



Norwegian University
of Life Sciences

Master's Thesis 2021 30 ECTS

Faculty of Biosciences

Tutors: Baptiste Grard (ISARA), Alexander Wezel (ISARA),
Tor Arvid Breland (NMBU)
Jens Dauber (Thünen Institute)

Mapping agroecology initiatives in Austria and Germany

Anna Théodora Brumer

Agroecology

Abstract

Transforming food systems is necessary to address the global issues of severe biodiversity loss, hunger and malnutrition, as well as the consequences of the rapidly advancing climate change. Agroecology as a systemic approach attempts to implement its worldview in practice. It has been recognised as a promising path of change. In order to strengthen this transformation efforts to map agroecology endeavours are ongoing. The aim of this study was to get an overview of the advancement in agroecology and collect information on existing initiatives in Austria and Germany.

In this study, 21 interviews were conducted to determine the recognition, understanding and development of agroecology in Austria and Germany in terms of movement, practice, policies and research. This was followed by interviews of initiatives following agroecological principles to illustrate what is already being done. Data was analysed and categorised in five pillars of agroecology: Movement, Practice, Living Lab, Science and Research Infrastructure, and Training and Education.

According to our results, the term of agroecology is not commonly used in Austria and Germany where the concept is mainly associated to a scientific discipline. Agroecological practices are implemented primarily through organic agriculture, which is very developed in Austria and to a lesser extent in Germany. Many networks, food councils, associations, and scientific projects exist. Each with specific purposes and ambitions to change farming and food systems. While most selected initiatives do not explicitly refer to agroecology, all follow agroecological principles and certainly play a key role in accelerating the transition.

Clarifying the concept of agroecology, overcoming economic and political barriers as well as fostering participation of a multitude of stakeholders in the transition will give key insights for the future development of agroecology in Austria and Germany.

Keywords: agroecology, Austria, Germany, mapping initiatives, organic agriculture, food system

Table of contents

Abstract	i
List of figures	iii
List of tables	iii
Acknowledgements	iv
1. Introduction	1
2. Material and methods	4
3. Results	8
3.1. Key informants' definitions of agroecology	9
3.2. Policies on agroecology	10
3.3. Implemented practices	11
3.4. Science and publications	12
3.5. Initiatives in Austria and Germany	13
3.6. Future development of agroecology	19
4. Discussion	21
5. Conclusion	24
References	25
Appendices	28
Appendix 1	28
Appendix 2.1	28
Appendix 2.2	29

List of figures

Figure 1: 13 principles of agroecology (adapted from HLPE, 2019), grouped by scale of application2

Figure 2: Movement, Practice, Living Lab, Science and Research Infrastructure, and Training and Education are the five pillars of agroecology (here abbreviated as AE) considered in this study.4

Figure 3: Main methodological steps.....5

Figure 4: Keywords used for the literature review, ordered in five main themes including the related terminology.5

Figure 5: Map of the different initiatives (legend: localisation sign) and localisation of key informants (legend: star). The different colours represent the 5 pillars: Movement (in violet), Practice (in red), Living labs (in light green), Science (in green), Education and Training (in blue).6

Figure 6: Wordclouds based on the key informants interviews for Austria (left) and for Germany (right). Agroecology, initiatives and link words were removed. The repetition threshold was lower for Austria than for Germany as there were less key informants (repeated 10 and 15 times respectively).10

Figure 7: Agroecological practices implemented in Austria (AT) and Germany (DE), in parenthesis number of key informants mentioning the practice.11

Figure 8: Publication focus (1990-04/2021) using five different themes and related keywords as a topic, 1) agroecology, 2) organic farming, 3) agroforestry, 5) regenerative agriculture, 6) food system. The blue columns represent the number of articles.....12

Figure 9: Timeline of number of publications in Austria (left graph) and Germany (right graph), including the five themes and related keywords of agroecology, organic agriculture, agroforestry, food system and regenerative agriculture as topic. The countries were included as topics in the Web of Science research.13

Figure 10: Barriers for the development of agroecology mentioned by the key informants (Austria in the top, Germany at the bottom). The barriers are ordered by frequency of mention, with the number of key informants referring to it in parenthesis, and were separated in different categories : economic, education and awareness, political framework, and other.20

List of tables

Table 1: Number of selected key informants and initiatives for both countries6

Table 2 : Key informants interviewed in Austria and Germany 7

Table 3: Selected initiatives in Austria and Germany and scale of application, stakeholders involved, and the general aim of the initiative..... 14

Table 4 : List of universities with a department or group researching on agroecology (and related subjects), named by key informants. 18

Table 5: List of research infrastructure in Austria and Germany. Most focus on agriculture either organic and/or conventional. 19

Acknowledgements

This study would not have been possible without the participation of all the interviewees, I am very grateful to all. Thank you to Baptiste Grard for your availability and great support throughout this work. Thank you to Alexander Wezel for giving me the opportunity to work on this project and regular feedbacks, to Tor Arvid Breland for your thought provoking comments and Jens Dauber for your guidance. I also want to thank the other mappers for sharing and exchanging on our work. Finally, many thanks go also to the interns at the ISARA and my colleagues of the double degree in agroecology NMBU-ISARA. And last but not least, I wish to express my gratitude to my family

1. Introduction

Agroecology has been proposed as a useful concept to transform farming and food systems facing global issues such as severe biodiversity loss, hunger and malnutrition, poor agricultural resilience to the consequences of climate change and insufficient livelihood security for farmers (Altieri et al., 2015; Wanger et al., 2020). Agroecology addresses environmental, social and economic dimensions (Altieri, 1989; Gliessman, 2018; Wezel et al., 2009), using a holistic or systems thinking approach needed to understand the complexity and the interconnectedness of food systems (Gliessman, 1990; Kerr et al., 2018). Through its transdisciplinary, participatory and action-oriented approach (Méndez et al., 2016), agroecology aims to consolidate the links between the diversity of stakeholders (farmers, producers, researchers, and consumers) as well as those between different disciplines (ecology, agronomy, social sciences, economy).

Various challenges to accelerate the agroecological transition have already been identified (IPES-Food, 2016; Cacho et al., 2018; Wezel et al., 2018; Gliessman, 2019). These include limited funding for agroecological research, lack of policies at EU level as well as weak connections between science, policymakers and farmers. A further challenge linked to the latter, is the implementation of the agroecological principles (Nicholls and Altieri, 2018), which need to be matched with concrete practices. The need to generate, combine and exchange knowledge to reach cognitive justice, i.e. in terms of alternative practices recognition and equity in access to knowledge (Coolsaet, 2016) also plays a key role in the development of agroecology. To overcome the aforementioned challenges and accelerate the transition, a long-term vision and a joint financial effort by the states are needed. As a step towards this, the European Union is planning to create a partnership on agroecology living labs and research infrastructure¹.

Transforming food systems requires a series of steps. The 13 agroecological principles (Figure 1), defined in the HLPE (2019) report, provide a guideline basis which has to be adapted to the context and scale they are applied in (Wezel et al., 2020). These principles include basic notions of soil and animal health directly linked to plant and human health (although these are not specifically listed). They also embrace broader concepts such as synergy and connectivity. Gliessman (2016) identified five levels of change, starting with three levels at the farm scale: 1) increasing input use efficiency, 2) substituting undesirable practices with more benign ones and using preventive methods and 3) a complete system redesign. At the two levels beyond the farm

¹ https://ec.europa.eu/info/research-and-innovation/research-area/agriculture-forestry-and-rural-areas/partnership-agroecology_en

scale, 4) producers and consumers are re-connected and 5) a global food system “based on equity, participation, democracy, and justice” is achieved.

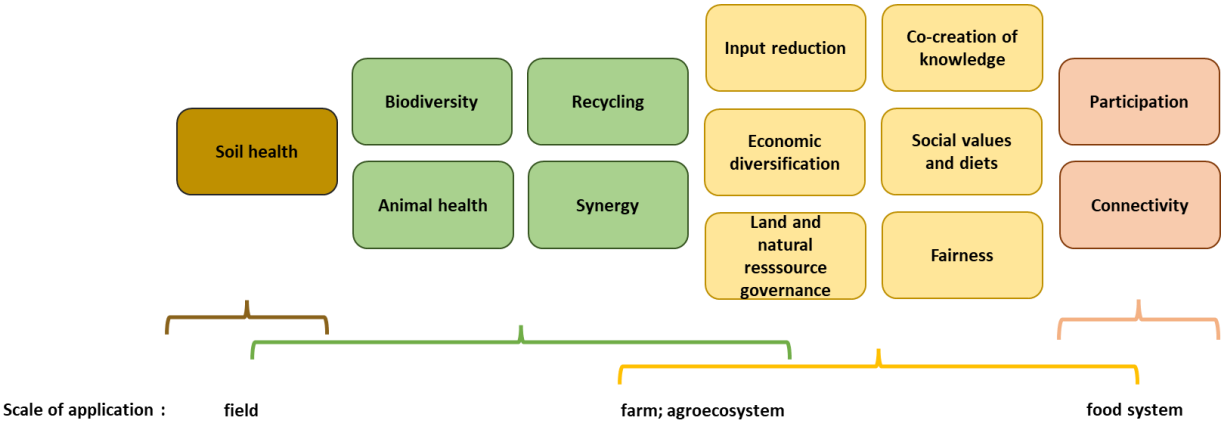


Figure 1: 13 principles of agroecology (adapted from HLPE, 2019), grouped by scale of application

At a national level agroecology is not widespread, actions are currently undertaken regionally/locally with there being a starting dynamic at EU level. France being the one exception that comes to mind where agroecology is defined in legal texts since 2014 (Wezel and David, 2020). While European countries differ in their approach to agroecology, it was reported that most conceive agroecology firstly as a science, then as a practice and to a smaller extent as a movement (Gallardo-López et al., 2018). Scientific theories and practices are encompassed in agroecology equally. To actively change food systems these need to be shared. In this regard, several sources or databases on agroecology, with different objectives already exist. The Agroecology Knowledge Hub², a web platform created by the FAO, shares relevant knowledge and policies (AgroecologyLex) on Agroecology around the world. In recent years, the importance of mapping and setting up databases on agroecology has been recognised, as “mapping has an important role to play in strengthening processes of transformation” (Milgroom et al., 2019). The ‘Ten Years Agroecology Project’ (TYFA), presented different agroecological initiatives, giving examples of successful practices in farming and food systems in 9 European countries (Moraine et al., 2016) and analysing their performance (production, economic, farm autonomy, work management, inputs self-sufficiency, domestic biodiversity and landscape diversity). A special issue around the development of agroecology in Europe (Wezel and Bellon, 2018) gave a first insight into the development of agroecology in different countries. It was followed by a preliminary report by the Youth Network of the association Agroecology Europe, which mapped initiatives in 11 countries in Europe (Agroecology Europe, 2020). A subsequent report provided analyses of the current state of agroecology and mapped initiatives in Hungary (Balogh et al., 2020) and on the West Balkans (Seremesic et al., 2021). Other projects encompass a map showing initiatives

² <https://cordis.europa.eu/project/id/101000478>

in Central and South America³, a list of over 30 initiatives⁴ worldwide, and a recent map of so-called «agro-ecological farming systems» identified in the UNISECO project⁵. These publications show that a multitude of initiatives and projects exist with different approaches on various themes such as education, commercialisation, production and food sovereignty. However, most of the previously mentioned reports and articles on the topic are incomplete (depending on the research focus, not all include number of participants, location, successes) and are not updated regularly if at all. Furthermore, they do not systematically assess limitations and impacts these initiatives have.

The aim of the current study was to map initiatives following agroecological principles and aiming to redesign the food system in two European countries: Austria and Germany. The term mapping is understood here as a collection of information on existing initiatives, e.g. examples of innovative projects or associations pursuing the improvement of agriculture. This study is part of the mapping of European initiatives within the scope of the Agroecology for Europe⁶ (AE4EU) project (see Appendix 1 for more details). The primary outcome of this effort is a data base on existing agroecology related efforts in Germany and Austria which allow for a better understanding of the main constraints that need to be overcome to reach a transformational level corresponding Gliessman's levels 3), 4), and 5). Having an updated analysis of the current state of agroecology in Austria and Germany, in terms of recognition, implementation and level of transition will provide a general overview that can serve as a basis for the creation of European policies. Favourable policies are key drivers to scale out agroecology (Cacho et al., 2018).

The objective of this study was to answer the following three questions:

- 1) What is the current state of development of agroecology in terms of movement, policies, practices and research in Austria and Germany ?
- 2) To what extent are existing initiatives in Austria and Germany identify with or follow agroecological principles?
- 3) What are the barriers and opportunities for developing agroecology in Austria and Germany?

To answer these question a series of experts and representatives were interviewed.

³ <http://www.fao.org/agroecology/home/en/>

⁴ <https://mapadaagroecologia.org/novidades?locale=en>

⁵ <https://uniseco-project.eu/case-studies>

⁶ <https://www.ae4eu.eu/>

2. Material and methods

Pillars of agroecology

The following five categories were considered as agroecology pillars in the AE4EU project: Movement, Practice, Science, Living Lab, Education and Training (see Figure 2). Associations, and farmers' unions promoting agroecology were considered as movements. Practices included farmers or any stakeholder that develop and implement agroecology. Research projects and programs, universities and institutions researching on agroecology were considered for the science pillar.

Living labs are open innovation networks involving a multitude of actors (Dekker et al., 2020; Leminen, 2015), beyond the farm scale, implementing and developing agroecological principles. These types of initiatives are often very recent and represent an important pillar for the agroecological transition and the European union. Education and Training is a pillar that is often integrated into Science, however, it was considered here as a separate pillar as it includes trainings that are done outside of academic settings and research infrastructures, for example, by NGO's.

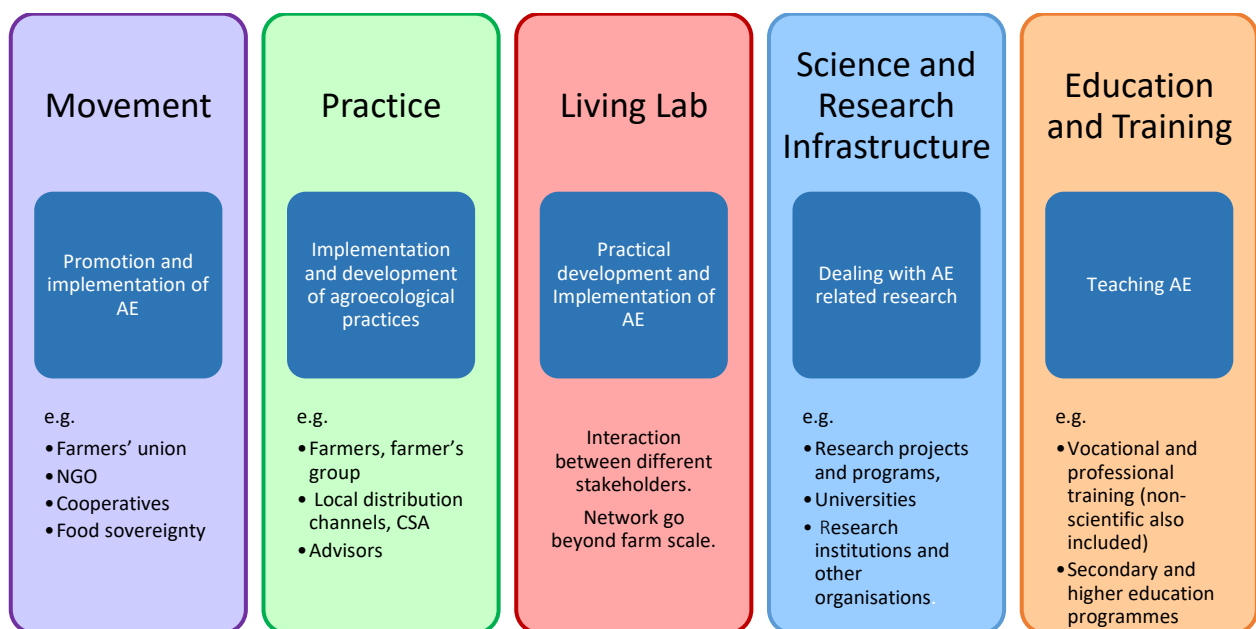


Figure 2: Movement, Practice, Living Lab, Science and Research Infrastructure, and Training and Education are the five pillars of agroecology (here abbreviated as AE) considered in this study.

Main methodological steps

The different methodological steps were determined collectively in the AE4EU project. These steps are summarised in Figure 3. The first step consisted of collecting information on agroecology in both countries, using different search engines and searching the use of the word "agrar(-)ökologie" and "biologischer Landbau" or "ökologischer Landbau" on government and

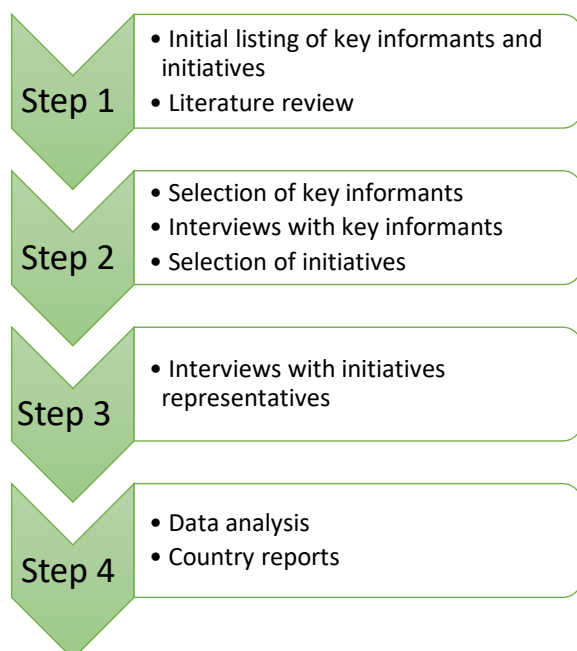


Figure 3: Main methodological steps

An analysis on academic publication focus in Austria and Germany was undertaken using the “Web of Science” platform, specific keywords related to topics linked to agroecology were chosen, including agroforestry, organic farming, regenerative agriculture and territories (see complete list in Figure 4). The country was also included in the topic search to compare the number of published articles where one of the contributing authors is a researcher in Austria or Germany and the number of published articles where the article focuses on research done in Austria or Germany.

The second step consisted of contacting and interviewing key informants. The selection of further key informants and initiatives was based on the interviews and initial listing. Some key informants were also involved in initiatives; in such cases, the interview questions for the initiative were asked at the end of the main interview.

Beyond this work, a country report was created for each country. These consist of a first part on the development of agroecology per pillar based on the literature research and the key informants’

initiatives websites. This allowed, creating an initial list of initiative. Organic agriculture and agroecology share an ecological worldview. Practices and methods used in organic farming are considered to be following the agroecology worldview and as such being a part of agroecology (Migliorini and Wezel, 2017). The DG-Agri survey⁷ from the European Commission was used to identify agroecology living labs and other initiatives in Austria and Germany. This was followed by a first selection of key informants and initiatives.

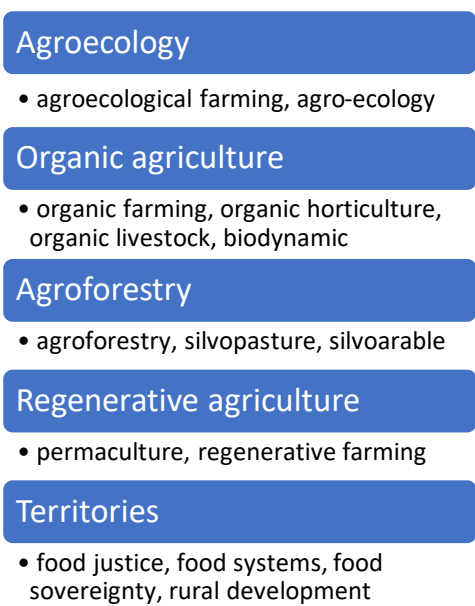


Figure 4: Keywords used for the literature review, ordered in five main themes including the related terminology.

⁷ <https://ec.europa.eu/eusurvey/runner/FirstScreeningAELLRI2020>

interviews, and a second part describing the existing initiatives. This reports, is a AE4EU project deliverables, will be published in the coming month.

Selection and interviews of key informants and initiatives

Key informants were selected based on their knowledge on one or more of the five pillars of agroecology. These included individuals. having participated in national agroecological gatherings/conferences, in previous mapping projects, or being researchers at universities or institutes with a focus on agroecology. Representatives of NGOs and civil society organizations active in agroecology and food sovereignty, as well as members of chambers of agriculture (e.g. in the organic farming section) were also selected, in addition to those identified in the DG-AGRI survey. Key informants were also asked to name other experts. The initiatives were then selected according to different criteria: being named by more than one key informant, having objectives in line with at least one of the 13 agroecological principles (Figure 1). They further had to be viable and have existed for over three years (with some possible exception for outstanding initiatives and recently created living labs).



Figure 5: Map of the different initiatives (legend: localisation sign) and localisation of key informants (legend: star). The different colours represent the 5 pillars: Movement (in violet), Practice (in red), Living labs (in light green), Science (in green), Education and Training (in blue).

Table 1: Number of selected key informants and initiatives for both countries

	AUSTRIA	GERMANY
KEY INFORMANTS	8	13
INITIATIVES	9	15

As agroecology is not a term that is commonly used in Austria and Germany, most initiatives selected did not label themselves as agroecological, but all were using one of the keywords used to find relevant publications for the literature review (Figure 4).

A further selection criteria was the localisation; an effort was made to find initiatives in the different regions of both countries (Figure 5). Interviews were carried out with a total of 21 key informants

and 24 initiatives (Table 1). In Austria half of the key informants were working at chambers of agriculture (Table 2) in different regions (all chambers were contacted, but only four responded). In Germany the majority of key informants were working at universities or research infrastructure (Table 2).

Table 2 : Key informants interviewed in Austria and Germany

Country	Interviewee	Type of structure	Pillars
Austria	AT1, AT2, AT3, AT5	Chamber of agriculture	Practice
	AT4	Research infrastructure	Science, Living lab, Education and Training
	AT6	NGO	Movement, Practice, Science
	AT7	University	Education and Training, Science
	AT8	Ministry of agriculture	Practice, Science
Germany	DE2, DE4, DE6, DE9	University	Education and Training, Science
	DE3	NGO	Movement
	DE1, DE5	Research infrastructure	Science, Education and Training, Living Lab (only DE1)
	DE10, DE12		Science
	DE7, DE8	Ministry of agriculture	Science
	DE11, DE13	Chamber of agriculture	Practice

Interviews

The interviews followed a grid developed and agreed upon by the AE4EU team (see Appendix 2.1) used by all mappers. The AE4EU grid is in English and was translated to German for this study. Only two interviews were conducted in English. The semi-structured interview started with a question about how often the key informants used the term agroecology and what their definition of it was. This was followed by a series of questions on their knowledge of initiatives in the five pillars. The last part of the interview consisted of questions on awareness, policies, practices used and barriers as well as opportunities for the development of agroecology. Key informants' interviews lasted between 30 and 70 minutes.

Initiative interviews based on other AE4EU common grid, were conducted with each of the selected initiatives (see Appendix 2.2). The interviewer asked general questions on the aim, starting year, involved stakeholders and future plans of the initiative. Those interviews lasted 30-45 minutes.

Data analysis

The interviews were analysed to establish an overview of the current state of agroecology of both countries. The following aspects were teased out: the awareness within the civil society, the level of integration in political directives at national and regional level, the existing educational

programmes and research projects and the supporting and hindering forces for the development of agroecology within Austria and Germany.

Data were summarised and analysed using a standardised Excel file also used for mapping agroecology in other European countries. The transcripts of the interviews with the key informants were used to create wordclouds of the most repeated relevant words, using R-4.1.0. The words agroecology and initiative were excluded as those were often repeated in the questions asked. These wordclouds give an overview of the common themes related to agroecology identified by key informants.

3. Results

Agroecology and organic agriculture

The Austrian agri-environmental programme ÖPUL (Österreichisches Programm für Umweltgerechte Landwirtschaft), supports amongst others water conservation measures, biodiversity conservation, integrative pest management, and organic agriculture (over 40% of its budget go to organic agriculture). It can therefore be considered as a programme promoting the development of agroecology. Historically, Austria is a pioneer in organic farming, starting with the development of biodynamic agriculture by Rudolf Steiner in 1924, the first biodynamic farms created in 1925 in Carinthia and the creation of first organic association (which became Demeter) in 1932 (Steinwider and Starz, 2020). Organic agriculture is promoted by the Bio-Aktionsprogramm 2015-2020, promoting key measures to further develop organic farming (Rech, 2015), which has been prolonged until 2022. Another element of this programme is the high allowance for organic farms in less favoured areas and the “Biobonus”. A specificity of Austria is that mountains make up 70% of its surface area and according to EU classification (Art. 32(2), Regulation 1305/2013) it is considered as a disadvantaged region. Austria has the highest area of organic farmland in the EU and third worldwide (Steinwider and Starz, 2020). Over 25% of the agricultural land in Austria is farmed organically (as of 2019).

For Germany, the position paper “Agrarökologie stärken- Für eine grundlegende Transformation der Agrar- und Ernährungssysteme ”(INKOTA, 2019), published in 2019, called for the German federal government to take a series of supporting measures for agroecology. These include specific financial support as well as the development of farmer-led research, principles of co-creation of knowledge used in research and the publication of a progress report every two years. The report “Entwicklungsperspektiven der ökologischen Landwirtschaft in Deutschland” (Haller et al., 2020) explains how organic and conventional agriculture could be optimised. Germany has a similar development of organic agriculture as Austria. In 2019, around 10 % of the farmland in Germany was farmed organically (Bundesministerium für Ernährung und Landwirtschaft, 2021).

In Austria and Germany, organic agriculture goes well beyond the European organic regulations with many established private guidelines. All key informants in Austria agreed that in its principles and practices it is very similar or even equal to agroecology, whereas in Germany agroecology was often seen as a broader subject built on the principles of organic agriculture.

3.1. Key informants' definitions of agroecology

In Austria, only one out of eight key informants used the term agroecology very often, three often, and five rarely in their respective work. In Germany five out of 13 reported using it very often while four often, and four rarely.

When asked about their definitions of agroecology, most (5) key informants in Austria defined it as a practice for sustainable production, meaning not negatively impacting the environment. Three defined it as a scientific discipline studying the interactions and relationships in an ecosystem of which two added that it is also a political movement. For Germany key informants mainly defined the concept as a science (10), with four also mentioning it being considered as a social movement and three using the threefold definition by Wezel et al. (2009). Some key informants argued that it is a holistic and systemic approach (2 in Austria, 4 in Germany).

Organic farming was also mentioned already in the definitions, with two key informants in Austria specifying that organic farming is the implementation of agroecology and two informants in Germany saying that agroecology is based on the principles of organic farming or includes organic farming. Three informants in Germany also insisted on the notion/idea that agroecology represents a transformative process towards a sustainable food system.

Interview keywords

Not counting the word agroecology and initiative the most repeated words during the key informants' interviews for Austria, were farms (Betriebe), agriculture (Landwirtschaft), farmers (LandwirtInnen), organic agriculture (Biolandbau), organic (biologisch), measures (Maßnahmen). For Germany they were agriculture (Landwirtschaft), measures (Maßnahmen), farmers (LandwirtInnen), biodiversity (Biodiversität), transformation (Transformation), organic farming (Ökolandbau).

The word "measures", frequently repeated for both countries, was most often linked to agri-environmental measures but sometimes also to nature or climate protection measures. The word "transformation" was mentioned by many key informants during the interview but one repeated it over twenty times, which explains it appearing prominently in the middle of the word cloud (for Germany, Figure 6). The frequent use of adjectives like "agroecological", "sustainable", "ecological" and "political" shows the purpose of the initiatives or ideas behind the notion of agroecology. "Consumer", "society" and "research" were also repeated by the key informants for Germany, as playing an important role in food systems. For Austria, "BioAustria" and "ÖPUL"

favourable elements for the development of agroecology, e.g limiting the amount of fertilizer, or protecting specific species.

3.3. Implemented practices

To get an overview of the different practices implemented in both countries, key informants were asked to name examples of the most commonly used practices. The following list (Figure 7) shows the many different answers. While some are identified practices, a few, like organic farming, refer to a production system which includes a series of different practices. Others are linked to an agri-environmental measure, such as for example flower strips, which is a method to increase the diversity of pollinators. Crop rotation and organic farming for Austria and flower strips and organic farming for Germany were the most mentioned practices. A common response to this question was that they could not really give an estimate to the frequency of use of these practices. One informant specified that while flowering strips are very common, they probably only represent 1% of agricultural surfaces in Germany when comparing it to the amount of organic certified agricultural surfaces, which is ten percent of agricultural surfaces; “organic farming is by far the most common practice”.

AT	Crop rotation (3)		
	Organic farming (3)		
	Flower meadows, flower strips (2)	DE	Flower strips (6)
	Traditional, old species, adapted cultivars (2)		Organic farming (5)
	Intercropping (1)		Agroforestry (2)
	Agroforestry (1)		Reduced or no tillage (2)
	Drip irrigation (1)		Intercropping (1)
	Direct seeding (1)		Mixed seed (1)
	Cover crops (1)		
	Reduced or no tillage (1)		

Figure 7: Agroecological practices implemented in Austria (AT) and Germany (DE), in parenthesis number of key informants mentioning the practice.

3.4. Science and publications

When looking at the articles published using the keywords related to agroecology (see Figure 8), the highest number of articles employ the concept of organic agriculture. From 1990 to April of 2021, 1080 articles using organic agriculture as a topic were published with at least one author from an Austrian or German research institution (Figure 8). In comparison, only 209 articles with agroecology as a topic were published by authors working in either countries, which is less than the 303 articles on food systems. For Germany, a very high number of articles on the topic of agroforestry has been published (671).

A further observation can be made on the number of articles also including the country as a topic (darker colours in Figure 8), which are noticeably lower in all five selected terms for both countries, showing that the research experiments or focus are very often based outside of Austria or Germany. Articles on organic farming represent 29% of the papers published on agriculture in Austria and 21% in Germany (research done in country) during the period from 1985 to 2021.

During the last five years, they represented 27% for Austria and 20% for Germany.

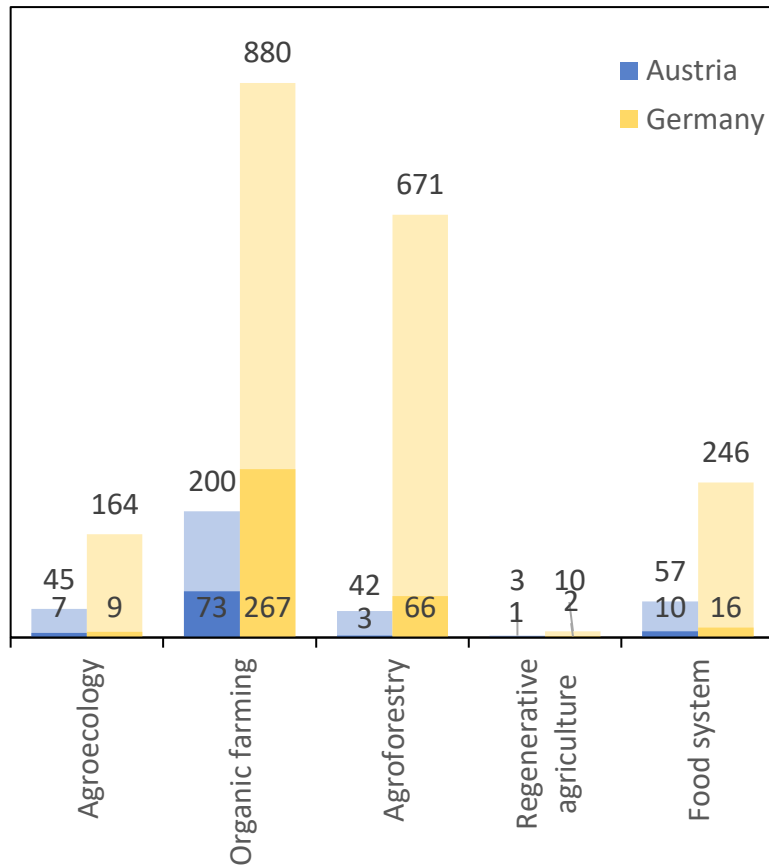


Figure 8: Publication focus (1990-04/2021) using five different themes and related keywords as a topic, 1) agroecology, 2) organic farming, 3) agroforestry, 5) regenerative agriculture, 6) food system. The blue columns represent the number of articles

The first scientific article (in English) on agroecology in Germany was published in 1993, for Austria it was in 2000 (Figure 9). The publication of articles on agroforestry and food system in Germany have increased in the last ten years. An increasing trend can also be seen for the articles on agroecology in Austria since 2018. At least one article on organic agriculture in Austria and Germany has been published every year starting from 1996 and 1999, respectively. Only one article on the topic of regenerative agriculture in Austria has been published so far (in 2004), whereas two were published for Germany (in 2018 and 2020).

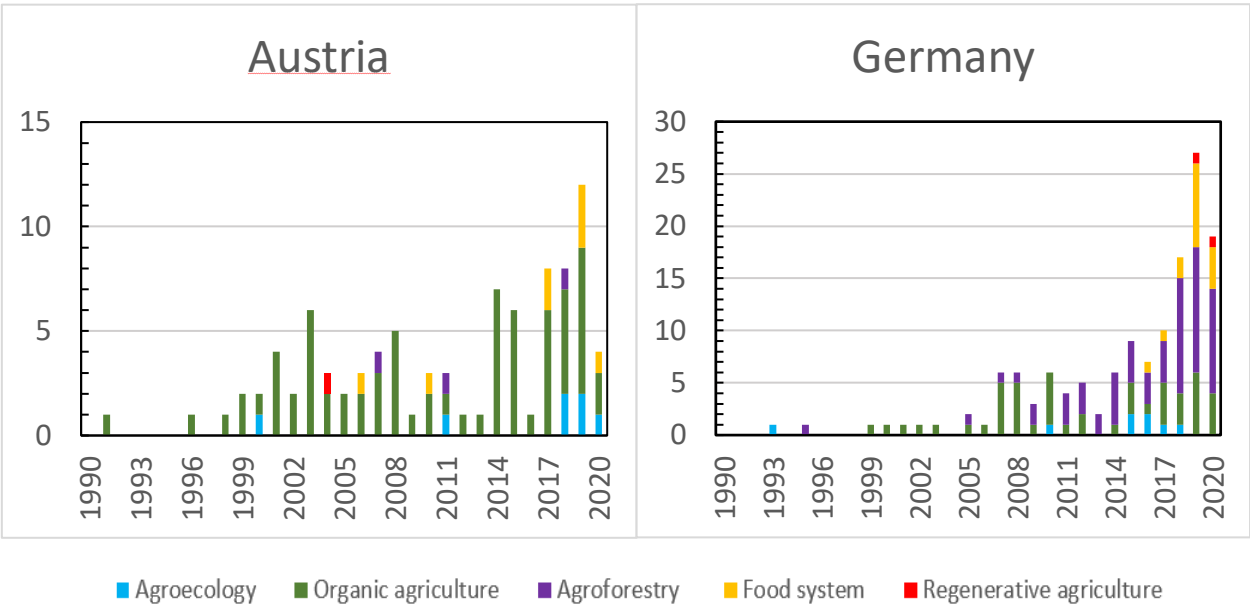


Figure 9: Timeline of number of publications in Austria (left graph) and Germany (right graph), including the five themes and related keywords of agroecology, organic agriculture, agroforestry, food system and regenerative agriculture as topic. The countries were included as topics in the Web of Science research.

3.5. Initiatives in Austria and Germany

Key informants named many initiatives even though a few argued that no agroecology initiative having a holistic approach and aiming to completely transform food systems existed either in Germany or Austria. The aim and general characteristics of the 24 selected initiatives are summarised in Table 3. For each pillar, a brief overview is given on existing initiatives, following Table 3.

Table 3: Selected initiatives in Austria and Germany and scale of application, stakeholders involved, and the general aim of the initiative.

In Austria:

Initiative name	Scale	Stakeholders	Started	Aim	Related pillars
<i>feld - association of the use of unused (Verein von Nutzung von Ungenutztem)</i>	Local	Civil society, farmers	2014	Reducing food waste by transforming unsold food	Movement
<i>Arche Noah</i>	International	Civil society	1989	Preservation and development of the diversity of cultivated plants	Movement Education and training
<i>Food Council Vienna (Ernährungsrat Wien)</i>	Local/National	Civil society	2018	Relocating – food system and decision making processes in Vienna	Movement
<i>Results oriented nature conservation (Ergebnis orientierter Naturschutz)</i>	National	Farmers, advisors	2012	Result based nature conservation planning	Practice
<i>Grand Farm</i>	Local	Farmers, researchers	Organic since 2006	Innovations along three themes: soil health, agroforestry, market gardening	Living Lab Practice Science
<i>Long Term Ecological Research (LTER)</i>	National	Researchers, farmers		Long term ecological research plots	Living Lab Science
<i>Biodiversity monitoring with farmers (Biodiversitätsmonitoring mit LandwirtInnen)</i>	National	Farmers, researchers	2007	Farmers monitoring biodiversity in agricultural landscapes, changing practices to promote biodiversity	Education and training Practice
<i>Bioschool Schlägl (Bioschule Schlägl)</i>	Local	Students	2002	Organic agricultural school (14-17 years old students)	Education and training
<i>Permaculture Academy (PIA – Permakultur Akademie im Alpenraum)</i>	National	Civil society	2004	Teaching permaculture (all ages)	Education and training

In Germany:

Initiative name	Scale	Stakeholders	Started	Aim	Related pillars
<i>Aktion Agrar</i>	National	Civil society	2014	Actions for agricultural turnaround	Movement
<i>German professional association agroforestry (DeFAF)</i>	National	Civil society, farmers, researchers	2019	Promote agroforestry in Germany	Movement
<i>Food council Frankfurt (Ernährungsrat Frankfurt)</i>	Local/National	Civil society	2017	Promote regional, fair and ecological food supply, involve civil society	Movement
<i>Organic model region in Bavaria (Ökomodellregionen Bayern)</i>	Regional	Civil society, farmers, advisors	2014	Increase organic production, create regional value chain	Practice
<i>Link biotopes in grassland (Biotopverbund Grasland)</i>	Regional	Researchers, farmers, advisors, civil society	2017	Create and maintain biotopes in grassland	Practice
<i>Demonstration network for pea and bean (DemoNet Erbse Bohne)</i>	National	Farmers, researchers	2016	Support cultivation and processing of beans and peas in Germany, linking demand and supply	Practice
<i>Network for animal wellbeing (Netzwerk Fokus Tierwohl)</i>	National	Farmers researcher	2019	Animal welfare, environmentally friendly and sustainable livestock farming	Practice
<i>Network vor stock protection (Vorratschutz Netzwerk, VSnet)</i>	National	Researchers, farmers	2019	Sustainable post-harvest protection	Practice
<i>Model organic farms in North-Rhine Westphalia (Leitbetriebe Biodiversität)</i>	Regional	Farmers, advisors	2015	Implementation and adaptation of agri-environmental measures	Practice Living Lab
<i>patchCROP</i>	Regional	Researchers, farmers	2019	Implementation and research on multi-functional sustainable production	Living Lab Science
<i>F.R.A.N.Z.</i>	National	Researchers, farmers	2016	Implementing effective biodiversity promoting measures	Science Practice
<i>Biodiversity Exploratories</i>	Regional/ National	Researchers, farmers	2006	Fundamental ecological research	Science
<i>Agricultural management and biodiversity (Agrarmanagement und Biodiversität)</i>	National	Students	2018	Master course for future biodiversity advisors	Education and training
<i>Bridging generations in agroecology</i>	National	Farmers, students	2020	Development of suitable seminars and courses on agroecology for farmers	Education and training
<i>Ackerdemia e.V. – Vegetable academy (GemüseAckerdemie)</i>	International	Students (pre-school, school)	2014	Strengthening awareness of the importance of nature and fostering food appreciation	Education and training

Geographic distribution of initiatives

Both Austria and Germany being federal states, most key informants agreed that regional differences existed regarding the amount of emerging initiatives, depending on the political will of the party leading the region. Diverse landscape also explains regional differences. For Austria, some mentioned a structural difference between the western, mountainous part and the hilly south-eastern part, where farms have greater surfaces and face less difficulties to be profitable using conventional techniques. For Germany, key informants had similar reactions, saying that depending on the geography and historical development, more diversified smallholdings can be found in the south than in the north. Another aspect mentioned was the tourism factor: regions often developed products and local value chains to attract tourism. A few informants also mentioned that there are more initiatives in proximity or within cities as there is an ever higher demand of city-dwellers for local and sustainable products thus creating a momentum for the development of agroecological initiatives. Some key informants also responded to this question by saying they have no idea or do not want to venture in an answer that is based solely on where they are and what they have seen, deeming such answer not representative.

3.5.1. Movements

The concept of agroecology has been used by different movements in both countries, even if the term itself is not always explicitly used. Movements are often linked to food sovereignty (e.g. ÖBV-via Campesina Austria, Nyéléni Austria) and Community Supported Agriculture (e.g. CSA, Solidarische Landwirtschaft in both countries). Over 40 initiatives⁸ of CSA have been listed in Austria and over 362 in Germany⁹. The association Sezioneri¹⁰ advocating for the rights of agricultural workers in Austria is also an example of an initiative that could be considered as agroecological in a loose, as it questions the current European system of using “harvest helpers” that have unfair working conditions and urges for a transformation of the workers’ status.

Another type of citizen-led movement is the emergence of food policy councils aiming to involve citizen in decision processes in food systems (Sieveking, 2019), and thereby creating a new appreciation for food and its producers, promoting local, sustainable and fair food supply. A map of different food councils in Austria and Germany and other European countries has been established¹¹. The food council in Vienna¹² follows sociocratic principles in decision making processes, meaning that everyone can express their ideas and opinions on specific proposals and decisions are taken in groups. Around 40 people are active in the different projects including the development of a nutrition strategy (named “Ernährungsstrategie”) with the city of Vienna and

⁸ <https://www.ochsenherz.at/solidarische-landwirtschaft-in-oesterreich-2/>

⁹ <https://www.solidarische-landwirtschaft.org/solawis-finden/karte#/>

¹⁰ <http://www.sezioneri.at/>

¹¹ <https://ernaehrungsraete.org/>

¹² <https://ernaehrungsrat-wien.at>

an urban field showcasing various land usages for the yearly food consumption per person in terms of vegetable and animal production amongst others. The food council in Frankfurt¹³ has a similar structure and has several working groups on education and awareness raising, production and marketing, zero waste, permaculture island. There are about 150 people involved with a high fluctuation. Both food councils follow agroecology principles such as recycling (food waste), co-creation of knowledge, social values and diets, connectivity and participation. Their work is based on volunteers and a difficulty mentioned by both is the lack of recognition and financial support by governments.

3.5.2. Practice and living labs

In Austria and Germany different regions have been labelled as 'organic model regions', their common objective is to increase the production of organic food and create short supply chains with the involvement of municipalities and different stakeholders of the food system. The Ökoregion Kaindorf (case study in the UNISECO project¹⁴), the BioRegion Mühlviertel in Austria and the different Öko-Modelregionen in Bavaria and Hesse, as well as the "Öko-Musterregionen" in Baden Württemberg were considered as examples of implementation of agroecology.

Four living labs self-identified in the DG-AGRI survey were interviewed: the Grand Farm¹⁵, the long term field experiments of the AGES (Austrian agency for health and food security), patchCrop¹⁶ and the Biodiversity Model Farms in Nordrhein-Westfalen¹⁷. All involve different stakeholders (farmers, advisors, researchers) and aim to transform or adapt practices. They differ in the principles of co-creation, indeed in the patchCrop project the farmer and researchers co-designed the experiment, whereas for the model farms the agri-environmental measures are proposed by the advisors and then implemented by the farmer.

Other initiatives included in the table under the pillar practice, such as the Biotopverbund Grasland¹⁸, DemoNet Erbse Bohne¹⁹, Netzwerk Tierwohl²⁰ and Vorratschutz Netzwerk²¹, could also be considered as living labs, as these networks link many different stakeholders to a common objective of increasing biotope connections, animal welfare and reducing the synthetic inputs for

¹³ <https://ernaehrungsrat-frankfurt.de>

¹⁴ <https://uniseco-project.eu/el/case-study/austria>

¹⁵ <https://grandfarm.at>

¹⁶ <https://comm.zalf.de/sites/patchcrop/SitePages/Homepage.aspx>

¹⁷ <https://www.landwirtschaftskammer.de/landwirtschaft/naturschutz/leitbiodiversitaet/index.htm>

¹⁸ <https://www.gruenlandzentrum.org/projekte/biotopverbund-grasland/>

¹⁹ <https://www.demoneterbo.agrarpraxisforschung.de/index.php?id=1>

²⁰ <https://fokus-tierwohl.de/de/>

²¹ <https://www.netzwerk-vorratsschutz.de/vsnet/de/home>

the post-harvest protection. The motivation behind the creation of these networks is not just the demonstration of different practices but the adaptation and idea exchange on the different practices, which is subsequently assessed by scientists before being disseminated nationally/regionally through guidelines or policies.

3.5.3. Science, Education and Training

Table 4 : List of universities with a department or group researching on agroecology (and related subjects), named by key informants.

	Universities	Subject area/Group
Austria	<i>BOKU - Wien</i>	Sustainable agricultural systems (agroecology and organic agriculture)
	<i>Innsbruck</i>	Agricultural and regional sociology
Germany	<i>Georg-August - Göttingen</i>	Agroecology
	<i>Hohenheim</i>	Ecology of Tropical Agricultural Systems
	<i>Kassel - Witzenhausen</i>	Organic agricultural sciences
	<i>Freiburg</i>	Nature conservation and landscape ecology
	<i>TUM (Weihenstephan)</i>	Life science systems
	<i>Humboldt (Berlin)</i>	Agricultural and food policy
	<i>Justus-Liebig - Giessen</i>	Animal ecology (landscape ecology)
	<i>Christian Albrechts - Kiel</i>	Landscape ecology
	<i>Bonn</i>	Economics of sustainable land use and bioeconomy
	<i>Leuphana – Lüneburg</i>	Sustainable use of natural resources
	<i>Greifswald</i>	Landscape Ecology and Ecosystem Dynamics
	<i>Münster</i>	Applied landscape ecology and ecological planning
	<i>Koblenz Landau</i>	Ecosystem analysis
	<i>Oldenburg</i>	Vegetation science
<i>Btu (Cottbus-Senftenberg)</i>	Sociological environmental issues	

The science of agroecology integrates a multitude of subjects and is often fragmented in different research areas in Austria and in Germany (Table 4). The most often named universities were the BOKU in Vienna, the university of Göttingen and the University of Hohenheim. The BOKU and the University of Hohenheim propose a master in Organic agriculture (EUR-Organic) and BOKU also one in Agroecology-Organic agriculture (AgrEco-Organic). The other universities listed in Table 4, have all groups or departments working on agroecology related subjects and offer various related courses that are rarely named agroecology and focus on specific topics.

Universities are not the only places where research occurs. Table 5 shows the different research infrastructure mentioned by key informants, some are federal institution. Only the IFAB in

Mannheim focuses on agroecology while others like Bioforschung Austria and FiBL, concentrate their research on organic farming.

Table 5: List of research infrastructure in Austria and Germany. Most focus on agriculture either organic and/or conventional.

Country	Research infrastructure
Austria	Bioforschung Austria
	HBLFA Raumberg-Grumpenstein - Higher federal teaching and research institute for agriculture
	AGES - Austrian Agency for Health and Food Safety Ltd
	IFAB - Institute for Agroecology and Biodiversity
	Thünen Institute
Germany	UFZ Helmholtz - center for environmental research
	ZALF - Leibniz Centre for Agricultural Landscape Research
	JKI - Federal Research Centre for Cultivated Plants
	Biodiversity exploratories
Both countries	FiBL - research institute of organic agriculture

Most of the articles on agroecology (see section 3.4) and related concepts are published by universities (BOKU, Hohenheim, Göttingen, Kassel, Bonn, TUM) and research institutions (AGES, ZALF, UFZ Helmholtz, Thünen Institute). Other universities and research institutions were not named by key informants but surfaced from articles consulted within the scope of the literature review: the University of Vienna and the Austrian Federal Agency of Water Management, the Technical University of Karlsruhe (KIT) and the University of Hamburg.

3.6. Future development of agroecology

Key informants were asked to identify the barriers (Figure 10) and opportunities to further develop agroecology in Austria and Germany.

Barriers

For both countries, economic barriers were the first and most mentioned barriers. These included the inadequate funding schemes, which do not really promote the implementation of agroecology, the insufficient remuneration of farmers and high labour costs. The lack of cost/benefit analyses, demonstrating that agroecology is not only key to answer many environmental problems but also economically beneficial in the long term, were specified by stakeholders in Germany. A further barrier mentioned was the influence of the agribusiness lobby. Economic barriers are closely linked to political barriers, with a lack of incentive to develop and implement biodiversity-promoting measures, and to consider farms, farmers, and the environment, including the consumers, as an

interconnected whole. The administrative burden is perceived as a discouraging factor for the development of agroecology.

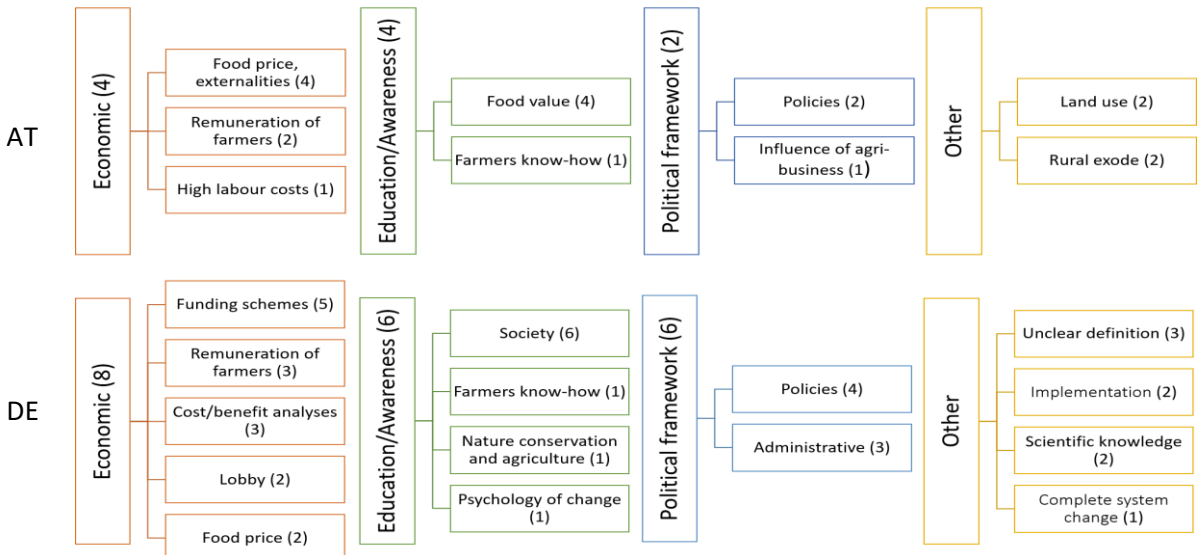


Figure 10: Barriers for the development of agroecology mentioned by the key informants (Austria in the top, Germany at the bottom). The barriers are ordered by frequency of mention, with the number of key informants referring to it in parenthesis, and were separated in different categories: economic, education and awareness, political framework, and other.

The third type of barriers is linked to the awareness and education of civil society (and farmers). Food prices were recognised as being too low in both countries as they do not account for the environmental externalisation of costs. In order to change this, some key informants argued that consumers need to become aware and ready to pay true costs, whereas others claimed that more financial means from the states or the EU could change this. While the conflict between nature conservation organisation and farmers was mentioned by most key informants in Germany, only one referred to this as being a barrier for the development of agroecology. For Austria, two key informants believed that the biggest hurdle is the land use, as it becomes more profitable to use the land for energy production than food production and land pressure is rising because of artificialisation. Other barriers raised were the gap between scientific research and implementation. Two informants pointed out that some elements in scientific knowledge were missing. The definition of agroecology being unclear and very broad, key informants for Germany see it as the first barrier needing to be overcome. Finally, one key informant said that the main barrier is the difficulty to completely change the system and get out of lock-ins to truly accelerate the transition of agroecology.

Opportunities

The majority of key informant agreed that the time was ripe for agroecology, and that there was a real momentum in both countries. The trend of consumers asking for local and sustainable products has been accentuated during the COVID-19 pandemic. More and more people are aware of the climate change threat and the loss of biodiversity. This leads to a change of

consumption habits and a readiness to support (organic) farmers. Bottom-up movements are increasing and the notion of living labs was seen as very promising by the few key informants who had heard of them. A few ideas for the development of agroecology were raised, starting with the improvement of the image of agriculture, reconnecting consumers to producers and the need to demonstrate the viability of agroecology. Another proposition was the recognition of the 'production of biodiversity' as an agricultural branch, similar to the energy production branch developed in recent years. A recommendation was the necessity to include all farmers organic and conventional and promote cooperation with all stakeholders involved in a territory, to remedy the too often opposing formed by nature conservationists and farmers. The last exhortation concerned the further development of organic agriculture and the risk of developing agroecology in parallel when it is in fact completely compatible to the notion of organic agriculture (Austrian key informant). For Germany, key informants addressed the fear that agroecology as it is not clearly defined and understood could weaken the high standards of organic farming and further play into the confusion of consumers. The most considerable opportunity for agroecology is to link food system stakeholders and to foster cooperative and bottom-up movements.

4. Discussion

Recognition and understanding of agroecology in Austria and Germany

The concept of agroecology is only recognised by few stakeholders in Germany and Austria, and it is understood differently among the interviewees of the present research. Finding key informants and initiatives proved to be difficult, as the word itself ("Agrarökologie") is not commonly used. Agreeing on a definition of agroecology remains a key task for its recognition in Germany where it is still mainly seen as a science as discussed by Wezel and Soldat (2009). The definitions given by key informants reflected their work, researchers and professors always defined agroecology as a science while advisors in the chamber of agriculture focused on the practice.

Another explanation for the lack of recognition of agroecology is the historical development of organic agriculture in both countries, which is the current alternative to conventional agriculture embracing a systemic approach to food systems. In fact, the highest number of articles published (in English) in the last 30 years are on organic agriculture. There seems to be an emerging trend on the topic of agroforestry in Germany and more papers using the term agroecology and food systems in the last ten years. Agroecology and organic agriculture regulations (EU regulations and IFOAM norms) have many common principles but diverge in some principles and practices (Migliorini and Wezel, 2017). For the moment there are no agroecology regulations at the European level. Only this year has the European Committee of the regions adopted an opinion

on agroecology (05.02.21²²) as “the answer to Europe's agricultural, social and environmental challenges “. In Germany the focus of policies is mainly on organic farming (Lampkin et al., 2020) something key informants pointed out. Agroecology cannot be summarised by a series of practices nor can organic agriculture really either. Creating specific regulations for it remains very questionable, as these would build on principles already adopted by organic agriculture. Attempts to implement the agroecology worldview in practice which is at the core of its systemic orientation are recognised under the label of organic farming and studies have shown the positive impacts in both countries (Darnhofer, 2005; Schafer et al., 2009).

Throughout the interviews all key informants mentioned organic agriculture, either when referring to initiatives or when talking about implemented practices. Agroecology practices have been listed in Wezel et al. (2014). Flower strips and organic farming, most frequently mentioned by key informants, are not practices but respectively an agri-environmental measure and a concept linked to a set of practices. The integration of the agroecology practices in both countries has not been quantified and most key informants expressed the necessity to determine their integration in the agricultural landscapes in both countries. The potential of these practices should also be (re)assessed.

Agroecology initiatives

A new aspect of this study is the inclusion of Living Labs and the mapping of non-scientific training on agroecology in comparison to previous mapping projects (Agroecology Europe, 2020; Balogh et al., 2020). A key feature of living labs is “involving users as co-creators on equal ground” (Almirall et al., 2012). However, this was not the case of all self-proclaimed living labs but was found in other initiatives that did not identify with living labs. The AE4EU project should bring more clarity to the concept of living lab and is an opportunity to highlight the high diversity that already exists.

Furthermore, there is a question of continuity: projects are often limited in time, although networks like the “Biotopverbund Grasland” continue beyond the funding period. Financial means was often presented as a limiting factor by initiative representatives. For example, the salary of the manager coordinating an “Öko-Modellregionen” in Bavaria is financed by the state of Bavaria for the first five years and then it goes through a regressive phase, which can lead to a different prioritisation of objectives (focus on local production and less on environmentally friendly production). Food councils could be considered as living labs with their purpose to democratise food systems, through horizontal governance, and aim to increase connectivity. At the moment one of the limitations of the food councils interviewed is the integration of farmers in these processes.

²² <https://cor.europa.eu/EN/our-work/Pages/OpinionTimeline.aspx?opId=CDR-3137-2020>

Overall, the initiatives found rarely called themselves an agroecology initiative. Four initiatives did: the biodiversity exploratories, the Grand Farm, the project bridging generations in agroecology and the permaculture academy (PIA). The others did not refute the term and when asked identified with the agroecological worldview. This is likely due to their understanding of what agroecology is (often not seen as a movement or in the broader sense of whole food systems) and the specific focus on one aspect of the initiatives (e.g. food waste). However, all follow a number of agroecological principles, the most common ones being the co-creation of knowledge and the participation principle. Indeed, almost all initiatives interviewed create and share knowledge and aim to transform food systems.

Development of agroecology

Economic and political barriers were the most commonly identified hurdle for the development of agroecology, along with the missing recognition and awareness. These findings concur with many other studies (Aare et al., 2021; Ferrando et al., 2021; Gliessman et al., 2019; Miles et al., 2017). The failures of the current political framework has led scientists to propose ten action points to completely change the CAP (Pe'er et al., 2020). True cost accounting could be used to overcome the barrier of too low food prices, which are a consequence of externalisation of costs on the environment and society (Benton and Bailey, 2019). Even though the barriers are numerous and difficult to overcome, the COVID pandemic and climate change are playing a key role in awareness raising and changing of consumption habits.

The interviews showed that a clear understanding of the conceptual focus of agroecology, that in its essence tends to operationalise its principles in practice is urgently needed to further develop agroecology. Without this there is a risk that the fragmented discipline taught and researched in both countries will not stimulate the necessary change of the status quo.

Methodological considerations

This study only gives an overview of some of the existing initiatives and a partial view of the current state of agroecology in Austria and Germany given it is based on the key informants' knowledge and readiness to respond. The information gathered from the key informants is based on their perceptions and interpretations, not always on facts. This is a clear limitation of these kind of studies aiming to characterise the state of agroecology in terms of movement, policies, practices and research. An alternative approach for assessing the implementation of practice could have been done by gathering data from publications and looking at the EU and state subventions for specific measures. Using surveys could have been served to gather more representative data.

The interviews took place during a three-month period permitting to form a non-exhaustive yet illustrative list of initiatives showing that agroecology is gaining recognition, and that existing

initiatives all work towards raising awareness going beyond Gliessman's levels 1-2. Even though their impact is limited by their scale, their concrete goals promote the transformation and long-term success of the agroecological transition. In this study the designation of agroecology initiatives was based on the information given by key informants. The initiative selection was not very strict as they only had to follow at least one agroecological principle to be considered. The purpose of this study was not to evaluate the initiatives, this could be done in a further step using the methodology developed by Dumont et al. (2021) or adapting the CERAI (2019) criteria.

5. Conclusion

Agroecology in Austria and Germany is recognised by few stakeholders and the definition is subject to various interpretations. The use of the term is increasing and different movements aim to spread the concept. In Austria and Germany different policies promote organic farming and implicitly the implementation of agroecology. However, these are few and far in between with insufficient funds. In both countries the research is too often fragmented, leading to very few advances in the development of agroecological practices. Practices' effectiveness has to be tested in the three dimension of agroecology, ecological, economical and societal impact.

Initiatives that work toward changing the food system have been developed in both countries contributing to the development of agroecology. The emergence of initiatives is contingent to the geographic, economic and political context. These initiatives have very specific focus, different ambition levels and are at different developmental levels. All can serve as examples for others and should be further evaluated in terms of their impacts and agroecological nature. In both countries movements are using the term agroecology often linked to food sovereignty, seed preservation or specific practices like agroforestry. Living labs are also being developed to link different stakeholders and develop together processes to reach a common goal.

Comparing the state of agroecology in different countries and establishing clear criteria for assessing agroecology initiatives will be determining in the next years. For this a commonly agreed upon clear definition is needed to raise the awareness of the civil society and decision-makers. Concrete best practices and robust evaluation criteria still have to be developed and used systematically to scale-out agroecology.

In the last years European countries have further developed the implementation of agroecology. The European "Partnership on agroecology living labs and research infrastructure" will contribute to the urgently needed transition in the current agricultural system.

References

- Aare, A.K., Egmoose, J., Lund, S., Hauggaard-Nielsen, H., 2021. Opportunities and barriers in diversified farming and the use of agroecological principles in the Global North – The experiences of Danish biodynamic farmers. *Agroecology and Sustainable Food Systems* 45, 390–416. <https://doi.org/10.1080/21683565.2020.1822980>
- Agroecology Europe, 2020. Agroecology initiatives in Europe. Corbais, Belgium.
- Almirall, E., Lee, M., Wareham, J., 2012. Mapping Living Labs in the Landscape of Innovation Methodologies. *Technology Innovation Management Review* 2, 12–18. <https://doi.org/10.22215/timreview/603>
- Altieri, M.A., 1989. Agroecology: A new research and development paradigm for world agriculture. *Agriculture, Ecosystems & Environment, International Symposium on Agricultural Ecology and Environment* 27, 37–46. [https://doi.org/10.1016/0167-8809\(89\)90070-4](https://doi.org/10.1016/0167-8809(89)90070-4)
- Altieri, M.A., Nicholls, C.I., Henao, A., Lana, M.A., 2015. Agroecology and the design of climate change-resilient farming systems. *Agron. Sustain. Dev.* 35, 869–890. <https://doi.org/10.1007/s13593-015-0285-2>
- Balogh, L., Réthy, K., Balázs, B., Kajner, P., Pignata, V., Poór, D., 2020. Mapping agroecology in Hungary. *Védegylet Egyesület, ESSRG*.
- Benton, T.G., Bailey, R., 2019. The paradox of productivity: agricultural productivity promotes food system inefficiency. *Global Sustainability* 2. <https://doi.org/10.1017/sus.2019.3>
- Bundesministerium für Ernährung und Landwirtschaft, 2021. *Ökologischer Landbau in Deutschland* 32.
- Cacho, M.M. y T.G., Giraldo, O.F., Aldasoro, M., Morales, H., Ferguson, B.G., Rosset, P., Khadse, A., Campos, C., 2018. Bringing agroecology to scale: key drivers and emblematic cases. *Agroecology and Sustainable Food Systems* 42, 637–665. <https://doi.org/10.1080/21683565.2018.1443313>
- CERAI, 2019. *Sistemas Alimentarios Territorializados en España: 100 iniciativas locales para una alimentación responsable y sostenible*.
- Coolsaet, B., 2016. Towards an agroecology of knowledges: Recognition, cognitive justice and farmers' autonomy in France. *Journal of Rural Studies* 47, 165–171. <https://doi.org/10.1016/j.jrurstud.2016.07.012>
- Darnhofer, I., 2005. Organic Farming and Rural Development: Some Evidence from Austria. *Sociologia Ruralis* 45, 308–323. <https://doi.org/10.1111/j.1467-9523.2005.00307.x>
- Dekker, R., Contreras, J.F., Meijer, A., 2020. The Living Lab as a Methodology for Public Administration Research: a Systematic Literature Review of its Applications in the Social Sciences. *International Journal of Public Administration* 43, 1207–1217. <https://doi.org/10.1080/01900692.2019.1668410>
- Dumont, A.M., Wartenberg, A.C., Baret, P.V., 2021. Bridging the gap between the agroecological ideal and its implementation into practice. A review. *Agron. Sustain. Dev.* 41, 32. <https://doi.org/10.1007/s13593-021-00666-3>
- Ferrando, T., Claeys, P., Diesner, D., Pol, J.L.V., Woods, D., 2021. Commons and commoning for a just agroecological transition: the importance of de-colonising and de-commodifying our food system. *Resourcing an Agroecological Urbanism: Political, Transformational and Territorial Dimensions* 61–84. <https://doi.org/10.4324/9780429433566>
- Gallardo-López, F., Hernández-Chontal, M.A., Cisneros-Saguilán, P., Linares-Gabriel, A., 2018. Development of the Concept of Agroecology in Europe: A Review. *Sustainability* 10, 1210. <https://doi.org/10.3390/su10041210>

- Gliessman, S., 2019. Making the transition away from industrial agriculture: using agroecology to promote food systems transformation. *Agroecology and Sustainable Food Systems* 43, 121–122. <https://doi.org/10.1080/21683565.2018.1529358>
- Gliessman, S., 2018. Defining Agroecology. *Agroecology and Sustainable Food Systems* 42, 599–600. <https://doi.org/10.1080/21683565.2018.1432329>
- Gliessman, S., 2016. Transforming food systems with agroecology. *Agroecology and Sustainable Food Systems* 40, 187–189. <https://doi.org/10.1080/21683565.2015.1130765>
- Gliessman, S., Friedmann, H., Howard, P., 2019. Agroecology and Food Sovereignty. <https://doi.org/10.19088/1968-2019.120>
- Gliessman, S.R., 1990. Agroecology: Researching the Ecological Basis for Sustainable Agriculture, in: Gliessman, S.R. (Ed.), *Agroecology: Researching the Ecological Basis for Sustainable Agriculture*, Ecological Studies. Springer, New York, NY, p. 367. https://doi.org/10.1007/978-1-4612-3252-0_1
- Haller, L., Moakes, S., Niggli, U., Riedel, J., Stolze, M., Thompson, N., 2020. Entwicklungsperspektiven der ökologischen Landwirtschaft in Deutschland. Umweltbundesamt.
- HLPE, 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition, A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome (No. 14).
- INKOTA, 2019. Positionspapier Agrarökologie stärken: Für eine grundlegende Transformation der Agrar- und Ernährungssysteme.
- IPES-Food, 2016. From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems. International Panel of Experts on Sustainable Food systems.
- Kerr, R.B., Rahmanian, M., Owoputi, I., Batello, C., 2018. Chapter 6: Agroecology and Nutrition: Transformative Possibilities and Challenges, in: *Sustainable Diets: Linking Nutrition and Food Systems*. CABI.
- Lampkin, N., Schwarz, G., Bellon, S., 2020. Policies for agroecology in Europe, building on experiences in France, Germany and the United Kingdom. *Landbauforschung : journal of sustainable and organic agricultural systems* 103–112. <https://doi.org/10.3220/LBF1611684471000>
- Leminen, S., 2015. Q & A What Are Living Labs? *Technology Innovation Management Review* 5, 29–35.
- Méndez, V., Bacon, C., Cohen, R., Gliessman, S., Editors, 2016. *Agroecology: a transdisciplinary, participatory and action-oriented approach*.
- Migliorini, P., Wezel, A., 2017. Converging and diverging principles and practices of organic agriculture regulations and agroecology. A review. *Agron. Sustain. Dev.* 37, 63. <https://doi.org/10.1007/s13593-017-0472-4>
- Miles, A., DeLonge, M.S., Carlisle, L., 2017. Triggering a positive research and policy feedback cycle to support a transition to agroecology and sustainable food systems. *Agroecology and Sustainable Food Systems* 41, 855–879. <https://doi.org/10.1080/21683565.2017.1331179>
- Moraine, M., Lumbroso, S., Poux, X., 2016. A comprehensive outlook on the diversity of Agroecological initiatives in Europe, TYFA. EFNCP, IDDRI.
- Nicholls, C., Altieri, M., 2018. Pathways for the amplification of agroecology. *Agroecology and Sustainable Food Systems* 42, 1–24. <https://doi.org/10.1080/21683565.2018.1499578>
- Pe'er, G., Bonn, A., Bruelheide, H., Dieker, P., Eisenhauer, N., Feindt, P.H., Hagedorn, G., Hansjürgens, B., Herzon, I., Lomba, Á., Marquard, E., Moreira, F., Nitsch, H., Oppermann, R., Perino, A., Röder, N., Schleyer, C., Schindler, S., Wolf, C., Zinngrebe, Y., Lakner, S., 2020. Action needed for the EU

- Common Agricultural Policy to address sustainability challenges. *People and Nature* 2, 305–316. <https://doi.org/10.1002/pan3.10080>
- Rech, T., 2015. Das Bio-Aktionsprogramm 2015-2022, Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft.
- Schafer, M., Nolting, B., Engel, A., 2009. Organic agriculture as a new player in sustainable regional development? Case studies of rural areas in Eastern Germany. *International Journal of Agricultural Resources, Governance and Ecology* 8, 158–179. <https://doi.org/10.1504/IJARGE.2009.026224>
- Seremesic, S., Jovović, Z., Jug, D., Djikic, M., Dolijanović, Ž., Bavec, F., Jordanovska, S., Bavec, M., Đurđević, B., Jug, I., 2021. Agroecology in the West Balkans: pathway of development and future perspectives. *Agroecology and Sustainable Food Systems* 0, 1–33. <https://doi.org/10.1080/21683565.2021.1913464>
- Sieveking, A., 2019. Food Policy Councils as Loci for Practising Food Democracy? Insights from the Case of Oldenburg, Germany. *Politics and Governance* 7, 48–58. <https://doi.org/10.17645/pag.v7i4.2081>
- Wanger, T.C., DeClerck, F., Garibaldi, L.A., Ghazoul, J., Kleijn, D., Klein, A.-M., Kremen, C., Mooney, H., Perfecto, I., Powell, L.L., Settele, J., Solé, M., Tscharntke, T., Weisser, W., 2020. Integrating agroecological production in a robust post-2020 Global Biodiversity Framework. *Nat Ecol Evol* 4, 1150–1152. <https://doi.org/10.1038/s41559-020-1262-y>
- Wezel, A., Bellon, S., 2018. Mapping Agroecology in Europe. *New Developments and Applications. Sustainability* 10, 2751. <https://doi.org/10.3390/su10082751>
- Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., David, C., 2009. Agroecology as a science, a movement and a practice. A review. *Agron. Sustain. Dev.* 29, 503–515. <https://doi.org/10.1051/agro/2009004>
- Wezel, A., Casagrande, M., Celette, F., Vian, J.-F., Ferrer, A., Peigné, J., 2014. Agroecological practices for sustainable agriculture. A review. *Agronomy for Sustainable Development* 34, 1–20. <https://doi.org/10.1007/s13593-013-0180-7>
- Wezel, A., David, C., 2020. Policies for agroecology in France: implementation and impact in practice, research and education. *Landbauforschung: journal of sustainable and organic agricultural systems* 66–76. <https://doi.org/10.3220/LBF1608660604000>
- Wezel, A., Goris, M., Bruil, J., Félix, G.F., Peeters, A., Bàrberi, P., Bellon, S., Migliorini, P., 2018. Challenges and Action Points to Amplify Agroecology in Europe. *Sustainability* 10, 1598. <https://doi.org/10.3390/su10051598>
- Wezel, A., Herren, B.G., Kerr, R.B., Barrios, E., Gonçalves, A.L.R., Sinclair, F., 2020. Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agron. Sustain. Dev.* 40, 40. <https://doi.org/10.1007/s13593-020-00646-z>
- Wezel, A., Soldat, V., 2009. A quantitative and qualitative historical analysis of the scientific discipline of agroecology. *International Journal of Agricultural Sustainability* 7, 3–18. <https://doi.org/10.3763/ijas.2009.0400>

Appendices

Appendix 1

The research project agroecology for Europe (AE4EU)

This article is based on the master thesis informing the work package 1, task 1.1 “Mapping Agroecology in Europe” of the Agroecology for Europe project (AE4EU²³). The AE4EU project started in January of 2021 and involves 12 partners from different universities, research infrastructure and movement distributed in ten countries. Part of the project has similar objectives as most mapping initiatives so far, the main difference is that it includes all European countries, which enabled a deeper analysis and directly informed the other objectives of the AE4EU project. One of the main goal of the AE4EU project is to create a European Agroecology network aiming to bring awareness, knowledge and promotion of agroecology across Europe. AE4EU is one of the two European coordination and support action (AE4EU²⁴ and ALL-Ready²⁵), funded by the EU Horizon 2020 Research and Innovation Programme, aiming to enhance the understanding and connect different actors of agroecology. These projects will lead to the creation of a Partnership on agroecology living labs and research infrastructure in 2024.

Appendix 2.1

Key informant grid

Do you know the term “agroecology” – and do you currently use it in your activity? (very often/often/rarely/never)

If yes,

How do you define or describe agroecology in your own words? (if needed: Can you give 1/2 examples to illustrate your thinking)

If no,

please mention related and linked words such as sustainable agriculture, biological/organic agriculture, regenerative agriculture, permaculture, biodynamic agriculture, climate smart agriculture, agroforestry, etc. If needed only, you can explain our understanding and definition of agroecology. Nevertheless, you shall avoid starting by this in order not to narrow the perception and speech of the interviewee.

Interview - Part 1. Initiatives in the country

1. Could you first indicate different initiatives in agroecology in your country?
2. Are there some initiatives which include Living Labs and/or practical implementation of agroecological practices?
3. Are there involved research institutions and research programmes related to agroecology?

²³ <https://www.ae4eu.eu/>

²⁴ <https://cordis.europa.eu/project/id/101000478>

²⁵ <https://cordis.europa.eu/project/id/101000349>

4. Are there any agroecological education and training programmes in agroecology or strongly related to agroecology in your country?
5. Are there other agroecology related examples/cases/initiatives not mentioned yet, for example, movements for food sovereignty, bottom-up initiatives such as CSA (community agriculture systems) or farmer's markets, collaboration between farmers and researchers?
6. And finally, among the examples and initiatives you provided, are there some with transnational/international cooperation (in which are involved more than one European country)?

Interview - Part 2. Agroecology in the country

7. How would you describe the present state of agroecology in your country?
8. How much do you think agroecology is known and recognized in your country (*well recognized/ enough recognized/ not very much recognized/ not at all recognized*) and by which stakeholder? Why?
9. How much do you think agroecology is known and recognized in your country at the decision making level? (*well recognized/ enough recognized/ not very much recognized/ not at all recognized*) Why? Could you name the decision making stakeholders?
10. In terms of practice would you say that agroecological practices are well implemented in your country (*well implemented/ enough implemented/ not very much implemented/ not at all implemented*)? Could you provide examples of the 2-3 main agroecological practices implemented? [*nota bene for the interviewer: have in mind the difference between an approach (i.e.: permaculture, regenerative agriculture etc.) and the agroecological practices (i.e.: no tillage, organic fertilization etc.), but do not discuss with the interviewee*]
11. Are there any policies in your country that help the implementation of agroecology? Are they specifically focus on agroecology? At which level (local/national/regional...)? Can you provide examples?
12. Are there some regions in your country in which more agroecological initiatives have arisen? If yes, have you an explanation for this?
13. What are the barriers for agroecology development in your country, in your opinion?
14. What do you think are the future perspectives and opportunities of agroecology in your country?
15. Last question: do you have other point/aspect you want to mention?

Appendix 2.2 Initiatives grids

Pillar - Movement

1. Description of the initiative - type of legal entity (formal/non-formal; public/private) - Who are the members (private/institutional/farmers etc.) – Who is leading (a person/a group of persons)
2. Objectives of the initiative
3. Agroecology elements: in which way does the initiative support the development and/or adoption of agroecological practices or the development of sustainable food systems?
4. Organization type
 - NGOs
 - Environment and food related organization
 - Farmers association

- Civil society organization
 - Food sector organisation
 - Small and medium-size enterprise
 - Other (please specify)
5. Does the initiative take place in one country or several countries? - If several, please precise country name
6. Which farming sectors or types of products does the initiative work on?
- Arable crops
 - Livestock
 - Horticulture – vegetables - fruits
 - Permanent crops – Trees
 - Not any specific sector - diversified system
 - Others – please precise
- Target (you can tick several choices)
- Community development
 - Farming development
 - New way of farming
 - Food sovereignty
 - Producer – consumer linkage
 - Lobbying
 - Policy making
 - Nature, landscape, environment conservation
 - Education
 - Training
 - Awareness building
 - Other (please specify)
7. Geographical scope
- Local
 - Regional
 - National
 - International
8. Networking
- Relationship with other organizations (if yes, with which ones?)
 - Partnership with other stakeholders (if yes, with which ones?)
 - Other (please precise)
9. Last question: do you have other point/aspect you want to mention?

Pillar - Practice

1. Description of the initiative - Precise the number of people/organization involved as well as the origin (what made it possible?).
2. Objectives of the initiative
3. Which agroecological practices are concerned?

4. Does the initiative have financial and/or institutional and/or stakeholder support?
5. Does the initiative take place in one country or several countries? - If several, please precise country name.
6. Which farming sectors or types of products does the initiative work on?
 - Arable crops
 - Livestock
 - Horticulture - vegetables
 - Permanent crops [fruit trees, etc.]
 - Forestry
 - Others – please specify
7. Does the initiative involve exchange between farmer and/or with other stakeholder/network?
8. Last question: do you have other point/aspect you want to mention?

Pillar – Living labs

1. Could you describe your initiative or living lab in a few words?
2. What are the main objectives of your initiative?
3. How many people are involved? And which organisations/stakeholders?
4. What is the type of organisation or stakeholder supporting the governance and the development of the initiative? (none, association, NGO, supply chain stakeholder group, ...?)
5. *[nota bene for the interviewer: “support the governance refer here to organization that help for the management/coordination of action in the living lab]*
6. How is the initiative funded? Do you have institutional support?
7. Is the initiative part of a network of exchange of experience, or expertise?
8. If yes is it local, national, European, international?
 - Local
 - National
 - European
 - International
9. If yes, what do you expect from such a network?
10. Agroecology elements: how does the initiative support the development and/or adoption of agroecological practices?
11. In what ways is your initiative innovative? Which type of innovations were developed or are under development?
12. Does the initiative take place in one country or several countries? - If several, please specify country name.
13. What are the type of actors involved (more detail than previously – you can tick several)?
 - Scientists
 - Farmers
 - Advisors
 - Farmers cooperatives

- Chambers of agriculture/farmers organisations
- Upstream industry (biocontrol, fertilisers, plant protection)
- Downstream industry (food, bio-based)
- Retailers
- Consumers organisations
- Environmental organisations
- Citizens
- Public authorities
- Others (please precise)

14. If you ticked public authorities, please specify which level(s)

- National
- Regional
- Local (municipality, town, village)

15. Specific topic of the living lab/initiative

- Agroecological practices and production
- Cooperation among farmers
- Cooperation between farmers and supply chain stakeholder
- Development and Marketing of local and/or traditional food products
- Food sovereignty
- Traditional crop varieties or animal breeds
- Other (please specify)

16. Which farming sectors or types of products does the initiative work on? (you can tick several options)

- Arable crops
- Livestock/permanent grasslands
- Horticulture - vegetables - fruits
- Permanent crops (fruit trees, short rotation coppice to produce bioenergy)
- Forestry
- Others (please specify)

17. Beyond farming, does the initiative cover some of the following aspects? (you can tick several choices)

- Upstream (seeds, machinery, biocontrol, fertilizers etc.)
- Food processing
- Marketing and retail
- Labelling
- Consumption
- Local development
- Other (please precise)

18. Last question: do you have other point/aspect you want to mention?

Pillar - Science

1. Description of the programme or project - Specify the number of people/organizations involved as well as the origin (what made it possible?). Please specify the name of project and of the programme.
2. Objectives of the programme/project.
3. Name of the leading organization/institution and (if applicable) research unit
4. Funding body of the project/programme
5. Organization type
 - University
 - Research centre/institution
 - Environment related organization
 - Food related organization
 - Farmers associations
 - Small and medium-size enterprise
 - Other (please precise)
6. Does the programme/project take place in one country or several countries? - If several, please precise country name
7. Cooperation or involvement with other type of actors?
 - Farmers
 - Farmers organization
 - Small and medium size enterprise
 - NGO
 - Civil society
 - Government - Policy maker
 - Other – please precise
8. Does the initiative involve different types of scientific discipline? If yes, specify.
 - Agronomy
 - Ecology
 - Animal science
 - Plant science
 - Social science
 - Political science
 - Economics
 - Other (please specify)
9. Main topics of programme/project
 - Agroecological practices
 - Arable crops
 - Livestock
 - Horticulture - vegetables
 - Permanent crops – Trees
 - Sustainable food systems

- Fairer supply chains
- Rural development
- Farmer – consumer cooperation or link
- Food products and marketing
- Transition towards agroecology
- Other

10. Research infrastructures elements: which are the types of services or tools that the programme/project provides or develops?

11. How does the programme/project support the development and/or adoption of agroecological practices or development of sustainable food systems? Are participatory approach used?

12. Geographical scope

- Local
- Regional
- National
- International

13. Last question: do you have other point/aspect you want to mention?

Pillar - Education and training

1. Description of the initiative or programme - type of legal entity (formal/non-formal; public/private) - Who are the members (private/institutional/farmers etc.)

2. Objectives of the initiative

3. Type of Education and training

- Workshops and activities of promotion of agroecology
- BSc or MSc programme in agroecology
- Training of farmers
- Training and advice to cooperatives or farmers organisations
- Training and accompaniment to agri-food enterprises
- Advice to and/or accompaniment of public institutions
- Other – please precise

4. What is the major orientation of the training or education programme?

- Knowledge focus
- Competence focus
- Dialogue, reflection focus
- Action/experiential learning
- Other

5. Lead actor carrying out the training or education programme

- Farmer organization
- University
- School - secondary education
- Training centre
- Private entity, company

- NGO
- Civil society organization
- Other – please precise

6. Does the initiative take place in one country or several countries? - If several, please precise country name

7. Main topics of training or education programme

- Agroecological practices
- Arable crops
- Livestock
- Horticulture - vegetables
- Permanent crops – Trees - Fruits
- Sustainable food systems
- Food products and marketing
- Transition towards agroecology
- Other

8. Duration of training or education programme

- 1 day
- Several days
- 1 week
- Several weeks
- 1 year
- 2 years
- 3 years

9. Last question: do you have other point/aspect you want to mention?



Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitenskapelige universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway