Ref. Ares(2023)8910370 - 31/12/2023



D1.2 – Systemic factors and innovation support for agroecology

PROJECT ACRONYM: CANALLS PROGRAMME: HORIZON Europe Grant Agreement: No 101083653 TYPE OF ACTION: HORIZON-RIA START DATE: 1 January 2023 DURATION: 48 months



Funded by the European Union



Document Information

Issued by:	UHOH, NIBIO
Issue date:	21.12.2023
Due date:	31.12.2023
Work package leader:	IITA
Dissemination level:	PU

Document History

Version	Date	Modifications made by
1 st	11/12/2023	University of Hohenheim (UHOH)- Germany
2 nd	20/12/2023	University of Hohenheim (UHOH), Norsk Institutt for Biookonomi (NIBIO)- Norway

Dissemination Level		
Public	Fully open	Х
Sensitive	Limited under the conditions of the Grant Agreement	
EU classified	EU-RESTRICTED, EU-CONFIDENTIAL, EU-SECRET under Decision 2015/444	



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For citation:

Ndah HT., Herrera B., Ottaviani AG., Giacopelli E.,(2023) systemic factors, policies, and innovation support services for agroecological transitions in Cameroon, Burundi, Rwanda, and Democratic republic of Congo. CANALLS Deliverable 1.2, University of Hohenheim, Stuttgart, Germany

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Acknowledgement

We acknowledge following CANALLS project partners who have been instrumental in the realisation of this report either through data collection or involvement in the feedback exchange process during the writing phase: RIK (DRC), RAB (Rwanda), ISABU(Burundi), IITA (Burundi), IRAD (Cameroon), IITA (DRC), IITA (Cameroon), AFAAS/CAMF (Cameroon), INERA (DRC), CAPAD, (Burundi), AATF (Kenya) and CIRAD (France)

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Executive Summary

To unlock the full potential of agroecology in the global shift towards sustainable food systems that provide safe, nutritious, and affordable food, it is crucial to consider not only the perspective of farmers but also all systemic factors influencing the adoption of agroecological practices. The capacity and resources for farmers to embrace agroecological practices, along with sustainable business models, depend on the ability of agricultural knowledge and innovation systems (AKIS) in place to facilitate agroecological transitions. Simultaneously, effective policies and governance instruments play a critical role in creating synergies, managing challenging trade-offs, and establishing an enabling environment that encourages and guides sustainable transitions.

The primary objective of this report has been to examine the systemic factors, policies, and innovation support influencing agroecological transitions. As part of the CANALLS WP1 (Analysis of current situation and forest transition landscapes), this report, fulfils objective 1.3 (Analysis of systemic factors and innovation support for agroecology). This corresponds to Task 1.4 (systemic factors and policies), 1.5 (innovation support for agroecology under framework of Agricultural Knowledge and Innovation System (AKIS) and serves as Deliverable 1.2

For Task 1.5 (section 2), we analysed and evaluated innovation support services within the AKIS framework. For this task, a literature review was carried out, AKIS diagrams were developed and discussed with country partners. In addition, 47 service provider organisations were surveyed. Through a systematic analysis of AKIS, we observed and characterised existing knowledge systems in which agroecological principles are relevant and potentially scalable. At the macro (national) level, the AKIS systems show variations in the number of actors and the degree of connectivity. Overall, understanding the dynamics of actors and connectivity within the AKIS systems is crucial for fostering collaboration, knowledge exchange and the transformation of agricultural practices towards more sustainable and agro-ecological approaches. At the Living Lab level, we found that there are important differences in the presence of organisations providing innovation support services in targeted agroecological practices. These differences may also indicate the possibility of sharing best practices in the adoption of agroecological innovations within regions or between countries. The findings suggest that different interventions are needed to address the unique conditions of each Living Lab. Regarding the characterisation of innovation support actors and their extension activities, we found that extension organisations promote agroecological principles and implement them in their work. Agroecological principles related to the promotion of agroforestry, input reduction and economic diversification have been widely mentioned. The extent to which this service provision is effective in promoting the adoption of agroecology needs to be investigated. In addition, more research on methodologies, best practices and gaps would be useful to improve the quality of extension services and further adoption of agroecological practices.

In the context of Task 1.4 (section 3) and following a co-design process, case study partners joined in the data collection process including a desk review, interviews with policy makers and focus group discussions. Findings indicate that while agroecology policies are present in the target countries, they are mainly incorporated into broader documents with general objectives. However, specific policies and initiatives that promote intercropping and Integrated Soil Fertility Management (ISFM) are effectively implemented at the grassroots level through training, certification, and compliance measures. Despite the existence of agroecological policies and initiatives, their effectiveness and adoption vary across the four countries. Therefore, it is crucial to improve policies, encourage collaboration, address farmer resistance, and invest in research and extension services to expand agroecology and reap its benefits for sustainable agriculture and rural development.



List of Acronyms

AE	Agroecology
AKIS	Agricultural Knowledge and Innovation System
ALL	Agroecology Living Labs
DRC	Democratic Republic Congo
ALL	Agroecological Living Labs
SSA	Sub-Saharan Africa
RW	Rwanda
BR	Burundi
CMR	Cameroon



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1. Introduction

Background

The global transition to sustainable food systems is key for delivering safe, nutritious, and affordable food for a rapidly growing population along with co-benefits for climate adaptation and mitigation that can help us achieve the Sustainable Development Goals (SDGs) (BSDC 2017). Still, hunger and food insecurity are once more on the rise around the world, with over 720 million people facing hunger in 2020 and 2.3 billion left without access to adequate food (FAO 2021). Meanwhile, the COVID-19 pandemic has highlighted the susceptibility of our food systems to major challenges raised by health and economic crises as well as conflict and climate change. With 2030 being less than a decade away, we are still far from achieving the SDGs - especially SDG 2 "zero hunger". We need to speed up the transition by innovating and redesigning our food systems in a way that can meet the challenges of both, today and tomorrow. In line with its Farm to Fork Strategy, the EU has a major role to play in accelerating and safeguarding a successful global transition to sustainable food systems. Partnering and working alongside Africa to this end is considered essential and with good reason (EU 2020), since Africa, its food systems and their rural communities are uniquely positioned at the crossroads of fast-paced transformations that bring new promising opportunities (EU 2020). African food systems have great potential for significantly enhancing food and nutritional security within and beyond Africa, while also driving inclusive and sustainable rural development (AGRA 2018). However, if we are to tap into this potential, we will need to overcome the major economic, environmental, human and policy challenges that these systems face, which in cases are exacerbated by conflict and high vulnerability in different regions across sub-Saharan Africa (SSA) (SWAC/OECD 2021).

This need is perhaps nowhere more evident than in Central and Eastern Africa regions, which have consistently had the highest prevalence of undernourishment and severe food insecurity in SSA. reaching 32% and 28% respectively in 2020 (BSDC 2017). This may come as no surprise considering that most farming systems in these regions are run by smallholder farmers who struggle to live off a few hectares of land (Vanlauwe et al (eds) (2013) while being challenged by climate variability and extremes (e.g., droughts, floods). In several countries (such as DRC and Burundi), long-term tensions along with the more recent adverse economic effects of the COVID-19 pandemic, exert further pressure on agricultural production systems already vulnerable (e.g. due to high poverty levels and limited market access) (Vanlauwe et al (2013), yet crucial for addressing the rising local, regional, and global food demand, as well as for biodiversity. In this context, we focus on the humid tropics of Central and Eastern Africa. These regions include an astounding variety of agroecological zones (in terms of altitude, land cover, landform, and soils) and diverse farming systems, from forest-based with shifting cultivation practices over to highland perennial and root crop and lowland mono-cropped cereals. Their agroecosystems are home for a great part of the rural population and a large diversity of living organisms, offering vital ecosystem services and potential for sustainable development (e.g. tropical agroforestry systems can store organic carbon, protect communities from soil erosion) (Cusack, D.F., et al (2016): Yet, farm productivity of current practices is low still, with many being unsustainable more often than not (e.g. cutting down forests to open new fields for cocoa or coffee, burning crop residues on the field after harvest), adversely impacting both livelihoods and the environment. This calls for more sustainable farming practices, suitable for humid tropics and able to



GA 101083653 deliver good nutrition and income for communities, while conserving and restoring their ecosystems and the services provided by them.

Problem

Agroecology offers much promise to answer this call. Evidence from practice in Africa shows that agroecology can increase productivity and build resilience to economic and climate shocks (H.L.P.E., 2019), delivering holistic solutions to complex food system challenges with people at their heart. Nevertheless, in spite this potential for agroecology, we are missing well-tested agroecological practices tailored to the humid tropics of Central and Eastern Africa as well as evidence on their performance to inform decision and policy making. Farmers need to build the capacity and resources to adopt agroecological practices along with viable business models to access and capture value from local, regional, or global markets. The capacity of AKIS to support agroecological transitions need to be reinforced as well, to help farmers overcome lock-ins and address risks that may impede adoption. Finally, many policy makers still lack awareness of how agroecology can address intricate challenges and/or how to establish synergies and manage difficult trade-offs to create an environment that incentivises and steers sustainable transitions.

CANALLS project and objectives

The EU project, CANALLS (Driving Agroecological Transitions in the Humid Tropics of Central and Eastern Africa through Transdisciplinary Agroecology Living Labs), has been initiated to address these critical knowledge gaps. Specifically, this project aims to explore systemic factors, policies, and innovation support that impact agroecological transitions in the region.

Within the context of CANALLS, this report, titled "Deliverable 1.2 - Systemic Factors and Innovation Support for Agroecology," fulfils Objective 1.3 of the project. This objective focuses on investigating the systematic factors, policies (T1.4), and innovation support mechanisms that influence the adoption of agroecological practices (T1.5). In particular, the report sheds light on the following key areas which corresponds with the different subchapters of this report:

- The functioning of innovation support services within the (AKIS) concerning organizational pluralism and service diversity (section 2).
- The state of policies, systemic factors, trade-offs, and synergies related to agroecological transitions (section 3).

As a second project report within the frame of WP1, it plays a crucial role in advancing our understanding of agroecological transitions and provides valuable insights to guide policy development and support innovation within the agricultural sector in the study case study regions, countries and entire Central and Eastern Africa as a whole.



2. Innovation support services under AKIS framework

2.1 Introduction

The main objective of Task 1.5 is to systematically map and describe the support service actors and their role in corresponding service activities to improve the agroecological transition in the CANALLS case study regions. Using the AKIS framework approach, the mapping and diagnostic focus of this task range from a national to specific Innovation Living Labs (LLs) level. Partners involved in this task are: UHOH (lead), CIRAD, RIK and IITA (DRC), RAB and IITA (RW), ISABU and IITA (BR), IRAD and IITA (CAM).

This report comprises the conceptual background, the objectives and research questions, the methodology followed and the findings by country. Finally, we include a synthesis of the results and conclusions and implications for practice, researchers, and policy makers.

2.1.1 Conceptual background

There is a consensus that to enhance economic development is crucial to focus on promoting sustainable innovations within agriculture and food systems. This could be done by targeting food production, sustainable intensifying farming practices, and effective cooperation among the multiple actors along food value chains. Especially the latter is vital, given the fading away of the linear innovation - generation - dissemination paradigm which has been replaced by open networks and multi-stakeholder platforms (World-Bank 2006). These networks are currently recognized as a basis for innovation generation, promotion, and scaling (Ndah et al., 2017; World Bank, 2006). These new arrangements are designed based on Agricultural Knowledge and Information/Innovation System (AKIS) concepts (World-Bank 2006). AKIS is defined as "the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields" (Article 102a Modernization, COM 2018/392).

Innovation networks have a positive impact on improving the innovation process needed for a change in the role of traditional agricultural advisory services, to remain competitive. Under these joint learning settings, the expectation from advisory agents earlier limited to supporting innovation processes with technology and information has changed. Other new roles and support service possibilities have emerged, promoting and enhancing innovation processes by carrying out intermediary functions and offering innovation supporting activities (Faure et al., 2019; Ndah et al., 2018). Such support providers and intermediaries are perceived as linking actors within the AKIS through knowledge brokerage. They foster a science-practice interaction within an innovation processes, while at the same time, positively influence the outcome of the innovation processes.

The highlighted dynamics and evolution in support and promotion of innovations in agriculture applies as well to the system and processes of Agroecology - recently earmarked as the most suited system able to support small scale farmers adapt to climate change and improve their livelihoods (Nicholls and Altieri, 2018). For enhancing agroecological innovation system and processes and especially increasing end-user adoption, there is a need for mobilizing and strengthening the broad range of new and emerging advisory and innovation support services presently provided by a pluralistic field of service providers described in Table 1 (Mathé et al. 2016; Faure et al., 2019; Ndah et al., 2018)



Table 1: Adapted typology of innovation support services

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Adapted typology of Innovation Support Services	Brief description
1. Knowledge awareness creation and exchange	support for the sharing of information or technical knowledge linked with new agricultural practices
2. Advisory, consultancy, and backstopping	frequent farm (extension) visits and support with problem- solving, jointly finding solutions, constant and ongoing advice, and extension discussions
3. Networking, facilitation, and intermediation	Support with strengthening collaboration, networking, group formation and collective action hence increasing links and connections with others
4. Capacity building on technical needs	receive training on technical issues linked with new practices e.g., related with plant and livestock production
5. Capacity building on functional needs	Capacity building on group leadership, facilitation, and general group management
6. Demand articulation	support to help farmers clearly express their needs, either capacity (skill) needs or resource needs (technical input, finance etc)
7. Improving access to resources	support in facilitating access to inputs, e.g., facilities, equipment, and financing
 Institutional support for scaling up niche innovations 	support for the design and application of rules, policies, taxes, and subsidies

Adapted typology from Faure et al., 2019b; Labarthe and Laurent, 2013; Mathé et al., 2016; Ndah et al., 2018; Toilier et al., 2018; and complemented with field experiences.

However, the picture of services and suppliers for the agroecological innovations subsystem in the Central and Eastern African region remains fragmented. There are multiple suppliers that address innovative practices and strategies using various methods, funding, and governance mechanisms, as well as different visions of transitions and sustainability. Moreover, several service providers encounter difficulties in clearly expressing and customising assistance for agroecological innovation processes in diverse farming systems, sectors, and scales.

Special attention should be paid to evaluating and improving the performance of AKIS at the Living Labs (LLs). It is important to assess the coherence among various support service providers, identify hindering factors (lock-ins) for further adoption, enhance the competences of farm advisers, and support policy dialogues to improve AKIS governance across farming systems, scales, and sectors.

2.1.2 **Objectives and research questions**

To address the mentioned gaps, Task 1.5 followed a structure methodology to systematically map and characterize AKIS, addressing three main levels: national level, Living Lab level and organizational level. Through a co-design process with project partners, this task has specifically aimed to:

- 1. Mapping of **AKIS** actors at national level for targeted countries.
- 2. **Mapping (inventory)** and characterization of advisory and innovation support service actors across targeted living labs.
- 3. In-depth characterization of services actors and activities through an organizational survey.
- 4. Elaborate policy **recommendations for AKIS governance models** conducive to agroecological transitions



Based on this objectives, Task 1.5 aimed to answer the following questions

- 1. What are the support service actors engaged at national (country) and local (Living labs) levels on enhancing transition of the agricultural knowledge and innovation system for agroecology?
- 2. How do those actors relate and interact together? How does the static picture of these actors' constellation look like?
- 3. Which advisory and innovation support service activities for agroecology are currently mobilized?
- 4. How are the specific agroecological principles currently addressed within the AKIS and what support needs exist and are yet to be covered?

2.2 Methodology

Task 1.5 analysed innovation support services within the AKIS framework. The task investigated the role of advisory and extension services in supporting agroecological innovations. To accomplish this, an inventory of support services was created, AKIS diagrams were drafted and discussed with the country's partners, and a survey was conducted with 47 service provider organizations. This section outlines our process for collecting, analysing, and validating data.

2.2.1 **Description of Living Lab (LLs)**

The Living Labs are in four targeted countries (Figure 1), each of them has a focal crop, according to the expected agroecological transition (Table 2).

Table 2: Living Labs description and focal crops.

Living Lab	Country	Focal crop
Giheta	Burundi	Coffee
Bujumbura	Burundi	Maize
Ntui	Cameroon	Cocoa
Uvira	DRC	Rice
Bunia	DRC	Coffee
Kabare	DRC	Coffee
Biega	DRC	Coffee
Kamonyi	Rwanda	Cassava





Figure 1 Location of the CANALLS Living Labs Source: Deliverable 1.1, CANALLS

Each Living Lab has different contexts and different characterisitics. In this section we present summarized descriptions of each of the LL.

Burundi

Giheta: Positioned in the highlands with a focus on coffee production, Giheta is in a transition phase of agro reforestation. The living lab is set to test various agroecological approaches, including agroforestry systems, intercropping (e.g., banana or timber trees), nutrient recycling from organic sources, organic pest control, and the development of an organic value chain. Anticipated outcomes encompass increased high-quality coffee productivity, the establishment of a new organic coffee value chain, and improved access to international markets through a certification scheme.

Bujumbura: Located in the lowlands with a maize-centric focus, Bujumbura is in a transition phase of deforestation. The lab aims to test agroecological approaches such as integrated soil fertility management (ISFM), integrated pest management (IPM), intercropping (Brachiaria, soybean), forage production, and the integration of crop-livestock systems. Expected outcomes include increased,



more stable maize productivity, improved soil health and biodiversity, increased climate change resilience, and improved farm diversification through crop-livestock interactions.

Cameroon

Ntui: Situated in the lowlands with a focus on cocoa production, Ntui is undergoing a transition phase marked by moderate to severe forest degradation. The living lab is set to test agroecological approaches, including traditional agroforestry systems, integrated soil fertility management (ISFM), and integrated pest management (IPM). The expected outcomes encompass increased cocoa productivity, improved soil health, forest conservation, and increased biodiversity.

DRC

Bunia: Situated in the lowlands and focusing on cocoa production. In a phase of low forest degradation, this living lab aims to test and implement agroecological approaches such as agroforestry systems, intercropping with diverse shade trees, integrated soil fertility management (ISFM), integrated pest management (IPM), and the development of an organic value chain. The expected outcomes include enhanced agroforestry systems, improved soil fertility, and the establishment of a resilient organic value chain.

Biega: Operating in the highlands, with a primary focus on coffee. In a phase of low forest degradation, this living lab seeks to test agroecological approaches, including agroforestry systems, intercropping with banana, nutrient recycling through local composts, integrated pest management (IPM), and the development of an organic value chain. Anticipated outcomes encompass increased high-quality coffee production, improved soil health and biodiversity, enhanced climate change resilience, reduced greenhouse gas emissions, and forest conservation.

Kabare: Operating in the highlands, specifically targeting coffee production during a transect of deforestation. The living lab aims to test agroecological approaches such as integrated soil fertility management (ISFM) and recycling of nutrients through coffee pulp and organic waste compost. The expected outcomes include improved control of nutrient flows, increased business capacity of coffee cooperatives, the establishment of a new organic coffee value chain, and improved access to local and international markets.

Uvira: Located in the lowlands and focusing on cassava and rice production in a deforested area. This living lab is testing agroecological approaches, including the integration of crop and livestock systems, forage production, integrated soil fertility management (ISFM) with nutrient recycling through manure, intercropping with legumes, and legume cover crops. Anticipated outcomes include reduced nutrient loss, improved soil health, better control of pest diseases in cassava, increased climate change resilience, and the development of sustainable rice production and alternative value chains for rice and cassava products.

Rwanda

Kamonyi: Positioned in the highlands with a focus on cassava production, Kamonyi is in a transition phase marked by deforestation. The living lab is designed to test agroecological approaches, including intercropping (i.e. with legumes), integrated soil fertility management (ISFM), nutrient recycling through organic waste compost, and farm diversification. Anticipated outcomes include increased cassava productivity, improved soil health and biodiversity, enhanced control of nutrient flows and recycling of nutrients, increased farm diversification through crop-livestock interactions, and heightened climate change resilience.



2.2.2 Data collection and analysis

The process of data collection was made in three main steps A) Desk review, B) Online survey, C) Country workshops, as shown in Figure 2.



Figure 2 Data collection steps

Desk review

An exploratory phase has been conducted for the desk review though online research. The main tools utilized were the Google search engine and Google Scholar. Sources taken in consideration ranged from scientific literature to project and program reports. For the inventory of advisory and extension providers, we used the database of the Global Forum for Rural Advisory Services (GFRAS) the connected database of the African Forum for Agricultural Advisory Services (AFAAS). For the inventory and characterization of education and research organizations, the database of the ASTI Network was used. The data collected were then used to create a first written document of the desk study, which was submitted to the project partners for a review and feedback round.

Parallelly, the same sources have been utilized to create a first draft of the national AKIS maps of each country. This phase followed the methodology described in the PROAKIS and i2Connect - Horizon projects, as well as described by Knierim et al., 2023. Once these drafts were ready, they were used as a navigation tool to initiate a collaborative process with each country team to improve the national AKIS maps. Online meetings were held with each individual country team. During these collaborative sessions, the country teams were asked to provide both feedback and new inputs to the initial diagrams. The online meetings were held on Zoom and the use of a Miro board, shared with the participants, allowed a live interaction and collaborative process. New actors and the linkages between each actor were added and characterized in this phase. The final output of this process was a definitive draft of the National AKIS map that could be a strong initial and guiding point for the final phase of the AKIS maps creation, represented by the in-person validation workshop in Kigali.



Online survey

The survey aimed to identify the characteristics of advisory service organisations in the countries. The participants were selected by local partners with the assistance of project partner AFAAS. The survey focussed on six key areas: organisational profile, advisory topics and methods, staff, capacity building needs, funding and relationships with other organisations (Annex 1). These areas were chosen based on previous research conducted in EU AKIS-related projects (PROAKIS and i2connect).

The project partners identified a list of organizations, to which an English and French version of the survey was emailed. A total of 47 advisory service organizations responded to the questionnaires between August 15th and September 15th, 2023. The organizations were distributed as follows: 12 in Burundi, 16 in Cameroon, 16 in DRC, and 7 in Rwanda (Table 3).

Table 3: Description of the sample of the online survey.

Type of advisory service organisation	TOTAL	Burundi	Cameroon	DRC	Rwanda
Advisory organisation	18	3	7	8	0
Organisation with an advisory component	23	7	6	6	7
Project with an advisory component	6	2	3	2	0
Total	47	12	16	16	7

Descriptive statistics and the identification of differences between countries were used to analyse the survey.

Country workshops

There were two validation workshops conducted as part of the data collection methodology. The first workshop took place in Bukavu, DRC on September 15th, 2023. During this workshop, the AKIS review results for DRC were presented, enriched, and validated. Additionally, a mapping and characterization of AKIS at LL level (Micro AKIS) were conducted for the four LLs in DRC, namely Biega, Bunia, Kabare, and Uvira. The second validation workshop was organized in Kigali, Rwanda on September 18th, 2023. During this workshop, the national AKIS review results for Cameroon, Rwanda, and Burundi were presented, enriched, and validated. Furthermore, a mapping and characterization of Micro AKIS were carried out for all the LLs in these countries, including Ntui in Cameroon, Kamonyi in Rwanda, and Bujumbura and Giheta in Burundi.

These workshops served as important platforms to review and validate the AKIS findings and to conduct detailed mapping and characterization of Micro AKIS for the respective regions and countries.

2.2.3 Limitations in the methodology

The AKIS mapping process methodology was implemented based on the previous experiences conducted in Europe within EU multi-actors funded projects. While this provides important theoretical foundations, it is also necessary to recognise that some elements needed to be adapted according to national realities. For example, the classification of some actors differs from their roles in the European sector (research and education) or private actors tend to have a greater influence (International NGOs). In addition, as this was the first exercise carried out in relation to AKIS, the main emphasis was placed on agricultural extension services.



During the first phase of the desk review, we encountered some difficulties in collecting information from the online search. While for some countries such as Cameroon and Rwanda there is plenty of scientific literature and projects reports available, this was not the case for others, especially Burundi. The lack of available sources made the overall process harder, and the final output limited. Some of the resulting gaps, however, were solved thanks to the participation and the inputs of the country teams.

When classifying the different actors of the AKIS, there were some cases in which a clear classification was not possible. These cases included public organizations engaged in research activities (i.e. RAB in Rwanda or ISABU in Burundi) or research organizations involved in the provision of extension service. Moreover, large organizations such as International Development Organizations play different roles and therefore were often classified and Hybrid Organizations. This category is meant to include also stakeholders involved under a project context, where they might play a role different from their core classification.

Another issue in classifying the AKIS actors was encountered during the collaborative sessions with the country teams and the validation workshops as well. It has often been the case that one actor was classified multiple times (i.e. at National level first and at LL level then), but differently. This inconsistency can be linked with what mentioned in the previous paragraph and falls in the overall difficulty in classification of actors. One possible explanation of this was identified in the use of a methodology developed for European countries within the PROAKIS and i2Connect projects but applied in a different region and context. Additionally, there were some limitations in the participatory methodology due to the different engagement of the country partners, as some were more responsive and proactive, while others were not.

With respect to the characterization of organizations, the purpose of the survey was to generate results that could be comparable with a limited number of questions. Although it proves to be a flexible tool easy to distribute and to answer, we have to consider several aspects regarding the interpretations. First the sample size is not representative of the organizations in the country; second, each survey was filled by one member of the organization, posing potential problems if this person is not aware of the process conducted by the organization. Finally, this analysis is based on the perspective of actors and members of the organisation. To triangulate the data, perspectives from farmers and extension agents should be collected.





2.3 Findings on AKIS analysis Cameroon

2.3.1 Results of desk review

While Cameroon ranks as the fifth-largest oil producer in sub-Saharan Africa, its economic backbone remains firmly rooted in the agricultural sector, constituting approximately half of total exports. Historical trends reveal the dominance of large plantations during the colonial era, cultivating lucrative cash crops such as cocoa, coffee, bananas, and rubber. Shifts in governmental strategies following the Green Revolution and the 1986 crop price crisis have contributed to the resurgence of agriculture as a pivotal industry in present-day Cameroon. Key cash crops encompass cocoa, coffee, cotton, bananas, rubber, palm oil, and groundnuts, with food crops including plantains, cassava, maize, and millet, arrow root, rice, Irish potato, and yam. Despite this evolution, traditional farming practices still hold significant importance in Cameroon.

The AKIS in Cameroon connects a diverse network of actors and knowledge systems committed to advancing agricultural development and innovation. This multifaceted system includes government agencies, research institutions, farmers' organizations, non-governmental organizations (NGOs), and private sector stakeholders. The purpose of this analysis document is to facilitate the identification of AKIS actors in Cameroon, with a specific focus on the Living Labs (LLs) case study regions and the agro-ecological practices targeted within the CANALLS framework.

AKIS Actors in Cameroon

This section provides a detailed overview of the AKIS actors, highlighting the complex network of links and knowledge flows among them. The text explores in detail the diverse range of actors, the nature of links, and the quality of knowledge flows.

Public Organizations/Authorities

In Cameroon, agricultural ministries and related bodies play a crucial role in coordinating the AKIS. Among them is the Ministry of Agriculture and Rural Development (MINADER), Ministry of Livestock, Fisheries and Animal Industries (MINEPIA) and Ministry of Scientific Research and Innovation (MINRESI). All three ministries (MINADER, MINEPIA and MINRESI) are engaged in AKIS coordination. While MINADER formulates policies and programs to enhance agricultural development and agroecology, issues linked with Animal-husbandry agriculture are directly under MINEPIA and MINRESI is devoted to Knowledge and Innovation development (Research). All three, collaborates closely with other government entities, particularly the Ministry of Vocational Training, and actively oversees private agricultural education, including the management of agricultural extension and supervision of the PNVRA.

The PNVRA (National Agricultural Research and Extension Programme) serves as the primary public entity delivering extension services to farmers in Cameroon, operating within the MINADER framework. Distinguished by its close integration with AKIS, PNVRA not only provides agricultural extension services but also engages in human resource training for extension agents. It fosters collaborations and partnerships with farmers' and producers' organizations, as well as private sector actors. The PNVRA secures funding from both the government and international institutions such as CGIAR centers, CIRAD, and foreign development agencies, as highlighted by GFRAS.



The Chamber of Agriculture, Fisheries, Livestock, and Forestry (CAPEF), situated within MINARED, functions as a representative body for farmers in Cameroon. CAPEF undertakes various responsibilities, including collaboration with private investors and indirect involvement in training services.

The Institut de Recherche Agricole pour le Développement (IRAD) operates as the Cameroonian government's arm for agricultural development. Functioning under the technical supervision of the Ministry of Scientific Research and Innovation and financially overseen by the Ministry of Finance, IRAD conducts scientific research and promotes agricultural development nationwide. It collaborates with state, regional, and international institutions, aligning its activities with sectoral strategies outlined by various ministerial departments involved in rural sector development.

The Ministry of Posts and Telecommunications (MINPOSTEL) is tasked with studying, producing, or commissioning equipment and infrastructures related to the Post and Telecommunications sectors. MINPOSTEL is instrumental in driving the development of Information and Communication Technologies (ICTs) and electronic communications, coordinating its efforts in liaison with relevant administrations.

Focused on supporting the sustainable development of cocoa farming in Cameroon, the Cocoa Development Company (SODECAO) plays a vital role in fostering practices that ensure the longevity and resilience of the cocoa industry.

Research and Education Organizations

Amongst the many Universities in Cameroon that contribute to advancing agriculture including fisheries, the University of Dschang, is recognized for its distinguished contributions to research and education and plays a pivotal role in advancing agricultural knowledge in Cameroon. Similarly, the Universities of Douala, and Ngaoundéré are dedicated to agricultural research and education, serving as key players in shaping the scholar landscape. Bamenda University of Science and Technology (BUST) stands at the vanguard of scientific and technological education, in agriculture, demonstrating a commitment to agroecological innovation and academic excellence. Additionally, the Centre de Coopération Internationale pour la Recherche Agronomique et le Développement (CIRAD), as a French institute, collaborates on numerous projects, working closely with various ministries in Cameroon. CIRAD's involvement extends to supporting advisory services, emphasizing a collaborative approach to agricultural research and development. The International Institute of Tropical Agriculture (IITA) is dedicated to the dissemination of agroecology and training, playing a crucial role in promoting sustainable agricultural practices and facilitating knowledge transfer. The World Agroforestry Center (ICRAF) positions itself as a leading institution in agroforestry research, contributing to sustainable land management practices by integrating agriculture and forestry to enhance environmental resilience. The International Potato Center (CIP) focuses on research and development in potato and sweet potato farming, playing a vital role in improving food security and livelihoods through innovative agricultural practices.

Private (profit-making) organisations

Private organizations in Cameroon encompass a diverse range, including consultancy firms, commercial companies, banks, insurance companies, cooperatives, and more. However, the provision of regular extension and advisory services to farmers by private companies is relatively limited. Notable exceptions are agricultural input supply companies that extend technical advice



specifically on cash crop production. Despite this, various private sector entities actively engage in the supply of agricultural inputs, trading, as well as the import and export of agricultural products.

Private distributors of agricultural inputs can be broadly categorized into individual suppliers, such as private traders, and collective suppliers, as outlined by Kuissu et al. (2021). The GFRAS database offers several examples of such private entities involved in agricultural activities, including: Complexe agricole du Cameroun Inc., Glochem Industries Ltd., Cameroon Chemical Fertilizer Production Company Ltd., Nlaten Farms Ltd., Agriculture and Pet Products (Mohamedouadventures, Ltd.), Lipenja Development Company.

Additionally, the Groupe d'Action pour le Développement (GRADEV) stands out as a private company actively engaged in extension work, boasting approximately 46 extension agents in in 2009. In addition, the CDC (Cameroon Development Coorporation) is the number 1 employer after the public service and function as a parastal-private institution under MINADER with a rich extension service base service and dwells on the export of mainly cash crops (e.g. Rubber, Banana, Palm oil etc). Other major private actors include the French companies on banana export like PHP (Plantation du Haut Penja)

Farmers' organisations in the third sector (FBOs)

In Cameroon, farmers' organizations predominantly manifest as collaborative entities, comprising both farmers' groups and trade associations, which encompass a mix of commercial companies and farmers' cooperatives. These organizational structures not only serve as platforms for collective representation but also actively engage in delivering advisory services and extension support to the farmers they represent, as highlighted by GFRAS.

Among the noteworthy organizations in Cameroon is Associations de Producteurs et de Stockeurs de Céréales (APROSTOCs), playing a pivotal role in cereal production and storage, thus contributing significantly to the agricultural landscape. Another example is the Northwest Cooperative Association Limited (NWCA), a cooperative association operating in the Northwest region, involved in diverse agricultural activities, and fostering collaboration among local farmers. Similarly, the Southwest Farmers Association, Ltd. is actively dedicated to enhancing the welfare and development of farmers in its area of influence. Operating in the Northwest region, Northwest Farmers' Organization (NOWEFOR) takes a crucial role in organizing and representing the interests of farmers in that region. At a national level, the Federal Association of Farmers of Cameroon (CAMFFA) unifies farmers from across the country, promoting unity and advocating for their collective interests. The Northwest Pig Farmers' Cooperative (Nowepifac) specializes in pig farming, concentrating on the collective development of pig farmers in the Northwest region. Beyond agriculture, the Cameroon Rural and Community Radio Association (CARCOR) contributes to rural development through community radio initiatives, disseminating valuable information to farmers. The National Confederation of Cotton Producers of Cameroon (CNPC) plays a vital role in representing and supporting cotton producers throughout the country. Additionally, the Cocoa Farmers' Organizations (ONPCCC), as one of the numerous cocoa producer organizations, actively contributes to the cocoa industry, working towards the welfare of cocoa producers. Meanwhile, the National Confederation of Cocoa Producers of Cameroon (Conaprocam), operating at a national level within the cocoa sector, represents the interests of cocoa producers and contributes to the overall development of the industry.

Service sector NGOs (non-profit)



In Cameroon, civil society organizations encompass a variety of entities, including charities and faithbased institutions. Among the notable ones in the country are PLANOSCAM, which aims to establish a continuous exchange and consultation framework among civil society umbrella organizations. PLANOSCAM works towards strengthening the capacities of civil society organizations in dialogue with various stakeholders and ensuring national representation in discussions on public policies. The Cameroon Association of Women Lawyers (ACAFEJ), founded in 1989, focuses on disseminating Cameroonian laws and regulations, as well as treaties and conventions ratified by Cameroon. The association actively combats and denounces all forms of discrimination against women and children. Another organization, Cercle International pour la Promotion de la Création (CIPCRE), a nongovernmental Christian organization founded in 1990, aims to assist individuals in taking charge of their own development. Concertation Nationale des Organisations Paysannes du Cameroun (CNOP-Cam) brings together around 80 farmers' organizations across the country's provinces and actively participates in shaping rural development policies. The Community Intervention and Action Agency (AIAC), a non-profit organization, focuses on restoring community balance and contributing to development by intervening in situations requiring action. Additionally, the Association for the Victims of the World aims to aid vulnerable children, victims of rape, young mothers, the elderly, and people with disabilities. Nature Roots Society (NAROS) supports the development, design, and implementation of innovative solutions, including those related to the digital payment market.

Hybrid organisations

Hybrid organizations, despite lacking a unique single legal entity, are considered active participants in projects within mixed constellations. In Cameroon, entities recognized for their engagement in supporting agroecology and agriculture under such joint structures include GIZ, Agence Universitaire de la Francophonie (AUF), SNV, IUCN, WWF, UNESCO, UNEP, and Wildlife Conservation. These organizations operate collectively, contributing to initiatives that promote agroecology and advance agricultural practices in Cameroon.

Advisory approach, role of ICT and public policy on the agriculture

Advisory approach

Over the years, Cameroon has primarily relied on the 'training and visit' approach to agricultural extension, which has been promoted by the World Bank and follows a top-down method. However, this approach has faced criticism for its inability to effectively address farmers' challenges and ensure the sustainability of their farming systems (Patrice Djamen Nana et al., 2011). The 'training and visit' approach focuses on providing training and disseminating information to farmers through extension agents. Unfortunately, it often neglects to consider local knowledge and practices, leading to limited improvements in farmers' decision-making processes and posing long-term sustainability challenges (Nestor, 2022). Currently, the coordination of this approach is handled by the PNVRA, which employs approximately 1,600 extension agent for every 625 farmers, makes it difficult to adequately meet the needs of individual farmers (Nestor, 2022). In contrast, the consultative approach has gained prominence in Cameroon since its initial implementation in 1998 in collaboration with partners such as IRAD and SODECOTON. This approach, characterized by a participatory and collaborative process, is now the primary extension approach used in various government programs, including PNVRA, ACEFA, SODECAO, and PNDRT (Nestor, 2022).



Information and communication technologies (ICT)

The Ministry of Posts and Telecommunications (MINPOSTEL) oversees ICT development and regulation in Cameroon. Despite a relatively high mobile phone subscription rate of 52.35 per 100 people, the country has a low Internet user rate of only 5 per 100 people, attributed to digital illiteracy and expensive broadband Internet. The government has made efforts to bridge the digital divide by implementing a national ICT development strategy and integrating ICTs into primary and secondary education. Various initiatives, such as the national electrification project and capacity building in ICT, have been undertaken to promote ICT. However, there is limited integration of ICT in agricultural extension programs, despite the growth of Digital Agriculture Technology (DAT) businesses in the private sector. These businesses offer services like e-marketplaces, farm management software, and advisory services through platforms such as community radio, mobile phones, Google Groups, blogs, and RSS feeds.

2.3.2 Results on AKIS system at national level

According to a static overview of the AKIS system for Cameroon, the hierarchy of organizations reveals a dominant presence of public organisations at one level. Following closely at the second level are research and education organisations, financial organisations, NGOs, private organisations, and others including middlemen and informal service providers such as friends and family. Farmer Based Organisations (FBOs), however, are observed to have a relatively limited presence and are located at the bottom level of the system. When it comes to knowledge flows and exchanges between the actors, international financial organisations seem to have a unilateral flow/connection with other actors. On the other hand, the remaining actors, including public organisations, research and education organisations, financial organisations, NGOs, private organisations, and FBOs, exhibit a unilateral flow/connection in terms of knowledge exchange across the entire system. Notably, farmers and farmer-based organisations stand out as having the most connections with all other actors in the agricultural knowledge system of Cameroon.



Figure 3: National Agricultural Knowledge and Innovation System (AKIS) of Cameroon, elaborated by the authors.



2.3.3 Results on AKIS system at ALLs level

For analysis at the LL level, we started off with asking participants which agroecological practices are present and relevant for their respective LL. In Box 1, we present the identified relevant practices for the two LL in Cameroon:

Box 1: Relevant Agroecological Practices in Ntui LL, as identified by participants.

Ntui LL

Limited to no tillage, Sun drying of beans, Natural Fermentation, Agroforestry, Pod harvesting, Pod breakage, Intercropping, Manure, Biopesticides, Organic Fertilizer, Biological Control, Shade Management

Ntui Living Lab (LL)

In the Ntui Living Lab (Figure 4) there is a range of active organizations including public, private, and Farmer Based Organizations. The organizations that are closest to farmers in terms of agroecological support fall under the "others" category, such as Rainforest Alliance and CAFI. Following closely are research organizations like IITA and IRAD, as well as public organizations like SODECAO and FODEC. On the other hand, private organizations (e.g., PRODUCAM, TELECAR) and Farmer Based Organizations have less influence on agroecology in this Living Lab.



Figure 4: AKIS at Living Lab level, Ntui Living Lab, Cameroon.

Notes:

- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
- 2) Legend of the levels of influence of actors in supporting relevant AE practices: 1st: High influence; 2nd: Medium influence; 3rd: low influence; 4th: very low influence



Overall, the results reveal that the most offered service activities by organizations in the Ntui Living Lab are those related to the design and enforcement of rules, policies, and taxes (Service No. 8), with a total of 35 service situations observed. This is followed by services focused on strengthening collaboration and networking (Service No. 3), with a total of 21 service situations observed. The third most offered service is linked to awareness creation, especially regarding new farming practices (Service No. 1), with a total of 20 service situations highlighted. On the other hand, the least offered services in the Ntui Living Lab are support for demand articulation e.g., for farmers to clearly express their needs (Service No. 6) and capacity building on group leadership and facilitation (Service No. 5).

Туре	Innovation Support Services ¹									
	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations		
Research	7	7	7	5	5	5	5	7		
Public	4	4	3	3	2	2	4	15		
Private	3	4	3	4	2	2	4	5		
Others	6	6	8	3	5	3	3	8		
Total	20	21	21	15	14	12	16	35		

Table 4: Diversity of innovation support service activities in Ntui Living Lab according to the type of organization.

. 1 See a description of the innovation support services in Table 2

2.3.4 Summary conclusion on AKIS results for Cameroon.

In conclusion, the national Agricultural Knowledge, and Information System (AKIS) in Cameroon has a diverse range of actors with high pluralism and connectivity. However, despite the dominance of public institutions at the national level, their active presence and support at the Ntui Living Lab level, particularly through public extension programs, are limited. The Training and Visit approach for extension remains prevalent in Cameroon, but with limited extension services. Despite the limited presence of Farmer-Based Organizations (FBOs) at the national level, they have a strong connectivity that confirms their positive impact on farmers' lives through innovative support services. However, at the Ntui Living Lab level, FBOs seem to have a lower visibility in influencing relevant agroecological practices compared to projects, research institutions, and private institutions. The most offered services within the AKIS system focus on policy, rules, and regulations (institutional support), followed by networking services for knowledge and awareness. However, services related to demand articulation, capacity building for group formation and leadership, and technical training are less offered by the actors. To enhance the AKIS system, it is important for actors to prioritize comprehensive services that address the diverse needs of farmers, including demand articulation, capacity building, and technical training. By doing so, a more inclusive and impactful agricultural knowledge system can be established, supporting relevant agroecological practices and benefiting farmers in Cameroon.

2.4 Findings on AKIS analysis DRC

2.4.1 **Results of the desk review**

The DRC is a large, resource-rich country in Central Africa with a population of around 95 million. It is the second largest country in Africa, covering a total surface area of 220 million hectares, with 33 million hectares designated as farmland (FAOSTAT, 2021). However, the DRC has faced internal



wars and armed conflicts between 1998 and 2008, resulting in political instability, infrastructure challenges, and institutional setbacks, which have adversely affected food security and human development (Ragasa & Ulimwengu, 2020). This analysis focuses on inventorying Agricultural Knowledge and Innovation System (AKIS) stakeholders in the DRC, specifically in the Living Lab case study regions of Biega, Bunia, Kabare, and Uvira. The aim is to map and characterize the players involved in innovation support services, analyse the role of advisory and extension services in agro-ecological innovation systems, and provide recommendations for AKIS governance models and advisory services to promote the agro-ecological transition.

Main Actors in DRC national AKIS

Agricultural extension services in the DRC involve various actors from the government, private sector, and civil society. Public extension services are managed by the Ministry of Agriculture, with the Service National de Vulgarisation (SNV) playing a key role in delivering national extension services (GFRAS, 2023; Ragasa & Ulimwengu, 2020) – though its role has weakened in the last years due limited funding.

The DRC has a relatively high ratio of extension agents to farmers compared to other African countries, with over 11,000 agricultural inspectors and monitors employed by the Ministry of Agriculture (Ragasa et al., 2016). However, despite this high number, the effective delivery of improved technologies and knowledge to rural communities has been challenging, hindering efforts to increase agricultural productivity. In the DRC, agricultural extension services are structured with agricultural monitors as the lowest level of field staff employed by SNV under the Ministry of Agriculture, Livestock and Fisherie (MINAGRI). These monitors are distributed at the village level and are supervised by sector agronomists and veterinarians, who report to agronomist and veterinary inspectors at the territory level, ultimately reporting to the provincial director (Ragasa et al., 2016).

In terms of agricultural research, the DRC has seen an increase in spending between 2009 and 2013, driven by government initiatives and donor-funded projects. However, recent years have seen a decline in investment due to reduced public funding. In 2016, the DRC's investment in agricultural research accounted for only 0.24% of its GDP, one of the lowest levels in Africa (ASTI, 2016). Challenges in infrastructure, equipment, transportation, and communication hinder the effective performance of agricultural research in the country (ASTI, 2016). The process of technology development in the DRC involves research institutions such as National Agricultural Study and Research Institute (INERA) and universities partnering with grassroots organizations to identify needs and design technologies. These technologies are then certified by the state and handed over to dissemination services, such as SNV, for distribution.

The extension workers collaborate with grassroots organizations to ensure the adoption of technologies by farmers and other actors in the crop value chain. Extension workers receive training from the technology designers to facilitate their mastery of the technologies. Adoption and impact studies are conducted to generate new information for research (Ragasa et al., 2016).

Following subsections highlight the prominent categories of AKIS actors in DRC mentioned in Appendix 5.1.

Public organisations/authorities

Public organizations and authorities involved in the agricultural sector in the DRC include ministries and related bodies responsible for formulating policies, allocating resources, and overseeing various



services. MINAGRI plays a central role in setting national policies and supervising entities such as the National Extension Service (SNV), National Agricultural Mechanization Service (SENAMA), National Seed Service (SENASEM), and National Fertilizer and Related Inputs Service (SENAFIC). These organizations report to the Directorate-General for Agriculture under MINAGRI. The Ministry of Rural Development (MINRD) is another important public entity in the agricultural sector. INERA, the National Institute for Agronomic Study and Research, functions under the Ministry of Scientific Research, Higher Education, and Universities. INERA collaborates with MINAGRI, MINRD, the private sector, higher education agencies, faith-based organizations, and NGOs, and is a key public agricultural research institution in the country (ASTI, 2016). Additionally, the Agri-Food Research Centre (CRAA) is also involved in agricultural research in the DRC.

Research and education organisations

In DRC, there are several research and educational organizations that contribute to the development of the agricultural sector. Kongo Mbanza Ngungu University (UKMN), Faculty of Agricultural Sciences at the National Pedagogical University (UPN-FSA), University of Kinshasa - Faculty of Agronomic Sciences (UNIKIN-FA), Catholic University of Bukavu - Faculty of Agronomic Sciences (UCB-FSA), University of Lubumbashi - Faculty of Agronomy (UNILU-FA), and Institut Facultaire des Sciences Agronomiques de Yangambi - Faculty of Agronomy (IFA-FA) are among the prominent institutions (Ragasa et al., 2016). Additionally, government institutions such as the Institut Supérieur d'Etudes Agronomiques (ISEA) and Institut Supérieur de Développement Rural (ISDR) are widely present across the territories of the DRC. These institutions play a vital role in providing training and education in agriculture, particularly in the development of extension workers and rural development agents (Ragasa et al., 2016). The Ministry of Education (MESU - Ministère de l'Enseignement supérieur et universitaire) supervises both ISEAs and ISDRs, ensuring their alignment with educational standards and objectives. The International Institute of Tropical Agriculture (IITA) has been the main channel the current government to have an impact on applied research. In DRC, IITA is working with research projects related to cassava, maize, soybean, banana, cocoa, and coffee

Private (for-profit) organisations

Private organisations are present in the agricultural sector. These include consultancies such as Agriconsulting and Proxfin, which provide expertise and advice on market analysis and sustainable agricultural practices. Commercial companies such as Feronia Inc. and SOCOFE are involved in the production, processing and distribution of agricultural products, while banks such as Equity Bank Congo offer agricultural loans and financing solutions. Cooperatives such as the Kivu Specialty Coffee Cooperative empower smallholder farmers by promoting collective action and market access. These organisations aim to contribute to the growth and development of the agricultural sector, improving productivity and the socio-economic well-being of farmers and communities.

Third sector Farmers' organisations

Farmers' organizations in the DRC play a crucial role in representing the interests of farmers and promoting agricultural development. These organizations, which include farmers' groups and trade associations, have established close relationships with international NGOs and donors in part due to the lack of trust in the government (Matiyabu & Patrik, 2019). Farmers' organizations, known as FBOs, operate at the provincial level and are coordinated nationally, often forming federations. Some examples of farmers' organizations in the DRC include COPACO (Confédération Paysanne du



Congo), which not only represents farmers but also promotes agro-ecological principles and has its own extension staff (GFRAS, 2023). Other notable organizations include FEC (Congo Business Federation), FNCCIA (Fédération nationale des chambres de commerce, d'industrie et d'agriculture), APRODECO (Association for the promotion and defense of the interests of Congolese traders), COPEMECO (Confederation of small and medium-sized enterprises in the Congo), as well as various service sector NGOs, civil society organizations, charities, and faith-based institutions. FOLECO (Federation of Secular and Economic NGOs), CNONGD (National Council of Development NGOs), and the Regional Council of Development NGOs are among the organizations supporting agricultural development in the country. These farmers' organizations and NGOs play a vital role in advocating for farmers, promoting sustainable practices, and contributing to the overall development of the agricultural sector in the DRC.

Hybrid organisations

A multi-stakeholder approach has been adopted in various agricultural projects, where different players come together in a mixed constellation. One example of this is the establishment of Agricultural and Rural Management Councils (CARGs) by the government in 2008, which serve as discussion platforms involving civil society organizations in policy and planning processes (Ragasa et al., 2013). Currently, there are approximately 140 CARGs operating at the district level, with one-third of the members being state actors and two-thirds being non-state actors, primarily farmers' organizations (Matiyabu & Patrik, 2019). The CARGs serve as consultation bodies for participatory policymaking and play a role in articulating demands and coordinating extension services.



Approaches adopted.

Figure 5: Detailed structure and operation of CARGs (Ragasa & Ulimwengu, 2020)



In terms of extension services, most providers in the DRC, such as SNV and governmental -run organizations, rely on the training, and visit approach, which was introduced through World Bank-funded programs in many sub-Saharan countries (Figure 5).

Faith-based organizations often utilize training or demonstration farms. However, more participatory approaches like demonstration farms are not as widely implemented as in other countries and are primarily used by NGOs and international organizations (Ragasa et al., 2008, Ragasa et al., 2016).

Information and communication technologies (ICT)

According to the World bank (2021), Information and communication technologies (ICT) have played a crucial role in transforming the agricultural landscape in DRC. These technologies have provided farmers with access to valuable information, improved communication, and enhanced productivity. One specific example is the use of mobile phones. Farmers in remote areas can now receive realtime weather updates, market prices, and agricultural tips through SMS services. This enables them to make informed decisions about planting, harvesting, and selling their produce. Mobile phones also allow farmers to connect with buyers directly, eliminating middlemen and ensuring fair prices for their products. Another example is the use of ICT platforms for accessing financial services. Digital banking and mobile payment systems have made it easier for farmers to access credit, make transactions, and receive payments. This has improved financial inclusion and reduced the risks associated with carrying cash. ICT has also facilitated remote training and extension services. Farmers can participate in virtual workshops, webinars, and online courses to learn about best agricultural practices, pest management, and crop diversification. Furthermore, ICT has played a significant role in data collection and analysis. Remote sensing technologies, such as satellite imagery, help monitor crop health, soil moisture levels, and pest infestations. This data can be analysed to provide valuable insights and support decision-making processes for agricultural development.

2.4.2 Results on AKIS system at national level

AKIS diagrams

At the national level, the static AKIS image in DRC indicates a strong presence of public institutions. These institutions play a dominant role, shaping policies and driving agricultural development initiatives. Following public institutions, there is a notable presence of third sector Farmer-Based Organizations (FBOs). These FBOs represent the interests and needs of farmers, advocating for their rights and providing support. On the other hand, research and education institutions, private organisations and non-governmental organizations (NGOs), do not appear to be as visible within the DRC's AKIS system. This implies that their participation and influence in shaping agricultural policies and practices may be relatively limited.

However, it is important to note the involvement of research and education institutions and NGOs may vary across different regions or contexts within the DRC. During the workshop conducted with the Living Labs, participants stated that the AKIS should be analysed considering the geographical differences between the North DRC and South DRC. Differences in both regions are explained by how the historical events shaped the institutional presence. The main difference between the two regions are the presence of the CARGs and the most prominent role of province level organisations in relation to the farmers in DRC South (Figure 6 and Figure 7).

In both AKIS systems, international organizations and FBOs exhibit a high level of interconnectedness with other actors in the system. The involvement of international organizations reflects the importance



of global cooperation and support in advancing agricultural development in the DRC. Regarding the types of connections within the AKIS, there does not seem to be a significant difference between unilateral and bilateral connections. The AKIS in the DRC appears to have a mix of both types of connections, indicating a diverse range of interactions and collaborations among different actors within the system.



Figure 6: Southern DRC National Agricultural Knowledge and Innovation System (AKIS)





Figure 7: Northern DRC National Agricultural Knowledge and Innovation System.

The AKIS images (both the north and south DRC) highlight the prominent role of public institutions and FBOs, while research and education institutions, private institutions and NGOs are relatively less visible. International organizations and FBOs demonstrate a high level of connectivity within the AKIS, and there is a mix of unilateral and bilateral connections among actors.

2.4.3 **Results on AKIS at ALLs Level**

The analysis at the LL level was conducted asking the participants which actors were present in the LL supporting relevant agroecological practices for the LL. In Box 2, we present the identified relevant practices for the four LL in DRC:

Box 2: Relevant Agroecological Practices in the Living Labs of DRC, as identified by participants.

Biega LL: agroforestry, association of legumes and coffee, intercropping, use of organic fertilizer, cover crops

Bunia LL: agroforestry, intercropping, cocoa, and legumes

Uvira LL: rice cultivation, irrigation, combination of rice and pisciculture, production of forage for livestock, integrated cropping -livestock systems, use of organic fertilizer

Kabare LL: integrated soil fertility management; nutrient recycling; fertilization and composting; agroforestry systems; processing of agricultural products; Intercropping (agroforestry, banana, coffee)

Biega Living Lab micro AKIS.

Generally, the results indicate that there are many AKIS actors involved in the promotion of agroecological practices relevant for the Biega Living Lab (Figure). Private actors such as ONAPAC, APDIK, and RAEK are considered the dominant players, with research actors like IITA, PNKB, INERA, and CIAT following suit.





Figure 8: AKIS at Living Lab level, Biega living lab, DRC.

Notes:

Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up Legend of the levels of influence of actors in supporting relevant AE practices: 1st: High influence; 2th: Medium influence; 3th: low influence; 4th: very low influence

On the other hand, there are fewer public actors like the Ministry of Agriculture, as well as other informal actors like Veterinary Doctors Without Borders, GASD, ADEA, and FAO. Overall, majority of actors are concentrated at levels 1 and 2, indicating their proximity to farmers and their involvement in agroecological practices in the area. However, when looking at the absolute numbers, the overall count of actors may appear relatively small.

Most service activities offered by actors in Biega Living Lab are focused on supporting farmers in clearly expressing their needs (*service 6*) and facilitating access to inputs (*service 7*). Research institutions primarily offer information sharing and technical knowledge (*service 1*), while public institutions are more involved in frequent farm visits and problem-solving support (*service 2*) as well as training on technical issues (*service 4*). Private institutions, on the other hand, offer a wide range of services (7 out of 8) and are the main organizational type providing the most services in the Biega Living Lab (Table 5)



Туре	Innovation Support Services ¹								
of orga nisatio n	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations	
Research	5	1	2	3	3	4	4	2	
Public	1	3	0	2	0	3	2	0	
Private	3	4	1	4	4	7	5	4	
Others	1	1	0	1	2	1	1	0	
Total	10	9	3	10	9	15	12	6	

Table 5: Diversity of innovation support service activities in Biega Living Lab according to the type of organization.

1 See a description of the innovation support services in Table 2

Bunia Living Lab AKIS

In the case of Bunia Living Lab, very few AKIS actors are observed. Some active actors include a few public institutions such as ONAPAC, SNV, and INERA. There are also few research actors like IITA and Shalom Uni, as well as few other organizations such as UPPCD. During the workshop, participants reported the presence of a single third sector NGO (i.e., RIKOLTO), and a single third sector farmer-based organization (i.e., CONAPC).



Figure 9: AKIS at Living Lab level, Bunia living lab, DRC.

Notes:

- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
- Legend of the levels of influence of actors in supporting relevant AE practices: 1st: High influence; 2nd : Medium influence; 3th: low influence; 4th: very low influence



Also in the workshop, participants reported the influence of organisations such as ADF and the influence that they can have in the adoption of practices, showing the importance of context in the adoption of those practices. It is worth noting that, apart from RIKOLTO and IITA, the other listed institutions are not closely involved with farmers and agroecological practices. Instead, they are mainly located at level 3, indicating a greater distance from direct engagement with farmers and agroecological activities (Figure 9).

The diversity of services offered by actors in the Bunia Living Lab is limited. The most frequently mentioned service is related to the sharing of information or technical knowledge linked with Agroecology or new agroecological practices (service 1), which was mentioned in up to 4 situations. The other service types (service 2, 3, and 4) were mentioned only in 3 situations or less, and some services were not mentioned at all or were barely mentioned in 1 or 2 situations. When it comes to identifying which institutions offer these services, the results show very few organisations (Table 6).

	Innovation Support Services ¹								
Type of organisa tions	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations	
Research	2	0	0	1	0	0	0	0	
Public	2	2	0	2	0	0	0	2	
Private	0	1	1	0	0	0	1	0	
Others	0	0	2	0	0	0	0	0	
Total	4	3	3	3	0	0	1	2	

Table 6: Diversity of innovation support service activities in Bunia Living Lab according to the type of organization.

1 See a description of the innovation support services in Table 2


Uvira Living Lab (LL)

The Uvira Living Lab has identified a limited number of AKIS actors, including private institutions (MINOKA, CDC KIRMA, APDIK), public institutions (SNV, IPAEL, INERA), and one research institution (IITA). APDIK, RIKOLTO (NGO), and Grenier (others) have a stronger connection to farmers and agroecological practices at level 1. However, most other AKIS actors operate at level 3, indicating a greater distance from farmers and agroecological practices (Figure 10).



Figure 10: AKIS at Living Lab level, Uvira living lab, DRC.

Notes:

- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
 Legend of the levels of influence of actors in supporting relevant AE practices: 1th: Hinh influence: 2th: Medium influence:
- Legend of the levels of influence of actors in supporting relevant AE practices: 1th: High influence; 2th: Medium influence;
 3th: low influence; 4th: very low influence

For the Uvira Living Lab it is observed that the main service offered by AKIS Actors in the area is capacity building on technical issues, specifically in crop and animal production (*Service 4*). However, there is a relatively low focus on other services, as indicated in Table 7. The specific services provided by research institutions, public institutions, and private sectors are barely visible, while organizations such as GIZ, GRENIER, and ZOA predominantly specialize in offering Service 4, which focuses on building technical expertise.



Table 7: Diversity of innovation support service activities in Uvira Living Lab according to the type of organization.

		Innovation Support Services ¹										
Type of organisa tions	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations				
Research	1	0	1	0	1	0	0	0				
Public	1	2	0	1	0	0	1	2				
Private	0	0	1	1	1	1	2	0				
Others	0	0	0	6	1	1	0	0				
Total	2	2	2	8	3	2	3	2				

1 See a description of the innovation support services in Table 2

Kabare Living Lab (LL)

For Kabare Livig Lab, a total of 21 AKIS actors have been observed to be active in supporting agroecological relevant practices.



Figure 11: AKIS at Living Lab level, Kabare living lab, DRC.

Notes:

Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
 Legend of the levels of influence of actors in supporting relevant AE practices: 1th: High influence; 2th: Medium influence; 3th: low influence;

Among these actors, 7 are from private institutions, 4 are from research institutions, 4 are from public institutions, 1 is from the third sector NGOs, and 5 are from other sectors. This indicates a dominance of private institutions in the AKIS system in Kabare. When considering the closeness of these actors in terms of influencing farmers and relevant agroecological practices, private institutions such as



DIOBAS, MERCY Corp, RAEK, and TCC have emerged as the primary actors at level 1. They are followed by a few research and education institutions like UCB and INERA. One NGO and one other sector actor each take the 3rd position at level 1, as shown in Figure 1.

The dominant services offered by actors in the Kabare Living Lab (LL) include creating awareness exchange (Service 1), followed by improving access to resources (Service 7), networking facilitation (Service 3), and demand articulation (Service 6), which involves helping farmers express their needs. When examining the different actors, research institutions mainly offer Service 4 (capacity building on technical issues), Service 3 (knowledge awareness exchange), and Service 6 (demand articulation). The private sector primarily focuses on Service 3 (networking facilitation), while other actors predominantly provide Service 4 (capacity building on technical issues). However, services offered by the public sector are not strongly visible based on the analysis.

		Innovation Support Services ¹										
Type of organis ations	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations				
Research	3	2	2	4	2	3	3	1				
Public	1	1	0	2	0	2	2	1				
Private	7	1	6	3	5	1	3	0				
Others	2	1	2	0	0	4	3	0				
Total	13	5	10	9	7	10	11	2				

Table 8: Diversity of innovation support service activities in Kabare Living Lab according to the type of organization.

1 See a description of the innovation support services in Table 2

2.4.4 Summary conclusion on AKIS results DRC.

According to the review of secondary sources, public institutions and farmers' organizations (such as COPACO, FEC, FNCCIA, APRODECO, COPEMECO, FOLECO, CNONGD, and the Regional Council of Development) serve as important platforms for representing farmers' interests, disseminating knowledge, and promoting agricultural development in DRC. They work closely with international NGOs and donors, acting as trusted partners. These organizations contribute to the empowerment of farmers and the promotion of sustainable practices. The DRC has fostered a multi-stakeholder platform with the establishment for involving civil society organizations in policy and planning processes. The review also provided insight into the extension service process. The training and visit approach is the primary method used in extension services, although NGOs and international organizations sometimes employ participatory approaches like demonstration farms.

According to the participants in the workshop there are important differences in the constellation of actors according to the geopolitical characteristics of the country. The historical trajectory of the development of the organizations in the country might determine the actual governance characteristics of the AKIS in the north of DRC and the constellation of actors in the South part. To understand the AKIS it would be necessary to analyse the knowledge flows considering those differences. The maps show a higher number of actors in DRC South, while a slightly higher connectivity in DRC North.



At the LL level, the findings suggest that there are very few actors present supporting relevant agroecological practices in Bunia and Uvira, with a stronger presence in the Living Labs of Kabare en Biega. The reason for those differences might be based on the current political situation in the intervention areas. The limited presence of actors at the field level and a higher influence of private actors working with agroecological practices at the living lab level contrast with the stronger presence of public actors at the national level.

In general, there is a low diversity in the offer of advisory services. To strengthen the AKIS system in Uvira, Kbare, Bunia and Biega it is crucial to promote a more diverse range of services and foster collaborations among different actors. This involves research institutions expanding beyond technical capacity building, the public sector increasing visibility and engagement, and actors diversifying their service portfolio, ensuring a broader spectrum of support and expertise in various agricultural areas.

2.5 AKIS analysis Burundi

2.5.1 **Results of the desk review**

Burundi is a landlocked country consisting of a land area of about 27,800 square km and a population of 12.8 million people, making it one of the most densely populated country in Africa.

Agriculture is the mainstay of Burundi's economy, accounting for about 40% of the gross domestic product (GDP), employing 84%, providing 95% of the food supply, and accounting for more than 90% of foreign exchange earnings (FAOSTAT, 2021). However, agricultural productivity in Burundi is hampered by several issues, including land degradation (Ceesay, E.K; Ndiaye,M.B.O, 2022), climate impacts (Huseynov,R., 2019), economic factors, lack of access to agricultural infrastructure, and inefficient use of water resources (FAOSTAT, 2021), all of which contribute to the increasing food insecurity in Burundi. According to the 2020 Global Report on Food Crises, 5 of the 10 worst food crises in 2019 were from Sub-Saharan Africa, with Burundi scoring the sixth lowest place worldwide on the Global Food Security Index (GFSI), with more than 40.6% of the population being chronically food insecure.

The agriculture sector generates approximately 90% of its foreign earnings, primarily through the export of tea and coffee. However, there are several challenges that hinder agricultural productivity in Burundi, such as droughts, rapid population growth, reliance on traditional farming methods, fragmentation of land, low land productivity, limited access to credit for smallholder farmers, and insufficient access to research and extension services (Stads & Ndimurirwo, 2011).

3.3.1.1 Main actors in Burundi

In Burundi, government extension services are implemented at four administrative levels national, commune, and collineⁱ levels (2.912 in total). At the national level, extension activities involve planning, coordination, budget allocation, policy development, and funds mobilization. Implementation activities primarily occur at the province, commune, zone, and colline levels. Coordination activities are more prevalent at the province level compared to others (Kinuthia et al., 2016).

Public organisations/authorities

Burundi's AKIS is comprise of a network of diverse organizations dedicated to the development and dissemination of agricultural expertise in the nation. MINEAGRIE (Ministère de l'Agriculture et de l'Elevage) leads the strategic design, planning, coordination, and execution of national agriculture and



livestock policies in Burundi. The GDA (General Directorate of Agriculture) and GDL (General Directorate of Agriculture), sets the framework for integrated approaches, while the DGMAVAE (The General Directorate of Mobilisation for Self-Development Agricultural and Environmental Extension) operates public extension services through its Directorate of Agricultural Training and Animation and 17 Provincial Bureau of Environment Agriculture and Livestock (BPEAE) at the provincial level. The GDA and GDL, under MINEAGRIE, spearhead efforts in their respective domains. The ISABU (Institut des Sciences Agronomiques du Burundi) serves as a research powerhouse aligned with MINEAGRIE, focusing on crops, livestock, farming systems, natural resource management and socioeconomics, and collaborates with various partners to develop cutting-edge agricultural knowledge and innovations. The CNTA (Institut des Sciences Agronomiques du Burundi), overseen by MINEAGRIE, contributes to the technological aspect of agriculture, integrating advancements in food safety technologies into the agricultural landscape (Kinuthia et al., 2016).

Research and education organisations

In the sector of education and research institutions, universities and specialized faculties are key players in shaping the knowledge landscape. The UB-FABI (Université du Burundi - Faculté d'Agronomie et Bio-Ingenierie), UB-ISFA and UN-FAA (Université de Ngozi - Faculté d'Agronomie et d'Agribusiness) house, respectively, 23 and 17 full time researchers, fostering academic excellence in the agricultural sector (*ASTI*, 2016). The UB-FSEG-ECORU (Université du Burundi - Faculté des Sciences Economiques et de Gestion - Département d'Economie Rurale) brings a focus on livestock and socioeconomic sciences, contributing a holistic perspective to agricultural development (*ASTI*, 2016). Additionally, the UPG (Université Polytechnique de Gitega) adds to the academic landscape, offering a polytechnic approach to agricultural education. In the broader context, CGIAR, a global agricultural research organization, serves as a valuable international partner, bringing a many expertise and resources to the AKIS of Burundi.

Third sector NGOs (non-profit)

CAPAD (Confédération des Associations des Producteurs Agricoles pour le Développement) is a non-profit confederation in Burundi, comprising 106 cooperatives and 86,000 producers, collaborating closely with BPEAE and other bodies for local project implementation. Twitezimbere focuses on farmer empowerment through targeted crop production training, particularly integrated soil fertility management, and collaborates with IFDC to stay updated with agricultural practices. ACORD (A Cooperation Agency for Research and Development) has been active in Burundi since 1994, engaging in agroecology, sustainable intensification, women's empowerment, and climate change mitigation (Acord, 2022). Inades-Formation Burundi, originating from the Catholic Church of Burundi, contributes a unique dimension to agricultural development with international recognition. FHI-Burundi intersects health and agriculture to promote the well-being of farming communities through holistic interventions. One Acre Fund supports smallholder farmers with comprehensive agricultural development solutions and resources. ADISCO (Appui au développement intégral et à la solidarité des collines) focuses on comprehensive development and solidarity at the hills level, aligning with the broader goals of sustainable and community-driven agricultural development in Burundi (Kinuthia et al., 2016)



Approaches adopted.

At the colline level, the use of model farmers is favoured due to the limited possibility of agronomists to reach all farmers. Extension activities at higher administrative levels are carried out through participatory approaches, which involve trainings, demonstration plots, the utilization of model farmers, and field visits. Farmers field schools are established by NGOs such as CAPAD and Twitezimbere. The primary challenge faced by government institutions in providing extension services is the insufficient budget, which restricts the range of services available to the communities (Kinuthia et al., 2016).

Information and communication technologies (ICT)

According to Hare et al. (2007), Burundi adopted a national ICT development policy late in February 2007 as an update to the national ICT strategy adopted in 2004, but it has not been implemented due to the government's focus on the post-war cease-fire issues and lack of funding. The national ICT development policy has six strategic objectives 1) Capacity-building, 2) Enhancement of a legal and regulatory environment, 3) Promotion of a base infrastructure, 3) Promotion of good governance, 4) Promotion and encouragement of private investment, 5) Promotion of the development of content and applications.

Despite having a policy in place, ICT uptake in Burundi is still very low with most of the ICT. facilities concentrated in the capital city Bujumbura. The country lacks a specific policy for ICT use within the education sector despite recognising ICT as an enabler in increasing access and quality of education facilities concentrated in the capital city Bujumbura. The country lacks a specific policy for ICT use within the education sector despite recognising ICT as an enabler in increasing access and quality of education facilities concentrated in the capital city Bujumbura. The country lacks a specific policy for ICT use within the education sector despite recognising ICT as an enabler in increasing access and quality of education facilities.

2.5.2 **Results on AKIS national level**

Error! Reference source not found.12 describes the AKIS at national level in Burundi. The map c aptures the constellation of actors and entities participating in the creation, implementation and diffusion of knowledge and innovations in the agricultural sector of the country.

According to the data collected, 15 actors have been identified and characterised according to the sub-system (sector) they belong to. Specifically, 3 actors were identified as public institutions, 2 actors as organizations involved in Research and Education, 1 as NGOs, 4 as entities belonging to the private sector, 1 as financial institution and 3 as others, including farmers and international organizations. The connection between each actor is represented by arrows connecting the boxes in the figure, and these can be unilateral or bilateral flows of knowledge and resources.

Farmers, farmer's organizations, and cooperatives display the highest number of connections (11). However, these connections are mainly unilateral, and they describe an incoming flow of knowledge and resources to the end users of those, namely farmers and FBOs. Besides these two categories, seed producers display a high number of connections with other actors (8), followed by research organizations (7) and by the Ministry of Environment, Agriculture and Livestock (MINAGRIE), NGOs and Media, each of them with 6 connections.





Figure 12: National Agricultural Knowledge and Innovation System (AKIS) diagram of Burundi; elaborated by the authors.

The number of connections can be seen as a measure of the involvement of an organization in the overall AKIS: the larger is the number of connections, the higher is the impact, the involvement, and the possible influence of an actor on the overall knowledge flow.

Seed producers keep both unilateral and bilateral flows with overall different kind of organizations, suggesting that they play a key role in the agricultural sector of Burundi. Same can be said about research institutions, which seem to be well connected all around the constellation of actors in the AKIS. On the other hand, according to the data collected, International Organizations such as GIZ, IFAD, World Bank and others, only share 3 connections with other entities, suggesting that their impact on the AKIS of Burundi is not as strong as other actors.

2.5.3 **Results on AKIS at ALLs level**

For analysis at the LL level, we started off with asking participants which agroecological practices are present and relevant for their respective LL. In Box 3, we present the identified relevant practices for the two LL in Burundi:

Box 3: Relevant Agroecological Practices in the Living Labs of DRC, as identified by participants.

Giheta LL

Supported agroecological practice: Agroforestry, use of biopesticides, composting, conservation agriculture, erosion control, intercropping, IPM, ISFM, mulching, pruning.

Bujumbura LL:

Supported agroecological practices: irrigation, fodding, fertlization, conservation agriculture, intercropping, IPM, agroforestry, intercropping, ISFM, water conservation, tillage, organic inputs, recycyling, use of organic fertilizers.



Figure 133 and Figure 144 the identified actors involved in the creation, dissemination, and implementation of agroecological practices at the Living Labs of Bujumbura and Giheta. The actors identified are providers of different advisory and support services, which have been classified from 1 to 8, as seen in notes under the Figures. Each box represents an actor, which has been classified according to the type of organization and sector they belong to, as described in the legend of the figure. The numbers in brackets indicate the type of advisory and support services that are offered by the organization. Moreover, the actors are spatially distributed according to 4 quarter division of the map, each of them representing a main sector, namely public, private, research and other, which includes international organization, FBOs and non-otherwise classified actors. There are 4 level of involvement in the creation, dissemination, and implementation of agroecological practices, represented by the circles on the map. The level of involvement has been identified during the workshops by the local partners of the project. At the centre of the diagram are the relevant agroecological practices adopted in the living lab, listed in Box 3

Bujumbura Living Lab

At the Living Lab of Bujumbura, 17 actors have been identified, classified, and assigned to the respective level of involvement. There are 5 actors working at 1st level, 8 working at the 2nd level and 4 working at the 3rd level. There is a balanced range of different actors, including public and private organizations, research institutions and others. Important research organizations such as IITA and ISABU work at the closest level of involvement, as well as the MINAGRI and FBOs. Other CGIAR centers such as IRRI and ILRI appear to be involved in the provision of support services at the 2nd level. NGOs and othe public autorities work both at 2nd and 3rd level at the Bujumbura Living Lab.



Figure 13: AKIS at Living Lab level, Bujumbura, Burundi

Notes:

- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
- Legend of the levels of influence of actors in supporting relevant AE practices: 1th: High influence; 2th: Medium influence; 3th: low influence; 4th: very low influence



In terms of services offered, Table 9 summarizes the number of actors offering a given service and what kind of sub-system of the AKIS they belong to. For example, Research institutions are mainly involved in the provision of services number 2 and 8, which consists in farm extension visits targeted to offer advice and solve problems and farm level, and in the support of policies design and implementation. The Public sector appears to be more focused on the provision of technical training, capacity building and on the identification of farmer's needs. Other actors such as NGOs and International organizations appear to be more focused on capacity building and direct technical assistance and training. Overall, there is a wide variety of services offered at the Bujumbura Living Lab.

		Innovation Support Services ¹									
Туре	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations			
Research	0	6	2	0	0	0	1	5			
Public	2	3	2	2	1	1	1	1			
Private	2	0	0	2	1	1	1	0			
Others	4	1	2	4	4	4	2	2			
Total	8	10	6	8	6	6	5	8			

Table 9: Diversity of innovation support service activities in Bujumbura Living Lab according to the type of organization.

1 See a description of the innovation support services in Table 2

Giheta Living Lab

Figure 14, **Error! Reference source not found.**illustrates the AKIS at micro level in the Giheta Living Lab. Contrary to the Bujumbura LL, where research and education organizations play a pivotal role, they do not appear to be involved in Giheta. Instead, private sector, different NGOs and public institutions are present and offering a different support service. In total, 13 actors have been identified: 4 working at the 1st level, 5 at the 2nd and 4 at the 3rd and last level. Private organizations are operating at all levels of collaboration, while public institutions are present only at the secondary level.





Figure 14: AKIS at Living Lab level, Giheta, Burundi

Notes:

- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
 Legend of the levels of influence of actors in supporting relevant AE practices: 1st: High influence; 2nd: Medium influence; 3rd:
- Legend of the levels of influence of actors in supporting relevant AE practices: 1st: High influence; 2nd: Medium influence; 3rd: low influence; 4th: very low influence

Error! Reference source not found. summarises the type of support services offered, based on t he number of actors offering them and at which level of support and type of organizations they belong to.

Overall, the services more frequently offered range from the sharing of information and technical knowledge about new practices (Service N.1), farm visits with participative problem-solving discussions (Service N.2), and technical training on plant and livestock production (Service N.4). Services N.5 and N.6 (capacity building and expression of needs) are offered as well, especially by NGOs and FBOs.

Туре		Innovation Support Services ¹									
	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations			
Research	0	1	0	0	0	0	0	1			
Public	2	2	1	2	0	0	1	0			
Private	2	2	0	2	2	2	2	0			
Others	5	4	1	5	5	5	1	1			
Total	9	9	2	9	7	7	4	2			

Table 10: Diversity of innovation support service activities in Giheta Living Lab according to the type of organization.

1 See a description of the innovation support services in Table 2

D1.2 - Systemic factors and innovation support for agroecology



However, few organizations engage in the provision of support services aimed to strengthen collective collaboration and group formation (Service N.3) and to support the design of rules and policies (Service N.8). As seen in the AKIS diagram, research organizations do not appear to offer any service in Giheta.

2.5.4 Conclusion on AKIS results Burundi.

At the national level, the AKIS in Burundi reflects a limited but well-connected network of actors, contributing to a diversified landscape. The preliminary desk review did not fully capture the strength of the private sector's role in the national AKIS. This oversight suggests a need for further exploration and acknowledgment of the private sector's significant contributions.

Gathering information for the desk review on Burundi proved to be challenging overall, indicating potential gaps in data availability or accessibility. Moreover, this suggests that further research and communication are needed to explore and fully capture the landscape of stakeholder engaged in the agricultural sector of the country. Despite this difficulty, media emerged as a pivotal player in the AKIS, suggesting a recommendation to leverage media channels and Information and Communication Technologies (ICTs) for enhancing the provision of extension services.

At the Living Lab level (LL), the recommendation is for increased involvement of private organizations, given their prominent role at the national level. This shift could enhance the local AKIS and promote a more balanced and comprehensive approach to agroecological practices.

An observed disparity between Bujumbura and Giheta underscores the need for targeted action to augment the number of actors involved in Giheta, especially focusing on research institutions.

Furthermore, there is potential for improved integration of international development organizations within both the national and micro-AKIS frameworks. Strengthening collaboration with these organizations could enhance the overall effectiveness and reach of Burundi's agricultural knowledge system, fostering a more inclusive and globally informed approach to agricultural development.

2.6 Findings on AKIS analysis Rwanda

2.6.1 Results of the desk review

Rwanda has an estimated population of 13.246 million, with 72.1 percent residing in rural areas. The country's population density is among the highest in the world, estimated at 434 persons/km2 (Rwanda Population and Housing Census, 2022). Rwanda is divided into five provinces, each divided into 30 districts, 416 sectors, 1,500 cells and 14,837 villages.

Agriculture is the primary source of livelihood for most of the population, but rural agriculture faces numerous challenges such as limited access to land, high costs of agricultural inputs, small average landholdings, soil erosion (GFRAS, 2023). Despite these obstacles, Rwanda's agricultural sector has been considerably growing since the 1994 genocide, also due to a complete reform of the agricultural extension services system. Positive drivers to agricultural growth include technical expertise in both the private and public sector, two to three cropping seasons annually, good access to urban markets, robust governmental support for ICT and business, relatively lower corruption levels than its neighbours, and opportunities for exporting to other countries in the East African Community (GFRAS, 2023).



Main AKIS Actors in Rwanda

This section captures an overview of AKIS Actors, organisational linkages (connections) with other AKIS actors. This reveals in detail diversity of actors, types of advisory linkages and quality of these linkages (Knowledge related services)

Public Organisations/authorities

The Ministry of Agriculture and Animal Resources (MINAGRI) takes a leading role in policy development and guidance within the AKIS. As the main funder of the Twigire Muhinzi program, MINAGRI also serves as the primary donor for the Rwanda Agricultural Board (RAB) (AFAAS, 2022). This key ministry sets the stage for agricultural initiatives and influences the broader direction of the sector. Working in close collaboration with MINAGRI, the Ministry of Local Government (MINALOC) oversees the on-the-ground implementation, planning, and execution of extension programs, including Twigire Muhinzi initiative. MINALOC's direct employment of extension staff, such as district agronomist officers and socio-economic and development officers (SEDO), ensures a seamless integration of programs at the local level (AFAAS, 2022; MacNairn & Davis, 2018).

The Rwanda Agricultural Board (RAB), operating autonomously within MINAGRI, is a cornerstone provider of formal extension services. Beyond its role in technical support for the Twigire Muhinzi program, RAB actively engages in research, particularly focusing on crops. With a team of 94 full-time researchers, it holds the highest number for any research organization in Rwanda. Funding for RAB is derived primarily from the Government of Rwanda, with additional support from international donors like FAO and CGIAR centers (ASTI, 2016).

The National Agricultural Export Development Board (NAEB), also under MINAGRI, specializes in providing extension and research services related to export products. Distinct from RAB, NAEB focuses primarily on tea and coffee cultivation and horticulture, following the consolidation of the Rwanda Tea Authority (OCIR THE), Rwanda Coffee Authority (OCIR CAFE), and Rwanda Horticulture (RHODA) (MacNairn & Davis, 2018).

Beyond the agricultural sector, the Rwanda Governance Board (RGB) plays a crucial role in governance coordination. As an independent public body, RGB promotes good governance principles across sectors, serving as the coordinator of the Joint Action Development Forum (JADF). The JADF is a multistakeholder platform facilitating interaction, information exchange, and collaboration among organizations involved in community development, particularly at the district level. While not directly linked to agriculture, the Ministry of Youth and ICT contributes to Rwanda's AKIS development.

Research and Education organizations

The University of Rwanda-College of Agriculture, Animal Sciences and Veterinary Medicine (UR-CAASVM), operating under the umbrella of the National University of Rwanda (NUR), is a key institution. This university conducts research primarily on crops and livestock, positioning itself as a significant player in the agricultural knowledge domain. Notably, UR-CAASVM goes beyond research and is directly involved in providing extension services, linking academic expertise with practical applications. Funded by the Government of Rwanda, UR-CAASVM plays an important role in advancing agricultural knowledge and innovations within the country (ASTI, 2016).

The Rwanda Institute for Conservation Agriculture (RICA) adds another dimension to the educational landscape by offering a Bachelor of Science program in sustainable agriculture. This institution



focuses on equipping students with the knowledge and skills needed for environmentally conscious and sustainable agricultural practices.

The Catholic Institute of Kabgayi (CIK) contributes to the AKIS through a focus on socio-economic research. This institution's emphasis on understanding the economic aspects of agriculture provides valuable insights that complement the broader agricultural research landscape (ASTI, 2016). The University of Kibungo - Faculty of Agriculture and Rural Development enriches the AKIS by providing specialized education and research opportunities in the field of agriculture. As part of the academic network, this university fosters a multidisciplinary approach to agricultural development.

Within the international research collaboration sphere, the CGIAR, represented by entities such as IITA (International Institute of Tropical Agriculture), CIP (International Potato Center), and CIAT (International Center for Tropical Agriculture), brings a global perspective to Rwanda's AKIS.

Private Organizations (for profit)

Due to Rwanda's history and predominantly rural nature, the private sector in the country is not particularly developed. Typically, it concentrates on cash crops and income generation and works with farmer households that have strong connections to the market (GFRAS, 2023). The private sector of extension services provision in Rwanda is generally smaller and more limited than other East African countries (MacNairn & Davis, 2018). This is due to a high level of control by the Government and to the presence of a predominant government-led extension system. However, there are examples of private companies that engage in business with farmers, providing extension and advisory services as well. Enterprise Urwibutso is a food processing company, engaged in the provision of training, education, and microcredit to smallholder farmers (MacNairn & Davis, 2018). Sosoma Industries is a grain miller that provides informal extension services about agronomical practices and agricultural inputs for grain crops (GFRAS, 2023; MacNairn & Davis, 2018).

Third sector Farmers Based Organizations (FBOs)

In Rwanda's AKIS, farmer-based groups and professional sector associations contribute significantly to the dissemination of agricultural knowledge. The Coffee Promotion Cooperative (COOPAC) exemplifies this, extending beyond its primary role in coffee promotion to provide shade tree seedlings and agroforestry-related information to its 8,000 members. Other notable groups include KAIGA Cooperative for Irish potato growers, COAMVU Cooperative for maize growers, MURUGO Cooperative focusing on livestock, Nyiramageni Cooperative specializing in rice production, and the Impuhwe Z'Imana Women Cooperative, likely oriented toward women in agriculture. The Koakaka Cooperative in Karaba specializes in coffee cultivation, contributing to the knowledge exchange among coffee growers, while the Abatangan Farmers Group represents collaborative efforts among farmers, possibly spanning multiple crops or enterprises. These groups play a pivotal role in fostering knowledge exchange and innovation within specific agricultural domains, ensuring that farmers receive tailored information to enhance the resilience and productivity of Rwanda's agricultural sector.

Third sector NGOS (non-profit)

CABI (UK) plays a crucial role by supporting the Rwanda Agricultural Board (RAB) and actively participating in the implementation of 65 plant clinics. These clinics serve as platforms for advising farmers about pests and diseases, addressing critical challenges in crop management and protection (MacNairn & Davis, 2018).



Other prominent entities include Africare, Land O'Lakes, Heifer Project International, HarvestPlus, CRS (Catholic Relief Services), and RWARRI (Rwanda Rural Rehabilitation Initiative). These organizations operate at the intersection of agriculture and community development, leveraging their resources and expertise to empower farmers and strengthen rural communities.

While Africare's specific activities in Rwanda's AKIS may encompass a range of interventions, Land O'Lakes, Heifer Project International, and HarvestPlus likely contribute to agricultural development through their respective areas of focus, such as sustainable farming practices, livestock improvement, and biofortification of crops.

RWARRI, the Rwanda Rural Rehabilitation Initiative, brings a localized and community-focused approach to rural development. Its activities include initiatives aimed at improving agricultural practices, livelihoods, and overall community resilience.

One Acre Fund (OAF) operates in Rwanda under the local brand Tubura, which means "to grow exponentially." OAF support many staple crops, such as grains, beans, and vegetables, which farm families rely on for food. OAF also offer commercial crops, livestock, and trees, to help farmers diversify their incomes. In 2021, in collaboration with the Rwandan government, OAF distributed 19.4 million timber trees for free to 1.4 million farmers countrywide, as well as more than 300,000 fruit trees through other channels.

Approaches adopted.

Rwanda's extension and advisory services system is characterized as pluralistic due to the involvement of several extension service providers, including the RAB, NAEB, UR-CAAVSM, projects, private sector, and NGOs.



Figure 15: Schematic representation of Twigire Muhinzi extension model (Kabirigi, 2022)



These providers offer different extension services and employ diverse approaches and methods (MacNairn & Davis, 2018). These can be formal government-led or farmers-led approaches and they include farmers field schools (FFs), Farmer promoters (FPs), training and visit (T&A) and volunteer farmer trainer (VFT) (Kabirigi, 2022).

However, the extension services system in Rwanda is centered around the Twigire Muhinzi model. This approach has been developed by the RAB and it consists of a farmer-to-farmer communitybased extension model (Kabirigi et al., 2022). The Twigire Muhinzi makes use of two existing models, the farmers field schools and farmer promoters, as seen in **Error! Reference source not found.**15. I n the first case, a group of farmers meet on a weekly base around a field school, while in the second case the farmer promoter will create a "Twingire group" (a group of farmers) around a demo plot (Kabirigi et al., 2022; MacNairn & Davis, 2018). Twigire groups also collaborate with other development initiatives, from the public sector, private sector, and NGOs.

Information and communication technologies (ICT)

As mentioned before, ICT use in agriculture is receiving support by the Government of Rwanda, for example with the establishment of the Ministry of Youth and ICT. Within the MINAGRI, the Agricultural Information and Communication Center (CICA) produces, among other agricultural information, ICT tools and approaches, such as the AMIS (The Information Gateway of the Agricultural and Livestock Sector of Rwanda) (GFRAS, 2023; MacNairn & Davis, 2018). The most common technology consists of SMS, being the internet and multimedia content, such as videos, rarely used and their adoption by farmers still to be implemented. The use of mobile phones for information distribution is quite common also among the Twingire groups (MacNairn & Davis, 2018).

An example of ICT provided by the private sector is AGRO FIBA, a mobile and web-based platform developed by the Rwandan start-up M-Ahwi, that reached over 10,000 farmers in the maize and rice value chains. It provided access to agronomic, market, and financial data via its platform and links to large-scale buyers and financial institutions (MacNairn & Davis, 2018).

The One Acre Fund also uses ICT by sharing agricultural and market price information via two-way SMS and piloting digital video with tablets. Twigire Muhinzi also utilizes mobile phones, community and national radio, and SMS texts for information dissemination. Similarly, the Orange Fleshed Sweet Potato (OFSP) project by the International Potato Center used SMS, radio, and video to disseminate information for effective production and consumption of sweet potato (GFRAS, 2023; MacNairn & Davis, 2018).

2.6.2 **Results on AKIS national level**

The AKIS of Rwanda is visually represented in Figure 6. The actors composing the AKIS have been mapped and linked with each other in order to capture the knowledge flow within the agricultural sector of the country. The AKIS of Rwanda appears to be quite pluralistic, with many actors involved. During the workshop, 26 main actors have been identified, most of them belonging to the public sector. Private organizations are present as well with 3 identified actors, while from the figure it is not possible to obtain an exhaustive assessment of the involvement of NGOs and FBOs in the AKIS, as they have been identified as unique actors.





Figure 16: National AKIS diagram of Rwanda.

The AKIS of Rwanda results to be strongly influenced by the public sector, as 16 out of the total 26 actors are public institutions. However, taking a closer look to how these are connected to each other and to actors of other sectors, it appears that the public sub-system is not well integrated in the AKIS as it could be. Many regulatory bodies are connected only to other public institutions, rather than showing collaborations with the private or civil society sectors. However, the district extension services, and the Rwanda Agriculture Board (RAB) display a larger number of linkages, with a variety of different actors. The importance of the local extension services and of the RAB is confirmed by the data collected in the desk study, which shows how the national extension policy is Rwanda is based on the Twigire Muhinzi system. The Twigire Muhinzi is coordinated by the RAB and implemented locally by the district extension services. This is well shown in the figure, where both RAB and the district extension services act as a pivotal hub of knowledge distribution and dissemination.

Private organizations are also involved in the agricultural knowledge flows of the country. Both agrodealers and product processors appear to play a key role in connecting the farmers to other actors, such as public institutions and regulatory bodies. Farmers appear well positioned within the AKIS, as they have many connections and receive inputs from both the public and private sector.

Nonetheless, the AKIS of Rwanda can be assessed as quite fragmented, based on the data collected. The central role of RAB and extension services at district level is not supported by an holistic and well connected framework of other actors that collaborate side by side in the dissemination of knowledge and innovations.

2.6.3 **Results on AKIS at ALLs level**

For analysis at the LL level, we started off with asking participants which agroecological practices are present and relevant for their respective LL. In Box 4, we present the identified relevant practices for the two LL in Rwanda:



GA 101083653 Box 4: Relevant Agroecological Practices in the Living Labs of Rwanda, as identified by participants

Kamonyi LL

Crop livestock integration, Terracing, Mulching, Conservation Agriculture, Organic farming, Crop Rotation, Crops Association, Intercropping, Agroforestry, Composting, Soil fertility improvement, vermicomposting

Kamonyi Living Lab

Figure 17 represents the diagram of the micro AKIS captured around the Living Lab of Kamonyi. Different actors have been identified, classified, and graphically distributed around the map according to the sector they belong to and the level of influence they have on the distribution and implementation of relevant agroecological practices.

The total number of actors identified is 27. There are 6 actors operating at the 1st level of involvement, 9 on the 2nd level, 9 at the 3rd level and 3 actors operating at the 4th level. There is a high variety of organizations and institutions involved in the Living Lab, with an overall balanced presence of different sectors. However, the private sector is the most represented in the figure, with 9 actors identified. Moreover, five out six of the actors involved at the 1st level are private organisations. Overall, it appears that the private sector has a higher influence on the support of agroecological practices compared to other sectors such as the public and research ones.

Nonetheless, research organizations are well represented as well, with both national and international actors working at the 2nd and 3rd level, respectively. In this figure, the RAB has been identified as a research institution, different to the classification it has at national level.



Figure 17: AKIS at Living Lab level, Kamonyi, Rwanda.



- Explanation of the numbers beneath the actors, symbolising the services provided: 1) Knowledge Exchange: Knowledge awareness creation and exchange; 2) Advisory Services: Advisory, consultancy and backstopping; 3) Networking: Networking, facilitation and intermediation; 4) Technical Capacity Building: Capacity building on technical issues, crop, and animal production; 5) Functional capacity building: Capacity building on functional issues, group formation and management; 7) Resources: Improving access to resources; 8) Regulations: Institutional support for scaling up
- 2) Legend of the levels of influence of actors in supporting relevant AE practices: 1th: High influence; 2th: Medium influence; 3th: low influence; 4th: very low influence

In **Error! Reference source not found.**1, the support services are listed and associated with the n umber of actors offering them, divided per type of organizations. The support in the exchange of knowledge (Service N.1) is the more frequently offered service, with 25 actors involved in it. It is mainly offered by research organisations, with the public and private sector working on it too. Advisory services (Service N.2) and support in demand articulation (Service N.6) are the second most frequently provided. They are equally implemented by research and private organizations, while the public sector does not appear to engage in the provision of them.

Overall, a wide range of support services are offered at the Kamonyi Living Lab, even though there are less actors engaging in the capacity building of group formation (Service N.5) and in the design of regulations and policies (Service N.8).

Table 11: Diversity of innovation support service activities in Kamonyi Living Lab according to the type of organization.

Types		Innovation Support Services ¹									
	Knowledge Exchange	Advisory Services	Networking	Technical Capacity Building	Functional Capacity Building	Demand Articulation	Resources	Regulations			
Research	8	7	3	3	3	7	3	4			
Public	7	3	2	4	3	1	4	7			
Private	6	6	7	5	4	7	5	1			
Others	4	2	2	3	2	3	5	0			
Total	25	18	14	15	12	18	17	12			

1 See a description of the innovation support services in Table 2

2.6.4 Conclusion on AKIS results Rwanda

The national AKIS in Rwanda presents a robustly pluralistic structure with numerous actors. However, the dominance of the public sector is a notable characteristic, resulting in a somewhat homogeneous landscape with limited diversity in actors beyond the public sector. Despite the richness in terms of the number of actors, the AKIS is not well-connected, indicating a potential need for improved coordination and collaboration among stakeholders.

Notably, the public sector, particularly the Rwanda Agricultural Board (RAB) and district-level extension services, stands out as dominant and highly connected. RAB and district-level extension services serve as critical knowledge distribution nodes, playing pivotal roles in the implementation of the Twingire muhinzi system. This observation aligns with the findings of the desk review, emphasizing the central role of these actors in coordinating and executing agricultural knowledge initiatives at the national level.

At the Living Lab (LL) level, a contrasting pattern emerges, showing a higher influence of private organizations, especially at the 1st level of influence. This local dynamic contradicts the national-level dominance of the public sector, suggesting a disconnect between the influence of public institutions at the national level and their impact on the ground within the Living Lab. Public institutions, which



play a critical role at the national level, do not appear to exert a strong influence at the LL, suggesting a need for a higher level of engagement of public stakeholders in the dissemination of agroecological practices.

In summary, while Rwanda's national AKIS is characterized by pluralism and the dominance of the public sector, there are disparities between the national and LL levels in terms of actor influence and connectivity. Addressing these disparities could enhance the effectiveness and inclusivity of Rwanda's agricultural knowledge system, ensuring a more cohesive and well-connected approach to increase the dissemination and adoption rate of agroecological practices.

2.7 Condensed synthesis on AKIS analysis

2.7.1 National level AKIS

Figure 18 provides a cross-cutting synthesis view of the AKIS in four countries, focusing on the number of actors and the degree of connectivity within the systems. The results of this analysis reveal interesting patterns and dynamics within each country's AKIS.



Figure 18: Countries distribution according to number AKIS actors and degree of connectivity

Starting with **Rwanda**, it is observed that the country has a significant number of actors involved in its AKIS. However, despite the higher number of actors, the connectivity within the system is relatively lower. This suggests that while there are many organizations and institutions contributing to agricultural knowledge, there may be limited collaboration and integration among them. The AKIS in Rwanda can be characterized as pluralist but fragmented, indicating the need for improved coordination and communication among the various actors. For Burundi, there is a lower number of actors compared to the other countries. However, there is a higher level of connection between these actors, indicating a more integrated AKIS. Despite the smaller number of actors, the AKIS in Burundi benefits from stronger collaboration and cooperation among them. This suggests a more cohesive and coordinated approach to agricultural knowledge sharing and dissemination in the country. In the AKIS compared to Rwanda. However, Cameroon stands out with the highest level of connectivity



between the actors. This suggests that while the number of actors may be fewer, there is a strong network and collaboration among them. The AKIS in Cameroon can be characterized as integrated but less pluralist, indicating the importance of leveraging the existing connections to enhance knowledge sharing and dissemination. Finally, in the **DRC**, the analysis reveals a slightly higher connectivity between actors, particularly in the DRC North region. However, overall, the number and diversity of actors within the AKIS in DRC is still relatively low.

When looking closely at the composition of actors in Figure 19, we can see that the most diverse is Cameroon, followed by Burundi. In terms of type of actors, Rwanda displays a large variety as well, but as seen before, the country's AKIS is strongly led by the public sector, making it less diversified.

Burundi is the only case where the private sector appears to be stronger than the public one, while in Cameroon (a country with a similar degree with diversity) the distribution of actors appears more balanced. Overall, Cameroon displays an equal composition of different stakeholders engaging the AKIS.





When looking at DRC, both in the North and the South we can see a limited variety of actors. What is noticeable is the absence of private actors in the northern part of the country. The abundance of FBOs and NGOs, on the other hand, is well visible in both parts of DRC. While DRC South displays a very strong influence from the public sector on the national AKIS, DRC North also shows the lowest number of actors in total. These trends are well reflected also at Living Lab level, with Bunia and Uvira being the LLs with less presence of organisations.

2.7.2 Living Lab (micro) AKIS

The analysis of the AKIS of actors in the LLs shows the number of actors at each level of influence towards the implementation of those agroecological practices that are more relevant for each LL.



From the graph we can see that Ntui (Ca) and Kamnoyi (Rw) have the largest amount of actors that potentially can support the implementation of agroecological practices. The LL with the lower amount of actors potentially supporting the implementation of agroecological practices are based in DRC: Uvira and Bunia.

From the graph we can identify that Ntui (CAM) and Kabare (DRC) have the largest number of actors directly influencing the adoption of agroecological practices (*Level 1*). The LLs in Burundi and Rwanda, on the other hand, have many actors who are not yet, but could potentially be, influencing the adoption of agroecological practices (*Level 2*). Bunia and Uvira have a limited number of actors who could potentially participate in LL activities. This may represent a restricted pool of resources that can be utilised to achieve objectives in both the short and long term (Figure 200).



Figure 20: Number of actors by LL according to the level of influence on the adoption of agroecological practices relevant for the LL.

Based on our previous analysis, we can infer that there are potential organisations that could be involved in supporting Living Labs in the implementation of agroecological practices. This has direct implications for the project, as we need to identify the barriers, interests, and motivations of these organisations and determine how we can effectively communicate with them to involve them in the co-creation process of the Living Labs.

The presence of organisations may indicate opportunities to exchange best practices in promoting agroecological areas within or between countries. It is important to consider this when developing the methodology for Living Lab exchanges. The results demonstrate that different strategies should be used to address the different conditions of each Living Lab. Special attention should be given to the Living Labs located in Bunia and Uvira. A specific approach should be carefully developed to overcome their limitations.



2.8 Characterization of advisory and innovation support service organizations

In this chapter, we present findings of a survey conducted to identify the main characteristics of advisory service organizations in the targeted case study countries of CANALLS. Focus of the survey was on characterizing advisory and innovation service organizational types, their scale of operation, the types of clients, the advisory and support services activities they offer, the topics of advice, the forms and methods of advice, the human resources involved, main financial mechanisms, and their linkages with other actors.

These results provide insights into the diverse landscape of advisory services and innovation support across the four case study countries (Cameroon, Burundi, DRC, and Rwanda). The findings of the survey will contribute to a better understanding of the strengths, weaknesses, and potential areas for improvement within the advisory services sector and the focused living Lab areas.

2.8.1 Type of organizations and services

A total of 47 organizations responded to the survey. Half of these were identified as organizations with an extension component, while only 6 were temporary projects. The most common type of organization in the sample was non-governmental organizations (NGOs), closely followed by farmerbased organizations (FBOs). In Burundi, a higher number of organizations classified themselves as private, as shown in Table 12. Many organizations identified themselves in more than one category, such as development and NGO or research and government.

	TOTAL	Burundi	Cameroon	DRC	Rwanda
Type of advisory service in the organisation					
We are an advisory organisation	18	3	7	8	0
We are an organisation with an advisory component	23	7	6	6	7
We are a project with an advisory component	6	2	3	2	0
Type of Organisation					
Government or ministry based advisory organisation	6	2	2	1	1
Farmer-based Organisation (FBO)	10	2	5	4	0
Private/Commercial advisory organisation	8	4	0	2	4
Non-governmental Organisation (NGO)	18	2	6	8	4
University	3	2	0	1	0
Research institution	4	2	2	0	0
Development institution	6	2	2	2	1
Enterprise	9	5	0	4	2
Other	1	0	1	0	0
Operation scale					
International	7	4	3	2	1
National	23	1	3	6	2
Regional	6	6	8	5	4
Subregional o local	11	1	2	3	0

Table 12: Type of organisation by structure and operation scale (N=47)



Most organizations operate at the national level, followed by the local level. In Rwanda, however, the regional level was the most reported level of operation (Table 12).

According to the typology of services (as described in the Methodology section above) most organizations offer trainings and capacity building and facilitate the exchange of knowledge. Approximately half of them provide consultancy and backstopping; very few engage in networking activities, or promote the demand articulation, and/or support access to resources (Table 13).

Table 13. Type of services provided (N=47)

Type of service	TOTAL	Burundi	Cameroon	DRC	Rwanda
Facilitate exchange of knowledge	36	11	13	11	5
Consultancy and backstopping	22	6	8	7	3
Networking/Facilitation/ brokerage	17	4	10	5	2
Demand articulation (access to markets)	12	4	5	5	2
Enhancing access to resources (supporting access to funding)	14	5	6	2	2
Training and capacity building	42	10	15	13	6
Providing support for the design and enforcement of laws and regulations for agriculture innovation	19	5	8	5	2

2.8.2 Type of clients and themes of advisory services provided.

Around 90% of the 47 organisations surveyed reported that they focus on young farmers or farmers' groups as their primary targets. Furthermore, more than half of these organisations also express a focus on women farmers, extension agents, and small or subsistence commercial farms. Targeting based on altitude or persons working in non-agricultural occupations (microenterprises and part-time farmers) was less frequent. Finally, it is noteworthy that at least one organisation in every country included in our study targets a specific group, such as pastoralists.

Table 14. Type of clients targeted by the organisations (N=47)

Type of clients	TOTAL	Burundi	Cameroon	DRC	Rwanda
Farmers with subsistence farms	26	9	10	8	2
Farmers with small commercial farms	26	8	12	8	2
Farmers with medium or large commercial farms	22	8	9	5	3
Part-time farmers	12	2	7	4	2
Producer groups	34	10	13	10	5
Small or microenterprises	15	7	6	3	2
Farm workers	18	3	9	7	0
Young farmers	38	10	15	14	3
Women farmers	27	8	12	10	1
Highland farmers	15	7	6	4	1
Lowland farmers	15	3	6	5	2
Pastoralists	17	4	8	7	1
Extension agents	29	9	10	7	6
Others	0	0	0	0	0



Farmers are targeted by organizations based on their crops. Generally, most organizations support the cultivation of maize, cassava, and agroforestry systems (Figure 211). The distribution of cropping systems varies according to the countries. Burundi has a higher percentage of organizations working on perennial fruits and small livestock. In contrast, organizations in Cameroon predominantly work with cocoa farming systems. Additionally, organizations in DRC focus on forest management, perennial fruits, and small livestock. Organisations in Rwanda primarily concentrate on coffee, maize, horticulture, and a larger proportion of livestock according to Figure 211.



Figure 21: Type of crops in which the organizations carry out advisory activities.

Looking at the farming systems, the most common types of advice provided are related to production practices, agri-environmental practices, and farm management (Table 15). About one third of the organisations provide some type of advice related to marketing, accounting and compliance with regulations and standards. Only nine organisations provide advice on the use of digital equipment, and most of these are in Cameroon (Table 15).

Within production-related advisory services, almost 90% of the organisations in all countries offer advice on agronomic practices. The second theme they focus more on is forest protection, confirming that agroforestry management issues are important for their clients and for the production systems they work in. Less than a third of the organisations provide advice on other aspects of production such as machinery or construction (Table 15).



Table 15. Themes of advisory service provided (N=47)

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	TOTAL	Burundi	Cameroon	DRC	Rwanda
Themes of advisory service provided					
Entrepreneurship and farm management	35	8	15	12	4
Production technologies and practices	40	11	14	12	5
Accounting/Bookkeeping	10	3	5	3	0
Marketing and logistics	12	4	4	4	3
Use of digital equipment and decision support systems	9	1	5	3	2
Support with compliance with regulation and standards	16	6	8	3	0
Agri-environmental measures and nature conservation	36	8	13	13	4
Tax and legal advice	6	2	2	2	0
Others	1	0	0	0	1
Themes in production related advisory	service				
Crop agronomic practices	42	11	14	15	6
Crop/Animal breeding	28	7	11	10	2
Livestock husbandry	21	5	7	7	4
Machinery	10	2	5	4	1
Building/Construction design	10	3	6	3	1
Timber, wood or forest products	9	2	3	4	0
Forest protection	27	6	10	10	3
Others	1	1	0	0	0

Consistent with the themes offered, the organisations surveyed indicated that the principles of agroecology on which they have the most influence are, in order, biodiversity, input reduction, soil health, economic diversification, land and natural resource management, participation, social values and diets, and recycling, with little variation across countries (Figure 222).





Figure 22: Agroecological principles (13) in which the organizations consider they have a larger impact.

The interview also revealed the principles in which organizations have limited influence: *Connectivity*, *Synergies*, *Fairness*, *Co-creation of knowledge* and *Animal health*. The relatively lower selection of those more "abstract" principles might be driven by the lack of clear definitions or practical applications. In general, it is important to note that the agroecological principles most often mentioned combine both diversification and increased income with those related to the protection of natural resources.

2.8.3 Methodologies used.

Most of the organizations surveyed provide individual and/or group advice, while only half of them offer mass media advice. The most used methodologies for advice delivery are face-to-face advice on the farm and group advice on the farm, as indicated in Table 166.

The most prominent method of providing advice is face-to-face interactions, either with individual farmers or in group settings. Approximately half of the organizations also mentioned the use of digital apps and phones as a means of delivering advice. Other formats such as demonstrations were identified as important and have the potential for further development. On the other hand, mass media channels, apart from radio and printed publications, were not deemed as significant for advisory services.



Table 16. Methodologies used by advisory service provided (N=47)

GA 101083653

Method	TOTAL	Burundi	Cameroon	DRC	Rwanda
Individual advice					
Face to face on the farm	46	12	15	16	7
Face to face outside the farm (e.g advisory office)	29	8	9	8	5
Telephone	26	4	13	9	3
Digital apps (e.g skype call, WhatsApp chat, telegram) and emails	23	4	11	8	3
None	1	0	0	0	1
Others	4	3	0	1	0
Group advice					
Group advice on the farm	41	10	14	14	7
Group advice outside the farm	33	10	11	8	7
Group advice via closed social media groups (e.g. WhatsApp group)	24	4	13	8	3
Webinars	4	1	1	2	0
Demonstrations, exchange visits	36	9	14	11	4
None	1	0	0	1	0
Others	1	1	0	0	0
Mass media advice					
Advice by internet (information from websites, blogs, forums)	22	4	12	6	2
Advice via social media sites (e.g. twitter, Facebook)	20	5	10	5	1
Printed publications, TV, radio, newsletters	29	10	8	10	4
None	8	1	1	4	2
Others	0	0	0	0	0

Figure 23 illustrates the frequency of activities conducted by the organizations. It shows that farm advice is provided weekly, while monthly activities include attending community meetings, providing farm advice, and organizing field days. Several times a year, the organizations engage in trainings outside the community, community meetings, providing training material, participating in fairs or markets, and offering farm advice. At least once a year, they provide written material or participate in fairs or markets. However, the use of videos and participation in fairs or markets are activities that are rarely or never undertaken by some organizations.



25 20 15 10 5 0 1. Assist to 2. Provide on-3. Conduct 4. Organize 5. Organize 6. Provide 7. Distribute or 8. Participate meetings in farm advice trainings field days farmer to written discuss videos in fairs or markets the community outside the farmer material to with farmers community exchanges farmers N/A Never At least one per year Several times per year Every month Every week

Figure 23: Advice activities conducted according to the frequency of realisation.

Based on these observations, several key interpretations can be made. Firstly, certain activities such as preparing written material, participating in fairs, and creating videos require significant resources and a well-thought-out strategy due to their complexity. These activities may involve extensive planning and coordination. Secondly, the face-to-face visit to farms or groups of farmers remains a vital and impactful activity. This emphasizes the crucial role of extension agents in facilitating knowledge transfer and providing personalized support to farmers. The direct interaction enables effective communication and tailored guidance. Lastly, networking activities such as field days, fairs, and peer-to-peer exchanges have proven to be highly accepted and feasible approaches for promoting and disseminating agroecological practices.

These activities provide valuable opportunities for farmers to connect, learn from each other's experiences, and share best practices. Their effectiveness lies in their ability to foster collaboration and create a supportive community of practitioners. In summary, while resource-intensive activities require careful planning, the face-to-face interaction and networking activities hold value in driving knowledge transfer and facilitating the adoption of agroecological practices.

About the digital tools used, Table 17 tells us that the most used digital tools and devices are mobile devices and messaging service. Less than half of the farmers use emails to communicate with farmers and social network.

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Table 17. Digital tools used (N=47)

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Digital tools	TOTAL	Burundi	Cameroon	DRC	Rwanda
Emails to contact clients	20	5	7	7	1
Social networks (facebook, twitter, instagram)	20	5	9	6	0
Messaging service (whatsapp, telegram)	29	8	13	9	2
Any specific app or decision support tool	3	0	1	1	1
Mobile devices (mobile phones, tablets, notebooks)	42	8	16	15	7
We don't use any digital tools to provide service to our clients	5	3	1	1	0

Communication technologies (disembodied digital technologies) appear to be more relevant to the digitisation of extension services, while other technologies requiring higher levels of investment (embedded digital technologies) remain to be explored. More research is needed to identify the barriers to the implementation and adoption of a wider range of technologies and the potential drivers.

2.8.4 Human resources

On average, each organisation has 20.80 employees and 12.6 extension agents. The proportion of female extension agents is lower at an average of 7.2 per organisation. Figure 24 shows a total extensionist-to-employee ratio of 1:2.



Figure 24 Number of employees, extension agents and female extension agents (N=45)



As shown in the Figure 25 and Figure 26, the organisations predominantly employ extension workers who have obtained a bachelor or high school diploma as their highest level of education. In most of the organisations, the average worker has accumulated 3 to 10 years of experience (Figure 26).





Figure 25 Number of employees according to their educational level (N=45) Two organizations with more than 100 employees were excluded from the analysis

Figure 26: Number of employees according to the level of experience (N=45) Two organizations with more than 100 employees were excluded from the analysis.

Over the last five years, the number of advisors

has significantly increased for half of the organisations. One quarter of the organisations believe that the number of advisors has significantly decreased, while the remaining 25% state that it has remained stable. This trend is different in Cameroon where a larger number of organisations stated that the number of advisors has significantly decreased (Table 18).

Number of advisors	TOTAL	Burundi	Cameroon	DRC	Rwanda
Significantly decreased	12	1	6	4	2
Significantly increase	22	7	6	9	3
The number of advisors remains the same	13	4	4	3	2
Total	47	12	16	16	7

Table 18. Trend in the number of advisors during the last five year (N=47)

2.8.5 Capacity building and incentives

Based on the data sample advisers, receive on average approximately 10 days of training per year. About 21 out of 47 organizations reported that over 75% of their training sessions were conducted internally. On the other hand, a considerable number of organizations, approximately 24 out of 47, indicated that less than 50% of their training was organized externally at the national level. Similarly, 26 organizations reported that less than 25% of their training sessions were organized externally at the international level. These findings highlight the reliance on internal resources and expertise for training purposes, with a relatively lower proportion of external training opportunities at both the national and international levels.



Table 19. Number of organisations and type of trainings received by its advisors (N=47)

Type of training	Less than 25%	between 25% and 50%	between 50% and 75%	More than 75%	Everyone	N/A
1. Trainings organised internally within the organization	4	12	7	9	13	2
2. Trainings organised externally at the national level	12	12	8	4	7	4
3. Trainings organised externally at international level	22	4	1	1	1	18

According to the data presented in Table 20, a significant number of organizations have implemented internal policies to incentivize extension agents. Half of the organizations surveyed reported having such policies in place to support the performance of their advisors. Interestingly, the proportion of organizations with incentive policies is higher in the DRC and Burundi. However, it is worth noting that despite the higher proportion, most institutions in Burundi reported not having an explicit policy of incentives for their extension agents. This suggests variations in the implementation of incentive policies across different regions and organizations within the surveyed area.

Table 20. Number of organisations reporting an internal policy to incentivize extension agents according to performance (N=47)

	TOTAL	Burundi	Cameroon	DRC	Rwanda
Yes	23	7	4	11	4
No	19	4	8	5	3
Dont know	3	0	3	0	0
Others	2	1	1	0	0

Most of the organizations mentioned that the most important technical skills needed by the advisors are those related with specific technological knowledge, followed by trainings about development of farm management strategy and ecology and environmental protection. This trend is similar in Burundi, DRC and Rwanda. For Burundi, they express the need to focus on the farm strategy but also in the knowledge on markets and farm viability (Table 21).



Table 21. Technical skills needed by advisors in your organisation to meet th	e challenges in the future (N=47)
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	TOTAL	Burundi	Cameroon	DRC	Rwanda
Specific technological knowledge (e.g farming practices, crop production technologies, ecosystem services)	35	7	14	12	6
Increasing the value added of farm products and short supply chains	28	9	9	9	4
Diversification of sources of income	22	6	7	7	4
Knowledge on markets and farm viability	22	9	9	3	3
Developing farm management strategy	32	10	12	8	5
Ecology and environment protection	31	7	12	10	4
Skills related to application for grants	24	5	12	7	3
Others	0	0	0	0	0

These results contrast with the results about methodological competences to realize extension work in an efficient manner. Here, most of the organizations mentioned digital skills, coaching skills and planning and conducting participatory methods for extension. That trend is similar across the four countries. (Table 22).

Table 22. Methodological skills needed by advisors in your organisation to meet the challenges in the future (N=47)

	TOTAL	Burundi	Cameroon	DRC	Rwanda
Facilitation skills	28	8	11	8	3
Networking skills	29	7	10	11	3
Coaching skills	32	8	10	11	5
Digital skills	33	8	12	12	5
Planning and conducting participatory methods of extension	30	6	12	10	5

2.8.6 Funding and linkages between actors

When looking into the funding sources, results show that more than half of the surveyed organizations across the four countries collects fee from their members. The second most common source of funding has been indicated as *other activities within the organization*. Actors based in DRC mention most frequently these two forms of funding. Same trend can be seen in Cameroon, where the two are the most common forms of funding.

Public funds are utilised by 16 out of 47 organisations under consideration. This funding source is more prevalent in Burundi, while only one organisation in Rwanda disclosed receiving government financial support. Funding sourced from international organisations is also a common source, with roughly half of the organisations reporting receiving some form of international funding. Compared to others, the funding deriving from local NGOs and service fees is relatively small.



Table 23. Trends on the number of advisors (N=47)

Main funding sources	TOTAL	Burundi	Cameroon	DRC	Rwanda
National or regional government funds (Public funds)	16	8	5	3	1
Cost-recovery from farmers (Fee for service financing)	9	2	4	3	1
Local or regional NGO funding	8	2	3	3	1
Contribution (membership fee)	26	5	8	11	3
International research or development organization	17	5	6	5	2
Other income-generating activities within the organisation	25	4	9	10	5
Others	1	0	0	1	0

The linkages of the organisations with other actors are also very variable. Table 24 shows how the surveyed organizations are connected to other actors among the respective national AKIS. The table shows the total number of organizations across the four countries that hold any kind of linkage or collaboration with the listed organizations on the table. The participants of the survey have been asked to classify their collaboration with other actors as non-existent, weak, average, strong and very strong. Most of the participants to the survey engage in either a weak or average collaboration with other actors of the respective countries' AKIS.

The results show that most of the surveyed actors have a very strong collaboration with Farmer based organizations (FBOs), followed by public authorities and international development institutions. FBOs are again the most frequent answer among the participants when asked about which actors they have a strong linkage with. They are followed by research institutions, NGOs and private companies. Very few are the organizations that engage in a very strong collaboration with both upstream and downstream players of the agricultural value chain.

Linkages with institutions	Non- existent	Weak	Average	Strong	Very strong	NA
1. Universities	9	9	19	7	2	1
2. Research institutions	2	12	14	12	5	2
3. Public authorities	5	10	16	7	8	1
4. Farmer based organizations	2	8	8	19	10	0
5. Non-Governmental Organisation	3	8	19	11	6	
6. Private companies	9	12	10	11	4	1
7. International Development Institution	7	13	11	7	7	2
8. Upstream players of agricultural value chains	15	13	9	5	2	3
9. Downstream players of agricultural value chains	16	11	10	6	2	2

Table 24. Linkages between advisory providers and institutions (N=47)



The connections between AKIS actors and universities are generally average to weak. This could be attributed to the role of universities within knowledge systems, or indicate a disconnection between formal education systems, extensionists, and applied research.

2.8.7 **Summary**

The analysis of advisory service providers reveals that innovation support providers implement agroecological principles, both implicitly and explicitly. The outreach of these organisations, which includes various farming systems, highlights the significance of natural resources and income generation for extension services. Therefore, it is crucial to include both aspects when scaling agroecological practices. Further investigation is required to determine the extent to which organisational actions align with the needs of farmers. Subsequent phases of the project will explore extension methodologies, institutional capabilities, and the feasibility of dissemination.

The client analysis points to a young farming population in diversified farming systems. Target groups, particularly women, have a high potential to undertake parallel projects to support agricultural production. The development of support methodologies, such as producer groups, model producers, or demonstrations on model farms, are identified as both existing and potential advisory services activities that can reduce adoption risks.

Capacity building of extension agents relies largely in internal training. From this perspective, the exchange of experience between organisations and countries presents an opportunity for exploration, especially benefiting from the desire to enhance technical content capacities, facilitation methodologies and the significant need for digital skills.

Most of the organisations sampled were farmer-based and local NGOs, with strong connections amongst themselves but weak connections with universities. There was a relatively stronger connection with applied research institutions, which may suggest that the current research agenda is influenced by research bodies funded from the international community. This offers a chance to connect globally but suggests that formal education systems could be disconnected from research which could impact the effectiveness of the AKIS structure and its future development.

Finally, it can be inferred that there is significant potential to connect the project's conceptual framework with the organizations' activities. The next steps require a review of potential starting points, such as organizational capacities, dissemination capacity or the application of agroecology content in a simplified and accessible manner.



2.9 Conclusion and implications on innovation support services within AKIS framework

2.9.1 Conclusion

This section of the report aimed to systematically map and characterize AKIS in the regions where CANALLS is working. We aimed to address levels of analysis: national level, Living Lab level and organizational level.

At macro (national) level, the AKIS systems reveals variations in the number of actors and the degree of connectivity. Rwanda has numerous actors, however, lower connectivity. Conversely, Burundi has the smallest number of actors, yet higher connectivity. Cameroon has the highest connectivity but a relatively low number of actors, and DRC shows differences according to the region of analysis. It is important to note that these results have been interpreted using concepts like those used to define AKIS systems in Europe (PROAKIS, University of Hohenheim). The number of actors represents the level of pluralism in the AKIS, indicating its diversity and amount. Similarly, the number of connections per actor serves as a proxy for the level of integration or fragmentation between actors. These concepts of fragmentation and pluralism can be used as a basis for further assessing the functioning of the AKIS, particularly in terms of how different knowledge systems contribute to the transformation of agroecological systems. Overall, understanding the dynamics of actors and connectivity within AKIS systems is crucial for fostering collaboration, knowledge exchange, and the transformation of agricultural practices towards more sustainable and agroecological approaches.

At Living Lab level, we found that there are important differences in the presence of organisations providing innovation support services in targeted agroecological practices. Those differences may also indicate the possibility of sharing best practices in the adoption of agroecological innovations within regions or between countries. The findings indicate diverse interventions are necessary to address the unique conditions of each of the Living Lab. Particular focus should be given to Living Labs located in Bunia and Uvira, and a tailored approach to overcome limitations must be carefully designed.

Regarding the characterization of service actors and their advisory activities, we have observed that advisory service organizations are promoting agroecological principles and implementing them into their work. Agroecology principles related with the promotion of agroforestry, reduction of inputs and economic diversification have been largely mentioned. The extent to which this service provision is effective in promoting the adoption of agri-environmental principles needs to be investigated. In addition, more research on methodologies, best practices and gaps would be useful to improve the quality of extension services and further adoption of agri-environmental practices.



Finally, we can conclude that there are several knowledge systems in place in which agroecological principles are relevant and potentially scalable. The implementation of co-creation activities could take stock on existing lessons learned and the identification of bottlenecks to overcome.

2.9.2 Policy implications

The overall findings of the AKIS analysis point to key policy implications applicable to the diverse contexts to all the four case study countries to foster collaboration and innovation within agricultural knowledge systems, contributing to more resilient, sustainable, and productive agricultural sectors.

Firstly, the analysis points out the need to connect the objectives of actors at both national and local levels. This collaborative effort should prioritize the inclusion of research institutions as bridges to test and disseminate agroecological innovations. Policymakers are encouraged to design frameworks that facilitate multi-stakeholder engagement, ensuring diverse perspectives contribute to the development and implementation of agricultural innovations.

Secondly, the need for collaborations between private organizations and research institutions is highlighted. Creating platforms for practical trials and scaling up innovations (similar to the EIP-Agri model of the European Union) are suggested. Those partnerships can be fostered by policymakers leveraging the strengths of both private and research sectors, enhancing the overall effectiveness of the agricultural knowledge system.

Those needs for connection could be done by considering existing methods and platforms for collaboration and connection between different actors, such as the CARGs in DRC, emphasizing the importance of adaptable and effective collaboration mechanisms. Policymakers are urged to connect these platforms with broader multi-stakeholder engagement initiatives, fostering a more cohesive and interconnected AKIS.

2.9.3 **Practical implications**

The analysis shows very different formats, actors and experiences. From a practical point of view, this implicates the potential on knowledge exchange beyond national borders to include collaborative initiatives between different countries and among different Living Labs (LLs). This cross-boundary exchange facilitates the sharing of diverse agricultural practices, innovations, and insights. It provides an avenue for mutual learning and adaptation, contributing to the enrichment and enhancement of AKIS on a broader, international scale. This approach recognizes the value of leveraging insights and experiences from different contexts to foster a more globally informed and interconnected agricultural knowledge landscape.

Looking the interactions between actors in the AKIS it is important to facilitate the connections between those actors with the weakest linkages to advisory service providers, such as Universities. In this regard, the training for trainers represents an opportunity to involve actors with a high potential


for replication, such as university professors. This strategic inclusion aims to create a snowball effect within the training ecosystem, given that many advisors and extension agents currently hold secondary school diplomas or bachelor's degrees. Incorporating University professors as trainers not only enriches the training pool with higher academic expertise but also establishes a dynamic knowledge exchange loop between academic institutions and the practical application domain.

2.9.4 Research implications

The following research recommendations are proposed to encompass several key areas aimed at advancing knowledge and understanding within the AKIS.

There is a call for further research on agroecological practices, delving into the specifics of what these practices entail and how they are perceived at the local and practical level. The recommendation includes investigating case by case, focusing on agroecological practices tailored for specific crops. This approach aims to capture the localized difficulties of agroecological adoption and identify context-specific factors influencing its acceptance among farmers.

In parallel, research on different digital devices and technologies is advocated, emphasizing opportunities beyond the already established use of mobile phones. Exploring technologies such as GIS mapping and the implementation of precision agriculture presents an avenue to understand the diverse digital tools that can contribute to the implementation of innovations and sustainable practices. This research can shed light on the potential benefits and challenges associated with incorporating these technologies into agricultural practices.

To gain insights into the factors hindering the adoption of agroecological practices, particularly from the perspective of farmers, a focused investigation is recommended. This research initiative would aim to directly engage farmers, seeking their perspectives on the challenges and barriers they face in adopting AE practices. By understanding these obstacles from the viewpoint of the primary stakeholders, tailored strategies can be developed to overcome adoption barriers.

Finally, initiating research directly with advisors and extension agents is proposed to gain a deeper understanding of their roles, practices, and how these aspects influence the adoption of AE practices. This approach aims to capture the perspectives of individuals within the AKIS framework, exploring the details of their activities and their impact on the promotion and adoption of agroecological practices. By delving into these specific areas, the research endeavours to inform targeted strategies and interventions for advancing sustainable and innovative agricultural practices.



3. Policies, systemic factors, trade-offs, and synergies for agroecological transitions

3.1 Introduction

In this section, we explore the interplay of policies, systemic factors, and trade-offs that influence agroecological transitions. Drawing upon systematic literature mapping, existing data, interviews, and focus groups, we assess the impact of policies, financial incentives, ongoing projects, local actors, and networks on agroecological transitions. Additionally, we identify synergies and trade-offs at various levels of our systems, encompassing field/farm, landscape, and food system.

To effectively inform decision-making and societal impact, we employ participatory approaches. Qualitative data gathered through these methods provides critical information for subsequent quantitative assessments.

Our findings reveal the diverse array of institutional settings, policy frameworks, and coordinating structures surrounding agroecological transitions. Based on this analysis, we provide tailor-made recommendations for enhancing these factors to support successful agroecological transitions.

3.2 Methodology:

In the context of Task 1.4 all the partners involved were asked to participate and be involved in data collection activities including 1. a desk and literature review; 2. individual in-depth interviews with policy makers; 3. focus groups discussion. Figure 27 provides an overview of the process, the requested tasks and schedule for data collection. To support ALLs coordinators in the data collection, and ensure consistency of methods across ALLs, a data collection protocol was developed by NIBIO (Annex 5.3). The data collection was implemented in the local language (French or English). Synthesis of data was then provided to NIBIO.

3.2.1 Literature review

For this purpose, we reviewed the literature on agroecological practices in agricultural policy research. We retrieved papers on Google Scholar, Web of Science and on Scopus. We removed the duplicates. We screened the abstracts of the remaining references to decide for inclusion or exclusion in the review process, using the following criteria:







Figure 27: Process and timing for data collection

Criteria 1: (focus on the selected agroecological practices of CANALLS ALLs). We include only papers if the abstract explicitly mentions the farming/agriculture level.

Criteria 2:

- 2.1. Prioritize the inclusion of papers about the target Countries or a single agroecology/policy system if the abstract makes some generalisation/mentions the relevance of their finding.
- 2.2. Papers investigate elements of the Agroecological system and interrelations between these elements.

Criteria 3: Include papers which describe policy change/transformation process within a food/agricultural system.

Exclusion criteria: Study is outside of Africa, does not focus (enough) on agroecology/policy, too technology/natural science focused, not about policy.

The review encompasses a total of 117 papers published between 1991 and 2023 (full list in annex 5.4). The papers were reviewed, with special attention put on understanding how authors approached the policy and identifying key systemic factors. We used an abductive approach, combining bottomup coding of the papers to highlight features of agroecology, elements that could be identified as systemic factors, as well as relevant themes (to link features and factors to specific contexts). We also used top-down codes, based on Van Mierlo et al. (2010), to guide the identification of system features and cluster the systemic factors.

3.2.2 Interviews

Based on the results of the systematic literature review, a questionnaire was developed to facilitate in depth interviews and assess policy and systemic factors (policies, financial incentives, existing



projects, local actors and networks) affecting agroecological transitions as well as to identify synergies and trade-offs at various levels of our systems (field/ farm, landscape and food system).

The questionnaire is designed to integrate the collected information from the literature, each ALLs coordinator received the questionnaire customized for the target Country.

In CANALLS we define Agroecological practices as those practices involving sustainable farming methods that harmonize ecological principles with agricultural production to enhance biodiversity, soil health, and resilience while minimizing external inputs. Key aspects include:

- Biodiversity: Promoting a rich variety of crops and animals to enhance agricultural production.
- Soil Health: Maintaining fertile and nutrient-rich soils without the heavy use of chemicals.
- Appropriate Chemical Use: Efficient and conservative use of synthetic pesticides and fertilizers.
- Water Conservation: Using water efficiently and preventing pollution of water bodies.
- Local Communities: Engaging with and benefiting local communities.
- Resilience: Building farms that can withstand environmental challenges like climate change.
- Reducing Waste: Minimizing food and resource waste through efficient production, distribution, and recycling.
- Health and Nutrition: Prioritizing the nutritional quality and safety of the products for consumers.

Assessing the agroecological transition in CANALLS Countries, from the perspective of policy makers is essential for understanding the progress, challenges, and opportunities in these areas. The questionnaire designed to gather insights from policy makers regarding agroecological practices and policies is in Annex 5.5:

3.2.3 Focus group discussion.

The overall objective of the focus group discussion is to validate the results of the individual interviews.

Why opting for Focus Groups?

Individual interviews are effective in capturing personal perspectives, but focus groups offer a unique space to identify group-level consensus and dissensus. Employing several focus groups serves various purposes, including ensuring in-depth discussion, managing participant speaking time, facilitating organization, accommodating diverse schedules, and enabling a more localized approach for multi-local Civil Societies (CS).

Who to Invite?

Decisions on focus group participants can be made collectively in a meeting or individually with each ALLs. Consideration should be given to separating groups based on their proximity to the ALLs, hosting parallel groups with mixed actors. Actor selection should align with the ALLs context, balancing consensus and divergence while considering gender diversity.

Who Facilitates?

Professional facilitators with advanced skills are recommended for focus groups. ALLs coordinators should rely on colleagues or external facilitators to ensure a clear separation between focus group discussions and other data-related activities. This helps maintain the project's objective focus during discussions.

Focus Group Guidelines



Section	Durnaga	Contont	GA TOTOSSOS
Section	Purpose	Content	Leau
Introduction (20 min)	This part of the discussion provides a solid basis for further discussion. The goal is to obtain validation about your preliminary output. This is the part of the discussion where objective data is presented	Present the results of the interviews, including policy landscape, current agroecological practices in the area, identified barriers, and levers for transitions.	ALLs coordinator
Focus Group Discussion (40-60 min)	This part of the discussion is when subjective data is collected (opinions, perceptions, etc). Possibly complementary data will also be brought up by participants.	 General principles for the focus group: should be specific about the ALL (not theoretical) Start with open questions, then continue asking details through 'follow-up questions (How, Why, etc.)1 	Focus Group facilitator
Closing (10 min)	Engage stakeholders for the duration of the project	Thank participants, provide information about the next steps, and communicate channels for updates from CANALLS.	ALLs coordinator

Context-Related Questions

Introduce the Case Study "desirable transformation" or "goal." Ask: What do you think of this sustainable transition? How to improve the initial situation? Why is this transition desirable? What is the rationale behind it? **Barriers-Related Questions** According to each actor, what are the main barriers and relevant levers? Who is responsible for the situation, and to whom does it answer? What factors are considered "given" by the environment? **Levers** Who can enable the transformation, and what characteristics make them capable? If the transformation happens, what are the positive and negative consequences? Who would be impacted positively and negatively?



3.3 Current policies related to agroecological transition in Africa.

The main existing policies for agroecological transition in Africa involve international, regional, and national frameworks aimed at promoting agroecology and sustainable food systems. The policies have been identified at AU, Regional and local levels:

AU and Regional Policies:

The African Union (AU) has committed to policies such as the Malabo Declaration, focusing on accelerated agricultural growth, ending hunger by 2025, and enhancing resilience to climate variability.

Regional Economic Communities (RECs) like COMESA, CEN-SAD, UMA, EAC, ECCAS, ECOWAS, IGAD, and SADC have developed policies and strategies to align with international obligations.

Global Agreements and Strategies:

The region has aligned with global efforts such as the 2030 Agenda for Sustainable Development (Desa 2016), the Paris Agreement on Climate Change (Agreement 2015), and various other international instruments.

At local level, initiatives and policies identified through the desk study are the following:

Democratic Republic of the (DRC):

The DRC has outlined its agricultural policies within the Country Strategic Opportunities Programme (COSOP) (Hanafi, Hurley et al. 2020), aligning with the Agricultural Sector and Rural Development Strategy (SSADR) from the National Strategic Development Plan (PNSD). The SSADR prioritizes family-based food-producing agriculture by smallholders and emphasizes improved access to markets. The overarching goal is to establish an inclusive and prosperous agricultural system where farmers, women, and young people engage in commercial farming with easy access to quality inputs, infrastructure, markets, support services, and affordable financing.

The COSOP is also in harmony with the National Agricultural Investment Plan (NAIP) 2014-2020 (Hanafi, Hurley et al. 2020), which envisions the gradual development of the agrifood sector through family farming, anticipating high returns for smallholders. Private sector involvement is encouraged to contribute to the growth of the agrifood industry. The government aims to improve farmers' living conditions by creating "poles of agricultural enterprises."

However, significant challenges hinder agricultural development. Inefficient and cumbersome land administration processes pose a major bottleneck, leading to insecure land rights that impact livelihoods and discourage investments in agriculture. The policy of decentralization, which grants provincial governments authority over agricultural programs, faces implementation challenges, contributing to the country's overall fragility.

In alignment with global commitments, the DRC's Nationally Determined Contribution (NDC) to the Paris Agreement emphasizes climate change mitigation and adaptation. The NDC shares similarities with the SSADR, expressing an interest in sustainable agricultural intensification and increased



resilience, particularly for small-scale producers. Notably, there is a specific focus on strengthening the resilience of women and young people in the agricultural sector, reflecting a commitment to inclusive and sustainable agricultural practices, which aligns with the principles of agroecology.

More specifically for the agroecological practices targeted within the CANALLS project for DRC:

- 1. Agroforestry Systems: The DRC recognizes the importance of agroforestry systems for sustainable land use and environmental conservation. The government aims to promote practices that involve intercropping with diverse shade trees to enhance soil fertility, crop productivity, and biodiversity (Bandi, Mahimba et al. 2022).
- 2. Integrated Soil Fertility Management (ISFM): The DRC acknowledges the significance of ISFM to improve soil health and crop productivity. Policies may emphasize the use of organic and mineral fertilizers, cover cropping, crop rotation, and other practices that contribute to soil fertility (Thienpondt 2016, Nsele, Fyama et al. 2022).
- 3. Integrated Pest Management (IPM): While specific policies might not be extensively documented, the DRC acknowledges the importance of IPM to manage pests sustainably. IPM practices, such as biological controls, cultural practices, and resistant crop varieties, align with the country's goals of reducing reliance on chemical pesticides(Munyuli, Cihire et al. 2017).
- 4. Organic Value Chain: While explicit policies might not be widely documented, there is an increasing awareness of the benefits of organic farming practices in the DRC. The country aims to promote sustainable and organic agricultural practices that contribute to soil health, environmental sustainability, and the organic value chain(Mulimbi, Nalley et al. 2019).
- 5. Intercropping (Banana) and Legume Cover Crops: Policies promoting intercropping, particularly with bananas and legumes, might be embedded within broader agricultural and land use policies, although they may not be explicitly detailed (Ocimati, Ntamwira et al. 2019).
- 6. Recycling of Nutrients: While explicit policies related to recycling nutrients through local composts or combining coffee pulp and organic waste compost might not be documented, the importance of nutrient recycling and organic waste management is recognized as a part of sustainable agricultural practices (Karume, Mondo et al. 2022).

Burundi:

Burundi faces challenges in its pursuit of reducing poverty and achieving shared prosperity, largely constrained by demographic burden and fragility. The country's growth prospects are affected by political, climatic, and economic fragility. Geographic and demographic characteristics, compounded by climate risks, put immense pressure on Burundi's rural lands. Despite being endowed with natural assets like abundant rainfall and fertile land, high population density and rapid growth lead to deforestation, soil degradation, and unsustainable agriculture practices (Mbago-Bhunu, Dagmawi et al. 2022).

Climate change exacerbates the situation, making Burundi the fourth most vulnerable country globally. Extreme weather events, including floods and droughts, have significant economic impacts. Deforestation and land degradation contribute to poverty, affecting livelihoods and food security, with notable consequences like stunting in children.

Historically policy measures have been insufficient, necessitating a proactive approach. The current policies aim to build a resilient landscape through sustainable land management practices, including terracing and bioengineering, to address soil erosion and increase crop yields. Improved weather forecasting and climate services, along with the adoption of sustainable agricultural practices.



Burundi's **national vision** (Burundi 2018) focuses on sustainable resource management, economic transformation, and poverty reduction. It addresses environmental challenges and supports the country's commitments to forest and landscape restoration, as well as international goals like the Bonn Challenge(Dave, Saint-Laurent et al. 2018) and the Sustainable Development Goals.

Moreover, **Burundi's land reform**(Verbrugghe 1965, Clerck 1971, 2008), addresses land titling constraints and promotes decentralized land administration while the **National Adaptation Programme of Action** is contributing to climate change adaptation and supports food security and nutrition goals by promoting diverse and nutritious crop varieties.

Burundi has been focusing on various agricultural and environmental policies to promote sustainable practices, including those related to agroforestry systems, intercropping, nutrient recycling, organic pest control, organic value chains, integrated soil fertility management (ISFM), integrated pest management (IPM), forage production, and integration of crop-livestock systems. Here's a general overview of some existing policies:

Agroforestry Systems and Intercropping: While specific policies solely focused on agroforestry systems and intercropping might not be extensively documented. Despite Burundi recognizing the importance of sustainable land use practices difficulties have been highlighted in the nursery sector (Havyarimana, Muthuri et al. 2019). The "National Agricultural Policy" emphasizes the integration of trees with crops and promotes agroforestry to enhance soil fertility and food security.

Nutrient Recycling from Organic Sources: While specific policies focused solely on nutrient recycling might not be widely documented, Burundi emphasizes sustainable soil management practices that include nutrient recycling from organic sources(Ndagijimana, Kessler et al. 2019). The "National Agricultural Policy" and related strategies promote the use of organic fertilizers to enhance soil fertility.

Organic Pest Control and Value Chains: While explicit policies focused solely on organic pest control and organic value chains might not be extensively documented, Burundi acknowledges the importance of reducing chemical pesticide use and promoting organic practices. The "National Agricultural Policy" encourages sustainable pest management and the development of organic value chains (Mbago-Bhunu, Dagmawi et al. 2022).

ISFM and IPM: The "National Agricultural Policy" outlines strategies for promoting integrated soil fertility management (ISFM) and integrated pest management (IPM) to improve soil health, enhance crop productivity, and reduce environmental impact (Stads and Ndimurirwo 2019).

Forage Production and Integration of Crop-Livestock Systems: The "National Agricultural Policy" recognizes the significance of forage production and the integration of crop-livestock systems to enhance food security and livelihoods through diversified agricultural practices (Bacigale, Nabahungu et al. 2018).

Rwanda

Rwanda's National Agricultural Policy (NAP) (Rwanda 2018) has been updated based on the need to adapt to rapid changes and evolving dynamics in policy and institutional environments since the 2004 policy. These updates aim to align with current country sector policies and international agendas, emphasizing the importance of coherence with national development orientations.

Other policies and strategies to which the NAP is aligned include:



- Vision 2020 (Kaberuka 2000): The current policy aligned with the vision, emphasizing the modernization of agriculture to employ 50% of the population and provide substantial income to the entire population.
- Vision 2050 (Gatete 2016, Rwanda 2020): Future development underlines agro-processing, advanced food industry, and technology-intensive agriculture, focusing on transformation for prosperity.
- National Decentralization Policy (Rwanda 2021) : The NAP recognizes the role of grassroots institutions in policy implementation, emphasizing decentralized participation in agriculture.
- Girinka Program (Kim, Tiessen et al. 2011, Kayigema 2013, Faustin 2020): Emphasizing the provision of a dairy cow for every poor family, this program aims at income generation, nutrition, and organic fertilizer use.
- Crop Intensification Program (CIP): Launched in 2007, CIP focuses on increasing agricultural productivity, ensuring food security, and self-sufficiency. It includes activities like bulk buying of inputs, training, subsidized provision of inputs, and post-harvest measures (Kathiresan 2011).
- East African Community (EAC) Vision 2050: One of its pillars is Agriculture, Food Security, and Rural development, aiming to enhance agricultural productivity for food security and rural economy transformation (Gatete 2016).
- Malabo Declaration: Provides direction for agriculture in Africa, focusing on accelerated agricultural growth, shared prosperity, and improved livelihoods (Mkomwa, Kassam et al. 2022).
- Sustainable Development Goals (SDGs): Acknowledges the centrality of agriculture in the SDGs, addressing natural resource sustainability, overcoming hunger, malnutrition, and ensuring food security.

In addition, the specific agroecological practices described in CANALLS ALLs in Rwanda, have been mentioned in different agricultural and environmental research and policies promoting sustainable practices, including intercropping with legumes, integrated soil fertility management (ISFM), nutrient recycling through organic waste compost, and farm diversification.

Intercropping with Legumes: Despite as part of CIP, Rwanda is currently not allowing intercrops, specific recent literature related to case studies in Rwanda, recognizes the importance of intercropping with legumes to enhance soil fertility, crop productivity, and agricultural sustainability. The country's agricultural policies emphasize the promotion of diverse cropping systems that incorporate legumes, such as beans and peas, to improve soil nitrogen content and overall farm productivity and based on recent scientific evidence (Schaedel, Majuga et al. 2023) (Ngango 2023) intercrops are more productive, more profitable and can be easier to adopt by farmers, as compared to the monocrops promoted through CIP.

Integrated Soil Fertility Management (ISFM): Rwanda has been working on integrated soil fertility management to improve soil health and agricultural productivity. The "National Fertilizer Policy" emphasizes the use of organic and inorganic fertilizers, as well as other practices such as cover cropping, crop rotation, and agroforestry, to ensure sustainable soil management.

Nutrient Recycling (Organic Waste Compost): Rwanda acknowledges the significance of nutrient recycling through organic waste composting to enhance soil fertility and reduce waste. The "National Integrated Solid Waste Management Strategy " aims to promote the production and use of compost from organic waste sources, contributing to sustainable agricultural practices and waste management (INFRASTRUCTURE 2022).



Farm Diversification: The "National Agriculture Policy" emphasizes the importance of farm diversification to enhance food security, livelihoods, and resilience. The policy encourages farmers to engage in multiple agricultural activities, including crop and livestock production, agroforestry, and other income-generating activities.

Cameroon

Agroecological practices in Cameroon are very diverse and are in line with the principles of agroecology. These practices include organic (or bio) fertilisation, biological pest control (biopesticides), intercropping, combined crop production, agroforestry, waste management/recycling, living fences, crop rotation, mulching, dyke construction, cover crop technology, biochar, scarecrow composting aquaponics and hydroponics, improved fallow, integrated conservation agriculture and beekeeping, improved seed/plant production and distribution, tree domestication, afforestation, premature agriculture, conservation agriculture, regenerative agriculture, organic agriculture, agroecological finance and communication (Tang et al., 2022).

Cocoa agroforestry in Cameroon has been widely explored by CIRAD and IRAD over the past two decades. In Cameroon, in contrast to the pure or full-sun monoculture model explained in (Jagoret, Ngnogue et al. 2018, Jagoret, Snoeck et al. 2018), most cocoa/coffee farmers combine their farms with other perennial, forest and multipurpose fruit species. The cocoa/coffee agroforestry system in Cameroon is therefore a multi-storey integration of fruit trees (mango, safou (Dacryodes edulis), bitter kola, avocado (Persea americana) coconut, kola (Cola nitida), pawpaw (Carica papaya), orange (Citrus sp.), grapes, rambutan, soursop, bush mango (Irvingia gabonensis), njangsang (Ricinodendron heudelotii), oil palm (Elaeis guineensis) and others.), food crops (yams, plantains, bananas, cassava and maize), perennial trees (rubber trees and woody species (e.g. Terminalia superba and Milicia excelsa)) and shade-tolerant cocoa/coffee trees on the same area. In the case of most farmers in the Centre, Littoral, South and South-West regions of Cameroon, cocoa/coffee agroforestry farms are highly diversified between different farmers and also at farm level, offering several advantages, including enrichment of forest and soil biodiversity.

Intercropping can be considered an old traditional cropping system in family farming, but what makes it an innovation is the application of its scientific principles for diversification. Intercropping has a long history in Cameroonian agriculture and is part of the reason why agroecology is "not new" in Cameroon, as it was applied without specific knowledge. However, the lack of innovation and the agroecological basis of the practice, as well as the fact that extension services have not taken extension to the next level is what makes the practice conventional. Thus, the application of scientific knowledge of intercropping saves space and resources, ensures better yields, repels pests, reduces weeds, increases nutrient use efficiency, and improves soil health and biodiversity. These benefits are enshrined in the principles of agroecology.

Cameroon is poised to embark on a journey of economic transformation under the ambitious **2035 Development Vision**. The 2035 economic emergence vision serves as a guiding compass for all plans, strategies, and programs in Cameroon. This vision, articulated in the 2010-2020 Medium-Term Development Plan, outlines a comprehensive strategy to propel Cameroon into the ranks of emerging economies emphasizing economic development in three phases (2010-2019, 2020-2027, 2028-2035). At the heart of the 2035 Development Vision lies the agro-ecology concept, which emphasizes sustainable agricultural practices that promote food security, enhance resilience to climate change, and contribute to improved livelihoods for rural communities. The vision recognizes the critical role of



agriculture in driving economic growth and poverty reduction, particularly in rural areas where the vast majority of Cameroonians reside.

To operationalize the 2035 Development Vision, the government of Cameroon has crafted several strategic frameworks, including the Poverty Reduction Strategy Paper (PRSP) and the Growth and Employment Strategy Paper (GESP).

The National Development Strategy (SND) 2020-2030.

The SND 2020-2030, the second phase of the DSCE, places a strong emphasis on the rural sector as the engine of growth for Cameroon's economy. The focus is on opening up production basins, developing hydro-agricultural areas, and prioritizing priority agropastoral sectors for agro-industrial development. Sustainability is a cornerstone of the SND, with a particular emphasis on the management of natural resources.

The Nationally Determined Contributions (NDC). Cameroon's pledge to reduce greenhouse gas emissions by 32%, highlights the importance of sustainable agricultural practices, water management, and forest conservation. The NDC aligns with Cameroon's vision to become an emerging country by 2035, focusing on poverty reduction, middle-income status, industrialization, and democratic consolidation. The government aims to reduce carbon footprint without hindering economic growth and is open to international support for financing, technology transfer, and capacity building.

The National Agricultural Investment Plan (2014-2020) outlines a comprehensive strategy to invest FCFA 3.35 trillion in agriculture, fostering growth and productivity in the sector. Priority areas include the development of agricultural sectors, modernization of rural production infrastructure, sustainable natural resource management, and capacity building for rural development stakeholders.

The implementation of these policies is not without its challenges. Cameroon faces a number of constraints, including limited access to finance, infrastructure gaps, and the need to enhance agricultural productivity and competitiveness.

Despite these challenges, Cameroon is well-positioned to achieve its economic emergence goals. The country's rich natural resources, skilled workforce, and growing entrepreneurial spirit provide a strong foundation for progress. Moreover, the government's commitment to sustainable development and inclusive growth aligns with global trends and expectations.

These frameworks provide a roadmap for implementing the country's key objectives, aligning with Cameroon's commitment to the Sustainable Development Goals (SDGs).

3.4 Literature review results on policies related to agroecological transitions.

3.4.1 **DRC**

Barriers

 Limited awareness and understanding of agroecology: Many farmers in the DRC are not aware of the benefits of agroecology or how to implement agroecological practices. (Ntamwira et al., 2023)



- Lack of access to resources: Farmers in the DRC may lack access to the resources they need to transition to agroecology, such as land, credit, and training. (Group, 2018)
- Unfavourable policy environment: Government policies in the DRC are not specifically targeting agroecological transitions and may not support them, for example by subsidizing conventional agricultural inputs. (Group, 2018)
- Limited access to markets: Farmers in the DRC may lack access to markets for their agroecological products. (Mulimbi et al., 2023)
- Risk aversion: Farmers in the DRC may be risk-averse and reluctant to transition to agroecological practices, which may be perceived as riskier than conventional agricultural practices. (Schut et al., 2016)
- Specifically to coffee but not limited to, lack of markets barriers are exacerbated by lack of certification schemes: informal selling and smuggling into neighbouring Rwanda and Uganda is affecting the local trade and certification possibilities (Titeca and Kimanuka 2012, Slosse, Buysse et al. 2022)

Drivers

- Growing awareness of the benefits of agroecology: There is a growing awareness of the benefits of agroecology among farmers, policymakers, and the public in the DRC. (Ntamwira et al., 2023)
- Government support for agroecology: The government of the DRC has developed a National Agroecology Strategy, which outlines a number of measures to support the transition to agroecology. (Karume et al., 2023)
- Farmer-led initiatives: Farmer-led initiatives are playing a key role in promoting agroecology and supporting farmers in the transition process in the DRC. (Katunga et al., 2014)
- Demand for agroecological products: There is a growing demand for agroecological products (e.g. white maize and cowpeas) in the DRC, both domestically and internationally. (Mulimbi et al., 2023)

In addition to the above, the following factors could also potentially drive agroecological transitions in the DRC:

- Climate change: Climate change is a major threat to agriculture in the DRC. Agroecological practices can help to make agriculture more resilient to climate change. (Karume et al., 2022)
- Degraded soils: Soil degradation is a serious problem in the DRC. Agroecological practices can help to improve soil health and fertility. (Thienpondt, 2016)
- Poverty: Poverty is widespread in the DRC. Agroecological practices can help to improve food security and livelihoods for farmers. (Smith, 2018)

3.4.2 **Burundi**

Barriers

- Lack of awareness and knowledge: Many farmers in Burundi are not aware of the benefits of agroecology or how to implement agroecological practices. (Kwizera, 2021)
- Limited access to resources: Farmers in Burundi may lack access to the resources they need to transition to agroecology, such as land, credit, and training. (Kwizera, 2021)
- Unfavourable policy environment: Government policies in Burundi may not support agroecological transition, for example by subsidizing conventional agricultural inputs. (Kwizera, 2021)
- Limited access to markets: Farmers in Burundi may lack access to markets for their agroecological products. (Henao and Baanante, 2006)



• Risk aversion: Farmers in Burundi may be risk-averse and reluctant to transition to agroecological practices, which may be perceived as riskier than conventional agricultural practices. (Kwizera, 2021)

Drivers

- Growing awareness of the benefits of agroecology: There is a growing awareness of the benefits of agroecology among farmers, policymakers, and the public in Burundi. (Ndayiragije et al., 2017)
- Government support for agroecology: The government of Burundi has developed a National Agroecology Strategy, which outlines several measures to support the transition to agroecology. (Stads and Ndimurirwo, 2019)
- Farmer-led initiatives: Farmer-led initiatives are playing a key role in promoting agroecology and supporting farmers in the transition process in Burundi. (Cochet, 2012)
- Demand for agroecological products: There is a growing demand for agroecological products in Burundi, both domestically and internationally. (Ochieng et al., 2014)

In addition to the above, the following factors could also potentially drive agroecological transitions in Burundi:

- Climate change: Climate change is a major threat to agriculture in Burundi. Agroecological practices can help to make agriculture more resilient to climate change. (Megerle, 2015)
- Population growth: Burundi has a rapidly growing population. Agroecological practices can help to produce more food on less land. (Moseley, 2022)
- The literature also suggests that agroecology can have a positive impact on livelihoods in Burundi. For example, Karuga (2022) found that agroecological farming led to improved income, food security, and nutrition for farmers in Kiambu County, Kenya.

3.4.3 **Rwanda**

Barriers

- Lack of awareness and knowledge: Many farmers in Rwanda are not aware of the benefits of agroecology or how to implement agroecological practices. (Alinda and Abbott, 2012; Bizimana et al., 2012; Cantore, 2011)
- Limited access to resources: Farmers in Rwanda may lack access to the resources they need to transition to agroecology, such as land, credit, and training. (Altieri, 2002; Clay et al., 2023; Clay and King, 2019; Delvaux and Riesgo, 2020)
- Unfavourable policy environment: The government of Rwanda has a number of policies that ban intercrops and support conventional agriculture, such as subsidies for chemical fertilizers and pesticides. These policies can make it more difficult and expensive for farmers to transition to agroecology. (Cioffo et al., 2016; Golooba-Mutebi, 2014)
- Limited access to markets: Farmers who transition to agroecology may face challenges in accessing markets for their products. This is because agroecological products are often less well-known and more expensive than conventional products. (Mutombo et al., 2022)
- Risk aversion: Farmers in Rwanda may be risk-averse and reluctant to transition to agroecology, as it may be perceived as a riskier approach to farming than conventional agriculture. (Antwi-Agyei et al., 2021; Esilaba et al., 2021)



Drivers

- Growing awareness of the benefits of agroecology: There is a growing awareness of the benefits of agroecology among farmers, policymakers, and the public in Rwanda. This is due in part to the work of farmer-led initiatives and NGOs that are promoting agroecology in the country. (Mutombo et al., 2022; Rwagara et al., 2021)
- Government support for agroecology: The government of Rwanda has developed a National Agroecology Policy, which outlines several measures to support the transition to agroecology. This includes providing financial and technical assistance to farmers, as well as promoting agroecological products in the market and massive reforestation campaign. (Brandt, Mugabowindekwe et al. 2023)(Government of Rwanda, 2022)
- Farmer-led initiatives: Farmer-led initiatives are playing a key role in promoting agroecology in Rwanda. These initiatives are providing farmers with training and support on how to transition to agroecology, as well as helping them to access markets for their agroecological products. (Rwagara et al., 2021)
- Demand for agroecological products: There is a growing demand for agroecological products in Rwanda, both domestically and internationally. This is due to several factors, including increasing awareness of the health and environmental benefits of agroecological products. (Mutombo et al., 2022)
- Climate change: Climate change is a major threat to agriculture in Rwanda. Agroecological practices can help to make agriculture more resilient to climate change. (Ifejika et al., 2021)

3.4.4 Cameroon

Barriers

- Inadequate policy environment: Cameroon has several policies supporting conventional agriculture, such as subsidies for chemical fertilizers and pesticides, but they are not specifically targeting agroecological transition. Additionally, they wouldn't be effective and sustainable because they are not tailored to the current socio-demographic characteristics. (Epule and Bryant, 2015; Okolle, 2019). Also, the Regulatory and Legislative frameworks together with inadequate political will and incentive to enforce regulations appears to be the major obstacle in adopting SFM practices in Cameroon (Alemagi,2011).
- Resistance to change: The reliance on traditional practices, deeply rooted in local culture, might lead to resistance when introducing novel agricultural practices/technologies. Farmers may be hesitant to deviate from established norms. Age, gender, and migration status are influencing factors on the transition to agroecology, dynamics of knowledge systems and collaborative approaches used by communities are hard to change. (Mala, W.A, 2009; Nkamleu and Manyong, 2005)
- Institutional Challenges: Institutional barriers, such as policy constraints or conflicting interests among stakeholders, may hinder collaborative management efforts for agroecological practices.
- Sustainability and Food Security Concerns: The research literature suggests that the potential implications of transitioning could pose risks to sustainability, food security, and the welfare of rural communities. These concerns can act as barriers to the adoption of new practices (Ntumngia, R. N., 2010; Nchinda et al., 2010).
- Initial investment: The adoption of agroforestry practices may require an initial investment in terms of time, labour, and resources. This can act as a barrier, especially for farmers with limited resources. (Côte et al., 2022; Tsufac et al.,)



- Limited access to markets: Farmers who transition to agroecology face challenges in accessing markets for their products. This is because agroecological products are often less well-known and more expensive than conventional products. (Paracchini et al., 2022; Tsufac et al.)
- Lack of infrastructure: The lack of infrastructure, such as roads and storage facilities, can also make it difficult for farmers to adopt agroecological practices. For example, if farmers are unable to easily transport their agroecological products to market, they are less likely to adopt these practices.
- Climate change: Climate change is another challenge that farmers in Cameroon face. Agroecological practices can help to make agriculture more resilient to climate change, but they may also require farmers to invest in new technologies and practices.

Drivers

- Environmental Sustainability: Agroecology is recognized as a driver for e.g. reducing chemical fertilizer use. It is promoted as an environmentally sustainable practice that improves soil health, reduces erosion, and conserves biodiversity.
- Agrobiodiversity Promotion: The emphasis on agrobiodiversity and its role in sustainable agriculture can be considered a driver. Promoting diverse crop varieties and plant species is key to agroecological practices.
- Soil Fertility Improvement: Agroecological practices, such as intercropping with trees, are driven by their capacity to enhance soil fertility. This can lead to increased crop yields without the need for chemical fertilizers.
- Policy Support: The literature highlights the policy implications of promoting agroforestry in Cameroon. Government policies that support and incentivize agroforestry practices can serve as drivers for their adoption.
- Climate Resilience: Agroforestry is acknowledged for its potential to enhance climate resilience in agricultural systems. This is a driver, particularly in the context of changing climate conditions.
- Collaborative Management: The concept of collaborative management of natural resources can be viewed as a driver for fostering agroecology. Collaborative efforts among different stakeholders can enhance the adoption of sustainable farming practices.
- Adaptive Approaches: The mention of adaptive management practices is indicative of a driver for agroecology. Adaptive strategies are essential for responding to changing environmental conditions and improving the sustainability of agricultural systems.

3.5 Results of the interviews with policy makers

3.5.1 **DRC**

Agroecological Policies Landscape

- In general, there is consensus on the existence of policies aiming at the promotion of agroecology and the transition towards its practices in DRC.
- The survey's results show significant difference in the understanding of agroecology by the respondents.
- The effectiveness/success of the current policies is linked to the farmers, their motivation in increasing their productivity or improving their livelihood but it is also mentioned that because the farmers are not reached the policies are not effective.



Policy Implementation, monitoring, and evaluation

- The implementation is done through project activities and training in collaboration with the local partners/stakeholders.
- The incentives are represented by inputs (seeds, fertilizers etc) but also by increased knowledge through targeted trainings.
- The barriers for an effective policy implementation are mostly financial i.e. lack of capital, logisticallimited access to inputs and markets, lack of knowledge and lack of integration with sciencescientific results seem not to be reflected in the policies.
 - The respondents have provided examples on how they have overcome some of the barriers e.g. for lack of funds → financial planning, fundraising.
- M&E is not common, for the few positive responders they do it through meetings and they use specific indicators that they have been developing within a specific project/framework.

Research and Knowledge Generation

- Most of the responders, states that the research results are not enough or at all used to formulate policies.
- The scientific results are transmitted to the end users through the extension service, through conferences, meetings, and dissemination material (brochures etc)
- Sensibilization campaigns for agroecology transition are existing for some of the responders otherwise there is not a system in place to ensure that the end users are trained in agroecology.

Collaboration and Partnerships

• While the majority has different levels of cooperation with international organizations to promote agroecology the majority is not a member of any international framework or agreement related to policies for agroecology.

Farmer Adoption of Agroecological Practices

• The adoption of agroecological practices is very low because of lack of awareness and knowledge. Additional hindrances are represented by the weak extension service and the cultural aspects.

Impacts and Outcomes

- The main positive impacts reported in relation to the implementation of current agroecology policies are those related to soil (fertility and stability) to the increase in productivity and to the circularity. The main negative aspects reported are those related to the higher cost of labour input and the low financial benefit in addition to the change in products availability.
- The successful initiatives that are mostly reported are those mentioning soil health and conservation (soil fertility, soil degradation, soil erosion) while the lessons learned from these experiences are very diverse: from environmental protection and food safety to waste recovery. Furthermore, the respondents highlighted the needs for technology demonstration and closer supervision of the farmers. Most importantly without a system monitoring and measuring sustainability and without supporting the agroecological practices, farmers return to their traditional practices when the project is ended.

Support and Resources



• There is not enough support and resources for supporting agroecological transition, there is need for increased financial support (incentives through governmental and private funds), increased workforce and improved knowledge.

3.5.2 **Burundi**

Agroecological Policies Landscape

- There are specific policies and initiatives in place to promote agroecological practices such as intercropping (legume), ISFM, nutrient recycling (organic waste compost), and farm diversification in Burundi. These include ISFM, crop rotation, and kitchen gardens.
- Goals or targets related to agroecology exist within policies, including improving yields, intercropping, kitchen gardening, and establishing nurseries. These policies and initiatives have been effective in promoting agroecological practices among farmers.
- The effectiveness of these policies/initiatives is strongly agreed upon, and they have led to
 increased yields and a reduction in environmental impact at the same time challenges for their
 success have been identified in limited knowledge and awareness of agroecological practices
 among farmers, the lack of access to inputs and services, and the lack of market access for
 agroecological products.

Policy Implementation, monitoring, and evaluation

- The policies and initiatives are implemented and enforced at the ground level through a number of mechanisms such as training of trainers on coffee shading, certification, and punishment for non-compliance.
- A number of incentives and support mechanisms exist, and they are provided to farmers to encourage the adoption of agroecological practices. The measures include punishments for noncompliance, motivation for farmers practicing organic cultivation, and higher prices for certified organic coffee.
- Challenges include resistance from farmers due to low coffee prices, and these are addressed through increased sensitization and raising coffee prices.
- Evaluation mechanisms are in place, including weekly reports, field visits, and interviews with farmers. Monitoring involves activities such as organic manure and agroforestry techniques, with indicators like increased yields and organic manure use. Indicators or metrics used include area covered by trees, good partnerships, savings, and the promotion of a clean environment.

Research and Knowledge Generation

- Research results are used for policy formulation, with initiatives like training on coffee farming systems and diversification of crops.
- Research findings and knowledge are shared with farmers and other stakeholders through a number of mechanisms. Most common dissemination tools mentioned are workshops, certification seminars, and training provided to and by cooperatives.
- Training programs for farmers and extension workers include ToT, FFS, and regular sensitization meetings.
- Relevant stakeholders, including farmers, have access to accurate information through regular meetings, exchange visits, and field visits.



Collaboration and Partnerships

- Burundi collaborates with international organizations, research institutions, and other countries to promote agroecology. Collaboration involves partnerships with organizations like INADES-Formation and COCOCA.
- Burundi is a member of a number of regional and international frameworks and agreements guiding its agroecological policies but membership or ratification of regional or international frameworks is not explicitly mentioned.

Farmer Adoption of Agroecological Practices

- The adoption of agroecological practices in Burundi is moderate. The extent of Burundi farmers adopting agroecological practices is mentioned with factors like resistance, lack of knowledge, and low yields.
- Factors influencing adoption or resistance include low coffee prices, lack of training, and farmers' hesitance in addition to the already mentioned factors related to lack of knowledge and awareness of agroecological practices, the lack of access to inputs and services, and the lack of market access for agroecological products.

Impacts and Outcomes

- Positive impacts observed include increased yields, preservation of soil fertility, and reduced environmental impact.
- No unintended negative consequences are mentioned.
- Successful initiatives involve coffee shading, conservation of production, savings, and the use of IPM practices.
- Lessons learned mention the need for awareness creation, sensitization, and improving logistics.

Support and Resources

- Allocated resources and support systems are considered moderately suitable, with indicators like land area, good partnerships, and savings.
- Additional resources or support mechanisms needed include improved infrastructure and market prices.

3.5.3 **Rwanda**

Agroecological Policies Landscape:

- No specific inclusive policy for promoting agroecology exists at the moment.
- Actions promoting agroecology are embedded within existing sector-specific policies and strategies.
- Standards at national, regional, and international levels stipulate guidelines related to agriculture, animal husbandry, aquaculture, and other sectors.

Policy Implementation, Monitoring, and Evaluation:

- Implementation of existing standards is low, requiring increased awareness and assistance.
- The Rwanda Standards Board (RSB) has a technical assistance program aiding farmers in standard implementation.



• Challenges include low awareness among farmers and limited literacy to understand technical provisions.

Research and Knowledge Generation:

- Scientific facts and findings from institutions like RAB and the University of Rwanda justify standards.
- Standards development involves a committee of experts, and technology transfer occurs through published standards.
- Training programs on agroecological matters are managed by RSB, and a stakeholder database is maintained.

Collaboration and Partnerships:

- Rwanda collaborates with international organizations (ISO, Codex, ARSO, EAC) for standardization.
- The adoption of agroecological practices is perceived to be low, influenced by factors like low awareness and limited accessibility to inputs.

Farmer Adoption of Agroecological Practices:

- The level of adoption is considered low, attributed to factors such as low awareness, limited land, and accessibility issues.
- Reduced environmental impact is seen as a positive outcome of existing standards.

Impacts and Outcomes:

- Positive impacts include reduced environmental impact and increased productivity, while negative consequences are not explicitly mentioned.
- Successful agroecological projects include soil erosion control and afforestation programs.

Support and Resources:

- There is a need for the harmonization of good practices at the country and possibly regional levels.
- Farmers are provided with support, including small stock, cows for green manure, lime, and compost subsidies.
- Various indicators are suggested for assessing the impact of agroecological practices.

3.5.4 Cameroon

Agroecological Policies Landscape

- There are policies and initiatives in Cameroon aimed at promoting agroecological practices. These
 include practices such as mix cropping, integrating various crops and trees with cocoa, and the
 recycling of nutrients through livestock practices. The integration of non-fruit or timber trees like
 "Inga Ingalus" and leguminous plants with cocoa is also encouraged.
- The main objectives of these agroecological policies and initiatives are to increase productivity and combat environmental degradation. However, the extent to which these objectives or targets have been achieved is considered difficult to measure.
 - Respondents perceive that the effectiveness of these policies and initiatives in promoting agroecological practices is very ineffective. The main obstacle identified for their effectiveness



is the lack of effective mass awareness. Other policies that promote agroecological practices in Cameroon focus on Integrated Sustainable Land Management Financing, National Environmental Awareness, Afforestation and Reforestation, and sustainable agriculture. These policies are considered effective in promoting agroecological practices by reducing the use of chemical fertilizers, lowering production costs, and increasing the profitability of agropastoral farms.

Policy Implementation, monitoring, and evaluation

- Evaluation Mechanisms for Agroecological Policies:
 - The existence of evaluation mechanisms for measuring the effectiveness of agroecological policies is not explicitly known. There appears to be a lack of detailed information regarding formal evaluation processes.
- Monitoring Progress and Results:
 - Progress and results of agroecological policies and initiatives are monitored by reviewing the actors involved in their implementation. However, specific mechanisms or methodologies for monitoring are not mentioned.
- Indicators for Assessing Impact:
 - To assess the impact of agroecological practices on the environment, livelihoods, and food security, indicators include evaluating current practices applied by producers and examining the level of food safety.
- Challenges and Obstacles:
 - Some challenges in implementing agroecological practices include farmers' resistance to change, especially those accustomed to traditional chemical farming. Agroecology is also considered expensive, requiring training and ongoing support for farmers.
- Environmental Focus:
 - MINADER's projects, in collaboration with other partners like the Ministry of Agriculture and Environment, aim to ensure that chemical products used in agriculture are not harmful to the environment and health. Initiatives include training farmers on organic compost production and the integration of threatened species into farming systems.
- Monitoring and Evaluation Framework:
 - The presence of a specific monitoring and evaluation framework for agroecological policies is not confirmed. Details regarding indicators and metrics for assessing impact are not provided.
- Challenges in Adoption:
 - Challenges in promoting agroecological practices include the need to convince farmers to transition, high certification costs for organic produce, and the lengthy conversion period for perennial crops like cocoa.
- Primary Focus Not Agroecology:
 - While agroecological practices are mentioned, the primary focus is on organic production. However, the maturity of farmers in agroecology is considered an important indicator.

Research and Knowledge Generation

- Collaboration with Research Institutes:
 - Collaboration with research institutes like IRAD and the University of Dschange is highlighted for innovative ideas and knowledge generation in agricultural practices.
- Implementation of Research Results:
 - Research results from institutions such as IRAD and the University of Dschange are applied in farm management techniques. These results are first practiced on school field farms and commercial farms. An extension service sector is then trained to disseminate these new practices to farmers using demonstration farms.



- Information Dissemination and Training:
 - The dissemination of knowledge includes updating farmers with vital information on best farm management. Technicians work closely with farmers, particularly in post-harvest management.
- Synergy with Other Entities:
 - Various entities, such as forest guards, community forest managers, and NGOs, collaborate to train farmers in practices like agroforestry and domestication of forestry animals. These collaborations aim to constantly update farmers with relevant information.
- Training Frequency:
 - Training activities are carried out regularly, often aligned with farming seasons, production campaigns, and pilot projects. These training sessions involve various stakeholders, including vulgarisers, coordinators, and farmers.
- Institutional Collaborations:
 - MINADER collaborates with research structures, both for knowledge sharing and for formulating agroecological policies. Research findings and existing projects are used to shape these policies.
- Research and Knowledge Requirements:
 - Continuous research is emphasized as a permanent need, with the aim of generating knowledge that respects the environment and supports sustainable agricultural practices.
- Awareness and Quality Assurance:
 - Raising awareness among producers about the importance of adopting agroecological practices is a priority. Collaborations with entities like FODEC and certification bodies ensure quality control of agricultural products.
- Data Collection for Planning:
 - Data collection involves obtaining information village by village, including the number of agricultural posts and cocoa producers. This data is crucial for planning and implementing agricultural practices.
- Role and Focus:
 - MINADER's primary role is implementation rather than research. They work with various partners to apply research findings, disseminate knowledge, and train farmers.
- Internal Control System:
 - An internal control system is established for training and monitoring purposes. Internal inspections, demonstration fields, and training sessions conducted by trained individuals contribute to this system.

Collaboration and Partnerships

- Collaboration with National Institutions:
 - The ministry collaborates with all institutions on the national territory, emphasizing widespread domestic partnerships.
- Promotion of Agroecological Practices:
 - Collaboration is aimed at developing research and fostering innovations in agroecological practices.
- Effectiveness of Collaborations:
 - Respondents believe that these collaborations could enhance the transfer of innovation in promoting agroecological practices.
- Regional and International Agreements:
 - The surveyed entities have not ratified or become members of regional or international agreements guiding agroecological policies, except for the host ministry, which has ratified international agreements.



- Private Sector Collaborations:
 - Collaborations with private entities, such as HUFFINE GLOBAL SOLUTION, FERTILE GROUND LLC, and international research institutions like IRAD, play an essential role in the field.
- Support from International Organizations:
 - International organizations, including the World Bank and the EU, provide financial support for the implementation of agroecological practices. The participation in international agreements contributes to achieving sustainability goals.
- Foreign Partnerships:
 - The involvement of foreign partners, supported by both financial resources and government collaboration, is recognized as a valuable aspect of promoting agroecological practices.
- Partnership with Government Ministries and NGOs:
 - Collaboration with government ministries, such as MINEPDED, GIZ, and international research institutions like CIFOR and CIRAD, contributes to the development of technical guidelines and feasibility studies.
- Promotion of Sustainability:
 - While not members of specific agreements, the focus remains on promoting sustainability and reducing environmental footprints.
- Involvement of External Experts:
 - Collaboration with international organizations, such as Naturland and FIBL, brings in external experts to contribute to the development of internal control systems and other agroecological initiatives.
- EU Collaboration:
 - Collaboration with the European Union (EU) extends to the design of agroecological transition advice sheets and manuals, particularly in the context of food security and resilience.

Farmer Adoption of Agroecological Practices

- Moderate Adoption Factors:
 - Constraints include limited resources, the challenging nature of the work, and a lack of information. These challenges can be addressed with the right support.
- Moderate Adoption in Mix Cropping and Agroforestry:
 - Farmers show moderate adoption in terms of mix cropping and agroforestry practices.
 - Influencing factors encompass economic considerations and resistance due to cultural and farming system preferences. For instance, some crops like maize are believed to require nonshaded areas for growth.
- Regional Variation in Adoption:
 - Adoption levels vary according to agroecological zones. The West, North-West, and Extreme regions, especially in the Mandara Mountains, exhibit stronger adoption. The nature of the soil, vegetation, and opportunities for integrating animal and agricultural production influence adoption.
- Low Adoption Synergy:
 - Adoption of synergy in agroecological practices is low, with moderate adoption in mix cropping, agroforestry, and organic farming.
 - Economic and climate change adaptation considerations play a significant role in influencing adoption, while resistance and cultural factors affect the choice of crops suitable for different areas.
- Moderate Adoption with Resource and Awareness Challenges:
 - Challenges in terms of adoption include insufficient resources for farmers to engage in largescale farming projects and a lack of awareness and accountability among stakeholders.



- Weak Adoption with Popularization and Supervision Challenges:
 - Factors affecting weak adoption include the failure to popularize agroecological practices among producers and a lack of supervision of producers during the adoption process.
 - High Adoption due to Environmental Awareness:
 - About 90% of Cameroon's cocoa is produced within the agroecological system, reflecting a high level of adoption.
 - Farmers are motivated to adopt these practices due to environmental awareness, realizing the importance of preserving the environment and the quality of cocoa produced.
- Poverty-Driven Deforestation:
 - Poverty and precariousness among producers often lead to deforestation, as some may be forced to sell land and trees at lower prices to address immediate financial needs.
- Limited Number of Producers Adopting Agroecological Practices:
 - The total number of cocoa producers in Cameroon is relatively small, with not even reaching 1000 producers.
 - However, among the targeted producers, around 400 have adopted agroecological practices, indicating a high level of adoption among this specific group.
- Motivations for Adoption:
 - Producers are motivated to adopt agroecological practices by the desire to earn more income and the potential health benefits of reducing chemical use.

Impacts and Outcomes

- Location-Specific Agroecological Practices:
 - Agroecological practices are applied in three cities and the Sudano-Sahelian zone of Cameroon.
 - \circ $\,$ No specific negative impacts were reported in these regions.
- Project Collaborations:
 - Several projects have been initiated in collaboration with institutions like SODOCOTON, IRAD, and FAO to promote agroecological practices.
 - A significant productivity gain has been observed, but it requires long-term involvement and wider outreach to reach more people.
 - Developing appropriate research programs and effective methods for popularizing these practices among producers is essential.
- Positive Impact and Outcomes:
 - Agroecological practices have led to an increase in general farm productivity, adapting to climate change, conserving plant species, maintaining soil biodiversity, and improving food safety.
 - These practices have helped reduce the use of farm inputs, which is a significant challenge for smallholder farmers.
 - Agroforestry and the synergy between animals and plants have improved livelihoods and ensured food security.
- Positive Environmental Impact:
 - Agroecological practices contribute to climate change adaptation and mitigation, including the sequestration of greenhouse gases and increasing cocoa production through soil fertilization.
 - The choice of fruit-bearing trees has economic impacts as it provides secondary products to producers.
- Potential for Negative Impact:
 - Lack of awareness and incentives, potential soil degradation, and economic dependence on cocoa if agroecological practices are not adopted could be negative consequences.
- Projects Supporting Agroecology:



- GA 101083653
 Various projects, such as the PNVRA project, IATI's Cocoa Soil project, and the ICRAF project, have promoted agroecological practices.
- Challenges in Raising Awareness:
 - While several producers practice agroecology, there is a challenge in raising awareness and promoting these practices at the national and international levels.
- Certification and Environmental Protection:
 - The number of producers involved in certification of organic produce has increased.
 - Environmental protection should not rely solely on imposing legal standards, but rather on establishing responsibilities and providing environmental protection incentives.
- Positive Impact on Farmers:
 - Producers have reported earning more money and reduced health issues by adopting agroecological practices.
 - Some challenges include more work when cocoa plants are young, the manual maintenance of young plants, ease of chemical spraying, resistance to changes, and disease exposure.

Support and Resources

- National Agricultural Extension System:
 - A better national agricultural extension system is needed to support the agroecological transition.
- Limited Implementation:
 - Several projects have extensive written documents but lack active implementation in the field.
 - Funding is required to assemble farmers and conduct workshops for training in agroecological practices.
- Resource Allocation:
 - Few resources are allocated to pastoralists and farmers to facilitate the transition to agroecological agriculture.
 - Resources need to be directed toward information campaigns, training, and specific support to encourage breeders and farmers in the transition.
- Challenges related to forest communities:
 - Some communities are strongly attached to forest resources and may not fully utilize subsidies provided to them.
 - Farmers need extensive training in modern farming systems as they are often accustomed to traditional practices.
- Training and Practical Examples:
 - A lot of training with practical examples is essential for successful transition.
 - Monitoring, evaluation, and incentives, such as awards for best organic farm produce, can encourage the adoption of agroecological practices.
- Resource Availability:
 - Resources for agroecological transition are currently insufficient and sometimes non-existent.
- EU Support:
 - The EU provides support, even though the resources are considered inadequate.
- Government Involvement:
 - The government is urged to allocate resources to support the transition.
- Financial Support:
 - FODEC and MINEPAT are mentioned as potential financiers of traceability and agroecological transition projects.





3.6 Validation of the results through focus group discussions: main takeaways

Based on the methodology described in Section 2.2 the validation process used the entirety of the focus group transcripts as the foundation for interpretation and understanding of the opinions of the participants. The validation process has been limited to focus group discussions organized in only two of the ALLs i.e. Biega and Kabare in the DRC.

The validation goal was to obtain feedback from farmers, policymakers, and other stakeholders on the survey results and to identify any other ideas or perspectives that were not considered in the survey and relevant for the local stakeholders.

The focus groups were composed by potential stakeholders in the creation of the Living Lab. Following the guidelines, the teams welcomed the participants, and the moderators briefly summarized the results of the survey and those of the literature review.

Then the participants were split into three small groups, and they were asked to read the results again and discuss among themselves; following the questions cited below:

- Do the literature review and survey results accurately reflect your experiences and views?
- Are there any other ideas or perspectives you would like to share?
- Are there important policies and systemic factors you would like to mention to support agroecological transitions?

The team encouraged participants to discuss and share their ideas openly.

A general session followed the group work, and each group presented the results of their discussion. The reports from each discussion group were recorded and summaries were drawn up in plenary.

The main takeaways from the discussion are with regards to:

Present agro-ecological policies

- Extension services are key services for informing agricultural stakeholders about agroecological practices. These services must above all be informed so that they can popularize any information or knowledge.
- The government through the supervisory ministry must support the agroecology approach by establishing laws and principles favouring agroecology.
- Implementation, monitoring, and evaluation of policies
- Training on agroecological practices is of great importance in leading to the agroecological transition. Therefore, try to organize training to inform all local stakeholders.
- State services must be contacted (mandatory partner) to facilitate the implementation of the project and its delivery.

Research and knowledge production

- Research results are not often shared with consumers so that they can put them to good use by integrating them into their operations.
- Therefore, develop strategies that can help ensure that all publications are accessible to all stakeholders.



To successfully carry out the agro-ecological transition, sometimes let farmers judge the practices
resulting from any research work as good or bad and do not seek to impose the practices on them,
because even in ignorance the latter master the ecology of their environment and the practices
that are favourable to it.

Collaboration and partnerships

- For the sustainability of projects that aim to promote the agro-ecological transition, it is necessary to involve all stakeholders from the beginning and not halfway.
- State services must be contacted (mandatory partner) to facilitate the implementation of the project and its delivery.

Adoption of agro-ecological practices by farmers

- Lack of knowledge is a blockage for farmers to adopt agro-ecological practices.
- Minimum tillage would be a good practice to avoid soil erosion.
- Technologies validated in a project must be validated by local farmers when they practice them.

Impacts and results

- From agroecological practices an organic value chain can be reestablished
- Once again quality consumption will be within everyone's reach.
- Agriculture-livestock integration can be re-established in the environment.

Support and Resources

- There is not enough support and resources to support the agroecological transition, there is a need for increased financial support, increased workforce and better knowledge.
- If agricultural roads existed, access to the market would be easy and the market price would be affordable to all.

3.7 Conclusions and recommendations for policies, systemic factors, and trade-offs

Despite its limitations, this study highlights that in the target countries, agroecology policies exist but they are often embedded into different documents that have a more general target. For example, specific policies and initiatives promoting intercropping and ISFM are implemented effectively also at ground-level through training, certification, and compliance measures. It was highlighted that research findings related to agroecology and specific practices, are used for policy formulation and shared to different stakeholders through workshops and training. Promotion of agroecology is done through collaboration and synergies with national institutions, private entities international organizations including the EU, and this is evident. Adoption of agroecology practices varies across regions, with high cocoa production fostering environmental awareness. In general, the respondents agreed on the positive impacts of the implementation of the agroecology practices and the related policies including as positive outcomes increased yields and environmental conservation, soil fertility and circularity. In relation to the challenges for increasing adoption through policies, they persist in relation to limited knowledge and awareness, market access, labour costs and financial benefits e.g. low yields.



Evaluation mechanisms and monitoring processes are unclear, and farmer resistance and perceived high costs hinder implementation. Collaboration with research institutes focuses on agrobiology rather than agroecology. Positive impacts include overall farm productivity, climate adaptation, and soil biodiversity. Challenges remain in the need for awareness and supervision.

The main recommendations for enabling agroecological transition can be summarized as:

- 1. offer more attention to small farmers and provide them with increased access to financial resources, good quality seeds, seedlings, and infrastructure.
- 2. strengthen government involvement in promoting agroecological practices and provide farmers with targeted training and support. Documentation, education, capacity building, and proper guidelines are highlighted as essential for the success of agroecological practices.
- 3. collaborate with international organizations and develop sub-regional programs focused on agroecology. The local level has been a recurrent theme raised in the focus group discussions
- 4. integrate and make more evident agroecological principles into public policies. Clarity is needed regarding sister concepts like regenerative agriculture, carbon agriculture, conservation agriculture, and agroforestry.

For each of the CANALLS country the specific recommendations have been summarized as:

- DRC: More focus on small farmers, job opportunities and training, integration across sectors and markets, more access to inputs including land, and more involvement of the politicians and better governance models.
- Burundi: Create a coffee innovation platform, address the need for real government involvement, collaboration, and the creation of an innovation platform, focus on key opportunities, address general challenges, and additional support or resources for implementing policies.
- Rwanda: Harmonization of good practices is recommended at the country level, along with extensive awareness. In addition, increased integration of agroecological practices into relevant policies for a policy framework should be done together with specific budget allocation. Opportunities for advancing agroecological practices include ongoing international work on circular economy, waste management, and composting.
- Cameroon: Prioritize and intensify research focused on agroecological practices, allocate sufficient funds to promote agroecological transition, enhance human and financial resources, raise awareness, and educate farmers, encourage agroforestry, engage the Ministry of Environment, collaborate with international organizations, develop a sub-regional agro-ecological transition program, promote agroecological practices as a national cause, and embed agroecological principles into public policies.

Overall, despite the existence of agroecological policies and initiatives, their effectiveness and adoption vary across these four countries. Strengthening policies, enhancing collaboration, addressing farmer resistance, and investing in research and extension services are crucial for scaling up agroecology and reaping its benefits for sustainable agriculture and rural development.



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5. Annexes

5.1 Key actors in the AKIS at country levels

Table 25: Key AKIS actors found in the desk review in Cameroon.

Acronym	Full name of the organization
MINADER	Ministry of Agriculture and Rural Development
PNVRA	National Agricultural Research and Extension Programme
MINEFOP	Ministry of Employment and Vocational Training
CAPEF	Chamber of Agriculture, Fisheries, Livestock and Forestry
IRAD	Institut de Recherche Agricole pour le Développement
MINPOSTEL	Ministry of Posts and Telecommunications
SODECAO	Cocoa Development Company
UoD	University of Dschang
UoN	University of Ngaoundéré
BUST	Bamenda University of Science and Technology
CIRAD	Centre de Coopération Internationale pour la Recherche Agronomique et le Développement
IITA	International Institute of Tropical Agriculture
ICRAF	World Agroforestry Center
CIP	International Potato Center
	Complexe agricole du Cameroun Inc.
	Glochem Industries Ltd.
	Cameroon Chemical Fertilizer Production Company Ltd.
	Lipenja Development Company
GRADEV	Groupe d'Action pour le Développement
APROSTOCs	Associations de Producteurs et de Stockeurs de Céréales
NWCA	Northwest Cooperative Association Limited
	Southwest Farmers Association
	Northwest Farmers' Organization
CAMFFA	Association of Farmers of Cameroon
Nowepifac	Northwest Pig Farmers' Cooperative
CARCOR	Cameroon Rural and Community Radio Association
CNPC	National Confederation of Cotton Producers of Cameroon
ONPCCC	National Cocoa Farmer Organisation
Conaprocam	National Confederation of Cocoa Producers of Cameroon
PLANOSCAM	Plateforme Nationale des Organisations de la Société Civile Camerounaise
ACAFEJ	Cameroon Association of Women Lawyers
CIPCRE	Cercle International pour la Promotion de la Création
CNOP-Cam	Concertation Nationale des Organisations Paysannes du Cameroun
AIAC	Community Intervention and Action Agency
NAROS	Nature Roots Society
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
WWF	Worldwide Fund for Nature
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNEP	UN Environment programme



Table 26. Key AKIS actors found in the desk review in DRC

Acronym	Full name of the organization
SNV	National Extension Service
SENAMA	National Agricultural Mechanization Service
SENASEM	National Seed Service
SENAFIC	National Fertilizer and Related Inputs Service
MINAGRI	Ministry of Agriculture, Livestock and Fisherie
MINRD	Ministry of Rural Development
INERA	National Institute for Agronomic Study and Research
CRAA	Agri-Food Research Centre
UKMN	Kongo M-banza Ngungu University
UPN-FSA	Faculty of Agricultural Sciences at the National Pedagogical University
UNIKIN-FA	Faculty of Agronomic Sciences
UCB-FSA	Catholic University of Bukavu - Faculty of Agronomic Sciences
UNILU-FA	University of Lubumbashi - Faculty of Agronomy
IFA-FA	Institut Facultaire des Sciences Agronomiques de Yangambi - Faculty of Agronomy
ISEA	Institut Supérieur d'Etudes Agronomiques
ISDR	Institut Supérieur de Développement Rural
MESU	Ministry of Education- Ministère de l'Enseignement supérieur et universitaire
Proxfin	Platform for dialogue and study, facilitating access to finance and education
Feronia Inc.	Canadian Based Agribusiness company owning oil plantation and deals in profuction, processing and distribution of Agricultural products
EquityBCDC	Equity Bank Congo
Kawa Kivu	Kivu Specialty Coffee Cooperative
COPACO	Confédération Paysanne du Congo
FEC	Congo Business Federation
FNCCIA	Fédération nationale des chambres de commerce, d'industrie et d'agriculture
APRODECO	Association for the promotion and defense of the interests of Congolese traders
COPEMECO	Confederation of small and medium-sized enterprises in the Congo
FOLECO	Federation of Secular and Economic NGOs
CNONGD	National Council of Development NGOs
CARGs	Agricultural and Rural Management Councils



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Table 27. Key AKIS actors found in the desk review in Burundi.

Acronym	Full name of the organization
MINAGRIE	Ministère de l'Agriculture et de l'Elevage
DGMAVA	Direction Générale de la Mobilisation pour l'Auto-développement et la Vulgarisation Agricoles
DPAE	Provincial Directorates of Agriculture and Livestock
GDA	General Directorate of Agriculture
GDL	General Directorate of Livestock
ISABU	Institut des Sciences Agronomiques du Burundi
CNTA	Centre National de Technologie Alimentaire
UB-FABI	Université du Burundi - Faculté d'Agronomie et Bio-Ingenierie
UN-FAA	Université de Ngozi - Faculté d'Agronomie et d'Agribusiness
UB-FSEG- ECORU	Université du Burundi - Faculté des Sciences Economiques et de Gestion - Département d'Economie Rurale
CAPAD	Confédération des Associations des Producteurs Agricoles pour le Développement
ACORD	A Cooperation Agency for Research and Development
ADISCO	Appui au développement intégral et à la solidarité des collines
UPG	Université Polytechnique de Gitega)
CAPAD	Confédération des Associations des Producteurs Agricoles pour le Développement
DPAE	Directorate of Provincial Agriculture and Livestock
IFDC	International Fertilizer Development Center
FHI - Burundi	Family Health International - Burundi



Table 28. Key AKIS actors found in the desk review in Rwanda.

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Acronym	Full name of the organization
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
RAB	Rwanda Agricultural Board
NAEB	The National Agricultural Export Development Board
RGB	Rwanda Governance Board
JADF	Action Development Forum
UR-CAASVM	Animal Sciences and Veterinary Medicine
RICA	Rwanda Institute for Conservation Agriculture
CIK	Catholic Institute of Kabgayi
CIAT	International Center for Tropical Agriculture
COOPAC	Coffee Promotion Cooperative
CRS	Catholic Relief Services
RWARRI	Rwanda Rural Rehabilitation Initiative
CICA	Agricultural Information and Communication Center
OAF	One Acre Fund



5.2 Survey organisational summary

Sections	Questions	Objective of the questions	Type of question
1. Presentation	Welcome, explanation and data protection	Introduction to the survey	
	Is your organization currently providing extension or advisory services for farmers?	Reminder of the purpose	Yes, No
	Consent (ethical aspect questions)		Yes, No
2. Profile of the organization	[1] In which of the following countries does your organization realize advice activities?	identify the countries	Options
	[2] Please indicate which of the following options best represents your organisation	Identify the type of organization	Options
	[3] To which of the following categories does your organisation belong?	Identify the type of organization	Multiple Options
	[4] What is the scale of operation of your organisation's advisory service?	Identify the scale of operation	Multiple Options
	[5] Which advisory activities does your organisation conduct?	Identify the activities and functions	Multiple Options
3. Clients	[6] From the following list, which options best characterize your organisation's client groups?	Identify main clients	Multiple Options
	[7] How many clients or clients group (on average) worked with your organisation for advisory service last year?	Quantify outreach of the services	Number
	[8] How many clients are women?	Quantify outreach of the services	Number
	[9] How many clients are young?	Quantify outreach of the services	Number
	[10] What farming systems does your organisation advise on?	Identify the focal crops	Multiple Options
	[11] What advisory services areas does your organisation offer?	Identify the type of topics	Multiple Options
	[12] In production-related advice, what topics of advice does your organisation offer?	Identify the type of topics	Multiple Options
	[13] In your opinion, to which of the following aspects of agroecology does your organisation contribute most?	Identify the importance of 13 agroecological principles for the organization provided	Multiple Options
	[14] What is the advisory topic most demanded by your clients?	Identify topics demanded by clients	Text
4. Methods	[15] Which advisory methods are most frequently used by advisors in your organization?	Identify the methods used	Multiple options
	[16] On average, what is the relative proportion of use (in percent) of the three advisory methods in your organization	Identify the importance of methods used	Scale
	[17] What activities do your organisation's extension agents usually carry out to advise farmers?	Identify the activities of the advisors	Multiple options
	[18] Which type of digital tools do you use for providing advisory services?	Identify digital tools used for provide advice	Multiple options
5. Human resources	[19] How many employees work in your organization?	To know the number of employees and advisors	Number


Sections	Questions	Objective of the questions	Type of question
	[20] Of the total number of employees, how many are advisors?	To know the number of employees/ advisors ratio	Number
	[21] In the past five years, what can be said about the number of advisors in your organisation?	To identify the trend in organisational changes	Option
	[22] What is the highest education level achieved by the advisors in your organization?	To know education level of advisors	Option
	[23] What is the level of experience of the advisors have?	To know education level of advisors	Option
	[24] On average, how many days does an advisor receive a training on the last year?	To know trainings received by advisor	Numbers
	[25] Approximately, how many advisors participated in a training in the past three years?	To identify the type of trainings received	Scale
	[26] Which organisations have you collaborated with in the past year to train advisors in your organisation	To identify potential actors related with the activities	Text
	[27] Does your organisation have some form of mechanisms to reward good performance and incentivize skills development for advisors?	To identify rewarding schemes	Yes/No
	[28] If yes, how are advisors rewarded or incentivized?	Get insights in rewarding schemes	Text
	[29] What are the technical and methodological knowledge and skills needed by advisors in your organisation to meet the challenges in the future?	To know specific skills needed by the advisors	Multiple options
	[30] What digital skills are the most relevant for your advisors?	To explore specific skills needed by the advisors	Text
5. Funding schemes	[31] What is/are the primary source(s) of funding for your advisory organization?	Identify financial sources	Multiple options
6.Linkages with other actors	[32] How would you rate the following actors in terms of the degree of cooperation in advisory service delivery?	To know the relation with other actors	Scale
7. Contact for the future	[33] Are you or someone of your organization interested to be contacted for a workshop to discuss the advisory service system in your country?	Identify interest in the worjshop	Yes/No
	[34]. Organisation information [optional]	Collect contact data	Text



5.3 Agenda for AKIS country focus group workshops

• Bukavu (DRC): 15.09.23; Kigali (Rwanda): 18.09.23

Time <i>(Kigali)</i>	Items			
8:30	Arrival of participants and settling			
8:45	Presentation of participants and opening of WS			
9:00	Objectives of WP1_& 1.5 overview.			
	PPT Intro- Agroecology			
Session 1:				
AKIS mapping and analysis of Innovation support services (T1.5)				
9:30	Ex1. identification of agroecological practices per LL			
9:55	Ex2. AKIS mapping at LLS level: Actors			
10.30	Coffee Break			
10:45	Subgroup presentations AKIS mapping at LLs levels: Actors			
11:00	Ex3. Characterisation of advisory and innovation support services at LLS level: Services			
11:30	PPT results from online survey: characterising support services from organizations perspective			
12:00	Introduction of AKIS mapping at national level			
12:30	Lunch Break			
13:30	Ex4: AKIS mapping at national level: draft AKIS diagrams as instruments of discussion			
15:00	Reporting on Mapping exercise			
15:15	Coffee Break			
Session 2:				
Assessing the agroecological transition in CANALLS LLs from the perspective of policy makers (T1.4)				
15:30	introducing Task 1.4, PPT of questionnaire			
15:45	validation of questionnaire, also get some answers			
16:00	Closing remarks and departure			



5.4 QUESTIONNAIRE: Agroecological Transition Assessment Questionnaire for Policy Makers

Section 1: Responder

- 1.1. Name (Optional):
- 1.2. Position/Title:
- 1.3. Ministry/Department/Agency:

Section 2: Agroecological Policies Landscape

2.1. Are there specific policies or initiatives in place to promote agroecological practices such as, Intercropping (legume), ISFM, Nutrient recycling (organic waste compost), Farm diversification in Cameroon/Rwanda/DRC/Burundi? If yes, please describe them briefly.

2.2. Are there any specific goals or targets related to agroecology within your policies?

2.3. How effective do you believe these policies/initiatives have been in promoting agroecological practices among farmers?

Section 3: Policy Implementation, monitoring, and evaluation

3.1. How are policies related to agroecology (listed in question 2.1) implemented and enforced at the ground level?

3.2. Are there any incentives or support mechanisms provided to farmers to encourage the adoption of agroecological practices?

3.3. What challenges, if any, have you encountered in implementing agroecological policies in Cameroon/Rwanda/DRC/Burundi? How have you addressed them?

3.4. Are there any evaluation mechanisms in place to measure the effectiveness of agroecological policies; How do you monitor the progress and outcomes of agroecological policies and initiatives?

3.4.1. What indicators or metrics are used to assess the impact of agroecological practices on the environment, livelihoods, and food security?

Section 4: Research and Knowledge Generation:

4.1. How often do you use research results for policy formulation in agroecology and who is producing these results?

4.2. How are research findings and knowledge shared with farmers and other stakeholders?

4.3. Are there training programs or capacity-building initiatives for farmers and extension workers on agroecological practices? If yes, please provide details.

4.4. How do you ensure that relevant stakeholders, including farmers, have access to accurate and up-to-date information on agroecology?

Section 5: Collaboration and Partnerships



5.1. Do you collaborate with international organizations, research institutions, or other countries to promote agroecology? If yes, please provide details.

5.2. Are you ratifying or are you member of any regional or international frameworks or agreements that guide your agroecological policies?

Section 6: Farmer Adoption of Agroecological Practices

6.1. In your opinion, to what extent have Cameroon/Rwanda/DRC/Burundi farmers adopted agroecological practices? (Low/Moderate/High)

6.2. What factors do you believe influence the adoption or resistance to agroecological practices among farmers?

Section 7: Impacts and Outcomes

7.1. What positive impacts, if any, have you observed because of agroecological practices in Cameroon/Rwanda/DRC/Burundi (e.g., increased yields, reduced environmental impact, improved food security)?

7.2. Have there been any unintended negative consequences of agroecological practices that you are aware of?

7.3. Can you provide examples of successful agroecological initiatives or projects in your jurisdiction?

7.4. What lessons have you learned from these experiences that can guide future agroecological transitions?

Section 8: Support and Resources

8.1. In your opinion are the allocated resources and support systems facilitating the transition to agroecological farming in Cameroon/Rwanda/DRC/Burundi?

8.2. What additional resources or support mechanisms could enhance the agroecological transition?

Section 9: Outlook

9.1. In your opinion, what are the key opportunities for further advancing promoting and scaling up agroecological practices in Cameroon/Rwanda/DRC/Burundi?

9.2. What are the main challenges that need to be addressed to ensure the successful continuation of the agroecological transition in the country?

9.3. What additional support or resources would be beneficial for implementing and expanding agroecological policies?

Section 10: Recommendations

10.1. Based on your experience, what recommendations would you make to improve the effectiveness of agroecological policies and practices in Cameroon/Rwanda/DRC/Burundi?

Section 11: Additional Comments



11.1. Please use this space to provide any additional comments or insights you believe are relevant to the assessment of the agroecological transition in Cameroon/Rwanda/DRC/Burundi.



5.5 List of the literature explored:

Autors	Year of publication	Title and publisher
Ababa, A.	2019	"Ministry of Agriculture Sustainable Land Management Program."
Adimassu, Z., et al.	2023	"Identification and Prioritization of Context-Specific Climate-Smart Agricultural Practices in Major Agro- ecological Zones of Ethiopia."
Akanmu, A. O., et al.	2023	"Agroecological techniques: Adoption of safe and sustainable agricultural practices among the smallholder farmers in Africa." Frontiers in Sustainable Food Systems 7: 1143061.
Alinda, F. and P. Abbott	2012	"Agricultural policy and institutional framework for transformation of agriculture, economic development and poverty reduction in Rwanda."
Altieri, M. A.	2002	"Agroecology: the science of natural resource management for poor farmers in marginal environments." Agriculture, Ecosystems & Environment 93(1-3: 1-24).
Amekawa, Y.	2011	"Agroecology and Sustainable Livelihoods: Towards an Integrated Approach to Rural Development." Journal of Sustainable Agriculture 35(2: 118-162)
Andersson, K., et al.	2022	"Window dressing inequalities and constructing women farmers as problematic gender in Rwanda's agriculture policy" Agriculture and Human Values 39(4: 1245-1261)
Antwi-Agyei, P., et al.	2021	"Motivations, enablers and barriers to the adoption of climate-smart agricultural practices by smallholder farmers: Evidence from the transitional and savannah agroecological zones of Ghana" Regional Sustainability 2(4: 375-386.)
Atta-Krah, K., et al.	2021	. Agroecological transformation for sustainable food systems: insight on France-CGIAR research, Montpellier: Agropolis International.
Austin, K. G., et al.	2020	"Impacts of climate change on the potential productivity of eleven staple crops in Rwanda" Sustainability 12(10: 4116.)
Balasubramanian, V. and L. Sekayange	1991	"Effects of tree legumes in hedgerows on soil fertility changes and crop performance in the semi-arid highlands of Rwanda" Biological Agriculture & Horticulture 8(1: 17-32.)
Barimah Owusu, A. and S. Frimpong "	2022	Agroecological Barriers and Farming System Innovations for Sustaining Livelihoods of Smallholder Farmers in Poor and Marginalized Communities in Ghana." Available at SSRN 4239581.
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5.6 Protocol for data collection for Task 1.4:

1. Introduction

The hereby document provides the ALLs coordinators with a very simple protocol for the collection and handling of data. The objectives of this protocol are to provide ALLs coordinators and their teams general and common guidance on how to: i) Consolidate insights from the policymaker interviews; ii) Highlight trade-offs and synergies between different strategies; iii) Identify potential policy recommendations for promoting agroecology and effectively support a agroecological transition.

The protocol proposed in this document is divided into two sections. The first section outlines the approach to accomplish Task 1.4 of the project, which involves the Systematic Literature Review. Relevant academic papers, policy documents will be identified and screened to identify existing barriers and drivers for effective policy implementation for agroecology transition and consequently develop a questionnaire for policy makers.

The second section focuses on the approach to gather information at local level and validate the results with multi-stakeholders focus group discussions. The outputs of the second section are discussion transcription capturing the feedback mechanisms that underlie barriers as well as potential drivers in every case Country.

2. Data collection methods

2.1. Systematic Literature Review:

Identify relevant academic papers, policy documents, and reports on agroecology and its systemic and policy factors. Employ comprehensive search strategies to locate relevant literature, including academic databases, online libraries, and government websites. Apply rigorous selection criteria to identify and include high-quality, relevant literature. Analyse and synthesize the literature to identify key systemic and policy factors affecting agroecological transitions.

2.2. Policymaker Interviews:

Conduct interviews with policymakers at different levels of governance (national, regional, and local). Develop a semi-structured interview guide to ensure consistent and comprehensive questioning across interviews.

Interviews should focus on the following topics:

- Awareness of agroecology and its potential benefits
- Current policies and programs related to agroecology
- Challenges and opportunities for implementing agroecology
- Potential synergies and trade-offs between different agroecological strategies

Interviews will be conducted by in-country partners (INERA, RAB, ISABU, IRAD, and CAMF) under the guidance of NIBIO.

2.3. Multi-actor Focus Group Discussions:

Organize multi-actor focus group discussions locally.



Participants should include representatives from various stakeholder groups, including policymakers, researchers, farmers, extension workers, and NGOs.

Focus groups should aim to:

- Consolidate insights from the policymaker interviews
- Highlight trade-offs and synergies between different strategies
- Identify potential policy recommendations for promoting agroecology
- Focus groups should be facilitated by in-country partners (INERA, RAB, ISABU, IRAD, and CAMF) under the guidance of NIBIO.

3. Data Collection Tools:

3.1. Systematic Literature Review:

Utilize relevant online databases, academic libraries, and government websites to identify relevant literature. Use search terms related to agroecology, the specific practices for the ALLs systemic factors, policy drivers, and barrier mechanisms. Apply critical appraisal criteria to assess the quality and relevance of literature.

3.2. Policymaker Interviews:

Develop a semi-structured interview guide with open-ended questions to encourage in-depth discussion. Prepare interview protocols with clear instructions and ethical considerations. Record interviews with permission from participants and transcribe them verbatim.

3.3. Multi-actor Focus Group Discussions:

Develop a discussion guide to structure the focus group discussions. Prepare detailed notes to record key discussions and insights. Facilitate discussions in a respectful and inclusive manner, ensuring equal participation from all stakeholders.

4. Data Cleaning and Analysis:

4.1. Systematic Literature Review:

Organize and categorize literature findings using appropriate data management tools. Identify key themes and patterns in the literature. Synthesize findings to develop a comprehensive understanding of systemic and policy factors affecting agroecological transitions.

4.2. Policymaker Interviews:

Review and analyse interview transcripts to identify key themes and insights.

Code transcripts using thematic analysis or other appropriate analytical techniques.

Compile and synthesize findings from individual interviews into a coherent report.

Multi-actor Focus Group Discussions:

4.3. Transcribe focus group discussions verbatim:

Analyse transcripts to identify key themes and discussion points.

Identify emerging insights and recommendations from the focus groups.

4.4. Data Dissemination:



GA 101083653 Develop a comprehensive report summarizing the findings from all data collection activities. The report will be part of the Deliverable 1.2