, website and social network, graphic charter. The network should have found sources of funding by the end of the NATAE project in 2026. Membership fees, along with external public or private funding are possible contributions.

Chapter 4

Discussion

Chapter 4 – Discussion

4.1 Governance

4.1.1 Points of attention and next steps regarding LL governance

From spring 2023 onwards, LL-leaders have been very busy with organizing the territorial diagnosis, the Living Lab launches and other NATAE-project obligations. In the time ahead until June 2024, LL-leaders are expected to stay busy with stakeholder activities in the context of:

- T2.1/T4.2 “farm household survey and modelling”: a stakeholder workshop and a farm household survey in early 2024; potentially some extra workshops or focus group discussions in the context in case not all necessary information can be drawn from the farm household survey.
- T4.3 “value chain analyses”: at least one consumer survey (T3.1 consumer study; early 2024), training workshop (T3.1 D3.1 - Memorandum of Cooperation; early May), participatory activities (T3.2; until February 2024), a farmer survey and focus group discussions (T3.3; summer 2024 onwards, under definition) and interviews with value chain actors (T3.2; January-May 2024).
- T4.4 “selection of AEP, indicators and scenarios”: at least one farmer workshop and two representative workshops in early 2024.
- T4.5 “experimentation and demonstration”: at least one farmer workshop and one representative board meeting in early 2024, and setting up participatory experiments as soon as possible after these workshops.
- Work on integrating T4.4 and T4.5 is ongoing.
- WP6: a workshop with farmers and value chain actors in 2024.

To work on a common understanding of systems thinking, the appropriation of accompanying methodologies, and collectively define and delineate the systems at stake in each LL, WP2 and 4 will organize an in-person meeting in April 2024 with LL-leaders. Building scenarios and using model results in participatory settings amongst others will be on the programme. The in-person-meeting will be focussing on the exchange of knowledge, experience and (disciplinary) perspectives off all involved andis expected to lead to better communication about, co-creation of, and appropriation of new systems thinking methodologies applied in the projectRepresentative board members have committed to several meetings per year (generally minim, which ensures stakeholder participation.

Representative board members have equally committed to taking a leading role in shaping the LL, ultimately leading to self-organization (in the ideal case). Such a role makes it interesting for board members to participate. It also reduces the workload for LL-leaders if decision making can be increasingly transferred to board members. Hence, we anticipate important decision making moments during representative board meetings.

Currently, such decision making could be impeded by an imbalance in participation by different stakeholder groups. NGOs, for instance, the private sector and the consumers were not represented much during the first representative board meetings, while government organization were (Table 2). Participation of farmers in the first representative board meeting varied across LL. LL-leaders should stay aware and act to obtain and preserve a balanced representative board in terms of representativeness for all stakeholder groups involved.

In addition, the NATAE project management stimulates LL-leaders continuously to mobilize their local expertise. LL-leaders are asked to express their role in the roadmap towards an agroecological transition. In some preliminary roadmaps LL-leaders express this already and this will be improved in the next version. Another point of attention for the updated roadmaps is the need to explicitly mention the role and implementation of a Memorandum of Cooperation (MoC) and/or a Participatory Guranatee System (PGS). MoC and/or PGS are value chain level AEP strengthening the valorization of agroecological products and an official output/outcome of NATAE (as D3.2 in the project).

The LL NATAE lead is composed of a team of multidisciplinary researchers and professionals, with specific functions such as leader, animator, event organizer. Team composition and roles are dynamic and differ between LL. No formal overview is available yet, but it will be created to better understand and support individual LLs.

In Tunisia, Morocco and Egypt, LL-leaders are also RL-leaders. This implies that RL should be enabled to start later (e.g. Tunisia), or delegate work to different team members or organisations (e.g. Egypt). Content-wise, RL could also opt for lighter or heavier methodologies regarding the replication of tools and results from LL. Time-wise and content-wise we envision a flexible approach.

4.1.2 Points of attention + next steps for MEDAE governance

The next steps, once the final version of the guidelines has been approved by the consortium, will focus on the official opening of the MEDAE network. For this, the registration form must be finalized as well as the MEDAE framework documents: Benefits and commitments of MEDAE members, Network operating principles, Shared principles of agroecology, and Action plan. This will be done in conjunction with the membership working group and, where appropriate, the communications working group.

Pending the formation of the steering committee, decisions will be taken by a restricted interim committee made up of the NATAE coordinating partner (CIHEAM IAMM) and the partner responsible for setting up and running the network (CARI). The advisory board can also be consulted and involved in decision-making. The process of setting up the steering committee will be launched in the coming months conform the original aim of having an active steering committee within a year.

Finally, an important issue will be to communicate widely on MEDAE activities and to make the MEDAE network known to organizations, to reach the objectives of having at least 70 members, of which 20 in Europe and 50 in North Africa, including at least 20 research institutes and 15 NGOs. A working group dedicated to the "recruitment" of new members is planned to meet this objective.

4.1.3 Opportunities and constraints for integration LL in MEDAE

NATAE project management (IAMM) will stimulate active participation of LL-leaders and RL-leaders in online seminars from MEDAE. So far, five webinars have been organized to which all LL- and RL-leaders were invited. Cross-visits in the context of T4.8, primarily organized for LL-leaders, will further stimulate the integration of LL in a wider network of North African regions working on an agroecological transition.

In NATAE, exchanges between LL and RL with similar production systems are foreseen. We started this exchange in the week of 16-20 October already, also to gauge the interest of RL-leaders to adopt methodologies that have been applied in the LL so far.

4.2 Identifying AEPs and building roadmaps

A first selection of promising AEP is presented in the reports on the territorial diagnosis and LL-launches. A first attempt has been made to include these in a roadmap, but some essential elements still need to be precised . In the sub-sections below, next steps until summer 2024 are detailed per work package.

4.2.1 Participatory activities (WP4, WP6)

In early 2024, the farm household characterization and survey will be conducted to capture the existing diversity of farm households in the different LLs. This information will help to identify farm household type specific AEPs.

The specification and selection of AEPs will be conducted in the context of T4.4 in January/February 2024 at two levels: the farm level and the LL-level.

1. A list of four to five specific and complementary AEPs at farm level will be prepared by LL-leaders, taking the preliminary roadmaps as a basis.
2. These AEPs at farm level will be the starting point of discussion in farmer workshops[9]. The final selection of AEPs at farm level will be based on stakeholder interests expressed during the workshop. AEPs may be tailored to specific farm types during the workshop. These AEPs will serve as input for the representative board.

In the preliminary roadmaps, AEP at value chain level align with AEP at farm level in the sense that they address the same crops. This only provides indirect support to AEP at farm level.

[9] The Living Lab Guidelines (D4.1) propose to start with an evaluation of importance and performance of indicators to address possible differences in how farmers perceive the issues at stake and the general problem definition. However, such an approach is probably too abstract, risking the much-needed concreteness and specificness that is currently lacking in the roadmaps. Based on participation of farmers so far in the LL-launches, we (safely) assume that farmers more or less agree on the problem definition, but might differ in opinion about the best solutions to address the problem. Because of the variety of stakeholder groups in the representative board, we do expect differences in perceptions on the main issues at stake. Hence, we will use a list of possible solutions as a starting point for discussion in farmer workshops, while in the representative boards, the starting point of discussion will be related to defining the purpose and sustainability issues of the farming system.

Further alignment should be sought by proposing AEP at LL-level that directly support AEP at farm level. This notion of AEP at LL level needs be further developed, illustrated and discussed with LL leaders and team, as it is extremely context-dependant.

The idea lagging behind this difference made between AEP at farm and LL level, is to identify potential for / to develop AEP combinations that relate farm choices to existing ecosystems and water management collective practices, to institutional frameworks or potential agroecological value chains. As the search of an optimal combination of AEPs, i.e. the main objective of NATAE, this way forward is interesting to explore.

- On the basis of stakeholders' farm level AEP selection, the representative board will identify and choose AEPs at LL-level. Those AEPs at LL-level should align with the AEPs at farm level.

The search for an optimal combination of AEPs is a scientific and practical challenge, not the least for LL-leaders guiding the LL process. In consultation with the representative board, their experience and knowledge of the local conditions will play a key role in defining optimal combinations of AEPs. Developing a common understanding on systems thinking and the systems at stake in each LL (as proposed in section 4.1.1) will support the identification of synergies and trade-offs between AEPs. It will also help to keep an eye out for the 'missing pieces' that turn a mere shortlist of AEPs into an optimal combination of complementary practices.

In the preliminary roadmaps, indicators are proposed in some LL regarding adoption rates of AEP (number of farmers and area covered). For the assessment of the sustainability of AEP, also indicators are needed that specifically enable the assessment of the performance of AEP. For instance, production costs for economic performance, labour intensity specified per gender for social performance, and water use efficiency for environmental performance. In both the farmer workshops and the representative board meetings of T4.4, locally supported indicators tailored to the local conditions will be identified to measure the performance of the selected AEPs. Preliminary guidelines will be provided to LL-leaders in December 2023.

The AEPs at farm level will be tailored to the farm household types in farmer workshops in the context of T4.5 in February/March 2024. On-farm experimental designs will be developed with farmers to acquire high quality data and to ensure dissemination of promising AEPs. The preliminary roadmaps indicate that these experiments will be conducted within the context of farmers field schools. Farmers will be trained to collaborate with researchers in monitoring and evaluating their experiments. This will enable them to further adapt and improve AEPs to their own benefits, and possibly in a next season of experimentation.

These works on farm level; LL level AEP selection are related to the forthcoming experimentations in the LLs (T4.5) and the design and assessment of policy options to foster AE implementation (WP6).

- For example, T4.5 will foresee in testing the baseline conditions for agroecology, i.e. testing soil and water quality for toxic elements and assessing the surrounding landscape. These baseline conditions will help defining appropriate experimentations and

will inform LL-leaders on the choice for a MoC, which doesn't require full compliance with agroecological principles or a PGS where full requirement is necessary.

- In the context of WP6 (EU-compliant policies), several workshops will take place. These workshops will not include important decision-making moments for local stakeholders. However, they will be key in supplying information to the value chain model that can evaluate the impact of AEPs at value chain level and evaluate policy options.

4.2.2 Framework (WP1)

On one hand, in NATAE, the definition of agroecology in the North African context has to develop through the LL dialogues on site between LL-actors and researchers on a transdisciplinary basis (communication process with local stakeholders, academic quality).

On the other hand, the NATAE report on agroecological indicators (D1.1) provides an overview of existing frameworks and indicators referering to agroecologic assessments, and aims at identifying and missing elements through the consortium participatory process (T1.4).

Guidelines are also being developed for T4.4 to allow means for comparative assessments with other forms of agriculture, e.g. conventional agriculture, and they propose a hierarchical framework for selecting local indicators per LL.

4.2.3 Modelling (WP2,3,6)

Modelling is foreseen to support the decision making regarding the implementation of specific AEPs and supporting policies. Different scenarios will be constructed by LL-leaders and representative boards in each LL to study the performance of AEPs under different possible conditions (e.g. economic, climate, institutional). WP-, task- and LL-leaders will exchange with one another to co-construct scenarios.

Supported by modelling, identified AEPs in LLs will be tested in RLs. The application of the model to each RL depends on data availability, time and capacities of RL-partners and the type of AEPs that will be tested. The AEPs from LLs will be a starting point for RLs. RLs can tailor the identified AEPs to the specific conditions. In case of complete incompatibility, RLs are free to put forward their own AEPs. In the context of T2.4 and T4.7, a preliminary concept note presents how modelling and other NATAE LL-activities could be implemented in a RL (Appendix A). This concept note will be further developed in December 2023/January 2024.

4.3 Monitoring matrix

The development of stakeholder networks in each LL serves the co-design of LL-specific AEP. For the co-design process, different (research) activities are planned (Table 6). During these activities, important input providing and decision making moments by local stakeholders are foreseen that influence the co-design process (Table 6).

Table 6. NATAE monitoring matrix regarding actvities and decision making.

NATAE-task	Activity	Input for decision making provided	Who provided input?	Decisions (to be) made (Task)	Who made/will make the decision	Decision made? (Y = Yes, N = No, NA = Not Applicable)						Previsional timing over the decision	Further actions
						PK17-MR	Ouislane-MA	Skoura-MA	Laghouat-DZ	Siliana-TN	El-Boghdady-EG		
4.2	Territorial diagnosis	Overview of relevant actors	Researchers	Invitation of representative board members (T4.2)	LL-leader	Y	Y	Y	Y	N	Y	September/October 2023 (January for Siliana)	-
4.2	Territorial diagnosis	Overview of possible AEP	Researchers	Which persons/organizations to interview	LL-leader	Y	Y	Y	Y	Y	Y	June-September 2023 (September-November for Siliana)	Include possible AEP in preliminary roadmaps
3.2	Value chain analysis	NA	NA	Preliminary selection value chains for analysis	Researchers + LL-leader	Y	Y	Y	Y	N	Y	September/October 2023 (January for Siliana)	Reflect on this during LL-launch
4.2	Representative board meeting 1	NA	NA	Signing consent forms	Representative board	Y	Y	Y	Y	N	Y	September/October 2023 (January for Siliana)	-
4.2	Representative board meeting 1	Semi-final code of conduct	LL-leader	Co-creating code of good conduct	Representative board	Y	Y	Y	Y	N	Y	September/October 2023 (January for Siliana)	Semi-final and final versions shared with representative board and uploaded to the cloud
4.2	LL-launch	Prioritization of AEP based on transect walk	Farmers, representative board, others present	NA*	NA	NA	NA	NA	NA	NA	NA	During workshops of T4.4 in January 2023 (timing tbd for Siliana)	Start thinking about experimentation & demonstration (ICARDA+LL-leader; T4.5)
4.2	LL-launch	Reflection on selected value chains	Farmers, representative board, others present	Final decision on which value chains to select	LL-leader in consultation with representative board	N	Y	Y	Y	N	N	September/October 2023 (February for Siliana)	Re-evaluate value chain selection and communicate back to participants
3.2	Final selection value chains	Extra reflections on selected value chains	LL-leader	Final decision on which value chains to select	LL-leader in consultation with representative board	Y	NA	NA	NA	NA	N	November for PK17 and January for El-boghdady	Communicate final decision with farmers and other stakeholders
4.2	Create preliminary roadmaps	Results territorial diagnosis and LL-launch	LL-leader	Preliminary selection of AEPs	LL-leader	Y	Y	Y	Y	N	Y	October/November 2023 (January/February for Siliana)	Gradually improve roadmaps; Start thinking about experimentation & demonstration (ICARDA+LL-leader; T4.5)

This Table continues on the next page

4.2	Farm typology construction	Farm functional and structural characteristics	Local experts, amongst others from the representative board	Preliminary farm typology	LL-leader	N	N	N	N	N	Y	January 2023 (June 2023 for El-Boghdady; December 2023 for Laghouat)	Implement household survey and enrich the farm typology
4.2	Farm household survey	Overview of farmers in the area to select 3-5 farmers per identified farm type	Local governments and NGO's	Selection of farm households for the survey	LL-leader	N	N	N	N	N	Y	January/February 2023 (June 2023 for El-boghdady)	Based on survey results, enrich farm typology and discuss it with stakeholders
4.2	Farm typology improvement + confirmation	Results from farm household survey	Farmers	Agreeing on final farm types	LL-leader in consultation with farmers and the representative board	N	N	N	N	N	N	February 2023	
4.3	Consumer survey	-	-	Selection procedure of respondents	LL-leader	N	N	N	N	N	N	First half 2024	
4.4	Farmer workshop on AEP + indicators	Shortlist of four to five specific AEPs Indicators to measure performance of AEPs	LL-leaders based on inputs from all actors Farmers	Selection of locally important indicators and farm-level AEP	Farmers	N	N	N	N	N	N	January/February 2024 (March for Siliana)	Use farm-level AEP as starting point for LL-level AEP.
4.4	Representative board workshops on AEP + indicators	AEP: farm-level AEP from farmer workshop T4.4	Farmers	Selection of locally important indicators, and AEP at LL-level	Representative board	N	N	N	N	N	N	January/February 2024 (March for Siliana)	
4.4	Representative board workshops on scenarios	AEP: farm-level AEP from farmer workshop T4.4	Farmers	Selection of locally important scenarios at LL-level	Representative board	N	N	N	N	N	N	April/May 2024	
4.5	Farmer workshop on farm-level AEP experimentation & demonstration	Farm-level AEP from farmer workshop T4.4	Farmers	Designing farm-level AEP-experiments/demonstrations	Farmers + LL-leader	N	N	N	N	N	N	February/March 2024 (April for Siliana)	
4.5	Representative board meeting on LL-level AEP experimentation & demonstration	LL-level AEP from representative board workshop T4.4	Representative board	Designing LL-level AEP experiments/demonstrations	Representative board	N	N	N	N	N	N	February/March 2024 (April for Siliana)	

*No decisions were made during the LL-launch, but bottom-up required information during this event was used to inform the LL-leader for writing the preliminary roadmaps and proposing a shortlist of four to five specific AEP during the farmer workshop of T4.4.

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Appendixes

Appendixes

Appendix A. the Synthesis of the diagnoses

Les pratiques agroécologiques en Afrique du Nord :

Résultats de 5 études diagnostic.

Rapport de Synthèse

Ali Daoudi

1. Introduction

L'équation alimentaire dans les pays de l'Afrique du Nord est très complexe et les options adoptées par ces pays pour garantir son équilibre, sont fragiles. Tous les pays de la région enregistrent des déficits agricoles structurels, notamment pour les produits alimentaires de base comme les céréales. Un déficit qui ne cesse de se creuser sous l'effet d'une demande croissante et d'une production locale qui peine à augmenter, voire qui régresse sous l'effet du changement climatique. Le recours à l'importation constitue donc un élément structurel de l'équilibre de l'équation alimentaire globale dans ces pays.

Dans ce contexte, la question de la transformation des systèmes alimentaires des pays de la région apparaît comme un impératif. Dans quels sens cette transformation doit s'opérer, quelles sont les dimensions de ces systèmes alimentaires qu'il faut repenser et comment y parvenir, c'est là des questions qui restent à explorer. Pendant des décennies, la voie de l'intensification de la production agricole et de la modernisation des autres maillons du système alimentaire (transformation, distribution, commercialisation), au sens de leur industrialisation et concentration, ont été les seules options envisagées et promues par les politiques publiques pour garantir leur sécurité alimentaire. Dans le secteur agricole, les résultats des politiques d'intensification sont mitigés, notamment par leur échec à promouvoir une agriculture pluviale performante et résiliente aux variations climatiques qui caractérisent la région.

Le projet NATAE est fondé sur le postulat que l'agroécologie peut constituer l'une des voies potentielles pour renforcer les systèmes alimentaires dans la région et consolider leur résilience aux multiples risques systémiques, notamment le changement climatique. Pour explorer les apports potentiels de l'agroécologie à l'agriculture des pays de l'Afrique du Nord, le projet a fait le choix d'étudier les systèmes de production agricoles dans différentes zones agroécologiques avec leurs systèmes et spécificités naturelles et socioéconomiques. Ainsi, les plaines céréalières, les zones de montagne et les oasis des pays du Maghreb sont retenues comme sites d'étude par le projet. Pour chacune de ces zones agroécologiques, un site ou deux sont retenus dans chacun des pays ciblés par le projet pour y examiner l'état des pratiques écologiques existantes et explorer la faisabilité et les conditions pour promouvoir des dynamiques locales de transition agroécologique.

Dans premier temps, l'effort du projet sera concentré autour de cinq sites devant accueillir les Living Labs ou Laboratoires Vivants du projet . Le premier travail, d'exploration engagé dans ces sites, a été le diagnostic territorial dont l'objectif principal est l'identification des systèmes de productions agricoles à potentiel agroécologique, leurs pratiques agroécologiques et la rationalité de leur adoption par les agriculteurs. La notion

de combinaison de pratiques agroécologiques, proposée par l'appel à projet dont est issu NATAE, a été également mobilisée, mais de façon inégale, selon les sites et les études.

2. Méthodologique : une diversité de choix, malgré un effort de mise en cohérence.

Sur les six sites retenus pour accueillir les LL de NATAE, cinq ont fait l'objet d'étude de diagnostic[10]. Des études réalisées, à l'exception de celles de Laghouat en Algérie, dans le cadre des projets de fin d'études par des étudiants de master recrutés par NATAE.

Pour assurer une certaine cohérence entre ces études et garantir la comparabilité de leurs résultats, une démarche méthodologique de référence a été proposée pour orienter les diagnostics territoriaux. Dans cette démarche (Daoudi, 2023 ; T4.2), le diagnostic territorial est orienté vers l'identification des pratiques agroécologiques, la caractérisation des systèmes de production dans lesquels elles sont adoptées et la caractérisation des chaînes de valeur dans lesquelles ces systèmes de production sont intégrés. Un intérêt particulier est accordé à l'identification des facteurs internes au système et ceux externes, déterminant l'adoption des pratiques agroécologiques par les agriculteurs ainsi qu'à la rationalité globale de ces derniers.

Les cinq diagnostics ont été réalisés, suivant des démarches méthodologiques adaptées par chacune des équipes en fonction de l'état des connaissances déjà acquises sur le territoire et en fonction des priorités arrêtés par chaque équipe de LL. Ainsi, les diagnostics de Boulemen (Maroc) et de Louxor (Égypte) ont davantage été orientés vers la construction de typologie des systèmes de production. Pour les trois autres (Laghouat/Algérie, Nouakchott PK-17/Mauritanie, Ouisslane-Meknès/Maroc), l'étude a principalement portée sur l'identification des pratiques agroécologiques et la caractérisation des systèmes de production. Même si elles partagent le même objet, ces trois études ont été réalisées suivant des cadres méthodologiques relativement différents.

3. Les territoires agricoles retenus par le projet :

Des plaines et montagnes semi-arides, sous climat méditerranéen des parties nord des pays du Maghreb (Tunisie, Algérie, Maroc), aux zones subsahariennes et sahariennes, les sites retenus par NATAE représentent la diversité des agroécosystèmes de l'Afrique du Nord (tableau 1). Le paramètre climatique détermine à lui seul, l'un des caractères clés de l'agriculture dans ces zones, pluvial versus irrigué. Dans les plaines et montagnes semi-arides, les précipitations favorisent une agriculture pluviale (production végétale et élevage) étendue dans l'espace, mais dont la productivité est corrélée aux précipitations et leur variabilité. Dans ces mêmes zones, la présence de sources d'eau pérennes (sources, nappes) ou conjoncturelles (oued), permet le développement d'une agriculture irriguée localisées.

Dans les zones subsahariennes, seul un élevage extensif et transhumant est possible. L'agriculture elle, n'est possible dans ces zones et dans les zones sahariennes qu'autour des sources d'eau (fleuves, oueds, nappes souterraines). En fonction des disponibilités des ressources hydriques, l'agriculture dans les zones sahariennes peut être limitée dans l'espace (oasis traditionnelle) ou étendue (nouvelles zones de mise en valeur).

[10] La sixième étude qui concerne la plaine céréalière de Siliana (Tunisie), n'a pas eu lieu pour des raisons logistiques. Un rapport sur la caractérisation de la plaine, les systèmes de production dominants et leurs pratiques agroécologiques est en préparation par l'équipe du LL local.

Au sein de chacune de ces grandes zones agroécologiques, une diversité de situations biophysiques (microclimat, topographie, hydrogéologie, etc.) et socioéconomiques (densité de la population, urbanisation, niveau de vie, disponibilité d'emplois non-agricoles, etc.) et politiques (aménagement de territoire, infrastructure, politique foncière, subventions à l'agriculture, accès crédit, etc.) déterminent la diversité des agricultures qui peuvent s'y développer. Le choix des sites dans NATAE intègre cette diversité des modèles agricoles, ainsi, l'agriculture périurbaine est représentée à travers deux contextes différents (plaine semi-aride du nord du Maroc et les zones subsahariennes de Mauritanie.

Tableau 1 : Présentation des sites d'études

Critères	**Territoire des LL**				
	Laghouat	**Pk-17 Nouakchott**	**Vallée Ouislane-Meknès**	**Skoura-Boulemen**	**Louxor**
Zones agroécologiques	Subsaharienne	Subsaharienne	Plaine semi-aride	Haute montagne semi-aride	Saharienne
Échelle administrative	Communes de Laghouat et d'El Assafia	Péri-urbain commune de Riyadh	Péri-urbain Commune de Meknès	Commune de Skoura	Villages d'Al-Baghdadi et d'Al-Zanaqatah
Superficie agricole (SAU ha)	12 322	3500		3853	
Modes de conduite (pluviale/ irrigué)	Irrigué (forage profond)	Irrigué (rejet station d'épuration eaux fleuve Sénégal)	Irrigué (source, eau usée) + Pluviale	Pluviale + irrigué (source et oued)	Irrigué (Nil)
Nombre d'agriculteurs	950	570		1500	
Cultures dominantes	Arboriculture fruitière, maraîchages, Blés, fourrages.	Maraîchages	Olivier, céréales, maraîchages, autres arboricultures, fourrages.	Olivier, céréales, maraîchages, autre arboriculture rustique	Blé et Maïs, sorgo, luzerne et canne à sucre.

L'analyse du contexte socioéconomique et naturel des sites des LL permet de dégager quelques éléments importants pour l'appréhension de l'état des systèmes de production agricoles et la compréhension de leur fonctionnement.

Les systèmes de production agricoles sont très différents d'un site à un autre. Les différences structurelles (superficie moyenne des exploitations, moyens de production (matériel agricole, bâtiments, autres investissements productifs)) peuvent s'expliquer par différents facteurs, notamment :

- **Régime foncier**. A travers les études diagnostic, deux principales configurations foncières peuvent être distinguées. La première est relevée à Laghouat et à Nouakchott-PK17, où le foncier relève du domaine privé de l'État. L'accès à ce foncier public se fait par l'attribution par l'État (Laghouat) ou par appropriation privative informelle (PK-17), avec ou sans régularisation ultérieure. A Laghouat, les superficies attribuées par l'État dans le cadre de la mise en valeur

varient de quelques hectares et quelques dizaines d'hectares ; mais c'est davantage les capacités techniques et économiques des agriculteurs qui semblent être le facteur limitant.

- Dans la deuxième configuration, la terre relève majoritairement de la propriété privée et peut être exploitée directement par les propriétaires (Skoura Boulemen, Louxor) ou cédée en faire valoir indirect à des fermiers (Ouislane-Meknès). L'insécurité de l'accès à la terre pour ces derniers peut constituer une contrainte importante. Une insécurité foncière accentuée par la pression urbaine sur les terres de la vallée de Ouislane.
- **Contraintes d'accès à l'eau**. A l'exception du site de Louxor, et dans une moindre mesure Laghouat où les terres agricoles sont irriguées, le manque d'eau constitue une contrainte majeure dans tous les autres sites. Au PK-17, le manque d'eau limite les superficies exploitées à quelques quelques milliers de mètre carré par exploitant en moyenne. A Boulemen, les terres irriguées sont l'exception, l'agriculture pluviale est dominante. Quant à Ouislane, le manque d'eau pousse à l'utilisation des eaux usées non épurées dans la partie basse de la vallée, et oblige à combiner cultures irriguées et cultures pluviales.
- **Pression urbaine.** A l'exception du site de Skoura-Boulemen, principalement rural, les quatre autres sites sont tous plus ou moins intégrés à une aire urbaine d'une ville importante (Louxor 1,3 millions d'habitants ; Nouakchott 900 mille habitants ; Meknès, 600 mille habitants ; Laghouat, 250 milles habitants). Les dynamiques agricoles dans ces sites, sont donc sous une forte influence des dynamiques économiques et spatiale de ces villes. Aux opportunités qu'elles offrent à l'agriculture (proximité des marchés), les villes exacerbent la pression sur les ressources productives (terre, eau, main d'œuvre).
- **Faiblesse des organisations professionnelles.** Les agriculteurs des sites étudiés ne sont que peu intégrés dans des organisations professionnelles (association professionnelle, coopératives) dynamiques qui contribuent à leur créer des opportunités et à les aider à dépasser leurs contraintes structurelles. En effet, à l'exception, des sites de Skoura , et dans une moindre mesure Ouislane et Laghouat, où certains agriculteurs font partie de coopératives d'extraction d'huile d'olive ou de transformation de plantes aromatiques et médicinales, l'action collective organisée ne semble pas très développées dans les sites étudiés.
- **Des marchés agricoles peu structurés.** Les études de diagnostics confirment une connaissance déjà établie. Les marchés agricoles dans la région sont généralement peu structurés ; la distribution des produits agricoles se fait surtout via un système de distribution complexe et composé, de circuits courts, long et moyennement long. A l'exception du commerce des blés, contrôlé par les États, et de celui des produits agricoles destinés à l'industrie de transformation (sucre, lait, huile, tomate de conserve, etc.), les circuits de distribution des produits agricoles sont très atomisés, composés d'un grand nombre de commerçants et d'intermédiaires (grossistes collecteurs, grossistes, détaillants). Les normes de production et la traçabilité de l'origine des produits agricoles sont impossibles dans cette configuration du marché. L'apparence extérieure est le principal signe distinctif de qualité. Les produits issus de l'agroécologie, doivent être vendus à travers des circuits dédiés, à créer, ce qui rend leur développement difficile.

- **Insuffisance de politiques publiques ciblées.** Les études de diagnostic ont souligné l'existence de politiques agricoles plus au moins importante dans chacun des cinq pays ; elles ont également mis en évidence l'absence d'actions ciblées pour toutes les catégories d'agriculteurs. A Ouislane, l'étude montre l'insuffisante intégration de l'agriculture périurbaine dans les dispositifs d'aide au développement agricole que prévoient les politiques publiques (plan Maroc Vert et plan *green generation*). En Égypte, l'étude de Louxor montre que les centres publics chargés de la vulgarisation agricole, ont fait des campagnes importantes sur les options d'adaptation au changement climatique (nouvelles variétés de maïs, installation de brise vent, etc.). Il n'est pas relevé le même effort de vulgarisation pour la réduction de l'utilisation des intrants chimiques. A Laghouat, l'affectation des terres publiques dans le cadre de la mise en valeur n'est pas accompagnée par la diffusion de modèles techniques respectueux de la durabilité des ressources naturelles. Les agriculteurs du PPK-17 ne bénéficient que de très peu d'aide publique, hormis celles distribués dans le cadre des projets de coopération internationale.

Le fonctionnement des systèmes de production agricoles reflète les arbitrages des agriculteurs effectuent pour atteindre au mieux leurs objectifs sous les contraintes que leur impose leur structure et l'environnement économique. Les choix techniques (choix des cultures, des élevages et de leur mode de conduite), sont souvent le reflet des compromis accessibles entre les objectifs des agriculteurs et leurs contraintes. Les résultats des études diagnostics mettent en évidence les difficultés d'accès au crédit, aux intrants et à la main d'œuvre que rencontre les agriculteurs.

Les contraintes de l'environnement limitent les possibilités d'intensification agricole (au sens d'utilisation massive d'intrants chimique et d'équipements agricoles) dans la majorité des sites.

4. Les systèmes de production et les pratiques agroécologiques

Malgré la diversité des contextes agroécologiques et socioéconomiques des territoires étudiés, les systèmes de production identifiés partagent de nombreux points communs, dans leur structure et leur fonctionnement. Ils évoluent tous dans des environnements fortement contraints. Les principales caractéristiques des exploitations étudiées dans les différents sites peuvent être résumées autour des points suivants.

- **Dominance des exploitations de petite taille.** La majorité des exploitations dans les cinq territoires étudiés, sont de taille faible (< 2 ha) à moyenne (< 5ha). Les exploitations de taille supérieure (>10 ha) sont très rares dans les territoires étudiés (Boulemen, Laghouat, Louxor). Les très petites exploitations (< 1 ha) sont majoritaires au PK-17.
- **Polyculture élevage**. A l'exception des exploitations du Pk-17, presque toutes spécialisées dans les cultures maraîchères, la majorité des exploitations des autres sites associent la polyculture et l'élevage. Les exploitations irriguées de Louxor pratiquent toutes une céréale d'hiver (blés) et une céréale d'été (maïs ou sorgo), en plus d'une culture fourragère (luzerne) et l'élevage. C'est le cas aussi de la majorité des exploitations à Ouislane, qui associent les céréales conduites en pluviale à des cultures maraichères irriguées et à l'élevage fermier de petite taille. Généralement, le maraîchage est présent dès qu'il y a de l'eau.

- **Faible niveau d'intensification de la production**. A l'exception des exploitations du site de Louxor, et de celles des périmètres de mise en valeur à Laghouat, la majorité des exploitations des autres sites sont faiblement intensives, au sens de d'utilisation importante d'équipement et d''intrants agricoles industriels (semences améliorées, engrais chimiques, herbicides et insecticides chimiques). Dans certaines exploitations, notamment à Ouislane et au PK-17, les systèmes de production peuvent être très intensif par le travail. Le recours à l'auto-approvisionnement en intrants (semences fermières, fourrages, etc.) et aux travaux manuels y est fréquent.
- **Variabilité de la production et des revenus agricoles.** Les systèmes agricoles conduits en régime pluvial (Boulemen et Ouislane) sont caractérisés par une très forte variabilité de la production et donc des revenus agricoles. La variation des revenus agricoles caractérise également les exploitations qui produisent des cultures maraîchères, dont les prix sont assez volatils sur les marchés (Laghouat, PK-17, Ouislane). L'élevage dans toutes ces exploitations constitue, une source de revenu relativement stable.
- **Importance de la pluriactivité.** Les chefs des petites et moyennes exploitations sont majoritairement des pluriactifs (Ouislane, PK-17 et Boulemen). Ils travaillent, comme salariés agricoles ou dans d'autres secteurs. La pluriactivité des chefs d'exploitation renseigne sur la faiblesse des revenus agricoles et sur le faible niveau d'investissement en travail nécessaire pour faire fonctionner l'exploitation.
- **Importance de l'autoconsommation pour certaines exploitations.** Chez les petites exploitations agricoles et les moyennes, l'autoconsommation constitue une composante importante de l'économie du ménage. Elle influence également les choix des productions.
- **La vente directe et la vente indirecte**. Les pratiques commerciales des exploitations varient considérablement en fonction des volumes de production et de l'occupation du chef d'exploitation. Lorsque les volumes de production sont faibles, la vente directe (au marché du village ou à l'exploitation) est privilégiée. D'autres préfèrent vendre à la ferme leur récolte aux petits commerçants, collecteurs, ou aux grossistes, lorsque les volumes sont plus importants.
- **Diversité des profils des agriculteurs.** Les agriculteurs dans les territoires étudiés n'ont pas tous une trajectoire professionnelle classique (aide-familiale/ouvrier agricole- métayer/fermier). Au PK-17 et à Laghouat, les exploitants d'origine urbaine ne sont pas rares. Généralement, leur capital expérience est faible et leur expertise technique également.

De ces caractéristiques et au-delà de cette diversité, se dégagent quelques traits communs aux systèmes de production agricoles dominants dans les territoires étudiés. Autour de ces traits, nous proposons la typologie générique suivante :

- L**es exploitations de taille moyenne à potentiel d'intensification limité** par des contraintes naturelles structurelles (absence d'eau d'irrigation et variabilité des précipitations). Ce type est représenté par des exploitations à Boulemen et peut également être observé dans les plaines céréalières de Siliana (Tunisie). Étant donné que le climat est le facteur le plus déterminant de la production agricole dans ce type de système, la fonction-objectif des exploitants qui les gèrent

peut-être formulée comme suit : « **stabiliser le revenu agricole par la maîtrise des coûts** ». Le recours à des pratiques qui pourraient être qualifiées d'agroécologiques se justifie par un calcul économique axé sur la maîtrise des coûts.

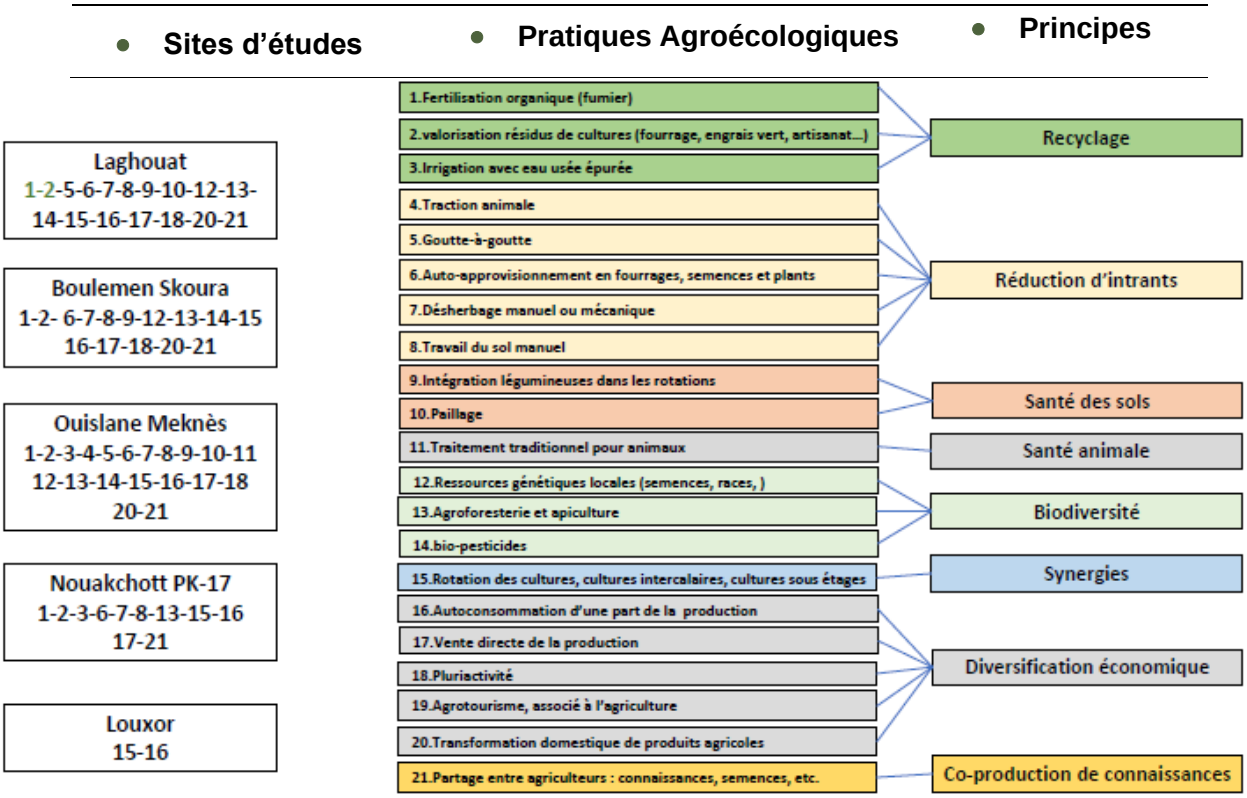
- **Les exploitations de taille moyenne avec un potentiel d'intensification** (Laghouat ; Ouislane, Louxor). Ces exploitations bénéficient généralement d'un accès fiable à l'eau d'irrigation, leur permettant ainsi de s'engager dans un processus d'intensification capitaliste de leur production agricole. À court terme, elles sont davantage influencées par les variations des prix sur les marchés que par le changement climatique. La rationalité des chefs d'exploitation peut être formulée autour de l'objectif suivant : "**optimiser le revenu par une intensification raisonnée**". Le choix des cultures et des pratiques techniques est réfléchi dans le but de réduire les risques liés au marché. Cette rationalité se traduit par une stratégie consistant en : 1) la diversification des cultures, avec l'introduction d'une culture dont le marché est stable (céréales), en complément des cultures lucratives (maraîchage et arboriculture), et 2) la réduction de l'utilisation de certains intrants coûteux ayant un faible impact (réel ou présumé) sur la production.
- **Les exploitations de petite taille orientées vers le marché**. Ce type d'exploitations, malgré leur petite taille, présente un potentiel d'intensification, notamment grâce à l'irrigation. On les retrouve dans les sites de Louxor, Ouislane, Pk-17, et Boulemen. Confrontés aux contraintes liées à la taille de leurs parcelles et aux difficultés financières, les chefs de ce type d'exploitation ont comme objectif :« **l'augmentation de la production et du revenu, dans les limites des moyens disponibles** ». Les ressources limitées imposent des choix techniques spécifiques, tels que l'utilisation de semences autoproduites, la restriction de l'usage d'engrais chimiques et de pesticides, ainsi que le recours au désherbage manuel.
- **Les exploitations de petite taille orientées vers l'autoconsommation.** Ce sont des exploitations familiales vivrières, qui dégagent peu d'excédents pour le marché. Elles sont identifiées à Ouislane et Boulemen et dans une moindre mesure au PK-17. L'objectif assigné à ces exploitations est de contribuer à l'approvisionnement du ménage en produits alimentaires, au moindre coût possible. Le recours aux intrants achetés est limité au maximum et la mobilisation des ressources locales gratuites est privilégié.

Les systèmes de production agricoles dans les territoires des LL sont soumis à de fortes contraintes, naturelles, et ou socioéconomique. Dans ce contexte, le recours à des pratiques agricoles qui peuvent s'apparenter aux principes de l'agroécologie s'intègre davantage dans une logique d'adaptation aux contraintes qu'à un choix délibéré de révision de leur modèle agricole dans une perspective de préservation de l'environnement, de protection de leur santé et celles des consommateurs et ou de promotion de pratiques socialement plus équitables.

Les diagnostics ont permis de recenser une liste importante de pratiques agricoles qui peuvent être assimilées à l'agroécologie selon les principes de cette dernière (figure 1). Ces pratiques exprimées en des termes

génériques dans la figure 1, peuvent se décliner sur le terrain à travers une multitude de variantes fortement indexées localement.

Figure 1 : Résumé des pratiques agricoles identifiées dans les territoires des LL



Pour le cas de l'Egypte, on peut signaler des pratiques spécifiques liées à la salinisation des sols comme le recours à des variétés résistantes ainsi que les culture surélevée (qui permet aussi des économies d'eau.)

5. Discussion et conclusion

Les pratiques agroécologiques recensées lors des diagnostics territoriaux dans les cinq sites d'étude, relèvent de dynamiques différentes. Ces pratiques peuvent être regroupées en quatre catégories selon leur origine et la rationalité qui a déterminé leur adoption.

- **L'agroécologie de l'héritage** : les oasis où des savoirs et savoir-faire, et savoir-être ancestraux existent et perdurent. Ces savoirs, sont l'accumulation historique de pratiques qui marchent dans un environnement aux multiples contraintes. Certaines de ces contraintes trouvent aujourd'hui des solutions modernes en dehors de ce cadre traditionnel et leur adoption perturbe la cohérence de l'ensemble du système oasien. Les oasis, en tant que modèle agroécologique par excellence, n'est plus viable d'un point de vue social (faible acceptabilité sociale : exigence en travail manuel et pénibilité) et économique (faible rentabilité et compétitivité), même s'il reste très valable sur le plan écologique.

- **L'agroécologie artisanale endogène :** les acteurs s'adaptent à des contraintes économiques (tenure foncière non sécurisée, difficulté d'accès aux intrants chimiques), techniques (faible taille des parcelles limitant la mécanisation et l'automatisation ; pas d'accès à l'eau ou accès insuffisant, pas de conseil agricole, etc.). Face à ces contraintes, les producteurs adaptent leurs pratiques agricoles par bricolage. Ces bricolages ne sont pas tous efficients et efficaces ; la sélection des meilleures pratiques se fera progressivement, par essai-élimination. Ce processus peut générer des modèles adaptés, mais seront-ils résilients à toutes les épreuves (économiques, sociales, et naturelles) ?
- **L'agroécologie exogène :** ce cas est relevé à Louxor, où de nouvelles pratiques sont introduites par les ONG et le gouvernement en réponse aux difficultés des agriculteurs locaux. Il s'agit de l'introduction de l'agriculture biologique, et d'introduction de quelques pratiques d'adaptation au changement climatique (arbre, comme brise vent, nouvelles variétés de maïs plus résistantes aux température élevées).
- **L'agroécologie de conviction :** Cette configuration n'a pas été documentée par les études diagnostic, même si elle doit exister chez certains acteurs des territoires étudiés. Son existence ne peut être, cependant, que marginale.

Si l'agroécologie, qui correspond à une certaine façon de produire des biens agricoles et de penser les rapports entre acteurs au sein du système alimentaire, peut faire sens dans tous les contextes agroécologiques à travers le monde, la notion de transition agroécologique ne peut cependant être généralisée automatiquement.

Une transition correspond à un processus de passage volontaire d'un état vers un autre. Dans les pays développés, l'artificialisation des processus productifs et leur concentration économique ont abouti à une augmentation phénoménale de la production agricole, et avec elle les externalités négatives sur l'environnement et la société. Dans ce contexte, la transition agroécologique implique l'abandon des pratiques agricoles et industrielles intensives et les pratiques économiques génératrices d'iniquité.

En Afrique du Nord, les agriculteurs ont toujours été confrontés à des conditions environnementales difficiles, adaptant leurs pratiques pour survivre. Les défis environnementaux continuent de peser lourdement sur l'agriculture locale, maintenant la production en deçà des besoins de la population. Dans ce contexte, la transition agroécologique se traduirait par la recherche de solutions techniques durables pour accroître la production dans le cadre de contraintes environnementales multiples. L'utilisation raisonnée d'engrais chimiques, combinée à d'autres pratiques de gestion de la fertilité à long terme, pour augmenter la fertilité des terres pauvres peut-elle être pensée comme une pratique agroécologique dans une compréhension de la transition agroécologique adaptée au contexte de l'Afrique du Nord ?

Appendix B. The programme of the LL AE diagnosis restitutions

Territorial Diagnosis Presentations Day
Programme
www.natae-agroecology.eu

NATAE Territorial Diagnosis Presentations Day
Programme
9 and 12 October 2023

This event is organized in two half days on the 9th and 12th of October 2023. The main objective is to provide the young professionals who are conducting the field research and the project partners with a first exchange on the preliminary results coming out of the Territorial Diagnosis Task T4.2 of the NATAE project.

More precisely, the two presentation days aim at:

- Arriving at a common understanding on the current context of the NATAE Living Labs territories including main actors and their characteristics
- Discussing the preliminary findings of the territorial diagnosis to refine the scientific roadmap of the project including elements on the way forward of relevant tasks that benefit from this task's outputs, such as precision over current existing agroecological practices and combinations, and the value chain selection, including main local challenges related to agriculture, human development and food security.

Programme

(Hours in Central European Time)
Each session includes 20 minutes presentation and 20 minutes of Qs & As

DAY 1 – Monday 9 October 2023	
14h – 14h10	**Introductory remarks** Melanie Requier-Desjardins, *HE NATAE Scientific Coordinator, CIHEAM-IAMM*
14h10 – 14h50	**Luxor Living Lab, Egypt** Heba Tallah Ali, *under the supervision of the CIHEAM-IAMM, France, Fadi Abdelradi and Othman El Shaikh EASD, Egypt*
14h50 – 15h30	**Laghouat Living Lab, Algeria** Souad Benmoussa and Adel Moulai, *under the supervision of the CARI, France and El-Argoub Association, Algeria*
15h30 – 15h45	Break
15h45 – 16h25	**Riyadh, PK-17 Living Lab, Mauritania** Theresa El Maalouf, *under the supervision of Cheikh Sidya-Fall, GRDR, Mauritania and the CIHEAM-IAMM, France*
16h25 – 16h45	**Concluding Remarks** *NATAE Advisory Board and Ali Daoudi, ENSA*

Funded by the European Union

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NATAE
North African Transition to AgroEcology

Territorial Diagnosis Presentations Day
Programme

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DAY 2 – Thursday 12 October 2023	
14h – 14h40	**Boulemane Living lab, Morocco** Rouba Al Dika, *under the supervision of Ghizlane Eschchgadda, the ENA-Meknes, Morocco and the CIHEAM-IAMM, France (LL boundary & farm typology)*
14h40 – 15h20	**Meknes Living lab, Morocco** Clara Nieuwenhuyse, *under the supervision of Fouad Rachidi, ENA-Meknes, Morocco and the WUR, Netherlands*
15h20 – 15h35	**Siliana Living Lab, Tunisia** Haifa BenMoussa, *under the supervision of Mehdi ben Mimoun, Ines Zouari and Nadhira Ben Aissa, INAT, Tunisia*
15h35 – 16h15	Break
16h15 – 16h35	**Concluding Remarks** *NATAE Advisory Board and Ali Daoudi, ENSAA*

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Appendix C. Concept note replication lab methodology

NATAE aims to identify and assess agroecological practices (AEP) in a Living Lab context. To assess their scalability, ideally, these AEP will be proposed, tailored and tested in so-called Replication Labs (RLs; T2.4 and T4.7). The RLs will start their activities in the course of 2024. Starting conditions will differ in each RL regarding the exact starting date (which can vary from January 2024 to September 2024), the local availability of data, the presence of an active network of stakeholders and the current degree of adoption of agroecological practices. To accommodate for these differences, this document presents a preliminary, flexible methodology for testing the scalability of AEP in RL. Lessons learnt from the first launches (probably in the RL in Algeria) will be considered in updating the methodology where necessary.

For each RL there is a set of obligatory activities (Figure A1; in blue) that can be conducted within the course of 12 months. In addition to these, RL-leaders, in consultation with a local representative board, can decide on conducting optional activities (Figure 1; in green). Obligatory activities are the formation of a local representative board, a RL-launch meeting, 3 representative board meetings and one season of experimentation & demonstration with at least one AEP at farm level. For the formation of the RL representative board, RL-leaders can opt for a preparatory stakeholder analysis in the context of a light territorial diagnosis which would take one to two person months of work before the actual RL-launch.

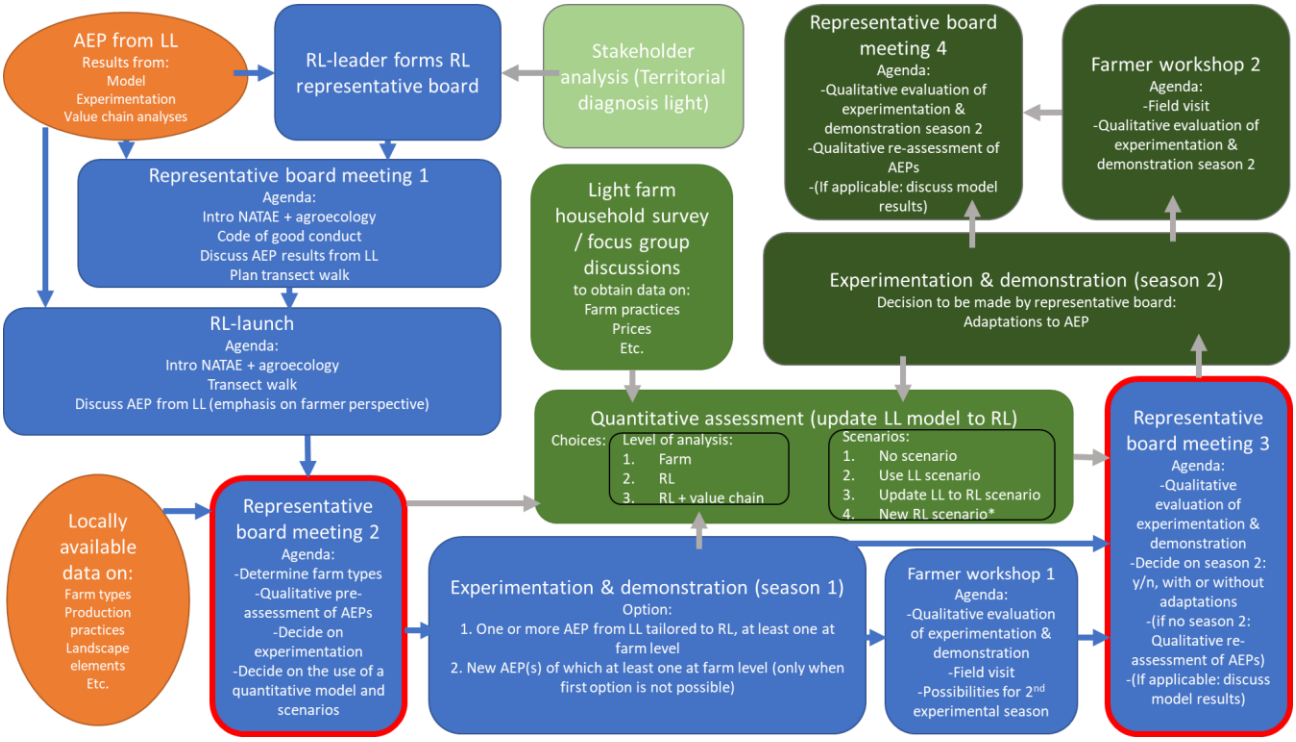

Figure A2. RL-methodology where orange ovals indicate data and rectangles indicate obligatory (blue) and optional (green) activities. Similar shading of green indicates that those optional activities are conditional for one another. A red outline indicates an important decision making moment regarding the choice of AEP and further activities. *This option implies an additional representative board meeting that is not indicated in the figure.

The AEP identified in LL will be the starting point of discussion for RL with a similar agroecological characterization, i.e. AEP identified in the peri-urban Living Lab of Ouislane, Meknes, Morocco will be discussed

in the peri-urban Replication Lab of Cape provinces, South Africa. Results from model, experimentation and value chain analyses from LL will be used as input for these discussions. It is expected that the AEP from LL need tailoring to local conditions in RL. It is preferable if at least one AEP from LL at farm level is replicated in the RL. Only in case local stakeholders indicate absolute incompatibility of all AEP from LL, a complete new AEP may be identified and tested in the RL. In case applicable, RL that are at an advanced stage compared to other RL with similar agroecological characteristics may also serve as a source of inspiration for that other RL in terms of replicating AEP. For instance, in case the oasis system of RL Atar, Mauritania is in advance of the oasis system of RL Kebili, Tunisia, AEP from the former RL could be replicated in the latter RL.

Important decision making moments will take place in the second and third RL representative board meeting (Figure A1; actvities with red outlines). During the second RL representative board meeting, decisions will be made on the AEP to be tested at farm- and, possibly, LL-level, and decisions will be made on the use of locally adapted models. In this meeting, a qualitative pre-assessment of AEPs will be conducted to guide the decision making. The qualitative pre-assessment can be seens as substituting or complementing quantitative model results. In case quantitative models will be used, extra data gathering activities need to be organized (light farm household survey and/or focus group discussions) and a decision needs to be made on which level the model will do the analyses (farm, LL-level, value chain level). In case of using a model, also a decision needs to be made on the inclusion of scenarios. In case included, the starting point for discussion is the scenario used in a comparable LL. Representative board members can accept that scenario as such, or propose adaptations that make the scenario fit better with the RL. They could also opt for building a scenario from scratch, which would require an additional representative board meeting. Results from models adapted to RL are proposed to be discussed only in RL representative board meetings. In case interested, RL-leaders could also organize a separate farmer workshop to discuss model results (not depicted in Figure 1). In case applicable, results from experimentation are ideally used to update the model adapted to the RL.

During the third RL representative board meeting, decisions will be made regarding the continuation and, possibly, adaptation of AEP to be tested in a second season. A re-assessment of AEPs is only foreseen during this meeting in case the RL representative board chooses for only one season of experimentation. In case the RL representative board opts for a second season of experimentation, it automatically co-opts for an additional farmer workshop and a fourth representative board meeting to evaluate the second season. IN that case, the re-assessment of AEPs is foreseen during the fourth representative board meeting.

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