Agroecology for Europe (AE4EU)

Towards the development of agroecology in Europe

Deliverable report D2.1 – Draft inventory of LLs, RI and Agroecology-Territories

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Executive summary

Work package 2 (WP2) focuses on the assessment and analysis of living labs (LL) and research infrastructures (RI) in the past and present independent of the scale and place at which they operate. To support the development of LLs and RIs in Europe, a set of indicators for the successful transition of agricultural production systems towards sustainability is identified and will be employed for evaluating the respective infrastructures and functionality of LL and RI. This set of indicators will be linked to opportunities to achieve the sustainable development goals (SDG) through agroecology and LL and RI. In order to identify skills, tools and methods that are promising drivers for future agroecosystem LL and RI, WP2 has elaborated on the two concepts of Living Labs and Agroecology Territories. For both concepts, trait and indicator grids were developed which are used for a more comprehensive data and information acquisition with the aim of getting representative samples of LL and AET across Europe. Based on the first steps taken in the two tasks and the preliminary analyses undertaken, the following conclusions can be drawn:

The two concepts of Agroecology Territories and Living Labs are both related to agroecological transformation of production and sustainable food systems. They aim at encouraging policy making towards schemes for innovation in natural resource governance and sustainable rural livelihoods. While the trait catalog for LL and the grid of transition processes for AET have been designed with concertation between TI and ISARA, the need for different indicators to characterize and assess both concepts became apparent. Although the two concepts cannot completely be merged, some place-based LL could be considered as AET such as Agroecology Living Labs and some AET can be considered as Living Labs if they include research infrastructures and networks, for instance through participatory research programs. The trait-- and indicator-based approaches of T2.1 and T2.3 will have a positive impact on the understanding of the stakeholders, providing a deeper understanding of the important functional and structural components of LL and AET. They will further help identifying initiatives that do not consider themselves as LL or AET and will help in placing those initiatives into a general framework of infrastructures accelerating the transition towards sustainable production and food systems.

When successful, both concepts will be used for informing the creation of the European Partnership an Agroecology and the approaches of trait- and indicator based assessments of LL and AET will disseminated to groups of stakeholders at the European as well as national level and engagement in application of the approach by stakeholders will be supported.

1. Introduction

Work package 2 (WP2) focuses on the assessment and analysis of living labs (LL) and research infrastructures (RI) in the past and present independent of the scale and place at which they operate. The overall aim of the investigation is to identify skills, tools and methods that support the development of LLs and RIs in Europe. The investigation comprises the human, social, agronomic, technical and ecological dimensions.

A set of indicators for the successful transition of agricultural production systems towards sustainability is identified and will be employed for evaluating the respective infrastructures and functionality of LL and RI. This set of indicators will be linked to opportunities to achieve the sustainable development goals (SDG) through agroecology and LL and RI.

For this purpose, we have considered the three main components of LL described in the MACS-G20 (2019) report on Agroecosystem Living Laboratories:

(i) transdisciplinary approach;
(ii) co-design and co-development with participants and
(iii) monitoring, evaluation, and/or research in real landscapes.

As transition towards sustainable production systems requires complex and long-term approaches (Wezel et al., 2016), the investigation is expanded as well towards the framework of Agroecology Territories (AET). AET are defined as places where stakeholders are engaging in a transition process toward sustainable agricultural and food systems (Wezel et al., 2016).

Following this, WP2 will be able to assess LL and RI in relation to the "Fit for purpose"[1] approach and will formulate recommendations to scientist, farmers and governments on how to sustain and develop LL and RI in Europe.

In general, the WP2 addresses five main questions:

1) What skills, tools and methods are expected drivers for the successful performance in LLs and RIs in agricultural landscapes towards the transition towards sustainable farming and food systems?
2) What skills, tools and methods are currently implemented in existing LLs and RIs?

[1] https://gltn.net/download/fit-for-purpose-land-administration-guiding-principles-for-country-implementation/

3) What can be achieved through these established skills, tools and methods in LLs and RIs?
4) What skills, tools and methods are promising drivers for future agroecosystem LL and RI to support processes of transitions in agricultural landscapes?
5) What are the key factors for sustainable transition at territorial scale?

WP2 is structured into three tasks. In this deliverable we focus on task 2.1 and 2.3 and present the first draft inventory of LLs, RIs and Agroecology-Territories. The first part of the report presents the draft inventory of LLs and RIs and the second part presents the draft inventory of agroecology territories.

2. Part 1: Draft inventory of Living labs

Task 2.1 Assessments of past and ongoing agroecological LL and RI

This task is responsible for the empirical analyses of the functioning, potentials and constraints of LL, and comparable initiatives, inter alia based on the mapping results of WP1. Two requisites are required to perform this task. First, a conceptual framework to drive the investigations and to place priorities. Second, results from the mapping exercises in WP1 for detailed analysis and to address our questions. The overall objectives for this task are:

1) Develop a conceptual framework for the assessment of past and ongoing agroecological LL and RI.
2) Establish an inventory about skills, tools and methods currently implemented in existing LL and RI.
3) Assess the impacts of these skills, tools and methods in LL and RI

2.1. Conceptual framework

LL may have slightly different meanings in different fields of research and to different actors or organizations. Nevertheless, all LL are known as user-centered approach with involvement of multiple actors to co-create, explore and evaluate the innovations together in a real-life condition.

Based on the executive report of international agroecosystem living laboratories (MACS, 2019), which is also the used definition in this project, LLs are *"transdisciplinary approaches which involve farmers, scientists and other interested partners in the co-design, monitoring and evaluation of new and existing agricultural practices and technologies on working landscapes to improve their effectiveness and early adoption"*. Three general components of agroecosystem living labs are defined (Figure 1):

1) transdisciplinary approaches,
2) co-design and co-development with participants, and
3) monitoring, evaluation and research on working landscapes.

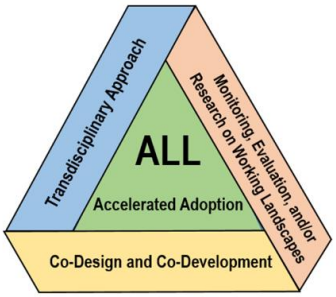

Figure 1: The three main components of Agroecosystem Living Lab (MACS, 2019)

Implementation of the living lab approach in agroecosystem might be a good solution to move faster and more effectively towards a sustainable agriculture and agri-food system as LLs deal with diverse aspects of agroecosystem (ecological, social and political), consider different actors who are involved in a project and address current challenges (e.g. water and soil problem, climate change, etc.).

In the practice of living labs, learning processes take place at the individual and community level. New knowledge is generated or previous knowledge confirmed or evaluated and information and knowledge is transferred to other regions as well as to the scientific communities and policy makers. Therefore, it is expected that living labs underlie internal and external driving forces to enable plausible pathways of transformative change towards sustainable agriculture and food systems. Specifically, co-creation and sharing of knowledge between farmers, scientists, advisors and authorities play an essential role in development of technical, social and scientific innovations (Wezel et al., 2020).

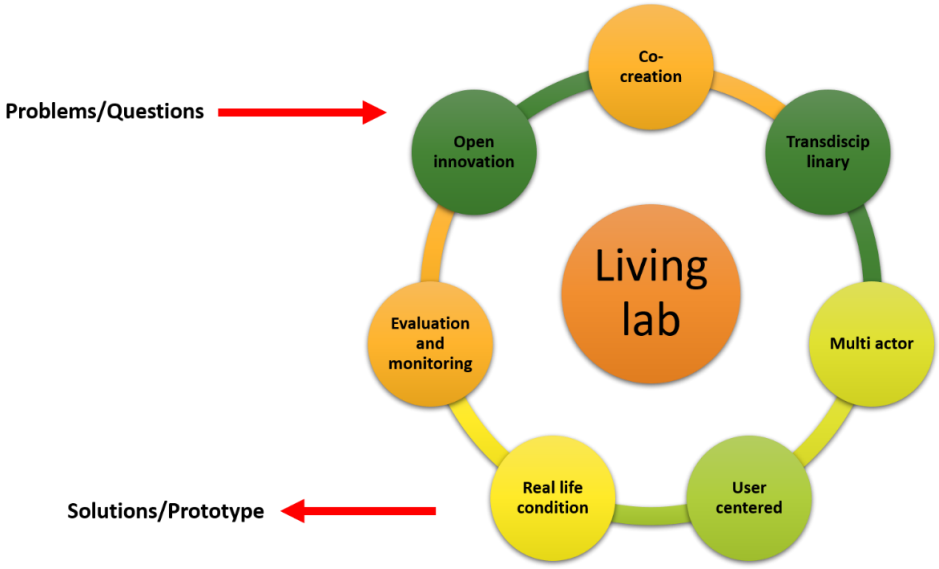

Figure 1: Schematic illustration of the main components of living lab. Indicators are extracted from ALL-Ready D1.1, 2021; MACS, 2019; Steen & van Bueren, 2017.

In our work, we use the conceptual framework for LL based on the main components of LL and their interactions (Figure 1). However, there are still many open questions and unknown areas which need to be investigated and discovered. In our work, we would like to address the following question (i) What makes the LL approach in agroecology unique; (ii) What are the differences between this approach and other interdisciplinary RIs?; (iii) How can LLs help move towards a sustainable agriculture system?; (iv) Which criteria are essential? And (v) What should be improved?

2.2. Methods

Inspired by the functional trait approach in ecosystem analyses (Diaz et al., 2007), to answer these questions, we decided to apply a trait-based methodological approach to enhance our understanding about the functionality of LLs and its drivers. We used a step-wise process to address the overall objectives in T2.1.

In a first step we performed a desktop study to identify variables (traits) that are suitable for the development of a conceptual framework for the LL and RI assessment. For this, we integrated the 5 transition levels formulated by Gliessman (2007): efficiency, substitution, redesign, reconnect consumers and producers, global fair food system as well as the "Fit for purpose" approach that also includes aspects such as efficiency, effectiveness, cohesion and relevance. We brought together variables for skills, tools and methods linked to human, social, agronomic and ecological perspectives within these frameworks, identified the interactions of these variables and derived to a new framework that builds the foundation for this task.

In a second step, we developed indicators for the assessment and tested their suitability. Further, data and information sources repository about LL and RI were developed from data and information sources mainly from WP1-T1.1 (Mapping) and own investigation about existing data and information (e.g. from previous EU projects related to agroecology).

In a third step, an empirical analysis will be performed to assess how skills, tools and methods pathway the transition towards sustainable farming and food systems. By comparing the findings with the theoretical framework, we will be able by the end of the project to identify strengths and limitations of past and future LL and RI as well as to develop recommendations.

In a final step, a set of principles for skills, tools and methods of LL and RI for transition processes and the acceleration of adoption of innovative farming practices will be presented. Findings from all steps will serve as best practice examples for future European LL and RI.

On the basis of the gained results of the functional trait analysis, we will be able to provide recommendations to scientists, farmers and governments on how future projects and initiatives associated with agroecological LL in Europe should be arranged and established to overcome the current challenges in agroecosystem under pressure of time and global changes.

This report mostly includes the results of step one and two and preliminary results of the first inventory of the initiatives. The complete results of the inventory together with assessment and analysis of the LL (step three and four) will be presented in the final report of T2.1.

2.3. Trait based approach

A trait is any characteristic of an organism that is expressed in phenotype and has specific function relevant to the response of an organism to the environment or effect on ecosystem properties (Violle et al., 2007). A living lab is comparable to an ecosystem with different living organisms (different actors) and abiotic components (LL criteria) that are linked together (co-creation, co-development) to fulfill the specific function (outcomes: e.g. solutions or products). Ecosystems are dynamic entities that are responding to environmental changes (interactions and networks within and between the systems) and therefore sustainability and resilience are considered as two important features of any living system including an agroecosystem and a LL. Considering LL as a living system, they can be assessed based on their functions and drivers that are inherent in the respective LL using the trait-based approach.

For assessing the existing agroecological LL in Europe, we have defined and developed a set of traits (criteria) that are necessary for successful performance of LL towards a sustainable agricultural and food production systems (

Table 1). Further, we have selected traits which are easy to understand and to measure (assign) in order to be able to get this information through a questionnaire or description of initiatives on their websites.

As a guideline towards sustainable food and agricultural system, we considered the following references for developing the trait catalog:

- the ten elements of agroecology suggested by FAO (2018)
- the 13 principles of agroecology (HLPE, 2019)
- the indicators of sustainability assessment of food and agricultural system (SAFA indicators: FAO, 2013)
- the indicators defined by CERAI (2019)
- list of agroecological practices (Wezel *et al,.* 2014)

We have performed the following steps, which led to the finalization of a catalog of traits and their indicators:

1) Literature review (e.g. EU-reports, published articles, agricultural platforms) to identify and select the traits that are suitable for the assessment of agricultural LL and RI.
2) Description of the specific function of these traits for agroecological projects as well as their relevance for a sustainable agricultural system.
3) Definition of a set of indicators to measure/assign traits of a given initiative.
4) Revision of the traits and indicators by members of WP2.
5) Finalization of the traits and their indicators.
6) Launch of a final catalog of traits and indicators.

Traits and their indicators are categorical data which are transformed in presence/absence form (1,0) in order to enable the statistical analysis of the data such as cluster analysis or multivariate analysis that will be achieved under WP2-T2.2.

In the next step, we have tested the catalog with primary and secondary data sources to check the feasibility of the catalog of traits derived from the literature review as well as to proof the data quality of sources.

2.4. Validation of the trait catalog

We have validated the applicability of the traits and indicators listed in our catalog with selected initiatives from the WP1-T1.1 database and stories of the BOND project which are available on their website[2].

The database of WP1-T1.1 is the result of the mapping of agroecological initiatives in Europe based on interviews and questionnaires. It includes LL as a sub pillar of agroecology which listed initiatives from different countries chosen by mappers as (potential) LL and some detailed information on criteria of agroecological LL.

We compared the mapping-criteria of WP1 with the criteria of our catalog by assigning three initiatives from the WP1-T1 in the trait catalog and we have identified similar criteria. In this way, we not only tested our developed trait-based catalog and indicators with the information from WP1, we also tested the suitability of the WP1 database for additional analysis of LL and RI in regard to traits and indicators.

More or less the same procedure was applied for the secondary data sources- the stories of the BOND project. The BOND online repository contains over 30 stories, presenting collective actions in place, in planning or already at its end with a focus on sustainable agriculture, marketing and the environment across Europe. All stories share the objective to establish a network of projects and people that focus on sustainable food systems.

We have taken the following steps:

- Selection of stories in the repository that are listed as “living labs”.
- Reading the stories linked with living labs.
- Performing text analysis to identified relevant criteria in the trait catalog.
- Assessment of the suitability of stories as data sources to inquire the traits of living labs.

When using the term “living lab” in the search function, four projects were presented. We have considered these four stories as secondary data sources and investigated in regard to data and information extraction for the trait catalog.

The selection was based on the search term “Living Lab”. It can be of value to use in future other search terms such as “participation”, “cooperation” or “collaboration” as synonyms for

[2] https://www.bondproject.eu/repository-2/bond-projects/

living lab approaches to expand the number of stories. Here, we report on findings from the test using four BOND stories that are presented under the term “living lab”.

2.5. First results and achievements

2.5.1. Trait-based catalog

Our developed trait catalog contains six main categories (Innovation, Learning, Co-design & Co-development, Implementation, Monitoring & Evaluation, Sustainability), 26 traits (criteria) and 130 indicators. Further it includes information on function and importance of each trait for LL initiatives. Also, each indicator is described in a simple and clear way with examples in order to avoid misunderstanding and misinterpretation of the indicators (not shown here). Scientific references are mentioned for indicators that are extracted from literature. An overview of the used traits and their indicators are presented in

Table 1. This table is a compact version of the trait catalog. Therefore, not all of the mentioned information above is included in this table. Further, we would like to mention that the word 'Indicator' in our trait-based approach is defined as something describing a situation or the state of something.

This catalog provides a consistent approach for inventory and assessment of the agroecological LLs and similar initiatives within T2.1

Table 1: Overview of the traits and indicators that are used in the trait catalog. Six main categories are indicated (bold and underlined). The following references have been used for preparing the trait catalog: CERAI, 2019; HLPE, 2019; MACS, 2019; Pavlovskaia, 2014; FAO, 2013; Silvius et al., 2017; Steen & van Brueren, 2017; Wezel et al., 2014; DG Agri note, 2021.

Traits	**Indicators**
Innovation	
Type of innovation	New technology/methods, new practices/processes, creative idea/concept, implementation/adaptation of existing solutions
Field of innovation	**Environmental elements**: Biodiversity, Soil, Water, Greenhouse gas regulation, Nutrient cycling, **Farming practices**: Crop choice, Plant & Animal breeding/Gene Technik, Crop-livestock integration, Fertilization/Nutrient mgmt., Weed, pest and disease management, Tillage management, Management of landscape elements, **Farming sector**: Arable crops/Permanent crops, Horticulture, Livestock, Grassland, Forestry, **Socio-economic practices:** Rural development, Food system, Food sovereignty, Marketing, Social movement and innovation, Education.
Learning	
Communication and learning tools	Regular internal meetings, Conferences & Seminars, Social media, Traditional media, Brochures/Vernacular documents/Newsletter, Field visits/Demonstration, Workshops & Trainings, Practices sharing groups & Group discussions
Digital competence	Website, Cloud/Chat portal, Network platform
Documentation	Scientific articles, Reports
Co-design & co-development	
Actors involvement	Scientists, Advisors, Farmers, Industry, Farmer organization/cooperative, Consumer (organization), Authorities/ Environmental organization, Funders, Retailers, Citizens/Volunteers, Policy makers)
Objectives	Objectives are fixed initially and cannot evolve, Objectives are fixed initially but can evolve marginally, Objectives are fixed initially but can evolve significantly all along the project
Engagement of participants	At beginning and end of scientific activities, Throughout the research project but with fix research agenda/objectives, Throughout the research as well as in planning the research/objectives
User involvement	Using user data, For users, User participation, No user participation
Governance	Someone manages, facilitates and organizes the project, Different actors have an equal voice over the development of project, Governance integrates multiscale approaches from local to global, Informal governance
Implementation	
Real life setting	Field experimentation with farmers, Community supported innovation, Answer to local ecological issue

Transdisciplinary approach	Different scientific expertise is involved, actions/plans for maximizing the contribution of all participants
Funding type	Public, Private, Mix, No funding
Funding size	Small, Medium, Large
Funding duration	<3 years, 3-5 years, > 5 years
Use of fund	Restricted use, Unrestricted use
Continuity of project	(will be) Extended, Income from the activity allows savings and/or reinvestment in the activity itself, Project is/will be ended by end of the funding
Monitoring & evaluation	
Monitoring	Field monitoring, Monitoring the progress and result of project through scientific research, Long term monitoring of innovation cycles, Monitoring of impacts at food system scale, No monitoring
Evaluation	Actors agreed on problems/questions that need to be answered by project, Solutions to the specific problem are developed/Challenges are addressed, Effectiveness & efficiency of project is analysed, Deficiencies are detected
Knowledge integration	environmental (ecological), economic, social & human, governance
Sustainability	
Ecological	Natural resources, Biodiversity, Energy & Material, Animal welfare
Resource efficiency	Recycling, Input reduction
Economic	Investment, Economic diversification, Stability of supply/production & market, Product quality, Connectivity, Local economy (development), Waste & Risk-reduction
Social	social values and cultural diversity, Diet and nutrition awareness, Fair trade practice/Labour rights, Society and equity, Participation of producers in governance, Human safety and health, Education
Political	Corporate ethics, Responsibility & holistic audits, Rule of law, Resource mgmt. & full-coast accounting

2.5.2. Testing the catalog on available databases for agroecological initiatives

Testing the catalog on available databases for agroecological initiatives showed that about 1/3 of the set of indicators present in the trait catalog, could be assigned based on the WP1-T1.1 database as well as the text from the BOND-stories. We experienced that the procedure we followed for extracting information from the stories is quite time consuming and took about 120 min for each story.

From working on the WP1-T1.1 database and the BOND stories it became clear, that specifically for the criteria of "Monitoring & Evaluation" and "Co-design & Co-development" as well as for "Sustainability" the lowest information was present in both datasets. Most information extracted from the BOND stories was related to the two categories of "Innovation" and "Learning" and from WP1-T1.1 database related to the categories of "Innovation", "Actors" and "Funding type". Some scattered information was assigned for "Sustainability".

However, the absence of the information in datasets do not denote the real absence of the traits in the respective LLs. For any conclusions in this regard, it turned out that the verification by the initiators of the initiative is important. As this missing information is important for the final assessment, it was decided in T2.1 to contact the initiatives and ask for information on the missing criteria.

During the process of the test inventory, indicators were adjusted, extended or improved at several places in the catalog. The testing also showed that some indicators should be added to the trait catalog and examples were improved as well.

In order to establish a more comprehensive inventory, we need further sources of information about agroecological initiatives (with potential LL) in Europe. Therefore, we have tried to expand our source of information to have a representative sample of LL initiatives in whole Europe. We have looked for the available sources and databases and have checked out how much information on our criteria can be provided by these sources (

Table 2). Unfortunately, no (open access) databases are available from these sources and although they have good information about agroecological criteria, they mostly provide metadata information about agroecological initiatives and no information about other more specific criteria required for our trait-based analysis.

Table 2: Available databases for agroecological initiatives

Project	Sources	LLs and similar initiatives	Limitation
Agroecology Europe (AEEU)	AEEU mapping report 2020 (PDF)	Information on selected initiatives in agroecology per country as text (based on interviews analysis)	No public access to the excel database of countries/survey
DG-Agri survey	DG Agri	Survey information per country (excel), 38 countries, based on the survey of European commission (1st screening AELLRI 2020)	Mostly metadata information
BOND project	Website of the project	Ca. 50 initiatives from 20 countries: short metadata information (excel) + short text description	No information about other criteria
ALL-Ready	1st deliverable July 2021 (PDF)	No information	No access to the initiatives list
AGROMIX UNISECO	Website of the projects	Information about criteria and methodology	Initiatives list or information not found yet

Overall, based on the conclusion that current primary data sources (WP1 mapping) and secondary data sources (BOND stories and other EU projects) do not provide sufficient information for the assessment of LL and RI, we decided to expand the investigation towards a mixed approach that includes to contact European LL and RI initiatives directly and query additional information from the mapped LL and RI to complement missing criteria that are so far not obtainable from primary and secondary data sources.

At this stage and for this deliverable, however, we had to focus on the information available from the mapping from WP1 although it provides only around 30% of the criteria information that we would need for the comprehensive analysis of the LLs and similar initiatives. The results of this exercise are presented in the next section.

2.5.3. Preliminary results of inventory of LL based on WP1 mapping database

From the 35 LL initiatives listed in the WP1 database so far, for only 17 LL the detailed information required for our trait approach was available. The 17 LL initiatives are located in eight European countries. A list of the countries and the number of LL initiatives in each country is shown in Table3. All 17 LL were assigned to the trait catalog.

The comparatively low number of LL at this stage is due to the fact that the mapping is an ongoing exercise and the full database will be available by the end of this year – including

around 20 countries. However, the table also shows that the number of LLs in each country as well in total is much lower than the number of agroecological initiatives. This relatively low number of LLs may indicate that this new participatory open innovation concept is not well known by actors of the agriculture system. Some initiatives which we may count as LL may not understand themselves as living labs because they may be not aware of the terminology and definition. Despite of the definition of LL in the literature, it may still be difficult to understand the concept and hence to interpret the respective initiatives in the mapping (especially for less experienced mappers). This pattern is more noticeable in some countries than in others.

Table 3: List of countries with detailed information on LL initiatives based on WP1 mapping database. Total number of agroecological initiatives (both contacted and not contacted ones) for the given countries as well as number of initiatives listed by mappers as LL for those countries are presented.

Country	Nr. of LL with information	Nr. of listed LL	Nr. of agroecological initiatives
Germany	5	10	27
Austria	2	10	19
Greece	3	5	25
Italy	3	6	111
North Macedonia	1	1	4
Portugal	1	1	5
Romania	1	1	26
Slovenia	1	1	7
Sum	17	35	224

The first analysis of 17 LLs in the trait catalog shows that, although the initiatives have different objectives, they mostly use *Implementation/Adaptation of existing solution* as "Innovation type". Only four initiatives are dealing with new technology or concept.

In the case of "Field of innovation", only few initiatives are working in the field of environmental elements and ecological issues (four LL) and just one of them works on environmental elements as main concern. This pattern can be seen in the "Sustainability" category as well where ecological aspects are less concerned by initiatives than economic and social aspects.

One element of LL which is well represented in all of the 17 LLs is participation of different actors in the initiatives. At least four different actors are participating in the initiatives. Those are mainly scientist, farmers, advisors, farmer organizations and authorities. However, detailed information about involvement of actors in the "Co-design and Co-development" process is missing and it is not clear to what extent and if all actors are engaged in defining the objectives, planning of the project and finding solutions. Therefore, it is difficult to say whether all the engaged actors have a same voice throughout the project, which ideally should be a case in LL projects.

Another interesting point is that almost all of the initiatives put high value on sharing networks and they are even part of the national or international networks or they have built a local/regional sharing networks or group discussion as result of their activities in their initiatives.

Information about funding (type, size and duration of funding) was only partly available and for half of the initiatives there was no information at all. Therefore, it is not possible to make a statement at this stage.

2.6. First conclusions based on the preliminary analysis and next steps

Although this analysis can only be considered preliminary, an important finding is that environmental and ecological issues appear to be underrepresented as objectives of the initiatives. If this trend prevails in the full analysis, we will strongly suggest to the European Partnership on Agroecology that ecological targets would need higher attention and had to be integrated in LL and other agroecological initiatives in order to move towards sustainable agricultural system. Also elaborating on new technology or concepts in addition to applying existing solutions may have to be stimulated by the partnership.

As a consequence of the limitation of the available data sources and in order to get a more complete set of data and information on agroecological initiatives, LL in particular, we decided to run an additional survey on selected LL/RI. For this purpose, we will use our trait-catalog to design a questionnaire to be send to the respective initiatives. Therefore, we will gather a list of LLs and similar initiatives as soon as possible. We will use the provided list by the WP1 database and the initiatives in the country reports but also initiatives that are listed on the website of the BOND project and other available sources (

Table 2). In a first joint meeting between AE4EU WP2 and ALL READY it was decided that ALL-READY will provide a list of LL, initiatives and organizations to complement our own list and will in return receive updates on the trait catalogue development via regular meetings between ALL Ready and AE4EU WP2.

Once we have completed the inventory and our dataset is completed, statistical analysis will be performed for the assessment of the LL initiatives. On the basis of the gained results we will be able to provide recommendations to the European Partnership on Agroecology and to scientists, farmers and governments of different regions on how future projects and initiatives associated with LL in agroecology in Europe should be arranged and established in order to well address the current challenges in agroecosystem under pressure of time and global changes.

If the concept of trait-based assessment of LL will proof useful, the approach will be disseminated with groups of stakeholders at the European as well as national level and engagement in application of the approach by stakeholders will be supported.

3. Part 2: Draft inventory of agroecology Territories

Task 2.3 Development of agroecology-territories as LLs for large-scale transition processes

3.1. Conceptual framework and research questions

To handle the challenge to develop sustainable agricultural and food systems in Europe, agroecology is considered as a lever for successful transition to sustainable agriculture and food systems with increased biodiversity, resource-conserving and climate resilient production and food systems. Agroecology and its various facets may have different implications on different scales of the food system, from field/plot scale, farm scale to the entire food system (Sachet et al. 2021; Wezel et al. 2020).

In recent literature, the territorial scale is highlighted as a key level at which stakeholders must engage in collective activities to construct viable pathways for agroecological transitions (Anderson et al. 2019; Lamine, Garçon & Brunori 2019; Pelzer et al. 2020; Triboulet et al. 2019; Vandenbroucke et al. 2020). Because transitions occurring solely on the farm level are not sufficient for ensuring sustainable agriculture systems, and because agroecology relies on ecosystem functions at landscape scale, it is necessary to link farmers and non-farmers on a scale that is larger than the farm (Jeanneret et al. 2021). Anderson et al. (2019) identify six domains of transition to sustainable food systems through agroecology; (i) access to natural ecosystems, (ii) knowledge and culture, (iii) systems of exchange, (iv) networks, (v) equity, and (vi) discourse. Place based approaches at community scale can play a great role in achieving conditions for transition.

Wezel et al. (2016) define the concept of 'agroecology territories' (AET) as places engaging in a transition process toward sustainable agricultural and food systems where

1. "a transition toward sustainable agriculture based on agroecological practices exists,
2. biodiversity and resource conservation are taken into account,
3. territory linked embedded food systems exist, and
4. stakeholders support the transition toward sustainable agricultural and food systems" (Wezel et al., 2016 p. 141).

Similar to AET, related concepts in both sustainable food systems literature and policy making schemes aim to encourage innovation in natural resource governance and sustainable rural livelihoods (MACS, 2019; Dias et al., 2021; Grard & Miskulnig, 2021).

AET could be considered as specific type of LLs that covers the three dimensions of adaptation of agricultural practices, conservation of biodiversity and natural resources and embeddedness of local food systems through a systemic approach at territorial scale (Figure 3). To be properly considered as LLs, AET should include a participatory approach which involve targeted users in innovation processes, and transdisciplinary research. These AET, which are defined as those in transition to sustainable agriculture and food systems, have significance in long-term research as they can give insights into the key stakeholders, enabling factors and barriers for transition processes to occur. In this way, developing the AET concept may contribute to a much-needed coherence between, on the one hand, scientific recommendations based on participatory research and, on the other, the relevance of policy making to support enabling conditions for developing sustainable food and agricultural systems.

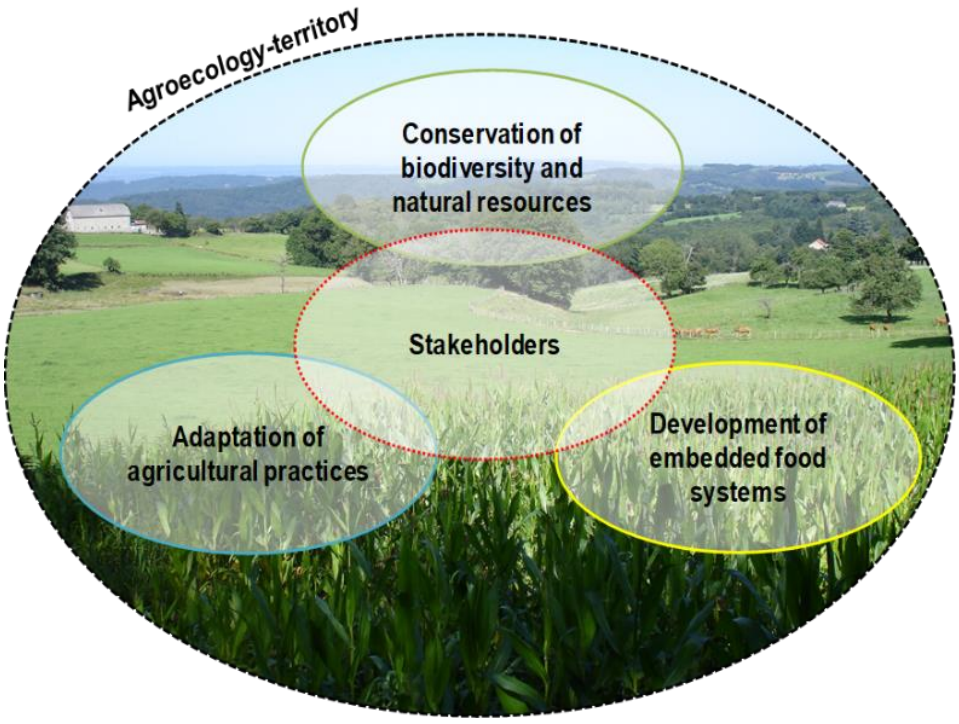

Figure 2: Schematic presentation of Agroecology territory with stakeholders as central actors and the three essential domains for transition (Wezel et al., 2016).

The general objectives of T2.3 are:

- To identify key factors for sustainable transition at territorial scale: key methods and skills, success factors and indicators for assessment
- To develop an inventory and analysis of agroecology territories throughout Europe.

This will be accomplished to answer the following research questions;

1. Which criteria and indicators to identify, characterize and assess agroecology territories?
2. What are the common and differing characteristics of agroecological territories over Europe?
3. What are the barriers and drivers for agroecology and food system transitions at the territory scale?

3.2. Method

In order to fulfill our research goals, we designed a four steps methodology:

Step 1. Literature review in order to have a first overview of references on AET case studies and identify key methods and skills for agroecology transition at territorial scale.

Step 2. Definition of criteria and indicators to identify, characterize and assess agroecology territories regarding: pathways toward sustainable farm and food systems, learning processes, sustainability focusing on different dimensions (human, environmental, agronomy, social, economy).

These first two steps have been achieved from September to December 2021 by Perrine Vandenbroucke and Baptiste Grard with the contribution of a group of students from the 'Master Agroecology' at ISARA: Lucy Zwigard, Charlotte Häuser, William Buckner, Joris Hijmans, Deborah Lamy.

This has led to the **step 3.** Inventory of agroecology territories (AET) over Europe allowing a comparative analysis and assessment of Agroecology Territories based on 9 case studies.

This step is handled by Perrine Vandenbroucke, Baptiste Grard, with the contribution of William Buckner in the frame of his Master thesis, supervised by Jeroen Groot (WUR). This inventory is currently ongoing.

Step 4. Synthesis, analysis of results according to our research questions and policy recommendations

3.3. First results and achievements

3.3.1. Step 1. Literature review

A first review was conducted to analyse specifically the mobilisation of AET in existing literature. A search on Google scholar for articles containing exactly the terms “agroecology territory” and “agroecological territory” provide respectively 38 and 33 articles. Further, 93 articles are listed on Google scholar which cite Wezel et al. (2016). Metadata was collected for a final list of 12 articles which were selected on the base that the authors both cite Wezel et al. (2016) except for one previously published article, and use the AET concept in a significant way. This was judged according to the use of the concept for developing an analytical tool, and/or the use of metacognition to assess the concept for its potential analytical use, and/or application of the concept to a theoretical or place-based set of problems.

The documents reviewed include eight scientific journal articles, one PhD dissertation, one MSc Agroecology thesis, one presentation during a forum on agroecology and one book. Three quarters of the documents apply AET to case studies while the other quarter comprises conceptual papers. Of the 12 articles, 10 explicitly mention “agroecology territory” and were published involving French research institutions. The two documents which do not explicitly mention the concept are included due to their citation of Wezel et al. (2016) and the clear link they make between a conceptual framework for agroecological transition with one or more of the three domains of AET. The literature review provides some first indications to go further through case studies from literature: Allgäu region (Germany), Wales (UK), Mediterranean territories and mostly French case studies (‘Pilat’, ‘Boucles du Rhône’, Corsica, ‘Vallée du Tarn’, ‘Pays Rabastinois’, etc.). From this review, we can observe that the AET notion remains mostly handled by French scientists. Some other concept like Biodistricts or Eco-region can provide other interesting cases of AET. Considering this observation, the inventory was enlarged thanks to the involvement and exchange with some AE4EU partners corresponding to different European countries.

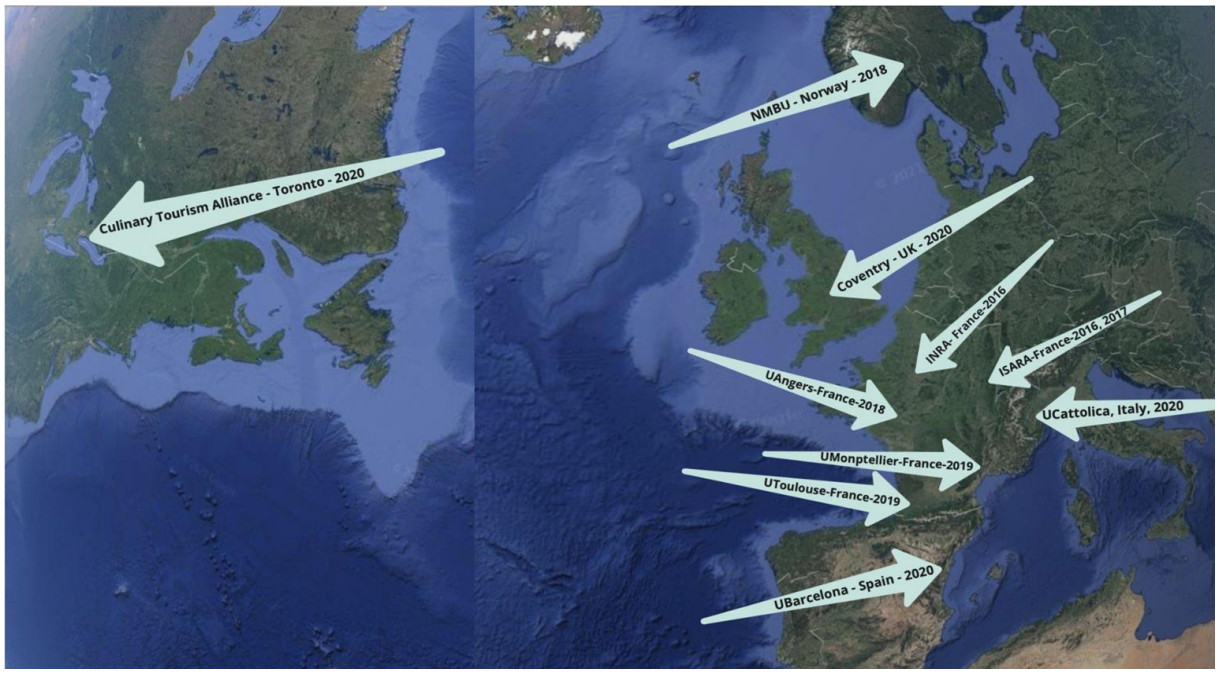

Figure 3: Geographical distribution of publications in literature review on AET (Group AgroEcos, 2021)

The literature review brought together a diverse and extensive amount of information relating to AET and conditions for agroecological transition, both empirically-based and theoretical. Those findings suggest indicators to characterize AET at three levels: (i) Farming systems, (ii) Territorial and biophysical conditions and (iii) Social beliefs and practices.

The different papers relate to transversal processes involving multi-actors and multi-stakeholders initiatives (Owen et al., 2020; Soulard & Meynard, 2016; Vandenbroucke et al., 2020; Wezel et al., 2016). Lamine et al. (2019) underscore how the approach of AET takes food systems as "socio-technical networks linking people, natural elements, and artefacts that interact with food issues". These authors offer a critique for AET, regarding how the concept may fail to address functional links between ecological and social processes (Lamine, Garçon & Brunori, 2019 p.7).

Important aspects which emerged in the literature involving AET include collective action, adaptive governance, decision-making processes and the collective management of resources. These aspects may be considered as “transversal” processes, which do not fit neatly into one of the three AET domains but rather involve multi-actor and multi-sector initiatives. Soulard & Meynard (2016, p.125) define three scales of relationship between agriculture and a territory: the farm, the territory of local collective action, and areas for applying local public policy. Vandenbroucke et al. (2020~~, p.115~~) consider how territories may be catalysts for agroecological transitions, which rely on various forms of governance related to coordination, learning and regulation processes.

Yet the notion of the territorial scale as important for agricultural land management existed prior to 2016 (Duru, Therond & Fares, 2015; Sebillotte, 2000). A paper by Gascuel and Magda (2015) proposes an agroecological territory project for which all actors relevant to specific resources are brought together for the management of common goods (land, soil, biodiversity, well-being, etc.) over the long term. These authors propose that the "transformations required to build an 'agroecological' project for a territory are profound because they imply changing the vision of the territory, developing new forms of coordination and an economy of local common goods".

The AET concept has recently been mobilised for analytical purposes. Gruber (2018) studied whether a particular territory qualifies as an AET using an indicator-based assessment tool. Lucas (2019) used AET to define categories for assessing case studies on collective territorial actions in France. Additionally, Padró et al. (2020) present a model, 'Sustainable Agroecological Farm Reproductive Analysis' (SAFRA), which generates scenarios to describe viable prospects for agroecology landscapes. The SAFRA tool is proposed to inform deliberative decision-making processes regarding agricultural land use and consumer-producer links at the territorial scale.

To conclude, the literature review points different methods and skills for agroecology transition at territorial scale related to:

- Collective action
- Adaptive governance
- Decision-making processes
- Collective management of resources/ Management of common goods
- Links between ecological and social processes

3.4. Step 2. Criteria and indicators to identify, characterize and assess agroecology territories

To characterize and assess AET, the choice has been made to focus on processes related to agroecological transition, as compared to measurable states or outcomes in a given territory. Unlike "taking snapshots", developing indicators for processes can help capture and document territorial development over time. Especially in the context of an agroecological transition, it is important that indicators can capture dynamic changes.

An analytical grid characterizing transition processes has been set up. This grid is based on the 13 principles for agroecology from the HLPE report (HLPE, 2019). Those 13 principles actually aim to generate pathways for incremental and transformational change towards more sustainable farming and food systems. Each of the 13 principles underwent a transformation from the principle (a suggestion statement) into processes (action statements). For instance, "Principle 1. Recycling: Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass" became "Closing resource cycles of nutrients and biomass".

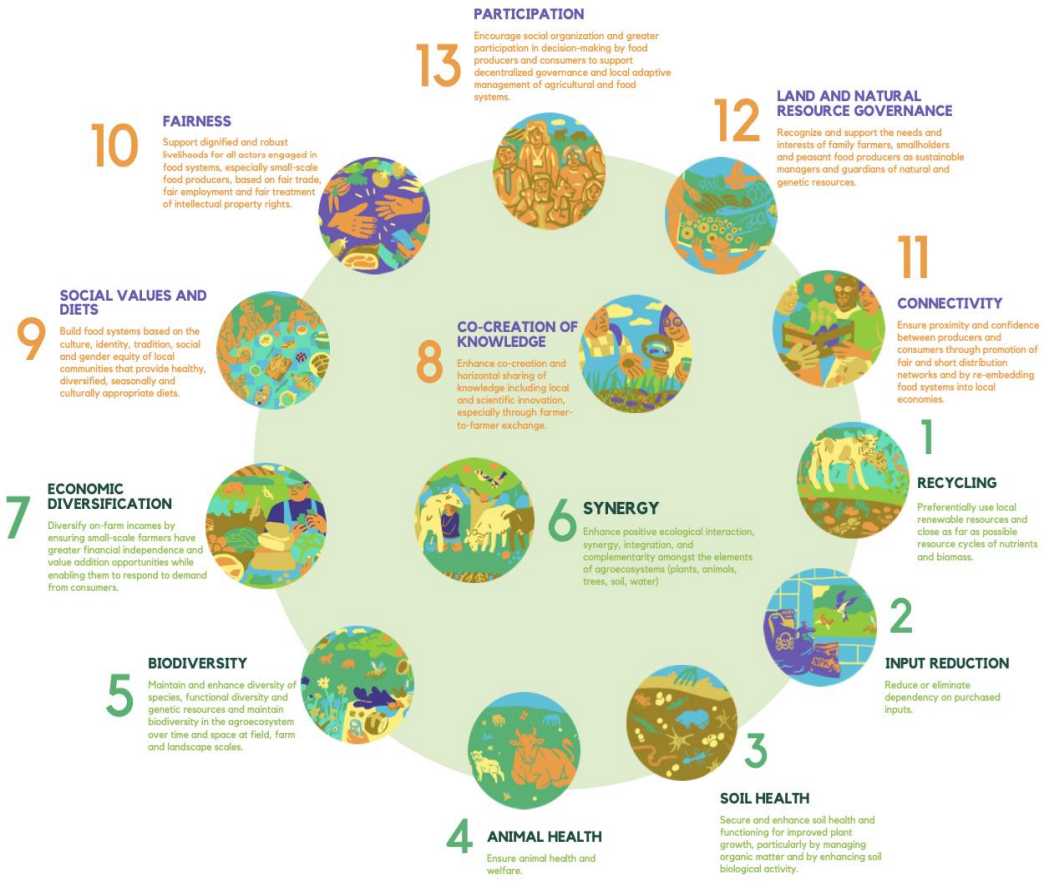

Figure 4: Principles for Agroecology (Source: Agroecology Europe 2021 adapted from HLPE 2019).

The grid has been organized in 4 categories: (i) adaptation of agricultural practices, (ii) conservation of biodiversity and natural resources, (iii) embeddedness of local food systems and (iv) a fourth transversal category rather related on stakeholders, governance and learning issues. This grid is considered as a good basis to analyse and assess processes ongoing in AET (Step 4).

Table 4: Comprehensive transition indicator grid. (Group AgroEcos, 2021; Buckner, Grard & Vandenbroucke, 2022)

Transition process indicator	Description	Elements of transition process	Reference(s)
Adaptation of agriculture practices			
Closing resource cycles of nutrients and biomass (A1)	Generating synergies between arable and livestock production systems.	Nutrients cycles Biomass	(Pelzer et al. 2020)
Increasing self-sufficiency of inputs (A2)	Valorizing local resources and creating farm systems based on ecosystem services of the territory; Reducing or eliminating dependency on purchased inputs; Collective risk perception, risk assessment and risk governance.	Self-sufficiency of inputs	(HLPE 2019; Moraine et al. 2019)
Securing and enhancing soil health and functioning (A3)	Agriculture practices that improve soil health and functioning are used on the farm and field scale	Soil health and function	(HLPE 2019)
Ensuring animal health and welfare (A4)	Animal health and welfare are considered vital in livestock management	Animal health and welfare	(Dumont et al. 2013)
Maintaining overall agroecosystem biodiversity in time and space at the farm scale (A5)	Having a holistic view of the species combination to improve robustness of the system with interspecific diversity.	Maintaining biodiversity in time Maintaining biodiversity in space	Presentation by E. Ollion 2021

Conservation of Natural Resources and Biodiversity			
Maintaining overall agroecosystem biodiversity in time and space at landscape scale (C1)	Increasing the compositional and configurational heterogeneity in a landscape	Maintaining biodiversity in time	(Fahrig et al. 2011; Tscharntke et al. 2005)
		Maintaining biodiversity in space	
		Access to genetic resources (seeds, livestock breeds etc…)	(Anderson et al. 2019; HLPE 2019)
Adaptive management of biodiversity and genetic resources (C2)	Adaptive management of the common land that conserves natural resources and biodiversity	Adaptive management for biodiversity (land and water…)	(Anderson et al. 2019; HLPE 2019)
Enhancing positive ecological interactions among elements of agroecosystems (animals, crops, trees, soil and water) (C3)	Synergy, integration and complementarity among elements of agroecosystems.	Animals	(Anderson et al. 2019; HLPE 2019)
		Crops	
		Trees	
		Soil	
		Water	
Embeddedness of Local Food Systems			
Developing fair and short food systems (E1)	Selling food that is regionally based and grounded in the principles of justice, democracy, and sustainability, and is able to support farmers and other actors	Economic diversification	(Campbell 2004)
		Dignified livelihood/fair employment	(HLPE 2019)
		Close proximity and trust between producers and consumers	
		Fair Trade	

Providing diversified diets (E2)	Providing diverse, seasonally-based, and culturally appropriate diets	Nutritious diets	(HLPE 2019)
		Seasonal food	(Hawkes et al. 2015)
		Culturally appropriate diets	(HLPE 2019)
Establishing circularity in the economy (E3)	Creating opportunities for the reusing and recycling of resources to avoid linearity in production	Closing resource loops to reduce waste and pollution	(Velasco-Muñoz et al. 2021)
		Extend time products remain in supply chain	
		Enhance use of renewable resources	
Transversal			
Providing responsible governance (T1)	Participatory forms of governance that emphasize human and environmental health while including issues surrounding social equity. As well, to include producers and consumers in decision-making and management of food production and food systems.	Local adaptive management	(Anderson et al. 2019; Gascuel et Magda 2015)
		Producers included	(Gascuel et Magda 2015)
		Consumers included	
		Responsible Land Tenure	(Anderson et al. 2019; HLPE 2019)
Enhancing co-creation and sharing of knowledge (T2)	Cooperation between actors with different knowledge and practices to develop and share new visions. Agricultural sector practitioners and academics engage in bridging activities to plan for future food systems	Enhancing co-creating of knowledge	(Cardona et al. 2021)
		Horizontal knowledge sharing	(Campbell 2004)
Addressing social and cultural issues (T3)	Considering social and cultural issues (identity, tradition, gender equity, social equity, fair employment) in the territory	Identity	(Campbell 2004)
		Tradition	
		Gender Equity	
		Social equity	

3.5. Step 3. Inventory of agroecology territories (AET) over Europe

To inventory AET over Europe, the first stage was to specify the criteria to select AET case studies.

Two criteria have been defined:

- Transition processes are engaged in the 3 domains of the adaptation of agricultural practices, conservation of biodiversity and natural resources and embeddedness of local food systems
- Territorial transitions are formalized through a program and there is a governance process involving stakeholders.

A call for case studies has also been set up and diffused to AE4EU partners in April 2022. While no spontaneous candidates emerged, the choice was to focus on 3 countries to go further in data collection: Italy, Germany and UK.

General informants who may have knowledge of potential Agroecology Territories were interviewed to locate regions or territories that may serve as AETs, and to learn more about policies related to agroecology in the informant's country. These informants were targeted because they are already working with, are in contact with, or have knowledge of potential AETs. The AE4EU partners network was mobilized to identify and/or be interviewed as general informants. The interview questions are designed to provide a generalized overview of the territories to determine if they can be appropriately considered as AETs due to the presence of agroecology transitions. In order to qualify as an AET for this research, a territory must demonstrate initiatives or actions taking place in the domains of AET. At this first stage, data collection only attempts to detect whether agroecology transition processes are carried out. If it is determined that agroecology transitions are occurring in two AET domains at least, the territory will be added to the AET inventory.

After one month of data collection,14 general informants' interviews have been held with 1 informant coming from Spain, 2 from Italy, 7 from Germany, 3 from the UK and 1 from France. These interviews have given insights into the comprehension of the Agroecology Territory concept in different European countries as well as an understanding of barriers, drivers, and key successes in transition processes.

The preliminary results reveal that the concept of Agroecology Territory does not make sense at the first stage for most general informants. This seems to be due to different barriers: the reference and meaning of agroecology in the different countries; territorial and regional organization differ from one country to the other; the way to handle issues of adaptation of

agricultural practices, of natural conservation of resources and embeddedness of food systems also vary between countries. Nevertheless, we could see in interviews with the general informant from Italy that the AET concept was easier to explain when compared to an already existing concept such as Biodistricts. So, effort was taken in a second round of interviews to target informants who are already working in regions/territories that have been pre-determined to be potential AETs. In Germany, the concept of model eco-regions (Öko-Modellregionen) was found to be relatively similar to AET because it combines multiple municipalities leading to a regional scale initiative that often includes elements from the three domains of AET. In France, the Regional Nature Parks ('Parc naturel régional') have been found to be a good example of potential AET. In the UK the Areas of 'Outstanding Natural Beauty' (AONB) may provide some examples for AET, however further research is needed in the AONB network. Those place-based programs for transition will be used to select a panel of 9 case studies.

3.6. Step 4. Comparative analysis and assessment of Agroecology Territories based on 9 case studies

Once the list of 9 case studies was established; a deeper stage of data collection with Territorial informants was set up. For this in-depth analysis, 3 to 4 key informants per territory were interviewed to give a detailed assessment of transition ongoing in the territory. Interviews were structured as open-ended questions supported by sub-questions and prompts to ensure the interview was guided and able to gather data relevant to territory dynamics and transition process indicators established in Step 2. Additional questions were asked to gather more information about the interviewee, as well as key meta-data on the territory.

This data will be analyzed through the grid of process indicators established in step 2. Moreover, we will test the application of the LL trait catalog on those case studies. The objectives are to identify key methods and skills and success factors for transition at territorial scale.

Table 5: Grid for interview with key informants in AETs (W. Buckner, B. Grard, P. Vandenbroucke, Feb 2022)

Target information	**Questions and prompts**
Informant information	What is your age and gender?
	What is your occupation and for which organization are you working with?
	Can you tell me about your work with this territory?
Agriculture in the territory	What forms of agriculture are happening in the territory? *Are there forms of agriculture that are dominant or more common than others?
	Are there features unique to the territory in terms of production, processing, crops or livestock grown? **Are there examples of PDO or geographic indicators?*
	What would you consider are the boundaries to the territory? **Geographic? *Stakeholder network used as boundary measurement?*
Policies related to agroecology	What policies exist that are related to agroecology and the food system? **Policies connecting stakeholders*?
Stakeholder information	What are the roles of the stakeholders in the territory? **What is the role of research projects in the territory?*
Adaptation of agriculture practices	Does the territory have existing initiatives in transitioning to sustainable agriculture? *Closing resource cycles of nutrients and biomass *Increasing self-sufficiency of inputs *Soil health and functioning *Animal health and welfare *Agroecosystem biodiversity at the farm
Conservation of Natural Resources and Biodiversity	Does the territory have initiatives in conservation of natural resources and biodiversity? *Biodiversity at landscape scale *Adaptive management of biodiversity and genetic resources *Positive ecological interactions among elements of agroecosystems

Embeddedness of Local Food Systems	Does the territory show the presence of an embedded food system? *Short and fair food systems *Diversified diets *Circular economy *PDO or geographic designations of origin?
Transversal category targeting governance, knowledge sharing and cultural issues	What methods of knowledge sharing exist in the territory? *Horizontal, vertical, role of formal & informal sharing. *Actors driving transition
	What social and cultural issues are considered in the territory? *Culture and tradition, gender and social equity. *Actors driving transition
	What type of governance structures exist? *Does this allow for stakeholder management? *Use Responsible governance section of Grid 3 transversal domain for talking points and prompts
Barriers/drivers and key success factors	Have there been key success factors in the transition? *Are there key dates that can be noted such as policies, funding, research etc.?
	What are the other drivers of transition in the territory?
	What have been the barriers and main difficulties?
*Additional section for territory stakeholders	What is your role in agroecology transition in the territory?
	What is your vision for agroecology in the territory? *Science, movement, practice?*
	How agroecology changed your day-to-day life?
	How do other territory stakeholders view agroecology?

3.7. Key results, lesson learnt and next steps

This first stage of analyses helped us to highlight the following key results:

- The literature review highlighted the importance of territorial scale in agroecology transitions. Besides the concept of Agroecology Territories (Wezel et al., 2016) is mainly handled by French scientists, some comparable frameworks developed over Europe (Anderson, 2019; Owen, 2020).
- An inventory of Agroecology Territories has started over Europe based on this concept, with the objective to select a panel of 9 case studies for a deeper analysis of transitions within Agroecology Territories. For this assessment, an analytical grid characterizing transition processes based on the 13 principles for agroecology from the HLPE report has been established (HLPE, 2019).
- The first round of interviews nevertheless highlights the difficulty for interviewers to handle the concept and identify case studies. But once referring to Biodistricts (Italy) or Ecomodel regions (Germany), the notion was much clearer. It seems that there is a potential to go further in the comparative analysis of place-based schemes for transition over Europe.

Once finalized, this analysis of AET and comparable place-based schemes will provide essential information for the European Partnership on Agroecology on the importance of place-based and territorial approaches for fostering transition towards sustainable agricultural systems.

Based on those first results the next steps for T2.3 are the following:

- Synthesis, answer to research questions and policy recommendation to develop Agroecology territories over Europe are finalized in Deliverable D2.4 in December 22.
- An academic paper will be submitted in 2023
- A webinar for farmers and citizen organizations, public stakeholders engaged in territorial schemes and agroecology transition will be held in the first semester 2023 to highlight and discuss the potential of “Agroecology Territories” to enhance transitions over Europe.

4. General Conclusions

In order to identify skills, tools and methods that are promising drivers for future agroecosystem LL and RI to support processes of transitions in agricultural landscapes and to describe key factors for sustainable transition at territorial scale, WP2 has elaborated on the two concepts of Living Labs and Agroecology Territories. This first approaches in tasks 2.1 and 2.3 involved literature and database reviews, followed by expert interviews to develop a better understanding of the two concepts against the background of the objectives of the European Partnership on Agroecology. For both concepts, trait and indicator grids were developed which are used for a more comprehensive data and information acquisition with the aim of getting representative samples of LL and AET across Europe. Based on the first steps taken in the two tasks and the preliminary analyses undertaken, the following conclusions can be drawn:

- The two concepts of Agroecology Territories and Living Labs are both related to sustainable food systems and policy making schemes, aiming to encourage innovation in natural resource governance and sustainable rural livelihoods (MACS, 2019; Dias et al., 2021; Grard & Miskulnig, 2021). While the trait catalog for LL and the grid of transition processes for AET have been designed with concertation between TI and ISARA, the need for different indicators to characterize and assess both concepts became apparent. Nevertheless, the two concepts cannot completely be merged, some place-based LL could be considered as AET such as Agroecology Living Labs (MACS, 2019) and some AET can be considered as Living Labs if they include research infrastructures and networks, for instance through participatory research programs.
- Living Labs and Agroecology Territories are not easy to identify and inventory:
    - Those concepts are so far not clear for many stakeholders.
    - The trait-and indicator-based approaches of T2.1 and T2.3 will have a positive impact on the understanding of the stakeholders, providing a deeper understanding of the important functional and structural components of LL and AET.
    - The trait- and indicator-based approaches of T2.1 and T2.3 will help identifying initiatives that do not consider themselves as LL or AET and will help in placing those initiatives into a general framework of infrastructures accelerating the transition towards sustainable production and food systems.

Overall, the first analyses provide promising results for the following steps to identify the key methods and skills of LL and AET. The structural and functional insights that will become available through the final analyses in WP2 will help to design policies schemes that could contribute to develop networks of initiatives aiming at enhancing Agroecology transition across Europe.

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