Unravelling the positions, roles, and agency of Farmers' Organizations in the promotion of agroecology in Burkina Faso

Aboubakar Hayatou Iyabano

Propositions

1. Changes in funding leads to the inefficiency of Farmers Organization's activities.
   (this thesis)

2. The effectiveness of systemic intermediaries such as Farmers' Organizations depends on their capacity to create friendships.
   (this thesis)

3. Effective time management is essential for the proper functioning of brain activity.

4. The spillover effect of the Ukrainian war on developing countries' economies recalls the key role of risks and uncertainties analysis.

5. Burkina's most urgent agricultural issue is improving the country's security situation.

6. Maintaining a stable work-life balance is exceptionally hard for junior professionals.

Propositions belonging to the thesis, entitled

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Aboubakar Hayatou Iyabano

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Iyabano Aboubakar Hayatou

Thesis Committee

Promotors
Prof. Dr C Leeuwis
Personal chair, Knowledge, Technology and Innovation Group
Wageningen University & Research

Prof. Dr LWA Klerkx
Personal chair, Knowledge, Technology and Innovation Group
Wageningen University & Research

Co-promotor
Dr R Lie
Assistant professor, Knowledge, Technology and Innovation Group
Wageningen University & Research

Other members

Prof. Dr AEJ Wals, Wageningen University & Research
Prof. Dr L Idrissou, University of Parakou, Benin
Dr JCJ Groot, Wageningen University & Research
Dr VC Materia, Wageningen University & Research

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Chapter 1

General introduction

1.1 Introduction: setting the scene

This thesis contributes to debates on the roles of farmers' organizations (FOs) in the development and implementation of agroecology with a particular focus on the sub-Saharan Africa context. This study investigates the diversity of FOs involved in the promotion of agroecology in order to unravel their influence in the stimulation of farmers' implementation of agroecological innovations based on case studies from Burkina Faso. Although there is recognition in the literature that the FOs as intermediary organizations (cf. Esman and Uphoff 1984) are always having a central place in the agriculture policy of Burkina in general (Arcand 2004; Konate 2013; Kaminski et al. 2011; Lamy 2005; Zett 2013) including the spread of agroecological innovations (Bancé 2013; Dugué and Girard 2009; Métouolé et al. 2018; Inter-réseaux 2015; Iyabano et al. 2021), there are still gaps in understanding the extent to which some Burkinabè FOs start promoting agroecological innovations, the rationales behind such promotion, and the manner in which they shape their members' decisions to implement these innovations. This thesis reduces these gaps by exploring the diversity of FOs in the promotion of agroecological innovations; detailing the way they support their members' implementation of the promoted innovations; investigating the overall FOs' influence on farmers' decisions towards these innovations. This thesis contributes to theory by looking at the positions, motivations, roles, and agency of actors such as FOs and farmers in the development and implementation of agroecology. The practical importance of this thesis is its contribution to policy-making by revealing the existence of interdependencies between farmers, FOs, and the broader institutional environment of agroecology in a country confronted with persistent land degradation such as Burkina.

This chapter first elaborates on the background of the thesis and then highlights the conceptual framework that set the stage for the empirical chapters. Thereafter, the chapter presents the general research objective and questions addressed, and the research methods applied. The chapter ends with the presentation of the thesis outline.

1.2 Research background

1.2.1 Challenges facing sub-Saharan agriculture

During the past years, a range of factors has emerged bringing to reshape agriculture, making it more responsive to new societal needs and priorities in countries around the globe (Ventura and Milone 2004). The design of today's agriculture systems is impacted by the increasing costs of fossil fuel-based inputs, technological changes, climatic variations, and by emerging power of consumers (Wezel and Francis 2015). The development of smallholder agriculture in developing countries faces challenges and constraints related to persistent food insecurity (Kilelu et al. 2013). In many sub-Saharan countries, a rapidly growing population coupled with the growing food demand, alongside

pressure on productive resources, are among the factors threatening food security (Pretty et al. 2011; The Montpellier Panel 2013). According to the International Assessment of Agricultural Knowledge, Science and Technology for Development-IAASTD (2009), the main challenges facing sub-Saharan agriculture include low productivity; rapid depletion of the natural resources; high levels of natural risk and uncertainty – aggravated by climatic variability; overall limited uptake of agricultural technologies; an asymmetric connection between farmers and market; and limited access to extension facilities. Furthermore, the frequent exposition of farmers to droughts caused by the climatic variability affecting the semi-arid areas of West African countries (Andrieu et al. 2015; Zorom et al. 2013; Lancelloti 2019; Debray et al. 2019) have largely contributed to accelerate the resource degradation, thereby placing many farmers in a vulnerable position to food insecurity.

1.2.2 Agroecology as a promising solution for the current challenges facing sub-Saharan agriculture

Agroecology has been recognized as a potential route to solve current challenges of agriculture production by offering multiple economic, social, and environmental benefits (Van Hulst et al. 2020; Wezel et al. 2009). Agroecology gained the attention of the international community and policy-making arena (cf. Anderson & Maughan 2021) following the publication of the IAASTD report in which many institutions like the European Union's Standing Committee on Agricultural Research and the UN Special Rapporteur on the Right to Food started to advocate for the agroecological forms of farming (Rivera-Ferre 2018). Agroecological initiatives aim at proposing alternative paradigms to industrial agriculture based on the encouragement of local use of innovations and resources by smallholders (Altieri and Toledo 2011). Though agroecology has gained recent attention in the international policy arena, the term was first used in the 1930s during which agroecology was mainly viewed as the scientific application of ecology in the management of agroecosystems (Wezel et al. 2009).

From the 1980s onwards, the term agroecology was also viewed as a movement for pursuing food sovereignty (Duncan et al. 2019) and/or a set of practices that promote environmentally friendly agriculture from the consideration of farmers' traditional knowledge (Wezel and Silva 2017; Altieri and Toledo 2011; Mier et al. 2018). Many agroecological techniques[1] already exist around the world and are applied in varying degrees according to regions and climatic conditions (Wezel 2017). Examples of these techniques include crop rotations, association of trees with crops, mixed crop-livestock integration, biological control of pests and diseases, and application of compost and manure (Wezel 2017; Mockshell and Kamanda 2018; Altieri and Toledo 2011; Iyabano et al. 2023; Probst et al. 2019; Descheemaeker et al. 2016). Several studies have highlighted the importance of agroecology

[1] Agroecological techniques are also called agroecological innovations or ecologically -based techniques in this thesis.

in the development of African agriculture in general (e.g., Ameur et al. 2020; Bellwood-Howard and Ripoll 2020; Bezner Kerr et al. 2018; Gliessman 2020; Pimbert and Moeller 2018; Mousseau 2015; Mugwanya 2019; Peano et al. 2020), and semi-arid West African countries like Mali, Senegal, northern Togo and Burkina Faso in particular (Bakker et al. 2021; Boillat et al. 2021; Bottazzi and Boillat 2021; Debray et al. 2019; Iyabano et al. 2021; Métouolé et al. 2018). This importance comes from their contribution in improving soil health since many African soils are nutrient-poor with very low use of external inputs (compared to the other regions of the world) (Pretty et al. 2011).

In the case of Burkina Faso, many studies have reported the key consideration of agroecology by many NGOs, agro-companies (such as those supporting cotton FOs), FOs, and in some cases agricultural policy actors[2] as a promising solution for slowing down the persistent land degradation issues (Kessler 1992; Slingerland and Stork 2000; Teklehaimanot 2004; Sidibé 2005; Sawadogo et al. 2008; Bancé 2013; Korbéogo 2015; Lancelloti 2019; Iyabano 2021). This consideration started during the first drought period (in the 1970s) with the promotion of improved traditional soil and water conservation techniques (Roose et al. 1999; Slingerland 2000). The promotion of these techniques was further amplified with the activities of Pierre Rabhi (a French agroecology activist) in northern Burkina during the 1980s drought period and the recent introduction (in the early 2000s) of organic agriculture technology throughout the country (Bancé 2013). The promotion of agroecological techniques was always conducted through joint cooperation between NGOs (the main proponents of agroecology) and FOs (see Bancé 2013; Iyabano et al. 2021) since FOs are those playing the intermediation between farmers and rural development institutions. This importance of FOs as institutional vehicles for the agricultural policy in Burkina can be traced during the last period of the colonial administration (during which FOs were the main connection bridges for reaching farmers located in villages) and later reinforced with the implementation of the structural adjustment reforms of the World Bank and the International Monetary Fund (Zett 2013; DSDR 2015).

The advent of the reforms was mainly characterized by the government transfers of most of the organizations of agricultural development activities to the (already existing and newly created) FOs. FOs then became very active in the provision of at least one of the three services to their members: economic (i.e. supplying micro-credits and input credits and organizing collective marketing of farmers' products), technical (by facilitating farmers' access to agriculture knowledge and information through the organization of training and exchange activities), and advocacy (i.e. acting as the spokesperson of farmers at the national and sometimes international arenas) (DSDR 2015; Zett 2013; Coronel and Keita 2010). Although some work has been done on the role of FOs in the development

[2] The considerations of policy actors (such as the Ministry of Agriculture and the confederation of FOs) mainly concern the promotion of some traditional soil fertility management techniques widely practiced by farmers such as composting, manuring and *Zaï* depending on the demand from international agricultural development partners. This is because their main focus is to improve the Burkinabè farmers' access to quality chemical fertilizers at reasonable prices.

and dissemination of agroecology in Burkina (Dugué and Girard 2009; Bancé 2013; Métouolé et al. 2018), questions remain about: what meaning do FOs and farmers' give to agroecology, what influences their promotion of agroecological innovations, and whether and how they contribute to farmers' decisions towards agroecology.

1.3 Conceptual orientation of the thesis

This research focuses on the role of FOs as innovation intermediaries in facilitating the development and implementation of agroecological innovations in Burkina. This is by connecting their members to the wider institutional environment of the agroecological innovation system. This section provides a brief overview of the perspectives used for studying the contribution of FOs in the promotion and expansion of agroecology in Burkina Faso.

1.3.1 The functions of innovation intermediaries within innovation systems

An innovation system is considered to be a network of organizations or individuals who demand and supply knowledge and technology focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance (World Bank 2006). The innovation systems approach, which stresses the importance of having organizations that facilitate the link between heterogeneous actors in the innovation process, is becoming recognized within the innovation literature through the use of concepts like "innovation broker" or "innovation intermediaries" (Klerkx et al. 2009). Innovation intermediaries perform many functions in supporting the innovation process by facilitating needs identification; building coalitions of different stakeholders; promoting platforms for information and knowledge sharing; sourcing funding for projects; and enhancing business skills and negotiation (Kilelu et al. 2011; Klerkx, Hall, & Leeuwis 2009; Mathé et al. 2016).

These functions are performed by actors: government agencies, companies, NGOs and FOs (Kilelu et al. 2011; Yang et al. 2014; Klerkx et al. 2009). As innovation intermediaries, FOs provide favorable conditions for integrating farmers into the wider innovation networks (Yang et al. 2014). This is by strengthening farmers' negotiation abilities in the markets to gain more competitive prices for both inputs and outputs, reduce transaction costs and information asymmetry, and improve the standardization of production (Ma and Abdulai 2016; Moustier et al. 2010; Yang 2013; Tefera et al. 2017; Orsi et al. 2017). FOs' marketing services, therefore, improved farmers' access to market opportunities and bargaining positions as they cannot access these services individually (Tefera et al. 2017; Orsi et al. 2017). FOs can also play a key role in the acquisition and direction of funds for the organization of innovation activities such as training, workshops, exchanges, and farm visit sessions (Reed and Hickey 2016; Bakhuijs 2013; Wennink and Heemskerk 2006) which are necessary for stimulating their members' to access updated agriculture knowledge and information.

1.3.2 FOs' and farmers' agency in the development and implementation of agroecological innovations

The question of how innovation networks effectively deal with the opportunities and challenges offered by their environment (Klerkx 2014) brings the importance of agency. Agency is defined by Giddens (1984) as the ability of individuals and groups to take action and make a difference in a course of events. This is determined by the resources and competencies (i.e. knowledge, skills, material and financial resources) that actors (both individuals and groups) have at their disposal for innovation (Klerkx 2014). Focusing on agency is particularly important for understanding the dynamics of the promotion and expansion of agroecological innovations as it can help to show how actors (in our cases, the FOs and farmers) define their valued interests and decide on a particular course of action (i.e. engagement in the promotion and/or implementation of agroecological innovations concerning FOs and farmers respectively) (López-García et al. 2021; Westley et al. 2013; Ollivier et al. 2018). Such decisions are usually determined by the everyday interaction between agroecological innovations actors through the intermediation of FOs. As one of the key intermediary organizations, FOs are thus very active in the mobilization of resources from their wider innovation networks in order to encourage their members' implementation of agroecological innovations (Mier et al. 2018; Schiller et al. 2020a; Schiller et al. 2020b). Furthermore, focusing on agency will also help to show the processes and interactions connected to the development and implementation of agroecological innovations by clarifying whether these actors (namely FOs and farmers) are genuinely interested in agroecology or promote it for opportunistic reasons.

1.4 Research objective and questions

This thesis aims to contribute to a better understanding of the position, roles, and agency of FOs in stimulating their members' implementation of agroecological innovations in Burkina Faso. From this aim, the following overarching research questions were derived to guide the different empirical chapters developed in Chapters 2 to 5:

- How has the place of FOs in the agriculture policy of Burkina Faso evolved over time?
- Why and how do the current FOs become involved in the promotion of agroecology, and how do the FOs and farmers define the term agroecology or agroecological techniques?
- How do FOs stimulate their members' interests towards practicing agroecology?
- What is the effectiveness of FOs' stimulation on farmers' agroecological innovations decisions?

1.5 Research methods

This section presents the summary of the overall methodological choices used in the thesis besides the fact that each empirical chapter has its own methodology section.

1.5.1 Research design

Addressing complex problems such as the development and implementation of agroecology requires a holistic research approach that seeks to understand processes and events in their real-life context. The case-study approach permits the researcher to develop in-depth, holistic, and meaningful characteristics of real-life social phenomena or processes (Yin 2009). The case-study approach is appropriate in this research because it stresses contemporary social processes in their actual setting by addressing the "how" and "why" questions. Cases were selected in a two-step process: an exploratory study followed by in-depth multiple case studies. Exploratory FOs' cases were identified after an extensive review of documents that focused on FOs and agroecology in Burkina Faso. The list of FOs' cases was completed during my participation in two agroecology gatherings organized in 2015 (i.e. the peasant innovation fair led by Prolinnova[3] and the agroecology workshop initiated by the NGO Inter-réseaux) where I had the opportunity to discuss the purpose of my research. In-depth FOs' cases were selected from those studied during the exploratory phase with the aim of detailed description of the dynamics of the FOs' involvement in the promotion of agroecological innovations, the way the FOs stimulate their members' interests towards these innovations, and the farmers' explanations of their decisions about the agroecological innovations promoted by their FOs. These FOs were selected according to their goals in promoting agroecological innovations: enhancing the productivity of commercial crops; improving the resilience of subsistence farmers; and enhancing both the productivity of commercial crops and the resilience of subsistence farmers.

1.5.2 Data collection and analysis

Data were collected through document research, observations and interviews (see Table 1.1). The use of multiple techniques helped to multiply sources of evidence to enhance the validity of the study (Yin 2009). Document research (such as reports on the FOs' projects, articles, newspapers, etc.) helped to obtain meaningful information related to each research question addressed. Observations during field visits helped to picture the types of agroecological techniques promoted by FOs. Interviews were conducted in three phases: 2015 (April to June), 2016 (November to May) and 2018 (February to May). The aim of the first two phases was to gain the necessary information for characterization of the case studies in order to identify the FOs' goals towards agroecology and unravel the way they

[3] Acronym of a network called "Promoting Local innovation in ecologically oriented agriculture and natural resource management (www.prolinnova.net).

stimulate their farmers' interest towards more agroecological innovations. The aim of the last phase was to complete the missing information during the previous phases by focusing on the in-depth identification of important events that shaped the promotion of agroecology from the three cases and the FOs' and their members' interpretation of the term agroecology and/or agroecological techniques. This phase also helped to obtain information concerning farmers' explanations of their decisions towards agroecology by emphasizing the influence of their FOs on these decisions.

Some of the interview data were audio recorded (whenever possible) and transcribed verbatim. The collected data were stored with other data obtained from interview transcripts and documents, and analyzed by employing multiple methods (see Table 1.1) depending on the research questions addressed in each empirical chapter. These include content analysis (Chapter 2, Chapter 3 and Chapter 5); event history timeline (Chapter 2 and Chapter 3); actor-matrix mechanism (AMM) approach for showing the types of actors the FOs are collaborating with to access to resources necessary for stimulating farmers' interests towards agroecological innovations (Chapter 4); and descriptive statistics and Vroom's expectancy equation of motivation (Chapter 5). Content analysis of documents and interview transcripts was used to shed light on the agricultural development functions performed by FOs in Burkina Faso (Chapter 2), to identify their goals in promoting agroecological innovations (Chapter 3), and to obtain farmers' explanations of their decisions about agroecological innovations (Chapter 5). Making an event history timeline helped to retrace the evolution of the place of FOs in the Burkinabè agriculture policy (Chapter 2) and to analyze the dynamics of the FOs' promotion of agroecological innovations based on their relations with external partners (Chapter 3). The descriptive statistics method was used to present the frequency of farmers' implementation of agroecological innovations situations. The Vroom's expectancy equation of motivation (cf. Vroom 1964) helped to analyze the influence of FOs on farmers' decisions about agroecological innovations. This equation is a product of individual instrumentality (i.e. the knowledge of the relationship between work efforts and desired behavior or outcome), valence (i.e. the value attached to the outcomes) and expectancy (i.e. individual's belief to perform the work successfully). Further details and underpinnings are provided in the empirical chapters.

Table 1.1 Overview of research design, data collection and data analysis used in the four empirical chapters

Chapter	Research design	Data collection methods	Data analysis
Chapter 2	-	Document research Informants and key informant interviews	Event history timeline Content analysis of documents and (informant) interviews
Chapter 3	Exploratory (n=8 cases) and (n=3 cases)	Document research	Content analysis of documents and FO interviews

	in-depth multiple case studies	Observations Informal and formal semi-structured interviews	Event history timeline
Chapter 4	Multiple case studies (n=3)	Informal and formal semi-structured interviews Observations Document research	Actor-matrix mechanism approach for the structure and functions of intermediaries
Chapter 5	Multiple case studies (n=3)	Document research Formal semi-structured interviews	Content analysis of documents and (farmers) interviews Descriptive statistics for farmers' situations for implementing agroecological innovations Vroom's expectancy equation of motivation

1.6 Thesis outline

This section introduces briefly the scope of the thesis, which consists of six chapters summarized in Figure 1.1. Chapter 2 is a historical chapter that presents the evolution of FOs' functions in the agricultural development activities of Burkina Faso within the three main periods of the country's agriculture policy. This chapter provides a relevant historical context to the next empirical chapters of the thesis (which specifically focus on the FOs that are currently involved in promoting agroecological techniques) by unravelling the dynamics of their functions in supporting farmers' agricultural development processes. Chapter 3 looks at the diversity of the current FOs in the promotion of agroecological techniques by focusing on their reasons for promoting agroecology and the way the FOs and farmers define agroecological terms. The results show that the FOs' promotion of agroecological techniques is largely connected to their aim of fulfilling one of these goals: enhancing the productivity of commercial crops; improving the resilience of subsistence farmers; enhancing both the productivity of commercial crops and the resilience of subsistence farmers. FOs are achieving these goals by constantly interacting with external partners to obtain the necessary assistance for the provision of agroecological support services to their farmers. The results also reveal that the FOs' definitions of agroecology or agroecological terms are mostly associated with the interpretation of agroecology as a collective practice encompassing both economic and ecological aspects of agriculture.

Chapter 4 continues the investigation of FOs' role in the promotion and expansion of agroecological innovations by detailing the process of FOs' stimulation of their members' interests towards agroecological innovations. The innovation intermediaries concept is applied to understand the intermediary functions of FOs in facilitating farmers' development of agroecology. The results show that FOs fulfill both the knowledge (i.e. the facilitation of farmers' access to learning facilities) and innovation (i.e. demand articulation/stimulation, network brokerage, and innovation process monitoring) intermediation functions in the process of stimulating their members' implementation of agroecological innovations. Chapter 5 deepens insights on the FOs' role in the development and implementation of agroecology by analyzing their influence on factors that affect farmers' agroecological innovations decision-making processes by following a system thinking perspective. The chapter presents an analysis of the diversity of farmers' implementation of agroecological innovations situations and demonstrates how the FOs influence farmers' agroecological behaviors based on the FOs' actions on the three main driving forces of innovation decisions: instrumentality, valence and expectancy. Finally, Chapter 6 provides a synthesis of the overall findings by discussing crosscutting issues and reflecting on the implications of the study.

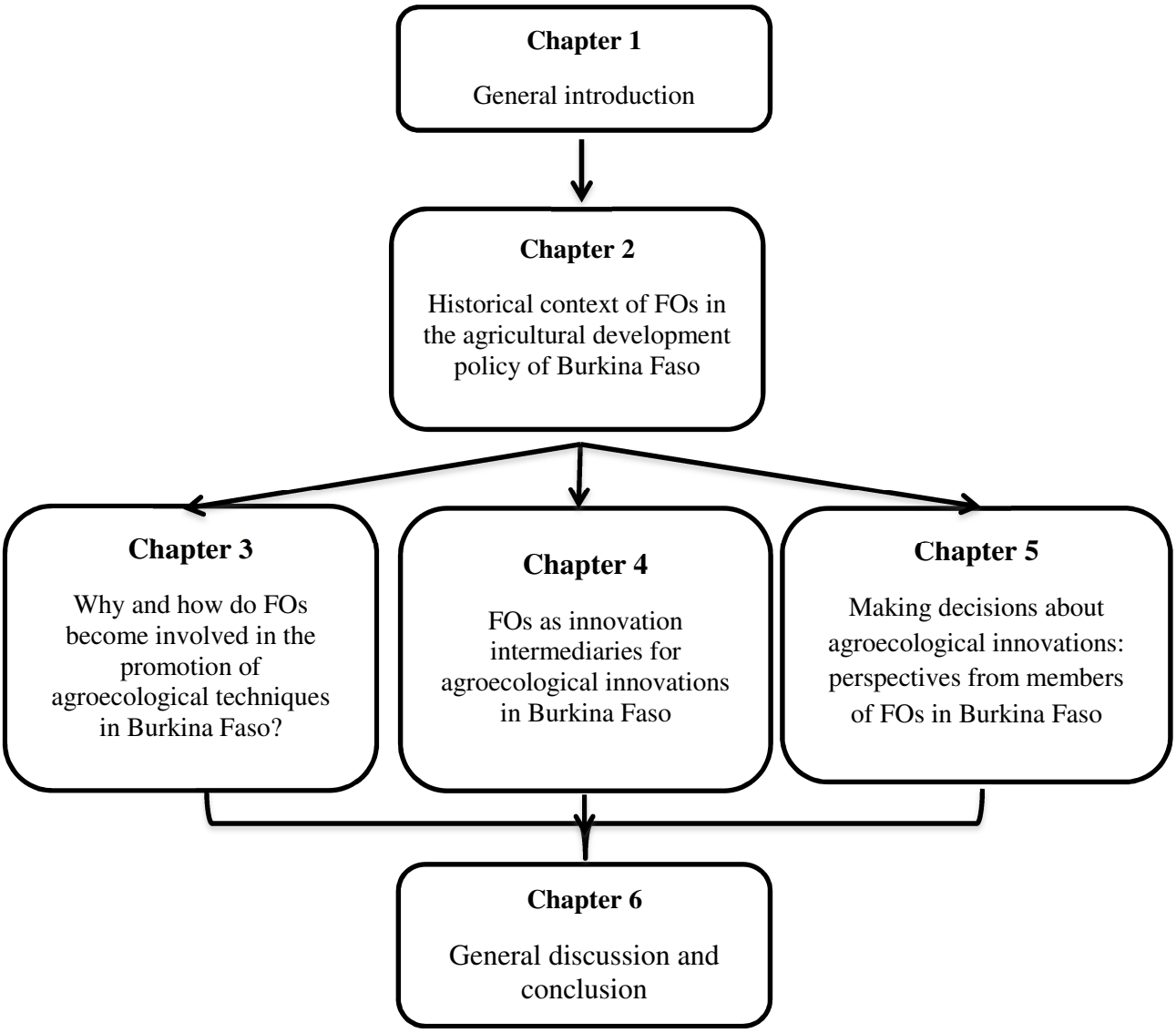

Figure 1.1 Overview of the thesis chapters

Chapter 2

Historical context of farmers' organizations in the agricultural development policy of Burkina Faso

This Chapter is to be prepared and submitted to the Review of African Political Economy as:

Iyabano, A., Leeuwis, C. Historical context of farmers' organizations in the agriculture policy of Burkina Faso

Abstract

This chapter presents the evolution of the functions of farmers' organizations (FOs) in the agricultural development of Burkina Faso. Based on an extensive literature review and interviews with resource persons, we traced back the evolution of the place of FOs within three main periods of the agriculture policy of Burkina. The study reveals the existence of both continuity and discontinuity of the place of FOs in the country's agriculture policy. The continuity of FOs' place is mainly related to their consideration (during all the three periods) as instrumental in the introduction of agricultural innovations. Whereas, the discontinuity of FOs' place is connected to the government transfer of the organization of many agriculture development activities to FOs following the implementation of the World Bank reforms during the third period of the country's agriculture policy. The consequences of these reforms were witnessed with the active involvement of FOs in the provision of economic, technical, and in some cases advocacy services. The study also indicates that the current configuration of Burkinabè FOs characterized by the existence of both community development-oriented and value chains-oriented FOs is largely shaped by the dynamics of the country's political and economic situations. The study concludes by recommending the integration of both types of FOs in the national agriculture policy debate so to reflect the diversity of the country's agriculture situations.

Keywords: Collective actions, Peasant movement, Agroecology, Agricultural value chains, Village associations.

2.1 Introduction

Since the implementation of the structural adjustment policies[4] in sub-Saharan Africa, governments and quasi-public corporations in charge of the agricultural development sector have seen their powers being reduced (Blein and Coronel 2013; Wanyama et al. 2009). Consequently, many governments had transferred most of their responsibilities in managing agricultural development activities (including the provision of input credits, technical training and marketing services) to farmers' organizations (FOs)[5]. Mercoiret (2006) has mentioned three main features of the implemented reforms in the context of sub-Saharan countries. Firstly, they were mostly imposed on sub-Saharan governments in relation to the global financial negotiations in order to obtain loans from the International Monetary Fund (IMF) and the World Bank (WB). Secondly, they largely followed a normative model (i.e. withdrawal of the government from direct support of most of the agricultural development functions, reduction of compensatory mechanisms and market liberalization) with little consideration of the diversity of agricultural situations in each country. Thirdly, the reforms were conducted at variable rhythms according to countries, regions and/or agricultural value chains. Following the implementation of these reforms, many West African FOs managed to undertake the transferred responsibilities by being actively involved in agricultural input supply, provision of extension services, product processing and collective marketing of farmers' products (Blein and Coronel 2013).

Numerous studies (see e.g. Blein and Coronel 2013; Bosc et al. 2002; Hrabanski 2010) have mentioned the prominent role of the structural adjustment reforms in the expansion of FOs in many West African countries. Examples of such expansion include the multiplication of farmers' village associations[6] in Mali and the creation of federations of several FOs for representing farmers in various negotiations with policy actors in Senegal and Benin (Bourgoin et al. 2020; Coronel and Keita 2010; Hrabanski 2010; Mangnus 2015). Although the IMF and WB reforms had renewed many West African governments' interest in FOs, it might be noted that the situation was different in a country like Burkina Faso as collective action initiatives were always central in the country's agriculture policy (Konate 2013; Zett 2013). This started during the last period of the colonial administration and continued with various government regimes (Lamy 2005). Burkina Faso also has the oldest post-Independence francophone West African FO (Pesche and Barbedette 2004).

[4] Structural adjustment policies in agriculture have been extensively implemented in sub-Saharan Africa since the early 1980s (Oya 2006). The policies included a series of neoliberal reforms with the expectation of redressing the economics of African countries through their integration into the global economy (Meagher 2003).

[5] FOs can be defined as membership organizations composed of farmers seeking to fulfill agricultural development activities through collective action (Tanguy et al. 2008) covering diverse forms of organizations ranging from village groups/associations to unions and federations (Diagne and Pesche 1995).

[6] These forms of FOs were initially promoted by the Malian Government during the nationalization of the cotton sector in 1974 in order to facilitate access to input credit, organize the collection of cotton lint and distribute payments of cotton farmers from the same village (Mangnus 2015).

The objective of this study is to analyze the history of the place of FOs in the agricultural development policy of Burkina Faso so as to unravel the dynamic of the functions they are playing in supporting their farmers' agricultural development processes. Besides adding to the literature on the role of FOs as institutional vehicles in the development of sub-Saharan agriculture, the study also provides a relevant historical analysis of the transformation of (many) Burkinabè FOs in relation to various national and international institutional changes. Section 2.2 outlines the data generation and analysis methods. Section 2.3 describes an overview of the major agroecological zones and the economy of Burkina. Section 2.4 presents the results by highlighting the place of FOs within three main periods of the country's agricultural development policy. Section 2.5 analyzes and discusses the results by emphasizing the continuity and discontinuity of the place of FOs in the Burkinabè agriculture development policy. The last section concludes by suggesting one policy recommendation from the results of the study.

2.2 Data generation and analysis methods

Data were generated from an extensive review of literature and policy documents, informant interviews and (two) key informant interviews. The first key informant was identified during my participation in a workshop (entitled the role of FOs and agroecology) organized by *Inter-réseaux* (an NGO), during which I approached one of the participants (a senior farmer, member of the administrative board of the *Fédération des Professionnels Agricoles du Burkina* based in Koungousi, the Center-North Region) following his presentation of the history of FOs in Burkina Faso. The second key informant (a member of the West African livestock network of FO called *Réseaux Billital Maroobé* in Dori, the Sahel Region) was identified following the advice of another workshop participant (a member of *Union niébé*, an FO). The interviews were conducted in the location of the two key informants (in December 2015 in Dori and February 2016 in Koungousi) to collect historical information of FOs in agricultural development activities. Furthermore, informant interviews were also carried out between 2015 and 2016 to obtain information on the current status and functions of FOs in agricultural development activities from the Ministry of Agriculture (the person in charge of FOs' development) and administrators of seven FOs identified during the *Inter-réseaux* workshop.

Based on information obtained from documents and interviews, I was able to reconstruct an overview of the history of FOs in Burkina's agricultural development and the extent to which various events have influenced their functions over time. This served as a guideline for additional document research to trace back the evolution of their place in the national agricultural development policy. Data generated from interviews and documents were organized, stored (in Microsoft Excel software) and analyzed using an event history timeline and content analysis methods (cf. Silverman, 2013). The event history analysis was mostly focused on the post-colonial period, since that is when the Government can be said to have the responsibilities for managing agricultural development activities,

although this remained largely influenced by the continuity of the colonial agricultural modernization projects. This event analysis helped to identify three essential periods that shaped the place of FOs in the country's agriculture policy. Content analysis of documents searched was used to shed light on the agricultural development functions performed by FOs and the task division between FOs and government during the three main agricultural development policy periods. Content analysis also helped to distinguish the three agricultural development functions performed by the current Burkinabè FOs. These include the provision of economic, technical and advocacy services (DSDR 2015; Zett 2013).

2.3 Overview of the major agroecological zones and economy of Burkina Faso

Burkina Faso is a landlocked low-income country of West Africa (with about 20 million inhabitants) located between Niger, Mali, Ghana, Togo, Benin and Côte d'Ivoire (Figure 2.1) with a Sudano-Sahelian climate consisting of four agroecological zones (UNDP 2007). The *strict Sahelian* zone is the far north part of the country where rainfall is between 200 and 500 mm/year and population density around 5 inhabitants per km^2. It is primarily a region of livestock herding, both sedentary and transhumant. The *Sub-Sahelian* zone is located between the north Sudanian zone and the strict Sahelian zone, with an annual rainfall of 600–750 mm and a population density of 36–50 inhabitants per km^2. The zone is characterized by intensive agro-pastoral activities constrained by decreasing rainfall and soil fertility leading to frequent food-security issues. The *north Sudanian* zone covers the middle part of the country with a rainfall of 600–900 mm and is the most densely populated zone of the country (more than 50 inhabitants per km^2) leading to increasing pressure on arable land. The zone is marked by the existence of both subsistence (sorghum and millet) and commercial crop farming (cotton, cowpea, maize, rice, vegetables) and the practice of nomadic pastoralism.

The *south Sudanian* zone is the most humid area of the country (with rainfall reaching 1000 mm) and a population density of 20 inhabitants per km^2. The zone is the prime target of migration of people coming from other regions of the country and agricultural activities are dominated by commercial crop farming (UNDP 2007). The economy of Burkina, like many other developing countries, depends largely on agriculture despite the advent of gold exploitation. The sector is dominated by small-scale farms with less than 5 ha employing 80% of the working population and contributes to an average of 34% of GDP (MAFAP 2013). The volume of the agricultural products contributing most to the national economy (foreign currency) is 60% for cotton, 34% for groundnuts and 4% for sesame (MAFAP 2013). The high contribution of cotton is a consequence of the strategic choice of the sector from the colonial period administration to the various post-colonial government regimes from 1960 onwards (Herrera and Ilboudo 2012).

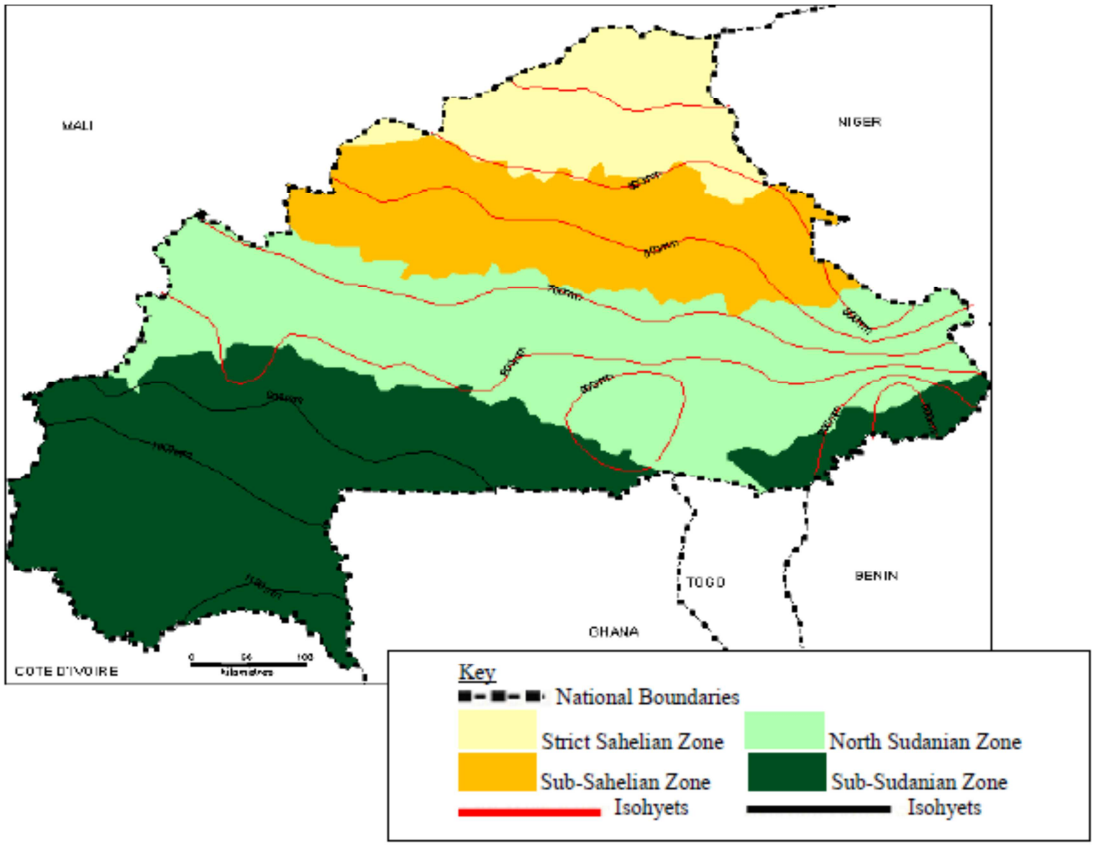

Figure 2.1 The agroecological zones of Burkina Faso. **Source**: UNDP (2007).

2.4 Post-Independence history of FOs in the agriculture policy of Burkina Faso

The post-Independence history of FOs in the Upper Volta[7] was marked by the continuity of the colonial strategy encouraging farmers to create FOs in the form of village groups locally called *Groupements Villageois* (GVs). The GVs were firstly tried out in the cotton sector (by the French colonial administration) for facilitating the production, collection and export of cotton (Kaminski et al, 2011). The GVs were established out of the existing traditional village organizations, where farmers from the same village used to gather to provide mutual self-help (see Ledea Ouedraogo 2002) for communal farming activities (i.e. plowing, weeding, and harvesting) during the peak labor requirement period. After Independence in 1960, the Government opted for the community development strategy by promoting the creation of GVs as instruments to implement agricultural modernization projects (Konate 2013; Zett 2013; Lamy 2005). Over the years, changes in political and economic situations have shaped the government policy towards FOs (Table 2.1).

[7] Upper Volta was the name of Burkina Faso before the advent of the socialist government in 1983.

Table 2.1 History of the place of FOs in the three main periods of the agriculture policy of Burkina

Period	Description
1960–1980: Indirect and direct government management of agricultural development activities by encouraging the creation of FOs to serve as the link with farmers	• Implementation of agricultural modernization projects by four French agricultural development organizations so-called "*Sociétés d'Intervention"*. These encouraged the creation of FOs in the form of village groups or "*groupements villageois"* (GVs) to facilitate provision of input credits, technical training and marketing support (for cash crops) to farmers. • Establishment of public organizations called "*Organismes Régionaux de Développement*" (ORDs) to take the place of the "*Sociétés d'Intervention"*. The ORDs continued to promote the creation of GVs for provision of input credits, technical training and marketing support to farmers.
1980–1990: Beginning of the government's giving responsibility to FOs to manage some agricultural development activities	• Implementation of the agrarian and land tenure reform by the "*Conseil National de la Révolution",* which created a government entity called "*Autorité de Mise en valeur de la Vallée du Sourou"* (AMVS) to promote the development of irrigated crops. The AMVS assigned the management of the irrigation schemes to the newly created cooperatives. • The reform also introduced the environmental issues into the national policy agenda and promoted the diffusion of ecologically based agricultural techniques. Besides the agrarian reform, the period of the 1980s was marked by the delegation of the management of input credits and marketing activities to the cotton GVs.
1990–onwards: Progressive transfer of most of the government responsibilities in managing agricultural development activities to FOs	• Implementation of the structural adjustment reforms in the agricultural sector characterized by the reduction of many government responsibilities in managing agricultural development activities • Structuration of rice and cotton FOs into the union of FOs and formulation of the agricultural value chain(s) law (*loi* 14) leading to the emergence of many FOs to undertake management of agricultural development activities previously managed by the government. These activities include the provision of economic (i.e. input credits and marketing) and technical support services to farmers.

Source: Own elaboration based on information obtained from document research and interviews

2.4.1 Period of indirect and direct government management of agricultural development activities: 1960–1980

The first post-Independence period of the Upper Volta agriculture policy was characterized by the implementation of agricultural modernization projects, during which Maurice Yaméogo (the first president of the country) assigned the task to four French agricultural development organizations commonly called "*Sociétés d'Intervention"* (SIs)". The four SIs included: the "*Compagnie Française des Fibres Textiles"* (CFDT, 1947–1979); the *"Société d'Aide Technique et de Coopération"* (SATEC, 1961–1964); the *"La compagnie Internationale pour le Développement Rural"* (CIDR, 1964–1968); and the *"Bureau pour le Développement de la Production Agricole"* (BDPA, 1965–1966) (Lamy, 2005). All the SIs encouraged farmers to create VGs to introduce modern agriculture innovations (i.e. animal traction tools for land preparation and synthetic inputs) and organize the marketing of cash crops (Ouédraogo 2005; Arcand 2004).

CFDT activities were mostly conducted in the Western Region for the development of cotton farming. The activities started in 1947 (during the colonial period), where CFDT firstly focused on capturing

farmers' interest in cotton cultivation based on free adhesion principles (Kaminski et al. 2011). The free adhesion principles were because cotton cultivation used to be a coercive tool imposed by the colonial administration in the 1920s, which pushed many farmers to start selling their cotton to local markets or to export their product to Ghana (bordering country) instead of supplying to the colonial administrators (Kaminski et al. 2011). CFDT encouraged farmers to create GVs in order to provide credit for inputs (i.e. synthetic fertilizers, pesticides and cotton seeds), technical training and marketing (including collection, ginning and export of harvested cotton) support (Kaminski et al. 2011). The CFDT agents were responsible for the organization of training following the prescribed technical recommendations of cotton farming (DGPV 2010). CFDT continued to be responsible for the development of the cotton sector until its replacement by SOFITEX—*Société des Fibres Textiles*—in 1979, a newly created parastatal agro-company owned by the Government, the French Geocoton group and the cotton FO (following the restructuring of the GVs in 1998 as described in Section 2.4.3).

Agricultural modernization projects were also implemented in three other regions of the country by three different SIs: SATEC in the Center, CIDR in the South-West and BDPA in the North (Arcand 2004). About 500 GVs were created for the provision of input credits and technical training, but most of these GVs disappeared soon at the end of project activities because of the low rate of credit reimbursement of these GVs since most of their members were primarily cultivating crops (such as sorghum, groundnuts and cowpea) for self-sustenance (Zett 2013). However, some of the GVs in Yatenga Province (in the Northern Region) continued some of their activities, namely, communal farming, after the end of the project activities. The continuity of communal farming activities was influenced by the mutual self-help culture largely practiced by Mossi[8] people (Ledea Ouedraogo, 2002). As explained by Lamy (2005) and Gentil and Mercoiret (1991), the GVs of Yatenga Province were the only cases built through the combination of traditional social organizations (based on mutual self-help activities) with modern forms of farmers' associations (for introducing modern agriculture innovations). The mutual self-help activities were usually conducted in the rainy seasons, during which young farmers formed groups called *Kombi-Naam* (translated into English as the power of youth) to carry out communal farming activities of members from the same village (Gentil and Mercoiret 1991). Nevertheless, the persistent droughts experienced in the Northern Region have pushed the GVs in Yatenga Province to continuously look for funding in order to supply synthetic inputs (on credit) to their farmers while maintaining their communal farming activities (Ledea Ouedraogo 2002). Following the advice of Bernard Ledea Ouedraogo (who was a Burkinabè agro-sociologist and one of the instigators of the modern form of *Naam*) and with the support of an NGO called "*Savoir se Servir de la Saison Sèche en Savane et au Sahel*" (6S), most of the GVs of the Northern Region were gathered to create an umbrella FO called the "*Fédération Nationale des Groupements Naam*" (FNGN) in 1967.

[8] Mossi is one of the three main Burkinabè ethnic groups mostly found in the Center and North Regions.

Afterward, President Sangoulé Lamizana (the successor to Maurice Yaméogo) created 11 "*Organismes Régionaux de Développement*" (ORDs) in the late 1960s to replace the SIs with the ambition of promoting rural development at regional level (DGPV, 2010; Lamy, 2005). The ORDs were public organizations (under the authority of the Ministry of Agriculture) mostly funded through bilateral (e.g. France, Germany, Netherlands, USA, etc.) and multilateral (e.g. WB) donors (Lamy 2005). Like the SIs, the ORDs also encouraged the creation of GVs to provide modern inputs and technical training to farmers. Farmers' training used to be conducted by the ORD agents based on instructions received from their technical direction (after undertaking multiple local experiments on selected sites) to transfer technical recommendations (DGPV 2010). Besides encouraging the creation of GVs, the ORDs also contributed to the establishment in 1968 of the vegetable crops cooperative called "*Union des coopérateurs burkinabé agricoles et maraîchères*" (UCOBAM), which was composed of three regional cooperatives and multiple village groups of vegetable growers (Zett 2013).

The UCOBAM was in charge of the production, collection and export of vegetables (such as beans, onion and potatoes) under the technical assistance of ORD agents (who were posted by the Ministry of Agriculture in the cooperative). The ORD training approach was criticized for its limited contributions to the substantial increase in farm production in many GVs (despite the considerable investments), which explained the introduction of the WB's training-and-visit (T&V) extension approach in 1977 (Lamy 2005). The approach consisted of organizing the group training of farmers (in every GV) and selecting some of the participants for monitoring the implementation of the subjects learned in their farms (DGPV 2010). The ORD agents were in charge of the selection of participants (who were those having the task of training and monitoring other members from the same village) for field monitoring visits (Lamy 2005). The T&V approach thus intensified both the communication between ORD agents and members of the GVs and the communication between members of the same GV.

2.4.2 Period of the beginning of government's giving responsibility to FOs to manage some agricultural development activities: 1980–1990

The early 1980s was a very critical period in agriculture in the country on account of the extensive droughts, causing famine in the northern regions of the country, and the arrival of Thomas Sankara as the new president after a military coup. Guided by socialist ideology, one of the first measures of the "*Conseil National de la Révolution*" (CNR) was the implementation of the agrarian and land-tenure reform through the promotion of the land-tenure act called "*Réorganisation Agraire et Foncière*" (RAF) in 1984 (Lamy 2005). The aim of the reform was to gain complete government control of arable land by assigning the management of the rural space to various village communities (Lamy 2005; UNDP 2007). A prominent example of the implementation of the RAF act was the creation in 1985 of a government entity called '*Maîtrise d'ouvrage de la vallée Sourou'* for the promotion of irrigated crops (initially focused on rice farming) in the Sourou Valley (Bin 2009; Bazile et al. 2018).

The entity encouraged the creation of cooperatives to facilitate the organization and management of the irrigation schemes. The entity was later transformed in 1986 into the "*Autorité de Mise en valeur de la Vallée du Sourou"* (AMVS), with assistance of the European Fund for Development, to continue the promotion of irrigated crops through a joint collaboration with the established cooperatives in charge of the management of irrigation schemes (Adjeffa 2015; Bazile et al. 2018). Irrigation schemes management activities include repair of pumping stations, maintenance of the drainage network, and collection of water charges from cooperative members (Adjeffa 2015). The AMVS promoted irrigated crops (including rice, maize and onion) by providing technical training (i.e. irrigation farming techniques and the use of irrigation materials) and input credits to cooperative members (Zett 2013).

Another example of the implementation of the RAF act was the introduction of environmental issues into the national agricultural development agenda (Lamy 2005). The RAF established a list of traditional practices (e.g. the slash-and-burn techniques) to be abandoned since they were contributing to the desertification of the northern regions. This led to the appointment of Pierre Rabhi (a French agronomist and agroecology activist) by Thomas Sankara in 1986 to promote agricultural techniques integrating ecological principles, known as agroecology (Lancelloti 2019). Rabhi's activities focused on the dissemination of ecologically based soil-management techniques such as stone bunds, compost, assisted natural regeneration, live fences, *demi-lune* and *zai*[9] for restoring degraded lands in the Center and North Regions. This was mainly through the organization of many training sessions that aimed to strengthen farmers' resilience to the extensive droughts. These farmers were grouped into GVs mostly composed of young farmers similar to the *Kombi-Naam* system described in Section 2.4.1 above. The activities of Rabhi were successful in the spread of many soil and water conservation measures despite its short duration as most of these techniques are still practiced by many Burkinabè farmers today (Lancelloti 2019; Iyabano et al. 2021). This was due to the change of the political regime following the overthrow in 1987 of the revolutionary (Sankara) government by Blaise Compaoré (the fourth president of Burkina). However, some of the then young farmers who participated in the training sessions of Rabhi later gathered to create three NGOs[10] commonly called "*Association des anciens élèves* de Pierre Rabhi" to continue the diffusion of agroecological techniques (cf. Iyabano et al. 2023) in Burkina Faso.

Besides the establishment of the RAF act, the period was also marked by the progressive delegation of the management of input credits to the cotton GVs (Zett 2013). This was done through a village joint-liability system or "*caution solidaire*" based on the principle of collective responsibilities of all members of GVs concerning the repayment of credits obtained from SOFITEX (Kaminski et al. 2011;

[9] It is a soil and water conservation technique consisting of digging pits that are later filled with manure and compost during the dry season before sowing (cereal seeds) at the beginning of the rainy season.

[10] The three NGOs are: the "*Associations pour la Vulgarisation et l'Appui aux Producteurs Agroécologistes*" (AVAPAS); the "*Associations pour la gestion de l'environnement durable*" (AGED) and the "*Associations pour le développement des techniques agroécologiques*" (ADTAE).

Zett 2013). SOFITEX provided loans to GVs through the "*Caisse Nationale du Credit Agricole"* (CNCA) which was the development bank providing financial services in villages (Singerland 2000). The GVs were equally assisted by the "*Centre Regional promotion Agro-Pastoral"* (CRPA)[11] in the process of writing credit requests to SOFITEX. The GVs also started to handle primary marketing activities such as the collection, storage and primary processing of cotton grain (Zett 2013). These GVs received from SOFITEX a lump remuneration per tonnage of cotton purchased.

2.4.3 Period of progressive transfer of most government responsibilities for managing agricultural development activities to FOs: 1990–onwards

The beginning of the 1990s was marked by the implementation of the structural adjustment reforms following the conditions imposed by the Washington consensus in order to obtain loans necessary for supporting the country's agricultural development. The implementation of these reforms was characterized by a series of institutional restructuring measures such as the liberalization of markets, the liquidation of the CRPAs (the public organizations in charge of providing input credits and technical training) and the establishment of decentralized structures[12] of the Ministry of Agriculture (Konate 2013; Zett 2013; DSDR 2015). The purpose of the institutional restructuring was to improve the efficiency of public and private institutions in supporting the Burkinabè agriculture sector to adapt to the new context (DSDR 2004, 2015; Konate 2013). Such adaptation implied the refocusing of the public administration on its sovereign missions of political and strategic orientation including the facilitation of farmers' access to extension services[13] and the setting of a regulatory framework; the encouragement of the emergence of FOs capable of taking on certain formerly government functions; and the promotion of a participatory approach at all levels (DSDR 2015).

The implementation of the reforms also obliged some of the existing FOs to structure their configuration so as to improve their autonomy in the performance of many agricultural development activities. Typical examples included the structuring of rice cooperatives of the Sourou Valley irrigation schemes into a union of cooperatives called "*Union des coopératives agricoles de la Vallée du Sourou*" (UCAVASO) and the creation of a union of cotton farmers, i.e. the "*Union Nationale des*

[11] CRPAs were public organizations created in 1988 (during the Blaise regime) from the transformation of the "*Organismes Régionaux de Développement"* (ORDs) to increase the integration of multiple activities (i.e. promotion of cash and food crops, livestock, rural education and infrastructure) in the regional rural development plan (Lamy 2005). Since their creation, the CRPAs relied on the ORD resources until the advent of the structural adjustment reforms in 1992 (DGPV 2010).

[12] The mission of these decentralized structures (which are found in every region and province of the country) is to provide technical assistance to farmers (grouped into FOs) although they are very limited in human resources due to the reduction of the recruitment of public agriculture advisors (civil servants) since the implementation of the structural adjustment reforms (DSDR 2015).

[13]The Government is facilitating farmers' access to extension services by strengthening the capacity of public (from decentralized structures of the Ministry of Agriculture) and private (from FOs, agro-companies and NGOs) agricultural advisors through various (theoretical and practical) training sessions organized at the "*Institut de l'Environnement et de Recherche Agricole du Burkina Faso"* (INERA, the national research institute) (DGPV 2010).

Producteurs du Coton" (UNPCB) (Zett 2013). The UNCPB was established in 1998 through the support of the WB, the *Agence Française de Développement* (AFD), the Government and SOFITEX based on the transformation of the GVs into local groups called "*Groupements de Producteurs de Coton"* (GPCs), composed of about 15–50 cotton growers from the same village (Kaminski et al. 2011). The purpose of replacing GVs with GPCs was to reduce financial diversion frequently witnessed with GVs due to the heterogeneity of their members (composed of both cotton and non-cotton growers), which limited the credit repayment capacity of the groups. GPC members are therefore self-selected by farmers, with a higher level of trust between members and a higher capacity to monitor each other under the umbrella of the UNPCB.

The establishment of the UNPCB opened the way for the introduction of new actors like private input providers, two private cotton companies[14] and private transport companies in the Burkinabè cotton sector. Moreover, the progressive transfer of some of the agricultural development activities from SOFITEX (and the Government) to UNPCB occurred between 2000 to 2006, during which the FOs started to provide cotton rotation-crop (maize) input credits, management assistance to the GPCs (as well as their regional and departmental unions), financial management and price negotiation (Kaminski et al. 2011). With regard to the functioning of the UNPCB, the union has a technical team (composed of technicians who graduated from universities and agricultural vocational schools) responsible for implementing programs and action plans decided by the management board. The continuous government support provided to the cotton sector through facilitating cotton farmers' access to input credits (via SOFITEX at that time) during the reform period had pushed many non-cotton growers to revolt in Dédougou (a department in Mouhoun Province).

Following the Dédougou riot, many GVs gathered to establish in 1996 the first federative FO (the "*Fédération Nationale des Organisations Paysannes"* FENOP) composed of non-cotton growers. Afterward, the government introduced in 1999 the cooperatives and village groups law called *loi 14*, calling existing FOs (including cooperatives and GVs) to structure themselves based on agricultural value chains in order to receive support. The *loi 14* emphasizes that all value chain FOs have to follow the administrative structure of the country ranging from village to province levels (DSDR 2015; Konate 2013). At the village level, farmers can form village groups or village cooperatives (in the case of irrigated crop value chains). These groups or cooperatives can further create unions and federations at the departmental and provincial levels, respectively. The federations can further join the national representation of farmers, which is the confederation based in Ouagadougou. The aim of this

[14] The two private cotton companies, which include the "*Société Cotonnière du Gourma"* (SOCOMA, a subsidiary of Geocoton) and *Faso Coton* (a subsidiary of a Swiss company called Paul Reinhart) were established in 2004 to provide input credits, training and marketing services to cotton farmers (grouped into GPCs) in their area of operation (the Center and the Center-East Regions) just like the activities of the SOFITEX in the Western Region (Kaminski et *al.* 2011). In this new configuration (i.e. the presence of three companies), the purchase price of cotton grain and the selling price of inputs are fixed at the national level.

configuration is to facilitate the connection between the local (for the provision of training, distribution of input credits and collection of farmers' produce), regional (for the acquisition of quality inputs and the search for market opportunities) and national (for representing farmers in the policy arena) levels (Konate 2013).

The introduction of *loi 14* led to the structuring and emergence of many FOs covering the majority of the country's agricultural value chains as summarized in Table 2.2. Besides the *loi 14* FOs, Table 2.2 also shows the existence of FOs legally registered under the community association law called *loi 10*. This law was introduced in 1992 promoting associations with the aim of realizing common objectives in various domains including cultural, social, professional and economic development of its members. FOs under this law are mainly involved in the promotion of general agricultural development projects (through support from national and international NGOs) targeting the improvement of rural livelihoods without focusing on specific agricultural value chains. Furthermore, it can be noted in Table 2.2 that all the FOs, regardless of their legal status (i.e. *loi 14* or *loi 10*) are actively involved in providing economic and technical services to support their members' agricultural development activities.

The provision of economic services implies supplying micro-credits and input credits and organizing collective marketing of farmers' products. Micro-credit services are mainly provided by the *loi 10* FOs as the case with the "*Association Inter-zones pour le Développement en Milieu Rural"* (AIDMR), where the FO sponsored (through the support of external partners) the installment of vegetable-drying equipment for their members (as part of its promotion of income-generating activities), whereas input-credit services mostly concern the *loi 14* FOs for the collective supply of synthetic fertilizers, seeds and pesticides to their members. Some of the *loi 14* FOs usually receive assistance from external partners in the process of providing input-credit services to their members. Examples include the UNPCB with the three cotton agro-companies; the "*Fédération Professionnelle des Agriculteurs du Burkina Faso"* (FEPAB) with the government project entitled the "*Programme d'Amélioration de la Productivité et de la Sécurité Alimentaire"* (PAPSA)[15]; and the "*Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun"* (UGCPA) with an NGO called "*Fondation pour l'agriculture et la ruralité dans le monde"*. Credits are reimbursed most of the time by deducting from the value of the sales of the products (e.g. cotton, cereals and cowpea, depending on the types of crop promoted by the FOs).

[15] The "*Programme d'Amélioration de la Productivité et de la Sécurité Alimentaire*" (PAPSA) was a project financed by the WB and implemented by the Burkinabé Government (2009–2019) with the aim of supporting farmers' development by providing subsidies to farmers (through their FOs) for input credits, infrastructure construction and the acquisition of postharvest materials (Faso 2020).

The provision of technical services, which is commonly witnessed in both the *loi 10* and the *loi 14* FOs, involves facilitating farmers' access to information on available farming techniques (e.g. soil fertility, soil and water conservation, pest and disease management, seed multiplication, etc.); product processing (which concerns mostly the cases of FOs involved in milk and dried mango production described in Table 2.2); and recommendations on the use of synthetic inputs. Farmers access this information by participating in the (group) training sessions organized by the FO advisors. The training methods used by FOs are mainly following the WB's T&V approach (see Section 2.4.1). Moreover, besides providing economic and technical services, some FOs (cf. Table 2.2) have also started to provide advocacy services by representing and defending farmers' interests to policy actors. The promotion of advocacy services is part of the adjustment reform measures of integrating a more participatory approach into the management of agricultural development activities. These services are mostly promoted by the confederation of FOs called "*Confédération Paysanne du Faso*" (CPF) and the union of FOs of provincial and local cotton FOs (UNPCB). CPF was established in 2002 to act as the spokesperson (Coronel and Keita 2010) for the FOs registered under the value-chains-based law (*loi 14*).

CPF is playing this function by voicing its members' interest during the formulation of agriculture policy documents, i.e. the "*Document de Stratégie de Développement Rural*", and participating in multiple workshops organized by the Ministry of Agriculture for negotiating on issues like quality and price of inputs (DSDR 2004, 2015). CPF is also present in the bi-yearly event called *Journée Nationale du Paysanne*. The event consists of organizing a series of discussion (between government authorities and farmers) concerning the country's agricultural development stakes (e.g. the land-tenure system, the input credits, and the price of products). The presidents of each federation (and/or union) of FOs are those in charge of bringing their members' issues to CPF. In addition, FOs like UNPCB played an important role in defending farmers' interests in the international agriculture events organized by the World Trade Organization conference in Cancún in 2004 (Kaminski et al., 2011). UNPCB acted on behalf of all other West African cotton FOs via a joint network of FOs known as the "*Réseau des Organisations Paysannes et des Producteurs Agricoles"* (ROPPA) (cf. Hrabanski 2010 for more details on ROPPA) to complain of imbalance observed between cotton farmers of industrialized countries who receive subsidies (and who have a say in the price determination process) with those of developing countries (Kaminski et al. 2011). It can be observed from these results that the FOs under *loi 10* are largely absent in the formulation and orientation of national agriculture policy and this constitutes a problem for these FOs and for the agricultural development of Burkina Faso.

Table 2.2 Summary of current landscape and functions of FOs in agricultural development of Burkina

FOs	Legal status	Functions			Number of members (farmers/village groups/cooperative)
		Economic	**Technical**	**Advocacy**	
AIDMR *Association Inter-zones pour le Développement en Milieu Rural*	*Loi 10*	Micro-credits	Training on farming techniques	-	700 farmers
Beo-neere	*Loi 10*	Collective marketing of organic vegetables	Training on farming techniques	-	225 farmers
CPF *Confédération Paysanne du Faso*	*Loi 14*	-	-	Representing farmers' interest to policymakers	30000 village groups
FEPAB *Fédération des Professionnels Agricoles du Burkina Faso*	*Loi 14*	Input credits; Collective marketing (of cereals and cowpea)	Training on farming techniques, product processing, use of synthetic inputs	-	750000 farmers
FNZ *Fédération Nian Zwè*	*Loi 14*	Input credits; Collective marketing (of cereals, cowpea and groundnuts)	Training on farming techniques, use of synthetic inputs	-	12000
FEB *Fédération des Eleveurs du Burkina*	*Loi 14*	-	-	Representing the interest of livestock keepers at national (via the CPF) and international (via a network called "*Réseaux Billital Maroobé"* (RBM) for the organization of transhumance) levels	225 village groups
FENOP *Fédération Nationale des Organisations Paysannes*	*Loi 10*	Micro-credits	Training on farming techniques, use of synthetic inputs	-	500000 farmers (212 village groups)
FNGN *Fédération Nationale des Groupements Naam*	*Loi 10*	Input credits; Collective marketing (of potatoes, cowpea and cereals)	Training on farming techniques, product processing, use of synthetic inputs	-	600,000 (5482 village groups)
Union Niébé	*Loi 14*	Collective marketing of cowpea	Training on farming techniques, use of synthetic inputs	-	1700 farmers
UNML *Union Nationale des Mini Laiteries et des Petits Producteurs de Lait Local*	*Loi 14*	Veterinary input supply	Product (milk) processing	-	1500 farmers
UGCPA *Union des Groupements pour la Commerciali-sation des Produits Agricoles*	*Loi 14*	Input credits; Collective marketing (of cereals, cowpea and hibiscus)	Training on farming techniques, product processing, use of synthetic inputs	-	2700 farmers
UCAVASO *Union des coopératives agricole de la Vallée du Sourou*	*Loi 14*	Input credits; Collective marketing (of rice, potatoes, onion and string beans)	Training on farming techniques, use of synthetic inputs	-	2015 (15 cooperatives)

UNERIZ *Union Nationale des Etuveuses de Riz du Burkina*	*Loi 10*	Collective marketing of paddy rice	Training on product (paddy rice) processing techniques	-	2734
UNPCB *Union Nationale des Producteurs de Coton du Burkina Faso*	*Loi 14*	Input credits for cotton and rotation crops (maize and soybean); Collective marketing	Training on farming techniques, product processing, use of synthetic inputs	Representing cotton farmers' interest at national and international levels	325000
UNPMB *Union Nationale des Producteurs de Mangues du Burkina*	*Loi 14*	Collective marketing of dried mangoes	Training on the use of organic pesticides and product (dried mango) processing	-	16 (village groups)
UNPRB *Union Nationale des Producteurs de Riz du Burkina*	*Loi 14*	Collective marketing of paddy rice	Training on farming techniques, product processing, use of synthetic inputs	-	9000
UNPSB *Union Nationale des Producteurs de semences du Burkina*	*Loi 14*	Input supply: cereal seeds	Training on techniques of seed multiplication	-	4000

Source: Own elaboration based on information obtained from the Service of FO Development of the Ministry of Agriculture concerning the complete list of the current FOs registered under the value-chains-based law (*loi 14*), the farmer leaders in Bam and Dori Provinces (who had provided some examples of FOs registered under the community association law (*loi 10*)) and document research.

2.5 Analysis and discussion: continuity and discontinuity of the place of FOs in the Burkinabè agricultural development policy

The results in Section 2.4 illustrate the evolution of functions performed by FOs in the agricultural development of Burkina Faso. Such evolution reveals both the continuity and discontinuity of the place of FOs in the country's agriculture policy. The continuity is mostly witnessed with the consideration (by various government regimes) of FOs as a tool for the introduction of agricultural innovations. The Government also continues to emphasize the establishment of FOs as the condition for receiving support such as input credits and/or subsidies. As Section 2.4 shows, the Government largely relies on FOs for the direct (during the first two periods of the agriculture policy) and indirect (mainly during the last period of the agriculture policy) provision of extension services to farmers, including introducing new farming techniques (based on prescribed recommendations), seeds and synthetic inputs. The direct extension was conducted by the government agents of public organizations present in every region (Sections 2.4.1 and 2.4.2), while the indirect extension is most of the time conducted through the facilitation of technical training of FO advisors and the activities of (some) government projects focusing on specific agricultural value chains (Section 2.4.3). This resonates with the conclusions of Mangnus (2015) on the reliance on economic benefits as a coercive measure for farmers to join the FOs, and that FOs are viewed as a tool that actors deliberately use for achieving outcomes that cannot be realized individually.

The discontinuity is witnessed with the FOs' shift from mostly being passive to being active actors by performing multiple functions in supporting their members' agricultural development. This shift is mainly due to the implementation of the structural adjustment reforms in Burkina like in many other

West African countries (Blein and Coronel 2013). Previously (Sections 2.4.1 and 2.4.2) serving as the connection medium between government organizations and farmers, most of the Burkinabè FOs started to be more actively involved in the management of many agricultural development activities. As could be observed in Section 2.4.3, many FOs increasingly took charge of providing input credits, marketing (for those involved in promoting agricultural value chains) and extension services. However, it emerges from the results that most of these FOs still depend on financial assistance from external partners (e.g. government, agro-companies, NGOs) to better organize the provision of credit services to their members. This corresponds with the observation made by Blein and Coronel (2013) concerning FO dependence on external funding to conduct certain activities.

Furthermore, the results also show that some FOs started to participate in agriculture policy debates in line with findings in other francophone countries (like Senegal and Benin) regarding FO involvement in the national and international political arena (Hrabanski 2010; Coronel and Keita 2010). Nevertheless, it could be noted that the participation of the Burkinabè FOs in the policy debates is primarily centered on the provision of economic services with limited consideration of the broader agricultural development issues (such as the questions of farmers' resilience and environmental degradation). This can be particularly relevant in a Sudano-Sahelian (cf. Section 2.3) country like Burkina confronted with increasing soil degradation and high population density (especially in the Center Region).

2.6 Conclusion

The historical study of FOs, over the main three periods of the agriculture policy of Burkina Faso, has shown their key functions in the country's agricultural development. The study indicates that the evolving political and economic situations of the country underpin the current configuration of the Burkinabè FOs. This configuration is reflected in the establishment of two different types of FO legislation, namely the value-chains-based law (*loi 14*) and the community association law (*loi 10*). While the *loi 14* FOs most frequently focus on upgrading agricultural value chains (through the organization of input credit supply, technical training and collective marketing services to their members), the *loi 10* FOs strive most of the time to promote general agricultural development activities (such as the provision of technical training and to some extent micro-credit services to their members). The study also indicates that the room for FOs' provision of credit (either for inputs or micro-projects) services largely depends on the availability of financial support from external partners. The study, therefore, recommends the integration of the *loi 10* FOs in the national agriculture policy debate to better reflect the diversity of situations in Burkinabè agriculture. Integrating *loi 10* FOs could help to voice the multiple farming challenges faced by their members and also to facilitate access of these FOs to government support programs necessary for the continuity of their rural livelihood development projects.

Chapter 3

Why and how do farmers' organizations get involved in the promotion of agroecological techniques? Insights from Burkina Faso

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Abstract

Agroecological techniques (AET) have been recognized by many farmers, NGOs, and farmers' organizations (FOs) as a promising solution for slowing down the persistent soil fertility degradation in West African drylands. In the context of Burkina, the promotion of AET is the result of the interactions between NGOs and farmers' knowledge through the intermediation of FOs. Although numerous studies have highlighted the instrumental role of FOs in the dissemination of AET in Burkina, there are limited studies focusing on the historical dynamic of FOs' involvement in the promotion of agroecology. To address this gap, this study aims to answer the following questions: why and how do FOs get involved in the promotion of agroecological techniques, and how do they define the term agroecology or agroecological techniques? A multiple case study approach was used to provide the answer to these questions. The results from the case studies reveal that the FOs' promotion of AET is largely connected to their aim of fulfilling one of the following three goals: enhancing the productivity of commercial crops; improving the resilience of subsistence farmers; enhancing both the productivity of commercial crops and the resilience of subsistence farmers. The quest to achieve these goals explained their constant interaction with external partners to get the necessary assistance for the provision of agroecological support services to their farmers. Furthermore, the results of the study also reveal that the Farmers' Organizations' definitions of agroecology or agroecological terms are mostly associated with the interpretation of agroecology as a collective practice encompassing both economic and ecological aspects of Burkinabè agriculture. A broader insight is that while FOs can fulfill important roles in agroecology transitions this comes with diverse interpretations of agroecology, in which FOs facilitate the hybridization of existing farmers 'practices with those proposed by external actors. The study concludes by suggesting areas for further research regarding the investigation of the effectiveness of the FOs' promotion of agroecology by looking at the influence of FOs on the drivers of farmers' decisions towards AET.

Keywords: Sustainable farming practices, Organic agriculture, Sahel, Agroecology, Sustainability transitions, Farmer Organizations.

3.1 Introduction

Over the past decades, there is a growing interest in agroecology as a response to multiple crises in the food system and problems encountered with conventional agriculture (such as the acceleration of soil degradation, the increasing emission of greenhouse gases, the loss of genetic resources, and general health issues) (Anderson et al. 2019a). The aim of agroecology is to develop agroecosystems with minimum dependence on synthetic inputs and maximum emphasis on farms' biological components to enhance soil fertility, guarantee crop protection, and boost overall productivity (Altieri 1983). Earlier references using the term agroecology can be traced back to the 1930s for studying the interaction of agroecosystem components based on methods derived from the agronomy and ecology scientific fields (Van Hulst et al. 2020; Wezel et al. 2009; Mockshell and Kamanda 2018). Initially considered as the scientific application of ecology in agriculture, the term agroecology is now increasingly also used by social (see e.g., Wezel et al. 2009; Rosset and Martínez-Torres 2012) and political (cf. Rivera-Ferre 2018) actors besides those part of the scientific arena. The use of this term by diverse actors is reflected by the existence of three widely accepted perspectives on agroecology as both a science, a movement, and a practice (Wezel et al. 2009).

As a movement, the definition of agroecology is primarily rooted in the environmental and agricultural movements following the detrimental impacts of conventional agriculture (Rivera-Ferre 2018; Wezel et al. 2009). The first environmental movement was founded in the USA during the early 1960s (Wezel et al. 2009) to deal with the consequences of pesticides on the environment. The expansion of conventional agriculture beyond the USA border led to the creation of farmers' agricultural movements (which consider more aspects of ecology and environment) in many Latin American countries between the 1980s and 1990s, with farmer-led organizations like 'La Via Campesina' as an important driving force (Rosset et al. 2019; Val et al. 2019). From the 1990s the definition of agroecology as a movement started to incorporate the notion of food sovereignty (Rivera-Ferre 2018) besides focusing on the ecological or environmental dimensions of agriculture. Food sovereignty can be defined as the right of people to produce and consume healthy food in an ecological manner through the emphasis on autonomy and equity (Altieri and Toledo 2011). The incorporation of the notion of food sovereignty also marked the beginning of the politico-cultural importance of agroecology (López-García et al. 2021).

The foundations of agroecology as a practice that emerged during the 1980s were initially intertwined with the movements promoting environmentally friendly agriculture (Wezel et al. 2009). The term agroecology is defined here as a collective practice of agriculture considering economic (i.e. the farm income, inputs efficiency, and cost-benefit ratio of production), social (including the health protection and food sustenance), and ecological (i.e. the preservation and restoration of resources such as soil and water) aspects, centered on the combination of traditional farmers' knowledge and knowledge coming

from modern scientific research (Rivera-Ferre 2018; Mockshell & Kamanda 2018; Velten et al. 2015). The literature emphasizes three principles (translated into various implemented techniques or practices) underpinning the definition of agroecology as a practice (Van Hulst et al. 2020). The principles imply increases in: i) efficiency; ii) substitution (of one input/practice for another), and iii) redesign of the agricultural landscape. Agroecological practices are viewed as new, amended, or adapted practices or techniques that contribute to more ecological and organic agriculture (Wezel et al. 2009). Examples of agroecological techniques (AET) include intercropping; biological control of pests and diseases; use of nitrogen-fixing crops; crop-livestock integration; crop diversification; agroforestry; compost; and anti-erosion measures; etc (Altieri and Toledo 2011; Wezel and Silva 2017; Slingerland and Stork 2000; Giller et al. 2021). Several AET have been promoted (by NGOs) since the 1980s to improve the agriculture production of subsistence farmers confronted with harsh environments throughout Latin America, Asia, and Africa (Altieri 2002).

AET have always been recognized by actors (such as farmers, NGOs, and Farmers' Organizations-(FOs)[16]) as a promising solution for West African drylands farmers facing intense soil degradation due to the effect of climatic variability coupled with the continuous population growth (Iyabano et al. 2021; Lancelloti 2019; Debray et al. 2019; Mockshell and Kamanda 2018; Andrieu et al. 2015; Bancé 2013). In the case of Burkina Faso, many studies (see e.g., Boffa 1995; Kessler 1992; Barro et al. 2005) have reported the existence of several AET traditionally practiced by peasant farmers. As Boffa et al. (2000), has pointed out farmers were protecting naturally-regenerated shea nut trees or karité (*Vitellaria paradoxa*) present in their cereal farms because of the multiple benefits (including food, wood for tools, shade, and income from selling the butter for cosmetic and pharmaceutical usage) they yield. Besides karité, néré (*Parkia biglobosa*) trees were also always maintained by farmers for their seeds (which are the ingredients of a local spice called *dawadawa* or *soumbala*), traditional medicine, and soil fertility improvement (Teklehaimanot 2004; Kessler 1992). Other AET widely practiced by Burkinabé farmers (namely those located in the northern regions) include stone-bunds, half-moons or *demi-lune*, mulching, *zaï*, manure, and compost (Slingerland and Stork, 2000; Sidibé, 2005; Barro et al. 2005; Sawadogo et al. 2008; Lancelloti 2019).

Although these techniques were traditionally practiced by the farmers in the northern regions, they were revived during the intensive droughts of the 70s and 80s that caused a decrease in average rainfall (Roose et al. 1999). This revival was characterized by the mobilization of NGOs working together with local farmers grouped into various FOs called "*Naam* groups" for the selection and dissemination of efficient AET that can help farmers to continue growing crops for their family

[16]FOs are defined in this study as all type of organizations ranging from village associations, village groups, to unions and/or federation composed of farmers that seek to fulfill agricultural development activities (Tanguy et al. 2008; Diagne and Pesche 1995).

sustenance (Ledea Ouedraogo 2002; Bancé 2013). During the same period, a farmer named Yacouba Sawadogo (who is still living in Yatenga province) began to grow trees in traditional *zaï* pits in order to reduce the effect of soil erosion (Bancé 2013). The technique was later spread through farmers' exchanges via their *Naam* groups. Besides NGOs and farmers, President Thomas Sankara also favored the revival of AET in northern regions by appointing Pierre Rabhi (in 1986) to be in charge of the dissemination of updated AET (including the technique of production of biopesticides) that can strengthen farmers' resilience to the extensive droughts (Lancelloti 2019; Bancé 2013). The activities of Rabhi consisted of the organization of AET training and exchanges session among farmers grouped into various FOs (i.e. *Naam* groups).

Moreover, the increased demand for organic certified products (by the international market) during the early 2000s has also contributed to the spread of AET in many other regions of the country (Bancé 2013). The promotion of organic products was mainly initiated by the actions of NGOs aiming to introduce organic agriculture technology to some farmers through the intermediation of their FOs (Bancé 2013; Iyabano et al. 2021). The overall implications of FOs in the development and spread of AET during the early drought period and introduction of organic certified products period was due to the central place they always have in the agriculture policy of Burkina Faso (Konate 2013; Zett 2013). This started with the colonial administration during which the FOs were serving as bridges connecting farmers with institutions and organizations in charge of agriculture development activities (Konate 2013; Arcand 2004). Following the implementation of the structural adjustment reforms (promoted by the World Bank and the International Monetary Fund) in the early 1990s, the government transferred most of the organizations of agriculture development activities to FOs (DSDR 2015). This transfer was marked by the creation and restructuration[17] (concerning the FOs that existed before the advent of the reforms) of many FOs in order to actively start the provision of economic (such as credits supply and collective marketing) and technical services to their farmers (DSDR 2015; Zett 2013).

It is widely recognized that FOs play important roles in agrifood innovation and transition (Groot-Kormelinck et al. 2022; Vilas-Boas et al. 2022; Yang et al. 2014), and this holds for agroecology as well (Rosset et al. 2019; Val et al. 2019; Schiller et al. 2020; Anderson et al. 2019a). However, not many studies look at how a range of different FOs at a country level approach agroecology (except Groot Kormelinck et al. 2022). Although previous studies have highlighted the instrumental role of FOs in the agriculture development policy of Burkina in general and the dissemination of AET in particular (Iyabano et al. 2021; Bancé 2013), questions about why and how do the current FOs get involved in the promotion of AET, and how do they define the term agroecology or AET are still to be

[17] This restructuration was mainly due to the establishment (in 1999) of a value chain law called "*loi 14*" calling for existing FOs to group according to value chains in order to better organize their provision of agriculture development services to farmers and some of the FOs that were grouped according to value chain can be registered under a community development association existing law called "*loi 10*" (DSDR 2015; Konate 2013).

answered. The objective of this study is, therefore, to seek the answer to these questions by exploring the diversity of FOs involved in the promotion of AET in Burkina Faso. Answering the first question can provide a clear understanding of the dynamic of FOs' promotion of AET in Burkina Faso thereby showing how this promotion intersects with the economic, social, and ecological aspects of local agriculture. Answering the second question can also contribute to the ongoing debate regarding the definition of agroecology and/or agroecological terms by focusing on the perspectives of local actors. After this section presenting the background and objective of the study, the next section outlines the research methods employed, starting with the selection of case studies, follows by the description of the data collection and data analysis methods. The results section starts by drawing a picture of the diversity of FOs involved in the promotion of AET. The second section of the results focuses on the historical dynamics of three FOs' involvement in the promotion of AET and the way they define the term agroecology or AET. Following the results section, the next section analyses the results from case studies and discusses key points from these results. The last section concludes the study by pointing out the implication of the results and outlook for future research.

3.2 Research methods

3.2.1 A case-study approach

A case-study approach was used to answer the question of why and how do diverse FOs get involved in the promotion of AET. This approach was chosen because of the nature of the study requiring empirical investigation of complex social phenomena and real-life contexts (Yin 2009). The FOs as case studies allowed us to get empirical data regarding the dynamic of agroecology development in Burkina Faso. FOs' studies also enabled us to capture the local actors' definition as they are composed of different types of members (including administrators, advisors, and farmers). FOs' cases were selected in a two-step process: an exploratory followed by in-depth multiple case studies. The exploratory phase aimed to identify the diversity of FOs engaged in the promotion of AET. FOs' cases were identified after conducting an extensive review of literature and project documents focusing on FOs and the development of agroecology and organic agriculture in Burkina. The identified cases were confirmed and updated during an interview (conducted by the first author) with a resource person working as the president of a rural development network called *réseaux gestion* in Ouagadougou. The list of FOs' cases was also completed during the participation of the first author in two agroecology gatherings (i.e. the peasant innovation fair organized in May 2015 by Prolinnova[18] and the agroecology workshop organized by an NGO named Inter-réseaux in November 2015) where some of the FOs involved in the promotion were identified and approached (including those discussed with the resource person mentioned above) to discuss the purpose of this research and to schedule additional

[18] Is the acronym of an NGO called Promoting Local innovation in ecologically-oriented agriculture.

interviews at their different location. A total of eight FOs were, therefore, identified as those involved in the promotion of AET in Burkina Faso (Table 3.1).

3.2.2 Data collection and analysis

Data were collected by using document research, informal (spontaneous conversations) and formal (planned conversations) semi-structured interviews conducted in two phases (cf. Table 3.1), and observations (during field visits). The first interview phase was conducted between, November 2015 to May 2016, with aim the main of getting information for the characterization of identified case studies. The phase started with conservations interviews with administrators and advisors (selected on the basis of their availability) to get to know FOs' case studies before planning the formal data collection field visits. The data collected focused on describing each case study according to their date of establishment, the types of crops supported, their members' location within the four phytogeographical zones of the country (presented in Figure 3.4 Appendix A), the current agriculture development functions performed, the types of conventional (if applicable) and agroecological techniques promoted (including the main partners supporting the promotion of these techniques).

The second interview phase was conducted between February and May 2018 for deepening information obtained during the first phase in order to identify important events[19] that shaped the FOs' promotion of AET based on three selected case studies (see the second section of the results). The phase also helped to look at the FOs' understanding of the term agroecology and/or AET from the perspective of their administrators, advisors, and farmers. Farmers were selected according to their location, types of crops grown, and previous cropping history (regarding the case of organic cotton growers from one of the case studies). These criteria were defined by the administrators and advisors (of the three FOs' cases) so as to get a large diversity of their definitions of agroecological terms. The selected farmers were all members of one of the three FOs studied during the second interview phase. Their age varies from 28 to 74 and they are composed of both men and women with diverse ethnic groups (including Mossi, Sénofo, Dafi, Fulani, and Bwaba depending on their geographical location) who largely depend on agriculture as their source of livelihood. During the field visits, interviewees were asked whether they know the term agroecology and how they would define that term, how they differentiate between AET and conventional techniques, and which terms do they usually use when referring to agroecology or AET in their FO.

Information obtained during interviews was completed with document research in order to multiply sources of evidence for the validity of the study (Yin 2009). All the interviews were transcribed and

[19]An event is something that occurs in real-life leading to some changes (such as international relations, organizational and managerial processes, group behavior, individual life cycles, etc.) and this can be studied through documentation, direct observation of the situations, and interviews of persons involved in these changes (Yin 2009).

stored together with the data obtained from research documents for systematic analysis through the use of two qualitative methods: content analysis and event history timeline analysis (Silverman 2013). Content analysis was used to find meaningful information from the data gathered in order to understand the goal of FOs in promoting AET by connecting the types of AET promoted with the FOs' objectives. The analysis was done with the aid of Sphinx (concerning the interview data) and Microsoft Excel software to sort, organize, store, and manage large amounts of textual data. Data were coded through an iterative reading and rereading of the transcripts to distinguish the current agriculture development functions of FOs and to identify the types of AET promoted. Codes were derived from the reviewed literature concerning the agriculture development functions performed by the Burkinabè FOs (cf. DSDR 2015; Zett 2013) and the diversity of agroecological techniques promoted in Burkina Faso (see Roose, Kabore, and Guenat 1999; Bancé 2013; Inter-réseaux 2015). The event history timeline helped to reconstruct the dynamics of three selected FOs' promotion of AET by stressing their evolving relations with external partners. Events were constructed based on (updated) information obtained from documents and interviews conducted with the administrators and advisors of the three FOs. Quotes were also used in this analysis to capture the FOs' definition of the term agroecology or AET.

Table 3.1 Summary of interview phases

Name of FO	First phase: 2015/2016	Second phase: 2018	Total number of interviewees
	Informal interviews and formal semi-structured interviews	Formal semi-structured interviews	
AIDMR: *Association Interzones pour le Développement en Milieu Rural*	• 1 administrator: the coordinator of the FO • 1 advisor	• 2 Administrators: the president and the coordinator of the FO • 1 advisor • 15 farmers	20
Beo-neere	• 1 administrator: the president of the FO • 2 advisors	-	3
FEPAB *Fédération Professionnelle des Agriculteurs du Burkina Faso*	• 1 administrator: a board member • 1 advisor	-	2
FNGN: *Fédération Nationale des Groupements NAAM*	• 2 administrators: 1 board member and the coordinator of the agricultural economic unit	-	2
UGCPA: *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun*	• 1 administrator: the coordinator of agriculture production unit • 3 advisors of the organic hibiscus program	• 2 administrators: the president and the coordinator of the agriculture production unit • 1 advisor of general agriculture activities • 15 farmers	22
Union niébé	• 1 administrator: a member of the administrative board • 3 advisors	-	4
UNPCB: *Union Nationale des Producteurs du Cotton du Burkina*	• 2 administrators: the director of agriculture development unit and the national coordinator of the organic cotton program • 2 organic cotton advisors	• 1 administrator (regional director of organic cotton) • 2 advisors: 1 for conventional and 1 for organic cotton • 14 farmers	21
Union Signassigui	• 1 administrator: the president of the FO • 3 advisors	-	4

3.3 Results

3.3.1 Exploring the diversity of FOs involved in the promotion of agroecological techniques

The study identified eight cases of FOs (cf. Table 3.2) involved in the promotion of AET in Burkina Faso with three distinct goals. These include the promotion of AET for enhancing the productivity of commercial crops; the promotion of AET for improving the resilience of subsistence farmers; and the promotion of AET for enhancing the productivity of commercial crops and the resilience of subsistence farmers. The goal of promoting AET for only enhancing the productivity of commercial crops concerns two cases of FOs i.e. the *Union Nationale des Producteurs de Coton du Burkina Faso*-UNPCB *and the Union Signassigui*. These FOs were established to better ensure the organization of the cotton value chain (concerning UNPCB), and the processing and marketing of paddy rice (concerning the *Union Signassigui*). They are doing that by providing the necessary economic (such as credits and collective marketing) and technical services to their members. The technical services include the organization of agroecological training sessions during which their advisors exchange with farmers about available ecologically-based soil fertility management techniques.

These include mulching, manure[20], and compost (an organic fertilizer created from a decomposed mixture of manure, crop residues, and water). They (FOs) usually initiate these training sessions after receiving assistance from external partners. For example, the promotion of compost pits conducted through the technical and economic assistance of partners like *Société des Fibres Textiles*-SOFITEX[21] (the case of UNPCB) or the *Fédération Nationale des Organisations Paysannes*-FENOP (the case of the *Union Signassigui*). Then the promotion of AET was intensified with their (FOs) engagement in the production and marketing of organic certified products such as cotton and rice respectively for UNPCB (cf. the second section of the results) and *Union Signassigui*. This was mainly by introducing the techniques of biopesticides production from the transformation of neem and the updated compost production techniques (i.e. the compost pile which is less labor intensive compared to the compost pits). The introduction of these techniques (in both FOs) was related to the necessity of complying with the standards for organic certification calling for a total absence of the use of synthetic inputs.

The goal of promoting AET for improving the resilience of subsistence farmers was observed with only one case of FO i.e. the *Association Inter-zones pour le Développement en Milieu Rural*-AIDMR (Table 3.2). This FO was established through the assistance of an NGO called *Eau vive* to jointly

[20] Manure is a traditional soil fertility management technique largely practiced by Burkinabè farmers.

[21] SOFITEX is a parastatal agro-company created in 1979 (for the development of cotton in Burkina), and currently owned by three main shareholders: the Burkinabè government, the French Geocoton group, and the UNPCB (after its creation from the transformation of village groups in 1998) (Kaminski et al., 2011).

promote soil and water conservation measures and soil fertility management techniques to tackle the persistent land degradation witnessed in northern Burkina (i.e. the sub-Sahelian and north-Sudanian zones, cf. Figure 3.4 in appendix A). Promoted AET (see the second section of the results for further details) include *zaï* (i.e. traditional soil and water conservation technique involving digging pits which are filled with manure and/or compost), mulching, manure, compost, stone-bunds (farms' water and nutrients catchment technique), *demi-lune* (which is a water and nutrients catchment technique consisting of digging pits in the shape of half-moons in the farms), and the association of trees with crops. All these AET are promoted by AIDMR because of their efficiency in restoring degraded lands. And the AIDMR's activity is centered on the improvement of these techniques by organizing various agroecological knowledge exchanges among members (from farmers to farmers and from farmers to advisors) regarding the updated AET. A typical example was observed with the recommendation of a *zaï* disposition that follows the shape of an equilateral triangle, which is more efficient in terms of capturing and conserving water as compared to the random disposition (which is widely practiced by many farmers in northern Burkina).

The last goal which is the promotion of AET for enhancing the productivity of commercial crops and the subsistence farmers' resilience concerns five cases of FOs presented in Table 3.2. All these FOs are actively involved in the promotion of many AET ranging from pests and diseases management techniques to soil fertility and water conservation measures. While most of the soil and water conservation measures are primarily targeting some of the FOs' members (especially those located in areas frequently affected by land degradation issues); the soil fertility management techniques (like compost and manure) are rather promoted for all the members of the FOs regardless of their geographical location. This is mainly due to their efficiency in increasing the productivity of their members' crops. The FOs are promoting these AET by organizing technical training of AET and facilitating members' access to some inputs (on credits and/or subsidies) and marketing services (co). The latter mostly concerns the cases of members involved in commercial crops which vary according to FO (cf. Table 3.2).

Although most of these AET are promoted by improving the already existing farmers' practices, the frequency of the provision of support services (by these FOs) largely depends on the availability of assistance from external partners. Examples include the dependence on the *Fédération des Professionnels Agricoles du Burkina Faso*-FEPAB and the *Union niébé* of NGOs like Oxfam (concerning FEPAB) and Fert (regarding the *Union niébé*) for supporting the organization of their compost training sessions. Similarly, the distribution of Faidherbia seedlings as incentives by FO like the *Union des Groupements pour la Commercialisation en commun des produits agricoles de la Boucle du Mouhoun*-UGCPA was based on the reception of financial assistance of an NGO called "*L'Œuvre Léger"*. It becomes clear from these results that the promotion of these AET by FOs intersects with the economic, social, and ecological aspects of the agriculture context of Burkina. This

is because the promotion of AET is essential for restoring and preserving the degraded soils of some of their members on the one hand and for improving the crops' productivity of their members on the other hand. Good productivity is important for the members' sustenance and/or members' income (concerning the cases of those promoting commercial crops).

Table 3.2 Characterizing the diversity of Farmers' Organizations involved in the promotion of agroecological techniques

FO	Date of establishment and objectives	Current agriculture development functions performed	Types of conventional techniques promoted	Types of agroecological techniques promoted (AET)			Main partners supporting AET	The goal of promoting AET
				Soil Fertility Management	Pests and Diseases Management	Soil and Water Conservation measures		
AIDMR: *Association Inter-zones pour le Développement en Milieu Rural*	Established in 1993 to strengthen the development of subsistence crops (sorghum, millet, and cowpea) of village members located in the center and northern regions (in the north Sudanian and sub-Sahelian zones). The FO is registered under the grassroots or community association law called "*loi 10*"	-Economic services: micro-credits (depending on the availability of funds) -Technical training services	-	-Compost, mulching and manure -Mixed sorghum-cowpea -Rotation sorghum-cowpea	-Biopesticides -Improved seeds	-*Zaï* -Stone-bunds and *Demi-lune* -Agroforestry	*Terre et Humanisme; Eau-vive; Emmauïs lescar-Pau*	Improving the resilience of subsistence farmers
Beo-neere	Established in 2013 to promote the development of organic vegetables (cucumber, watermelon, and cucumber) and subsistence crops (sorghum, millet, cowpea) of their members located in the center and northern regions (in the north Sudanian and sub-Sahelian zones). The FO is registered under "*loi 10*"	-Economic services: marketing -Technical training services	-	As above	As above	As above	*Terre et Humanisme*	Enhancing the productivity of commercial crops and improving the resilience of subsistence farmers
FEPAB: *Fédération Professionnelle des Agriculteurs du Burkina Faso*	Established in 2001 to structure the cereals (maize, sorghum, and millet), fruits, and vegetable value chains operating in the sub-Sahelian, north and south-Sudanian zones. The FO is registered under the corporatist or value chains law called "*loi 14*"	-Economic services: credits-inputs, marketing -Technical training services	-Improved seeds -Pesticides, -Synthetic fertilizers	-Compost, mulching and manure -Mixed sorghum-cowpea -Improved cowpea seeds	Improved sorghum seeds	As above	Oxfam ; AFDI-*Agriculteurs Français développement international ;* FAO; McKnight foundation	As above
FNGN: *Fédération Nationale des Groupements NAAM*	Established in 1967 (during the implementation of agriculture modernization projects) to support the development of subsistence (sorghum, millet, and cowpea) and commercial crops (cereals surplus, potatoes, tomatoes, and cowpea) of their	-Economic services: credits-inputs, micro-credits, marketing -Technical	As above	-Compost, mulching and manure -Mixed sorghum-cowpea -Rotation sorghum-	As above	As above	USAID; McKnight foundation	As above

	members located in sub-Sahelian, north and south-Sudanian zones. The FO is registered under "*loi 10*"	training services		cowpea -Improved cowpea seeds				
UGCPA: *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun*	Established in 1993 initially for the collective marketing of surpluses of cereals (maize, sorghum, millet) and cowpea of their members living in the Boucle du Mouhoun region (located in north and south-Sudanian zones). The FO is registered under "*loi 14*"	-Economic: credits-inputs, marketing -Technical training services	As above	As above	As above	As above	*L'Œuvre Léger ;* McKnight foundation ; *Fondation pour l'Agriculture et la Ruralité dans le Monde*	As above
Union Niébé	Established in 2003 to structure the cowpea value chain of farmers living in the central region, located in sub-Sahelian and north Sudanian zones. The FO is registered under "*loi 14*"	-Economic:, marketing -Technical training services	As above	-Compost, mulching and manure -Mixed sorghum-cowpea -Rotation sorghum-cowpea	Biopesticides	As above	Fert, an NGO	As above
UNPCB *Union Nationale des Producteurs du Cotton du Burkina*	Established in 1998 to structure the cotton value chain from the transformation of former FOs (called *Groupements Villageois*) composed of both cotton and non-cotton growers to FOs composed of only cotton growers operating at local, departmental, provincial, and national levels (present in the north and south-Sudanian zones). The FO is registered under "*loi 14*"	-Economic: credits-inputs, marketing -Technical training services	As above	-Compost, mulching, and manure -Rotations and associations of crops with legumes	-Biopesticides -Trap crop .	-	SOFITEX *(Société des Fibres Textiles) ;* FAO Catholic Relief service; Helvetas	Enhancing the productivity of commercial crops
Union *Signassigui*	Established in 2007 to organize the processing and marketing of paddy rice in the Hauts-Bassins region located in the south-Sudanian zone. The FO is registered under "*loi 10*"	-Economic: micro-credits, marketing -Technical training services	As above	-Compost, mulching, and manure	Biopesticides	-	FENOP: *Fédération Nationale des Organisations Paysannes,* an umbrella FO registered under "*loi 10*"	As above

Source: Own elaboration based on information obtained from documents research, interviews and observation.

3.3.2 Historical dynamics of three FOs' promotion of agroecological techniques

This section presents the historical dynamics of three selected cases of FOs' promotion of agroecological techniques (AET) and how these FOs define the term agroecology or AET. The three cases are selected according to their goal of the promotion of AET (see the first section of the results). The first case (i.e. the *Union Nationale des Producteurs du Coton du Burkina Faso*-UNPCB) is selected from one of the two cases of FOs promoting AET for enhancing the productivity of commercial crops. The second case (i.e. the *Association Inter-zones pour le Développement en Milieu Rural*-AIDMR) corresponds to the only case of FO promoting AET for improving the resilience of subsistence farmers. The third case (i.e. the *Union des Groupements pour la Commercialisation en commun des produits agricoles de la Boucle du Mouhoun*-UGCPA) is selected from one of the five cases of FOs promoting AET enhancing the productivity of commercial crops and improving the resilience of subsistence farmers.

(a) Case 1: The UNPCB: an FO promoting AET for enhancing the productivity of commercial crops

UNPCB was created in 1998 (Figure 3.1) as a formal FO in charge of the development of the cotton value chain following the partial liberalization of the governance of the cotton sector (Dowd-Uribe 2014). The creation of UNPCB was the result of the transformation of the former local cotton FOs known as *Groupements Villageois* (which is composed of both cotton and non-cotton farmers) following a series of negotiations between the *Société des Fibres Textiles*-SOFITEX, international donors, and the former local cotton FOs. The new local cotton FOs called "*Groupements de Producteurs de Coton"* (GPCs) are composed of only cotton farmers for better management of credits-inputs (obtained from SOFITEX) repayment through a collective responsibility of all farmers within every GPC (Luna 2019). UNPCB is an umbrella union composed of many GPCs grouped into departmental and provincial sub-unions. SOFITEX is also supporting UNPCB in the provision of technical training (including the recommendation of cotton farming and the techniques of compost production) and the organization of harvested cotton marketing (Dowd-Uribe 2014; Luna 2020). The liberalization of the sector also favored the arrival (in 2004) of two other companies: the "*Société Cotonnière du Gourma*" (SOCOMA) and FASO COTON for supporting the provision of credits and marketing to cotton farmers in areas not covered by SOFITEX (Dowd-Uribe 2014).

Nevertheless few years after its establishment, the FO started to face challenges related to low cotton productivity affected by issues such as continuous decrease of soil fertility, low cotton prices, reduced

effectiveness of cotton pesticides, resistance to cotton pesticides, and the breeding of pest-sensitive cotton varieties, reduced subsidies of inputs, amongst others (Kaminski et al. 2011; Bassett 2002; Petit 2003). This situation resulted in the low credit repayment of the majority of the FO's members. To tackle the decrease in soil fertility, the FAO assisted UNPCB to start (in 2004) the promotion of conservation agriculture technology (Ndah et al. 2014). This was by adapting and testing (with farmers-members of the FO) technologies for crop diversification and intensification (through the development of fodder crops) so as to apply conservation agriculture principles[22]. Like FAO, another NGO called Helvetas also supported UNPCB to introduce organic cotton technology. This was part of the organic cotton aiming to exploit a global niche market of certified cotton (Coulter 2011; Dowd 2008). Helvetas transferred the management of the project to UNPCB since the FO was familiar with the organization of the cotton value chain. UNPCB created a sub-value chain within the conventional cotton structuration from national to local levels. Helvetas sponsored the recruitment of organic cotton advisors within the agriculture production unit of UNPCB. These advisors are those in charge of the provision of technical training at the GPCs level. The introduction of the organic project marked the beginning of many AET that were not previously promoted by UNPCB.

The introduction of the organic project marked the beginning of the promotion of many AET (that were not previously promoted by UNPCB). This mostly concerned the techniques of pests and diseases management such as the production of biopesticides from the grains of neem or the association of organic cotton with crops like okra (to serve as a trap for some cotton pests). Every farmer within a cotton-producing village can join the project under the condition of not having sprayed chemicals on the farm for two consecutive years. This requirement explained why most of the project sites were selected in forested areas which offered the possibility of fallow practice (Dowd, 2008). In 2013, UNPCB started to cooperate with the Catholic Relief Services-CRS (an NGO) to continue its promotion of organic cotton by receiving both technical (i.e. updated knowledge of the organic technology) and financial (like inputs subsidies) assistance.

When the administrator (director of the organic cotton unit in Banfora) and advisor were asked about their definition of agroecology or AET they replied: *"Agroecology, is a technique of living in harmony with nature with no external inputs in comparison to conventional techniques…Here* (in UNPCB)*, we use the term organic agriculture for our farmers in relation to the organic cotton program…It is almost the same as agroecology, but organic agriculture has a certification constraint"* (administrator). Or "*Agroecology is a method of farming respecting the environment for future generation…We use the term organic agriculture and this is for small farmers who can produce with non-chemical inputs* (i.e. through using manure, compost, and bio-pesticides)…"(advisor). The

[22] The principles of CA are the low soil disturbance, the high mulching of the soil with crops residues, the diversification of crops (rotations or associations) with legumes (Kassam et al. 2009).

majority of farmers interviewed were not familiar with the terms agroecology or AET, but they rather used the term organic (as shown in the previous quotes) when speaking about the alternative of conventional techniques as noted in their following statements: "*organic cotton is the one with no herbicides for land preparation where we used biopesticides* (for crop protection)*"* (woman farmer). Or *"conventional cotton in comparison to organic cotton is equal to credits* (for accessing to synthetic fertilizers and pesticides*) and health poison* (from the spray of pesticides)*"* (man farmer). *"…For me organic cotton is women's cotton, I am not familiar with conventional cotton, but I know that it involves many expenses* (for inputs) *and credits'* (woman farmer). Or "*Never heard the word agroecology…I was involved in conventional cotton, and if it happened that you are having debts (for paying credits), they (GPCs) will never give you input credits anymore*" (man farmer). The fact that most of these farmers mentioned their non-familiarity with the term "agroecology" does not mean that they were practicing these techniques prior to the advent of the organic cotton project. This is because techniques like manure and compost are always part of members' strategies for soil preparation in cotton farming. This is more frequent for farmers located in the north-Sudanian zone (see Figure 3.4 appendix A) explaining the actions of partners like SOFITEX in the organization compost training to reinforce members' knowledge on the integrated (combination of synthetic with organic) soil fertility management techniques (cf. the first results section).

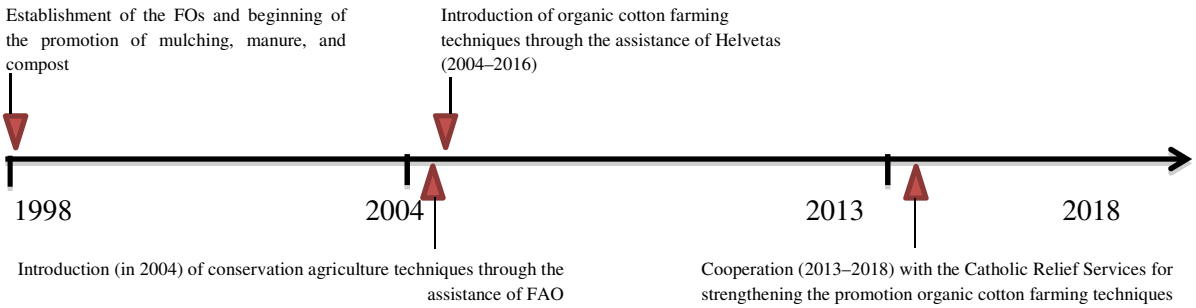

Figure 3.1 Historical dynamics of UNPCB's promotion of agroecological techniques

(b) Case 2: the AIDMR: an FO promoting AET for improving the resilience of subsistence farmers

The AIDMR was established in 1993 (Figure 3.2) as an FO composed of groups of young farmers promoting AET (e.g., compost, *zaï*, stone-bunds, etc.) in the center and northern regions of Burkina. These techniques were promoted because of their positive contribution to the restoration of degraded lands witnessed in the Yatenga province (also located in the northern region). In 1997, *Emmaüs Lescar Pau*, (an NGO introduced by Eau vive, which was the first partner of AIDMR) sponsored the organization of multiple village training and exchanges (between members of the FO) on various

AET. *Emmaüs* later connected AIDMR to an NGO called *Associations pour la Vulgarisation et l'Appui aux Producteurs Agroécologistes*-AVAPAS to reinforce their technical knowledge of the promoted AET. AVAPAS is an NGO established (during the late 80s) by the former students of Pierre Rabhi to continue the diffusion of AET in Burkina Faso. Pierre Rabhi is a writer, farmer, and activist for agroecology based on the preservation of natural resources and farmers' autonomy (Rabhi 2016). In 2006 *Emmaüs* assisted AIDMR to build an agroecological training center in Betta (in the Oubritenga province, the center region) to intensify the organization of the AET training for both members and non-members (including neighboring farmers and other actors suchlike national and international NGOs) of the FO. In 2008, AIDMR received the assistance of *Terre et Humanisme* (an NGO of Pierre Rabhi) to develop a catalog of the promoted AET, which also includes techniques like seed multiplication and the development of biopesticides. This catalog is serving as the training tool used by the FO's advisors.

Administrators' and advisors' definitions of the term agroecology were largely associated with the agriculture of protection (i.e. the ecological aspect of agriculture) as stated in the following quotes: "*Agroecology is defined as an ethic of life...Everyone should respect all the elements of the environment…Agroecology is the agriculture of protection which is translated into Mooré* (the spoken language in the center and north regions) *as 'Kokol Zanga Koobo-KZK', i.e. agriculture of protection...To be an agroecologist means to focus on farmers' autonomy*" (administrator: the coordinator). And "*Agroecology is about the protection of everything that lives on the earth, what we can see and what we cannot see...*" (administrator: the president). Or "*KZK means protection of air and soils by avoiding pesticides…*" (advisor). The term KKZ is thus used by the administrators and advisors of AIDMR to speak about agroecology to the farmers (members). Examples of farmers' explanations of agroecology are illustrated in the following quotes: "*I heard about agroecology from AIDMR in the name of KZK, in agroecology there is compost…*" (man farmer). And "*AE (KZK) equals to compost which improves soil fertility for three to four years… It does not require too much rain to work... whereas; conventional techniques depend on synthetic fertilizer*" (man farmer). Or *KKZ with AIDMR,…Compost increases yields for filling my silo*" (man farmer). And "*Agroecology: compost gives well (good production); whereas NPK (referring to synthetic fertilizers) requires a lot of water*" (man farmer). Or *"KZK and I have participated in training* (organized in AIDMR) *even if there are others (*farmers*) who are ahead of me in this knowledge… In AE, I am the one who is making my inputs* (compost in this case)"(woman farmer). It can be noted from these quotes that, although the AIDMR is speaking about the ecological aspect of agriculture when referring to agroecology, most of the farmers' explanations of AET are rather centered on the economic aspect of farming (i.e. efficiency and autonomy) derived from the compost application. These explanations can be due to the fact that compost is one of farmers' traditional soil fertility management techniques largely practiced

(in association with other techniques like *zaï* and half-moon) in the areas of AIDMR operation: the north Sudanian and Sub-Sahelian zones.

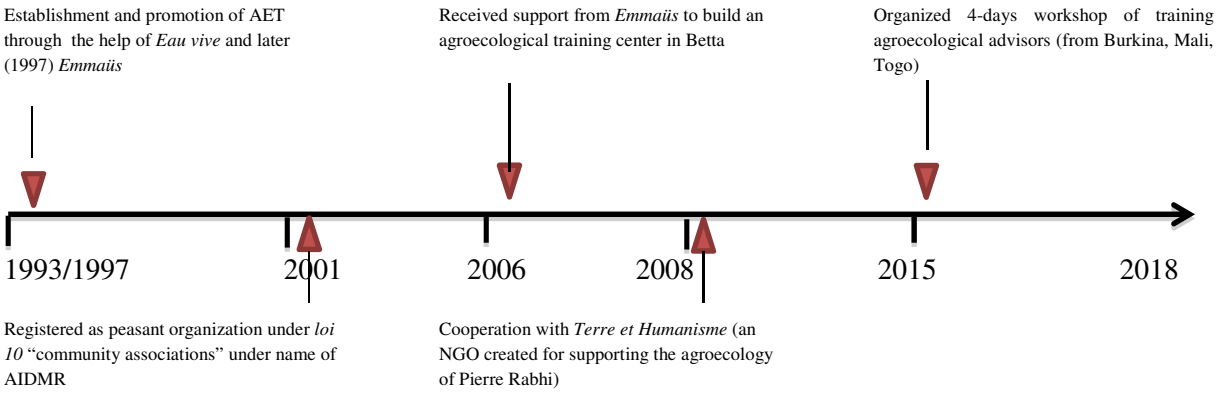

Figure 3.2 Historical dynamics of AIDMR's promotion of agroecological techniques

(c) Case 3: The UGCPA: an FO promoting AET for enhancing the productivity of commercial crops and improving the resilience of subsistence farmers

The UGCPA was established in 1993 (Figure 3.3) for ensuring the collective marketing of cereals (maize, sorghum, millet) and cowpea surpluses in the Boucle du Mouhoun region. The establishment of this FO was sponsored by the Canadian development agency (*Agence canadienne de développement international*, ACDI) through the intermediation of the *Union des producteurs agricoles du Québec* (UPA). UPA assisted the FO in the organization of marketing activities, which included collecting, packaging, and transporting farmers' surpluses from villages to the FO's stores. In the late 1990s, UGCPA started the production and exportation of organic certified hibiscus. This production was facilitated by the provision of credits inputs and technical training (on ecological management of soil fertility and post-harvest handling of hibiscus) to members interested in organic hibiscus farming. In 2002, UGCPA collaborated with the national agricultural research institute to implement a participatory selection and multiplication of improved (resistant) sorghum varieties project funded by the French Global Environmental Facility.

In 2009 UGCPA received the assistance of an NGO called *Fondation pour l'Agriculture et la Ruralité dans le Monde*, to develop an agro-environmental policy. The aim of this policy was to sensitize its members on soil fertility depletion issues and the consequences of the intensive use of pesticides. The policy also helped to sort and communicates (through the use of video) a list of recommended AET that can enhance both commercial crops' productivity and farmers' resilience to land degradation. In

2013, *Oeuvre leger* (an NGO) assisted UGCPA to implement a climate change mitigation project aiming to promote a new cowpea variety, the use of biodigester, and the promotion of agroforestry. The promoted cowpea variety is grown as a single crop and produces more leaves (serving for forage) and grains (for food consumption and profit-making) as compared to the variety grown as a mixed crop. When an administrator was asked about the definition of AET, he pointed to both compost and synthetic inputs as noted in the following quotes: *"Agroecological techniques are those involving rational use of pesticides* (to deal with synthetics inputs) *and compost for soil fertility*" (administrator: the director of the agricultural production unit). Most of the definitions of AET used by the advisor and farmers were centered on compost as illustrated in the following quotes: "*Agroecological techniques refer to the use of use of compost or farafinogo* in Dioula (the spoken language in Boucle du Mouhoun region) *in growing crops*" (advisor). Or "an a*groecological technique is the compost (Farafinogo) which is not rapid* (compared to the synthetic fertilizers), *but stay longer…*" (woman farmer). And that *"Farafinogo is very positive in conserving humidity…I applied it in my maize farm together with synthetic fertilizers...*" (man farmer). Or *"Agroecological technique is the compost (Farafinogo), it is not rapid, but lasts long…The opposite (toubabou nogo or synthetic fertilizers) is rapid but costly)* (woman farmer). *'Compost is less expensive and lasts longer, whereas synthetic fertilizer doesn't retain water…'* (man farmer). Although farmers' explanations of compost are mostly focused on the existing economic aspect of local agriculture associated with its efficiency for crop productivity, the results also show the existence of some ecological explanations of compost application. This was mostly observed with maize farmers since they were those mentioning the role of compost in water retention in their respective farms.

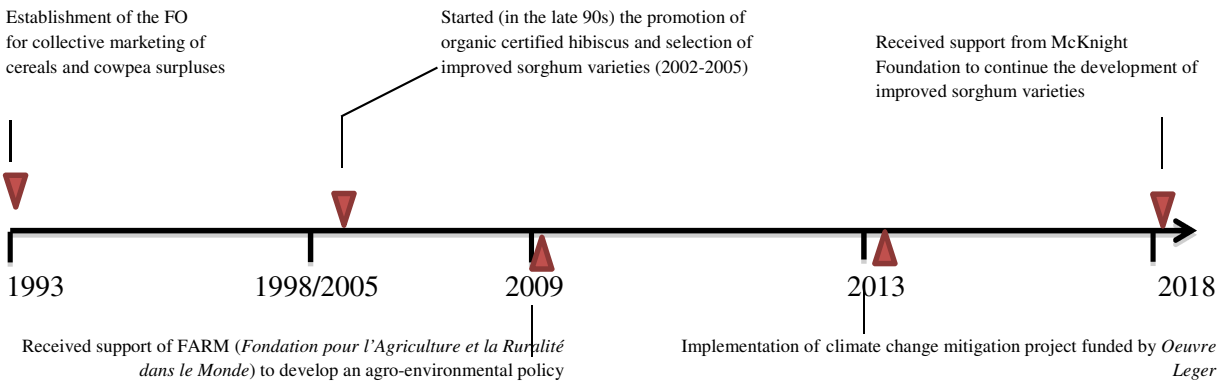

Figure 3.3 Historical dynamics of UGCPA's promotion of agroecological techniques

3.4 Analysis and discussion

As the results show, echoing findings elsewhere (e.g. Groot Kormelinck et al. 2019; Schiller et al. 2020), FOs can play important roles in promoting agroecology. In this section, we will reflect on the questions that guided the study: why and how do FOs get involved in the promotion of agroecological techniques, and how do they define the term agroecology or agroecological techniques?

3.4.1 External partners as the main trigger of the intensive promotion by FOs of agroecological techniques

The above results indicate how external partners (dominantly NGOs) have shaped the intensive FOs' promotion of AET. As shown in the results sections, most of the FOs were already promoting many AET (especially those related to soil fertility management and conservation measures) since their establishment. The promotion of these AET is a continuity of a broader dynamic of ongoing experimentation of agroecology (based on traditional practices) in northern Burkina (more precisely the Sahelian and the north-Sudanian zones) which was amplified during the droughts of the 70s and 80s. This dynamic was characterized by the engagement of NGOs in a participative development of adapted AET (see Roose et al. 1999; Lancelloti 2019; Bancé 2013; Ledea Ouedraogo 2002; Bancé 2013). NGOs continued to be active in this dynamic as they are those assisting the current FOs in updating their members' knowledge about the improved AET like the case of the promotion of a new disposition of *zaï* and/or the less labor-required composting technique.

Furthermore, the involvement of some FOs (through the assistance of NGOs) in the production of organic certified crops has contributed to intensifying the promotion of many other types of AET and/or the promotion of AET in areas characterized by limited agroecology experimentation such as the south-Sudanian zone. FOs are, thus, continuously interacting with NGOs in order to have access to technical and (in some cases) financial assistance necessary for their promotion of AET. The establishment of these relations is sometimes facilitated through the actions of their (FOs) previous partners and/or through a request for cooperation from the NGOs themselves. This is consistent with Mockshell and Kamanda (2018) conclusions, regarding the dominance of NGOs within the landscape of actors supporting the promotion of agroecology, and those of Mockshell and Birner (2015), on how donor priorities also shape agricultural development. However, contrary to Mockshell and Kamanda's (2018), the above results also show the implication of another actor (a parastatal agro company) involved in supporting some FOs' promotion of agroecological technical techniques besides the NGOs. The involvement of this actor is mainly due to its implication in a crop-livestock integration program (Slingerland 2000) which was also targeting cotton farmers located in the northern regions and this connects to ideas of private sector actors such as traders being influential in stimulating more sustainable forms of agriculture (Grabs and Caradenuto 2021).

3.4.2 Farmers' Organizations definitions of agroecological terms

The results reveal that most of the FOs administrators' definitions of agroecological terms were rooted in their broader goal of the promotion of agroecological techniques. These terms are either defined as organic agriculture or *Kokol Zanga Koobo*' (i.e. the agriculture of protection) or the use of compost as shown in sub-sections (a), (b), (c) of the second section of the results respectively. The term organic agriculture was also mentioned by the advisor and farmers in the first case study (sub-section (a)) to refer to the inputs substitutions of the alternative to the conventional techniques. The term compost was similarly used by all the members in the third case study (sub-section (c)) to refer to the technical efficiency of the alternative techniques. The term '*Kokol Zanga Koobo*' was differently defined by the administrators/advisor and farmers in the second case study (sub-section (b)). Concerning the latter, farmers' definitions were primarily focused on input efficiency, while the administrators' and advisors' definitions emphasized resource preservation. These differences show that farmers' definitions were mostly reduced to agricultural production (i.e. the economic aspect of agriculture) with very limited integration of the ecological aspect of farming (cf. Mockshell and Kamanda (2018)).

Moreover, examining the three FOs' explanations of agroecological terms from the above results shows the existence of areas of convergence and divergence. The area of convergence concerns the contrast (as per Giller et al. 2021) of some agroecological techniques such as compost with synthetic fertilizers (used in the conventional techniques). This contrast implies both the cost-benefit (case 1) and the efficiency of this technique in managing soil fertility (cases 2 and 3). The area of divergence was the inclusion (case 3) and exclusion (case 1 and case 2) of synthetic inputs in the explanations of agroecological techniques. These results, therefore, support the observations of Wezel et al. (2009) concerning the existence of multiple definitions and interpretations of agroecology within the local actors' arena. This interpretation of agroecological terms is sometimes induced by the broader discourses and interpretations of agroecology of international donors (as per Mockshell and Birner 2015; Smith et al. 2014), and while this may stimulate elements of agroecological development it may dilute some of its original meaning (especially as a movement) since it becomes co-opted (see also Giraldo and Rosset 2018; Schiller et al. 2020).

3.5 Conclusion

This study has demonstrated why and how FOs do FO get involved in the promotion of agroecological techniques (AET) in Burkina Faso. This was by identifying three main goals behind the promotion of agroecology (i.e. enhancing the commercial crops' productivity or improving the subsistence farmers' resilience or enhancing both the commercial crops' productivity and the subsistence farmers' resilience) and by showing an intense involvement of external partners in the amplification of their promotion of AET. This study shows that the social life of agroecology in Burkina is a result of FOs'

hybridization of existing farmers 'practices with those proposed by external actors. Such hybridization explains the FOs' navigation on a spectrum from light to heavy promotion of agroecology, depending on their geographical location, the values of the farmers and other actors involved, and the types of crops supported. The study also shows the complexity related to the local actors' definitions of agroecological terms as AET are mostly interpreted as a practice that encompasses the economic and ecological aspects of agriculture, and to a lesser degree as a movement with a particular set of socio-economic values also. The broader implication is that in the debate on agroecology transitions, these blended or hybrid forms of agroecology should receive more attention, and what drives processes of FOs making choices in how they approach agroecology. Since most of the identified FOs are promoting AET by facilitating their farmers' access to technical training and (to some extent) market, and credit services, the study calls for further investigation of the effectiveness of these services for a broader agroecological transition. Future research could also look at the detailed drivers of farmers' decisions towards AET and how do the FOs influence these decisions.

Chapter 4

Farmers' Organizations as innovation intermediaries for agroecological innovations in Burkina Faso

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Abstract

Agroecology has been recognized as a potential solution that proposes multiple benefits of the agricultural systems. The aim of agroecology is to develop practices that increase farmers' control over their productive resources. In many developing countries, the promotion of these practices is mainly facilitated by the support of intermediaries' organizations such as Farmers' Organizations (FOs). Detailed studies on the way they support their farmers' implementation of agroecological innovations are still scarce, and though agroecology practices, movements and transitions in Africa are gaining increasing attention there are limited studies on the roles of FOs in this realm in the context of Africa and Burkina Faso in particular. Thus, the objective of this study is to provide the answer to the question of how do FOs stimulate farmers' agroecological behaviors in a country like Burkina Faso. Three cases of FOs were, therefore, selected to unravel the FOs' support of farmers' agroecological innovations behaviors. The results show that FOs fulfill both the knowledge and innovation intermediations functions in the process of stimulating their farmers' implementation of agroecological innovations. While the knowledge intermediation functions are focus on the facilitation of farmers' access to learning facilities; the innovation intermediation functions include demand articulation/stimulation, network brokerage, and innovation process monitoring. Finally, the study suggests areas for further research concerning the description and explanation of the farmers' decisions to implement agroecological innovations, such as looking at how intermediation may contribute to broader transitions and how it connects with the political activities of FOs.

Keywords: Ecological principles, Organic agriculture, Innovation system, Innovation brokers, Food systems transformation.

4.1 Introduction

Current challenges of increasing food production while decreasing environmental problems call for the search of alternative paradigms integrating ecology with agriculture known as agroecology (Berthet et al. 2016). Agroecology has been recognized as a potential pathway to realizing the numerous benefits of agricultural systems (Van Hulst et al. 2020). These benefits are obtained by the application of ecological principles to agricultural production as the alternative to the use of agrochemicals and genetically modified germplasm (Haggar et al. 2020). Agroecology proposes practices that increase farmers' control over their productive resources and broader access to food grown in environmentally friendly ways (Altieri and Toledo 2011; de Tourdonnet and Brives 2018; Mier et al. 2018; Haggar et al. 2020). Proposed practices also allow optimal management of nature and biodiversity agroecosystems (D'Annolfo et al. 2021). Several authors (see e.g., Berthet et al. 2016; Gliessman et al. 2017; Röling and Jiggins 1998; D'Annolfo et al. 2021) have noted that the development of such practices is highly knowledge-intensive, and this requires a combination of farmer's traditional knowledge with scientific knowledge.

The combination of knowledge sources is due to the specificity of agroecological innovations which are mostly based on the incremental (de Tourdonnet and Brives 2018) improvement of existing farming practices. Agroecological innovations are defined in this study as all agricultural techniques integrating ecological principles (Uphoff 2002) to optimize the management of agroecosystems (Altieri and Toledo 2011). The integration of these principles also considers the social (cf. Altieri and Toledo 2011) dimension of agriculture beyond only focusing on the technical and environmental ones. Examples of ecologically-based agricultural techniques include intercropping, crop-rotations, compost, manure, agroforestry, biological control of pests and diseases by using natural enemies and biopesticides (Altieri and Toledo 2011; Wezel and Silva 2017). The combination of knowledge sources necessitates an active mobilization of diverse actors with multiple perspectives such as farmers, advisory services, agro-companies, etc (Berthet et al. 2016). Mobilizing these actors, therefore, demands the need to have organizations that act as a bridge to facilitate linkage creation between actors.

This bridge function is mostly performed by intermediary organizations called "innovation intermediaries" (see Klerkx, Hall, and Leeuwis 2009) in the innovation systems literature. Howells (2006 p.720) defines an innovation intermediary "as an organization or body that act as agent or broker in any aspect of the innovation process between two or more parties". Examples of innovation intermediaries in the agriculture sector include government agencies, private companies, NGOs,

consultants, special programs (e.g. consortium), and Farmers' Organizations (FOs)[23] (cf. Kilelu et al. 2011; Yang et al. 2014; Kilelu, Klerkx and Leeuwis 2017; Cerf et al. 2017; Westbrooke et al. 2018; Kivimaa et al. 2019; Goldberger, 2008). According to Kilelu et al. (2013), innovation intermediaries perform many functions for agriculture development including organizing farmers to identify their needs and promoting platforms for information and knowledge sharing.

In the context of developing countries' agriculture, Bakhuijs (2013), reported the significant implications of FOs in many agriculture innovation activities. These were reinforced by the withdrawal of the direct government intervention in agriculture development activities after the implementation of the structural adjustment reforms (between the 1980s and 1990s) promoted by the World Bank in many developing countries (Mercoiret, Pesche, and Bosc 2008). This reinforcement was due to the considerable benefits of collective action of FOs which are largely acknowledged by many policymakers and agriculture development actors(Verma et al. 2019). Many FOs started to be actively involved in the agriculture development activities following the reduced role of governments imposed by the reforms (Blein and Coronel 2013; Diagne and Pesche 1995; Jacob and Lavigne 1994).

As intermediary organizations (cf. Esman and Uphoff 1984), FOs have now become central in establishing partnerships with public and private agriculture development actors to better access to resources necessary for the provision of knowledge and innovation services (Wennink and Heemskerk 2006; Reed and Hickey 2016; Chirwa et al. 2005; Luo et al. 2020; Wynne-Jones et al. 2020). FOs provide these services to members by creating favorable conditions for production and utilization of agriculture knowledge and integrating members into agricultural innovation systems. FOs have been found to implement the community-based extension approaches through the creation of joint learning at the individual and organization levels (Kiptot and Franzel 2019). FOs can also contribute to the creation of innovation platforms so as to allow their members to participate in the co-production of technologies (Pretty et al. 2020). Besides participating in the knowledge generation, FOs can be very helpful in the creation of sustainable market access of its members' products (Mangnus and Schoonhoven-Speijer 2020; Ramirez et al. 2018; Groot Kormelinck et al. 2019; Gboko 2020). As Esman and Uphoff (1984) have indicated, FOs thus stimulate several different horizontal linkages (between farmers) and vertical linkages (with other organizations in the value chain and institutional system), and these linkages are often made in a complementary fashion (Kilelu, Klerkx and Leeuwis 2017).

[23] FOs (including unions, association, and groups with different structuration levels) can be defined as membership organizations contributing to fulfill farmers' agriculture development activities through collective action (Tanguy et al 2008).

Specifically, a number of studies have highlighted the core contributions of FOs in the development of agroecological innovations (Mier et al. 2018; Schiller et al. 2020a; Schiller et al. 2020b). This is by providing space for farmer-to-farmer (or *Campesino a Campesino*) knowledge exchanges and funding the construction of agroecology schools (Altieri and Toledo 2011; Mier et al. 2018; Schiller et al. 2020a). FOs can also provide special marketing facilities (such as the organic certification) for products grown based on the integration of ecological principles (Mier et al. 2018; Schiller et al. 2020a; Home et al. (2017). Veltmeyer (2019) points out that FOs can be effective in defending small-scale farmers' right to access the land. Farmers' right is essential for food sovereignty (see Anderson et al. 2019b) promoted by transnational organizations defending agroecology like *La Vía Campesina* (LVC) (Giraldo and Rosset, 2018).

While these previous studies have shown that FOs play roles in the agroecological innovations systems (AeIS), more detailed studies on the way they support their farmers' implementation of these innovations are still scarce. Furthermore, though agroecology practices, movements, and transitions in Africa are gaining increasing attention (Ameur et al. 2020; Bakker et al. 2021; Bellwood-Howard and Ripoll 2020; Bezner Kerr et al. 2018; Boillat et al. 2021; Bottazzi and Boillat 2021; Gliessman 2020; Pimbert and Moeller 2018; Mousseau 2015; Mugwanya 2019; Peano et al. 2020; Toillier, Bancé and Faure 2021), there are limited studies on the roles of FOs in this realm in the context of Africa and Burkina Faso in particular. Thus, the objective of this study is to fill the gap in the literature by answering the question of how do FOs stimulate their farmers' implementation of agroecological innovations in Burkina Faso.

Focusing on Burkina case studies is interesting because of the longtime involvement of FOs in the promotion of agroecological innovations. This started during the extensive droughts of the 70s and 80s and increased in the last decade with the advent of organic farming practices (Roose, Kabore, and Guenat 1999; Bancé 2013). The involvement of FOs in agroecological innovations in the context of Burkina was due to their important functions in the country's agriculture development activities traced back during the independence period (Lamy 2005; Konate 2013). The next section presents a conceptual framework to analyze the innovation intermediaries' functions of FOs for agroecological innovations. Then follow the sections describing the research methods applied and the results obtained three selected cases of FOs. The last section discusses the key points from the results and concludes by pointing out implications of these results for policy, practice, and areas for further research.

4.2 A conceptual framework for analyzing the innovation intermediaries' functions performed by FOs in supporting farmers' implementation of agroecological innovations

Over the past, there has been an evolution of systemic thinking in agriculture innovation literature (cf. Klerkx et al. 2012) characterized by a shift from technology-oriented to more holistic approaches so-called agricultural innovation systems (AIS). According to Klerkx et al. (2012), AIS are essentially about multi-actor interactions and structures (such as institutions, infrastructures, policies) that may serve to improve innovation. The AIS, influenced by the 'national systems of innovation' of Lundvall (1992), was first used by the World Bank to understand the complexity of agriculture innovation processes by focusing on the way different actors interact, share, exchange and use knowledge (World Bank 2006). The AIS approach was later used by authors like Schiller et al. (2020a) to describe the development of innovations based on ecological principles known as the agroecological innovations system (AeIS).

As a subset of AIS, components of AeIS include individuals, organizations, and institutions which can be grouped into five innovation domains following the categorization of AIS components of Rajalahti et al. (2008); Arnold and Bell (2001). These include the research domain, the enterprise and demand domains, the support structures, and the intermediary domains. *The research domain* primarily involves public and private research organizations producing codified and tacit knowledge. The *enterprise domain* involves agro companies, NGOs, FOs, and farmers using and producing codified and tacit knowledge. *The demand domain* primarily involves consumers of domestic and international markets as well as policy and quality assessment actors (e.g. certification agencies). *The Support structures*: these are organizations and institutions (mostly NGOs, networks of traders, and FOs) in charge of the provision of necessary resources to stimulate agroecological innovations. *The intermediary domain* involves organizations whose activity is to broker access to knowledge and innovation services from one actor of the domain to another, and thus playing the functions of innovation intermediaries (cf Howells 2006).

The literature identifies two broad functions of innovation intermediaries in supporting innovations i.e. the knowledge intermediation function which includes supplying information and facilitating farmers' learning process; and the innovation intermediation function which entails providing inputs, scoping market opportunities, managing networks of various actors, and, monitoring the innovation process (Kilelu et al. 2011; Yang et al. 2014). These functions are played by actors such as NGOs, national extension agencies, and FOs in many developing countries (see the above introduction section for further examples of innovation intermediaries). In the case of FOs (which is the type of innovation

intermediary central to this study), Yang et al. (2014) study highlight their fulfillment of the above-listed functions to support innovation processes. These functions have informed the framework presented in Figure 4.1 to understand the functions of FOs as innovation intermediaries in supporting farmers' implementation of agroecological innovations.

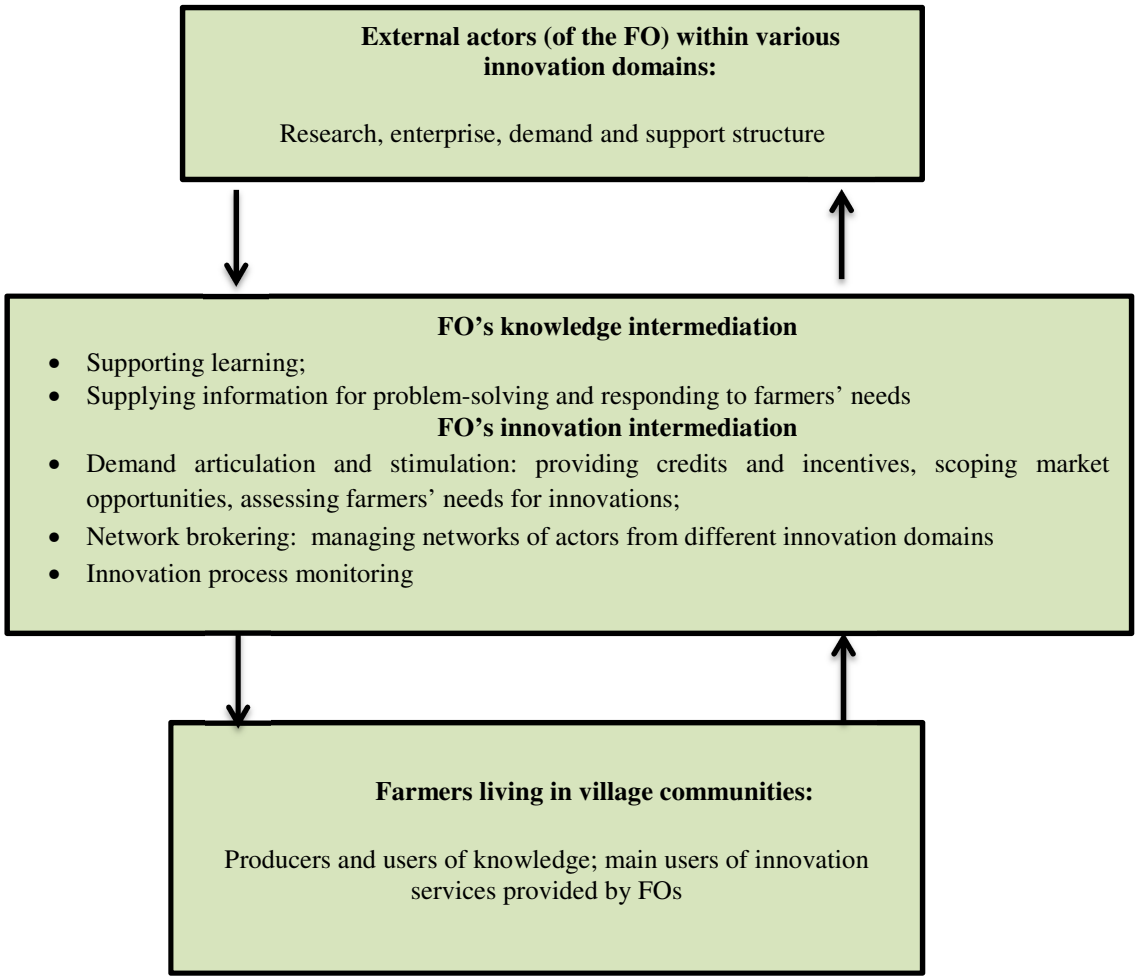


Figure 4.1 A conceptual framework to analyze the possible innovation intermediaries' functions of FOs in supporting farmers' implementation of agroecological innovations. **Source**: Own elaboration based on Yang et al. (2014); Kilelu et al. (2011); Arnold and Bell (2001).

4.3 Research methods

A case-study approach (Yin 2009) was chosen as appropriate to understand the innovation intermediation functions of FOs to answer the 'how question' addressed in this study. Three FOs case studies were selected according to their goal of the promotion of agroecological innovations in Burkina Faso. These include the promotion of agroecological innovations for enhancing the productivity of commercial crops concerning the *Union Nationale des Producteurs du Coton du Burkina Faso*-UNPCB; the promotion of agroecological innovations for improving the resilience of

subsistence farmers regarding the *Association Inter-zones pour le Développement en Milieu Rural*-AIDMR; and the promotion of agroecological innovations for enhancing the productivity of commercial crops and the resilience of subsistence farmers concerning the *Union des Groupements pour la Commercialisation en commun des produits agricoles de la Boucle du Mouhoun*-UGCPA.

4.3.1 An overview of the three selected FOs case studies

The first case (i.e. UNPCB) was established in 1998 as an FO in charge of the development of the cotton value chain by providing necessary economic (credits-inputs and marketing) and technical services to their members. The establishment of UNPCB was the result of long process involving the *Société des Fibres Textiles*-SOFITEX (a parastatal cotton agro-company, owned by the Burkinabè government, the French Geocoton group, and the UNPCB), international donors (such as the World Bank, and the "*Agence Française de Développement*, AFD"), and the former local cotton FOs called "*Groupements Villageois*" and the new "*Groupement De Producteurs de Coton,* GPCs". Initially established for the development of conventional cotton (by focusing on the use of synthetic inputs), UNPCB started to get involved in the promotion of practices aligned with agroecology (by introducing the conservation and organic agriculture techniques to their members but without using this wording) to better improve cotton's productivity. UNPCB, thus, mainly focuses on the economic dimension of agroecology by promoting the minimum tillage and the substitution of synthetic inputs with the ecological ones (concerning the organic cotton) and/or the combination of both synthetic and ecological inputs.

UNPCB is composed of about cotton 325000 farmers grouped into various GPCs, located in the village communities. One GPC has about 15 to 50 members self-selected by cotton farmers from the same village on the basis of a joint-liability (concerning the repayment of inputs-credits). Every GPC[24] has one treasurer, one secretary, and one president elected by the members of the group. These GPCs are further grouped into departmental and provincial cotton farmers' union[25]. The objective of this grouping is to better channel the economic and technical services from the national union (i.e. UNPCB) to the local farmers' groups (i.e. GPCs) levels. GPCs are composed of diverse types of farmers from various farm sizes, gender, and types of cotton grown (either conventional or organic cotton). For cotton farmers, joining the GPCs is the main possibility for accessing to credit-inputs and marketing services offered by the national union. At the national level, the UNPCB is structured as follows: a general assembly (a supreme decision-making body composed of one national president and

[24] The GPCs are those in charge of the organization of cotton primary marketing activities (i.e. the collection and storage of cotton grain). The GPCs are receiving rebates from SOFITEX according to the tonnage of cotton supplied. These rebates constitute the main income source of the GPCs and the other unions of the UNPCB.
[25] There are about 26 departmental and 280 provincial unions across the country. And both the departmental and provincial unions also have a president elected by their members.

three representatives of all the provincial cotton farmers' unions)[26]; a board of directors (which is the executive office of UNPCB composed with the national coordinator and twelve members elected by the general assembly); a legal and control office; and a multidisciplinary technical team (including the director of agriculture development unit and the technical advisors appointed at the departmental and provincial unions).

The second case (i.e. AIDMR) was established in 1993 as an FO composed of groups of young farmers in charge of the promotion of ecologically-based techniques in the center and north regions. The establishment of AIDMR was facilitated through the technical and financial assistance of *Eau Vive* (an NGO). Most of the AIDMR's activities are primarily centered on the provision of agroecological technical training services to their members. Agroecological innovations are mainly promoted by AIDMR with the goal of improving the resilience of their members (mostly involved in subsistence farming) challenged with advanced soil degradation. The FO, therefore, focuses on the socio-economic (promotion of family farming, resilience, autonomy), technical, and ecological (preservation and restoration of members' soil fertility) dimensions of agroecology. AIDMR has the following structuration: one coordinator (the founder of the FO); one president (appointed by the coordinator of the FO); four endogenous advisors (who are also farmers living within the village communities); and about 700 subsistence farmers with an average farm size of less than 5ha. These farmers are grouped into 47 villages (composed of small-scale subsistence farmers of both gender) and every village group has a president chosen by the village members. Although there is no restriction for farmers to become members of the FO, AIDMR is highly encouraging prospective members to pay the annual contribution of 1000 CFA Franc[27].

The third case (i.e. UGCPA) was established in 1993 for the organization of collective marketing of cereals (maize, sorghum, millet) and cowpea surpluses in the Boucle du Mouhoun region through the technical and financial assistance of a Canadian development agency (*Agence canadienne de développement international*, ACDI). Following propositions from external partners and in line with its objective of supporting small-scale farming, UGCPA started the promotion of agroecological innovations with the goal of enhancing the productivity of commercial crops and the resilience of some of its members confronted with persistent soil degradation. This explains, the economic and (to some extent) ecological dimensions of agroecology of UGCPA. The technical dimension is mostly linked to the efficiency of ecological inputs (combined with the synthetic inputs or not), whereas the environmental dimension is connected to the soil preservation.

UGCPA is composed of about 2700 members (consisting of both small and large-scale farmers) growing subsistence and commercial (including conventional and organic) crops, grouped into 79

[26] All the general assembly members are among the large-scale cotton farmers of the country (with an average farm size of 100 ha).
[27] CFA Franc is the currency used by many West African francophone countries.

village groups (composed of farmers with various farm sizes and gender). Every village group has a president elected by the members from the same village. UGCPA is structured as follows: a general assembly (composed of one president and two representatives of every village group[28]); a board of directors (composed with cereals and hibiscus committees); and a technical team (with ten technical advisors in charge of the organization of training activities). Every farmer who joins the village groups is automatically considered a member of the national union. The main condition for the creation of village groups is the capacity of the village members to supply at least 20000 kilograms (i.e. 200 bags of 100 kilograms) of cereals during every farming season.

4.3.2 Data collection and analysis

Data were gathered (Table 4.1) through informal and formal semi-structured interviews (with three FOs' administrators and advisors) conducted during three fieldworks periods conducted by the first author (i.e. 2015, 2016, and 2018). The interviews sought information on i) the situation of FO's relations with various actors in the agroecological innovations domains'; ii) types of the agroecological knowledge and innovations support services provided to farmers. These interviews helped to capture the overview of the type of innovation support services provided to (concerning partners) and received from (concerning farmers) the FOs. Document research (such as reports on the FO's projects), (participant and non-participant) observations, interviews with farmers, and some of the FOs' partners were also used to complement information obtained from the interviews.

The participant observation was conducted during field visits (between March and April 2018) to gain clear insights on the FOs' agroecological innovations support services. The non-participant observation was mostly conducted during participation (in November 2015) in an agroecology workshop organized by Inter-réseaux (an NGO) where a presentation was given of agroecological innovations services by the organizations of the three case studies. The purpose of using these multiple sources of data collection methods was to ensure the validity of the study by means of triangulation (Yin 2009). All the interviews (both written and recorded) were transcribed to identify FO's functions in the agroecological innovations processes. Transcripts were analyzed through coding guided by the concepts reviewed i.e. the components of the agroecological innovations system and the innovation intermediation functions performed by FOs.

The analysis was conducted through the use of an actor-mechanism matrix (AMM) approach. An AMM is a tool developed by Bakhuijs (2013) to show the types of actors contributing to agriculture innovation in developing countries. AMM shows insights in both the structure (actor types) and functions of intermediaries (cf. Bakhuijs 2013) as it gives indications on what types of actors the

[28] All the members of the general assembly and board of directors are involved in large-scale farming with an average farm size of 25 ha.

farmer organizations can collaborate with to access different resources necessary for supporting farmers' innovation processes. Actor types can contribute to innovation through various support mechanisms they provide to FOs. Microsoft Excel was used to create matrices of FO's relations with different actors of the agroecological innovations domains as well as FO's knowledge and innovation support services provided to farmers. Examples of these services were further illustrated using photos (taken during the field visits) in the results section below.

Table 4.1 Data sources of the study

FO	Number of interviewees	Interview period and interviewees		Observations	Document research
		2015/2016	**2018**		
		Informal interviews and formal semi-structured interviews	Formal semi-structured interviews		
AIDMR: *Association Interzones pour le Développement en Milieu Rural*	21	• 1 administrator: the coordinator of the FO • 1 advisor • 1 main partner of the FO called *Terre et Humanisme*	• 2 Administrators: the president and the coordinator of the FO • 1 advisor • 15 farmers	Workshop and field visits	Reports on the FO's projects
UGCPA: *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun*	23	• 1 administrator: the coordinator of agriculture production unit • 3 advisors of the organic *hibiscus* program • 1 of the FO's partners called (*Fondation pour l'Agriculture et la Ruralité dans le Monde*)	• 2 administrators: the president and the coordinator of the agriculture production unit • 1 advisor of general agriculture activities • 15 farmers	As above	As above
UNPCB: *Union Nationale des Producteurs du Cotton du Burkina*	21	• 1 administrator: the national coordinator of the organic cotton program • 2 organic cotton advisors • 2 main partners of the organic cotton program: Catholic Relief Service and Helvetas	• 1 administrator: the provincial coordinator of the organic cotton in Banfora • 1 advisor of organic cotton in Banfora • 14 farmers	As above	As above

4.4 Results

4.4.1 FOs as a key intermediary domain actor for agroecological innovations

The results of the study revealed the active involvement of FOs in connecting various innovation domain actors (Figure 4.2) in order to facilitate their farmers' implementation of ecologically-based agricultural techniques, through many 'vertical' and horizontal linkages' (Esman and Uphoff, 1984; Kilelu, Klerkx and Leeuwis 2017). The implementation of these techniques (by farmers in all three FO) is very essential in achieving FO's goal of the promotion of agroecological innovations. Such goal include the enhancement of commercial crops' productivity (the case of the *Union Nationale des*

Producteurs du Coton du Burkina Faso-UNPCB), or the improvement of subsistence farmers' resilience (the case of the *Association Inter-zones pour le Développement en Milieu Rural*-AIDMR), or the enhancement of both commercial crops' productivity and subsistence farmers' resilience (the case of the *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun*-UGCPA).

Overall, all three FOs, regardless of their goal, have collaborated with actors of the support structure (mostly NGOs) to get access to resources needed for the creation of agroecological innovations conditions. These include the reception of training facilities (to foster knowledge generation) and input funding to stimulate farmers' implementation of agroecological innovations. For example, Helvetas (an NGO) supported UNPCB to introduce organic cotton techniques. This was by providing technical (i.e. training FO's advisors on the technical requirement of organic cotton farming) and economic (such as subsidizing biopesticides and access to premium) assistance to the FO. Helvetas' introduction of organic cotton to UNPCB was mainly due to its key role in the development of (conventional) cotton value chain. Besides Helvetas, the Catholic Relief Service-CRS (an NGO) also assisted UNPCB in the development of organic cotton. While Helvetas' assistance started after contacting the UNPCB, CRS' assistance rather came from the FO's side through its application to a call for a project targeting the improvement of rural livelihood.

Similar to UNPCB, AIDMR and UGCPA also received NGO's support to engage in the promotion of agroecological innovations. Examples include the reception of funding from NGOs like *Terre et Humanisme* and *L'Œuvre Léger* (which provided Faidherbia seedlings and bio-gas materials to UGCPA to improve their knowledge of agroecological techniques and spread the use of Faidherbia seedlings to AIDMR and UGCPA respectively. The connection with NGOs (in all the three FOs) was mainly established through the commitment of the top leadership of the FOs which include the national presidents and some national coordinators (concerning the UNPCB and AIDMR cases). It is the task of these leaders to channel the information and resources received from NGOs to their corresponding local farmers' groups. Furthermore, the results also revealed the contribution of an actor other than NGOs in supporting the innovation process. One of the examples witnessed was the involvement of an agro company called SOFITEX (*Société Burkinabè des Fibres Textiles*) in the provision of processing facilities for organic cotton to UNPCB. SOFITEX (which is one of the key partners of UNPCB since its establishment) is providing a special ginning factory to process harvested organic cotton separated from that of the cotton conventional one. This separation is mainly due to the need to avoid the contamination of organic cotton with pesticide residues present in conventional cotton.

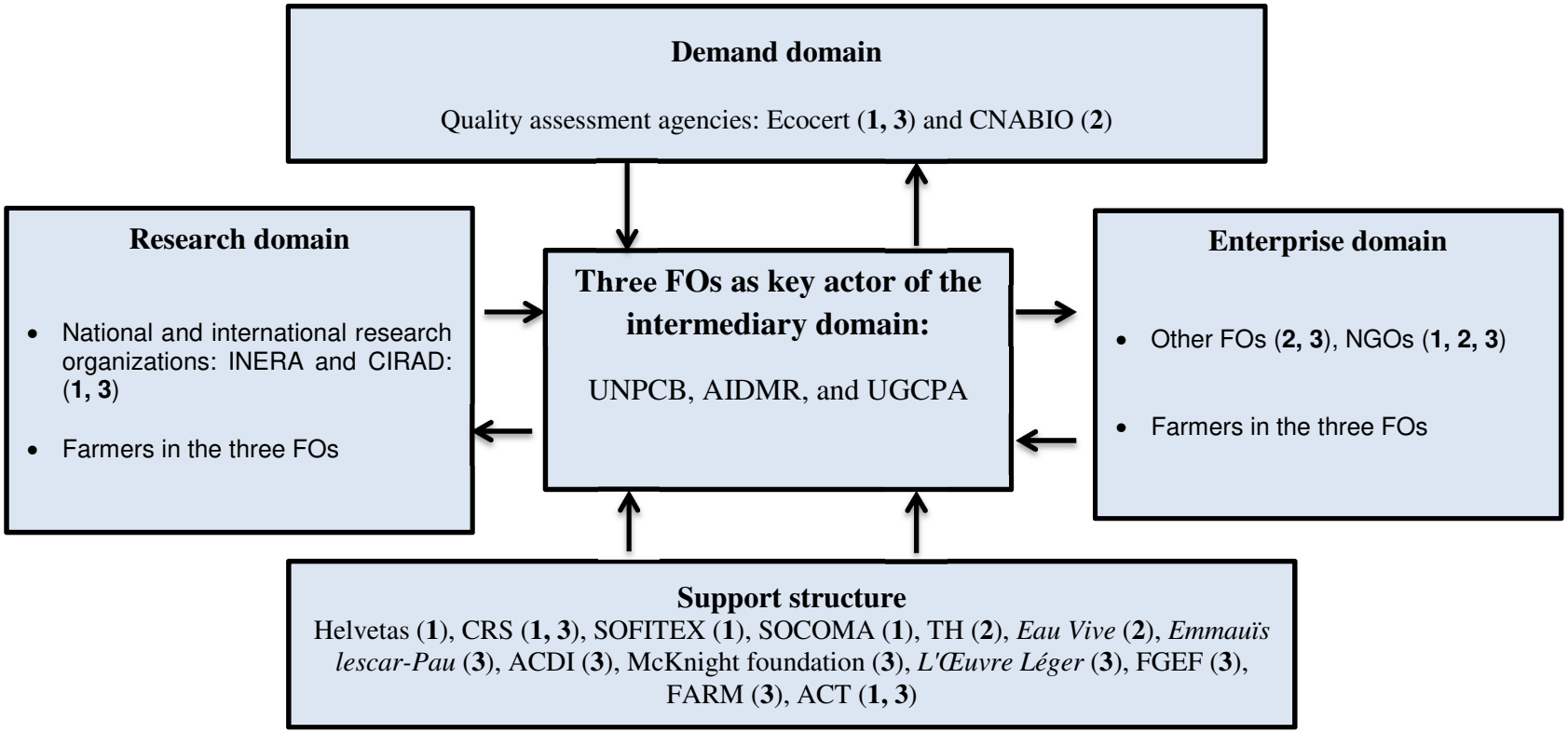
FOs also established relationships with actors of the research domain in the agroecological knowledge generation process. This is by developing technical recommendations and information sharing (between FOs and some partners, and between farmers within the FO). The establishment of these relations was conducted by the involvement of the technical team who were previously briefed (by the national leadership, i.e. the presidents of the FOs) about the FOs' engagement in the process. For example, INERA (*Institut de l'Environnement et de Recherche Agricole du Burkina Faso*), which is the main Burkinabè research organization, provided technical assistance for the development of ecologically-based cotton pests and diseases management techniques and the development of improved sorghum seeds to UNPCB and UGCPA respectively. This was by training the FOs' advisors and providing space and researchers to conduct trials and experimentations (both in the station and on-farm). Another example of actor collaborating with FOs in this domain is the involvement of CIRAD (*Centre de cooperation internationale en recherche agronomique pour le développement*) in helping FO like UGCPA to implement an agro environmental policy funded by an NGO called FARM- (*Fondation pour l'agriculture et la ruralité dans le monde*). CIRAD provided technical assistance in the selection and communication of recommended ecologically-based agricultural techniques. Last but not least actor in this domain is the farmers themselves since most of the promoted techniques were developed based on the improvement of existing practices.

Farmers are also contributing to the knowledge generation process by sharing information with other members, i.e. horizontal linkages. Farmers can share information about their practices during group meetings organized in the FO (concerning AIDMR) or through informal communication with other members living in the same village. The group meetings were most of the time organized by the FO's coordinator at their agroecological training center. Moreover, Figure 4.2 also indicates the establishment of FOs relations with other FO (within the enterprise domain) in the agroecological innovations development process. This was the case of the collaboration between UGCPA with FOs such as FEPABE (*Fédération Professionnelle des Agriculteurs du Burkina Faso*) and FNGN (*Fédération Nationale des Groupements NAAM*) in the participative breeding of sorghum seeds project[29]. This was also the case of AIDMR's collaboration with an FO called Beo-neere in building an agroecological innovations catalog. The catalog was built during a workshop organized by the coordinator (through the financial assistance of *Terre et Humanisne*) to serve as a training tool for AIDMR's members as well as non-members farmers (e.g., those present in the village communities or from FOs like *Beo-neere*). Farmers are using the acquired knowledge to improve their agriculture production for more household sustenance and/or profits for commercial products such as cotton,

[29] This project was initially funded by the French Global Environmental Facility to experiment for the experimentation of participative sorghum selection, and later continued their activities with the support received from McKnight foundation. UGCPA started to train their farmers to become expert in the production and marketing of *Kapelga, Gnossiconi* and *Flagnon* sorghum varieties.

hibiscus, and cereal surpluses. Some of these products are quality-controlled (see the second section of the results) before reaching the final consumers.

It becomes clear from these results that FOs are the key intermediary domain actor for the development of agroecological innovations. This is demonstrated by their engagement in multiple relationships with other actors of the innovation domain to ensure the flow of knowledge and innovation services for triggering the agroecological innovations processes. These relationships are usually established at the top leadership levels of the three FOs and are mostly organized around their broader goal of the promotion of agroecological innovations. While all the three FOs are engaged in the collaboration with the support structure' actors, the number of actors (in all the four innovation domains) collaborating with FOs is much higher for those involved in the promotion of commercial crops (i.e. UNPCB and UGCPA). This could be explained by the fact that these FOs were already familiar (even before getting involved in the intensive promotion of agroecology) with the establishment of multiples collaborations in searching for market opportunities of their farmers' products. Furthermore, it can be noted from the above results that, the NGOs constitute the main external actors' type supporting the most the FO's development of agroecological innovations.



1= actors collaborating with the *Union Nationale des Producteurs du Coton du Burkina Faso* (UNPCB); **2=**actors collaborating with the *Association Inter-zones pour le Développement en Milieu Rural* (AIDMR); **3=** actors collaborating with the *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun* (UGCPA).

CNABIO: *Conseil National de l'Agriculture Biologique*; **INERA**: *Institut de l'Environnement et de Recherche Agricole du Burkina Faso*; **CIRAD**: *Centre de coopération internationale en recherche agronomique pour le développement*; **SOFITEX**: *Société Burkinabè des Fibres Textiles*; **SOCOMA**: *Société Cotonnière du Gourma* **CRS**: Catholic Relief Services ; **TH**: *Terre et Humanisme*; **ACDI**: *Agence canadienne de développement international* ; **FARM**: *Fondation pour l'agriculture et la ruralité dans le monde*; **ACT**: African Conservation Tillage Network (ACT); **FGEF**: French Global Environmental Facility.

Figure 4.2 An illustration of FOs as a key intermediary domain actor for agroecological innovations in Burkina Faso. **Source:** Own analysis based on Arnold and Bell (2001).

4.4.2 The knowledge and innovation intermediation functions of FOs to stimulate their farmers' implementation of agroecological innovations

The results of the study indicate that all the three FOs (i.e. UNPCB, AIDMR, and UGCPA) performed both knowledge and innovation intermediation functions (Table 4.2) to stimulate farmers' implementation of agroecological innovations. The knowledge intermediation functions involve the provision of farmers' learning facilities by employing several methods. These include the organization of group training (at the FO's location), field demonstrations (at the selected farms), and individual exchanges between farmers and FOs' advisors. Group training is organized as formal group meetings during which the FOs' advisors[30] explain and exchange with farmers on topics connected to the organic agriculture technology (the cases of UNPCB and UGCPA) or on more general topics related to the ecologically-based agricultural techniques (as observed with AIDMR and UGCPA). In the case of AIDMR, the group meetings are considered (by the FO's coordinator and advisors) as an important occasion for farmers' sharing experiences of successful ecological practices. The frequency of group meetings is either yearly-based (concerning the UNPCB due to certification requirement), or during the implementation of new agriculture development projects.

Moreover, grouped meetings can also be conducted with the aim of sensitizing members about environmental issues connected to the high use of pesticides as observed with UGCPA. This was through the use of a video for communicating the risks of pesticides, as shown by the following quote from the coordinator of the agriculture production unit: "*through video, farmers now understood the dangerousness of certain* (synthetic) *products which can harm the environment and human health*". Group training is most of the time complemented with field demonstrations to show the applicability of various techniques discussed during various meetings. This can be through conducting on-farm experimentations of various ecological fertilization techniques (i.e. the application of compost, manure, or both in the selected farms) as was the case with UNPCB or the demonstration of compost pile techniques, which is conducted in all the three FOs. In the case of AIDMR, field demonstrations are conducted in the FO's training center and/or in the selected farms belonging to the president of the various village groups.

The compost pile technique is an aerobic method of decomposition of a mixture of manure, crops residues such as cereal straw), and water. This mixture is later transferred (twice to thrice within two months) into another pile to ensure the oxygen flow needed for compost production. Compost pile is increasingly promoted by these FOs due to its limited requirement in labor compared to compost pits,

[30] Advisors are either agricultural technicians appointed (by the national union technical team) in provinces (mostly the case of UNPCB and to some extent UGCPA) or some highly skilled farmers living within the village communities (concerning AIDMR and UGCPA).

which were previously adopted techniques by many FOs' members. Compost pile is also promoted due to its efficiency in the management of soil fertility as explained by one advisor of AIDMR in the following quote: "*So we made a comparison between compost pits and the new one* (i.e. compost pile)*, and we saw that the new one is the best* (in terms of increasing soil fertility)". Figure 4.3 shows an example of a place prepared by one member of AIDMR to demonstrate the aerobic compost-making technique to other members living in the same village.

The last learning method employed by the FOs studied is the promotion of individual exchanges between farmers and advisors. In the case of UNPCB for example, farmers-advisors exchanges take place when organic farmers identify unknown issues (e.g. damage caused by new pests) in their farms. It is the task of the advisor to seek ecological solutions to the identified problems because of the certification requirements. In the case of AIDMR, farmers-advisors exchanges usually take place at the beginning of the farming season, during which interested farmers approach FO' advisors to express their needs for advice on techniques such as compost pile and *zaï* (which consists of digging and filling pits with compost and/or manure) techniques to restore soil fertility as this is the common problems faced by AIDMR' farmers. Advisors can provide an immediate solution to farmers' needs by using available training materials such as pictures (obtained from an NGO called *Eau Vive*) showing the recommended disposition of *zaï* following an equilateral triangle shape (see Figure 4.4). They can also invite these farmers to join the field demonstrations usually organized at the beginning of the farming season.

Figure 4.3 An example of a place prepared by one member of AIDMR to demonstrate the aerobic compost-making technique (left). **Figure 4.4** A training material used by one AIDMR' advisor for showing the recommended *zaï* pits disposition (right).

The results in Table 4.2 also indicate that FOs perform wider innovation intermediaries' functions beyond facilitating farmers' access to agroecological knowledge. These functions cover most of the innovation intermediation functions summarized in Figure 4.1: demand articulation/stimulation, network brokerage, and innovation process monitoring. Demand articulation focuses on the provision of economic (such as supplying credits, inputs, and marketing facilities) and technical (e.g. through various communications between advisors and farmers as stated in the previous paragraphs) services to activate farmers' needs for agroecological innovations. For example, UNPCB provides organic inputs in credits to farmers interested in growing organic cotton. Inputs include organic cotton seeds and commercial biopesticides called Batik (*Bacillus thuringiensis*), which have to be paid back upon selling organic cotton. Besides inputs, UNPCB also supported the construction of stores (see Figure 4.5) in the organic farmers' villages through the financial assistance of the Catholic Relief Service-CRS (one of the key organic cotton partners of UNPCB) as part of the provision of organic premiums. All these services are reaching farmers (grouped into GPCs) through the intermediation activities by their provincial and departmental unions which are those directly connected to the national union.

Furthermore, the search for market opportunities (by the national coordinator of the union and the provincial coordinator of the organic cotton program) of the organic cotton rotation crops such as sesame and soybean has also contributed to increasing the farmers' demand for organic cotton farming techniques. The commercialization of rotation crops thus contributes to the diversification of farmers' revenue as illustrated by the quote from an organic cotton advisor in Banfora, "*rotation crops such as sesame kept maintaining the income source of farmers depending on the market environment*". Like UNPCB, AIDMR and UGCPA also provide inputs either in the form of credits (the case of UGCPA), or subsidies to stimulate farmers' implementation of agroecological innovations. The provision of these subsidies in the two FOs largely depends on the assistance of external partners. Most of the subsidies are provided by the partners, as part of their objective of strengthening farmers' interest in the production of compost. A typical example of subsidies was the distribution of materials like wheelbarrows and shovels (which are used for the collection and transportation of manure) by AIDMR (through funding obtained from *Terre et Humanisme*) to their farmers. Most of the farmers in AIDMR and UGCPA were selected for the subsidies according to their contribution to the membership fees (which serve in funding some of the operation cost of FOs' activities).

Figure 4.5 An organic cotton store built with the support of the Catholic Relief Service

Network brokerage (Table 4.2), which is the common function observed with all three FOs, is mostly performed by FOs to get access to innovation support services from different actors (as shown in the first section of the results) and to search for market opportunities. Concerning the latter, the presidents of the national unions (and in some cases the provincial coordinator of the organic cotton program) are those in charge of price negotiation and establishment of market agreements with international buyers (e.g. Victoria's Secret for organic cotton in UNPCB) or wholesalers (mostly the case of organic hibiscus in UGCPA), who in their turn sell the products to exporters like Olam Burkina Faso. The products are sold in kilograms, the 2018 prices used by UNPCB and UGCPA were 335 CFA Franc for organic cotton and 1000 CFA Franc for organic hibiscus. These products are firstly certified to ensure the absence of synthetic inputs. Certification, therefore, enables the FOs to monitor their farmers' implementation of agroecological innovations.

Certification is conducted by a third-party organization such as Ecocert concerning UNPCB and UGCPA. It is the task of Ecocert to select and visit the sample of farms to be certified following its predefined standards of organic products. Moreover, the results of the study also reveal the implication of AIDMR in the certification process despite being primarily focused on the improvement of farmers' subsistence crops. This is due to the recent involvement of the FO in the creation of a network of actors promoting ecological products (targeting the domestic market), called CNABIO (*Conseil*

National de l'Agriculture Biologique). Unlike the two other FOs, AIDMR is mostly certifying their products (i.e. the collected and processed mango and shea nut) under the participatory guarantee system where the FO (as well as other members of CNABIO), is also involved in the process of certification. Certified products are usually sold during exhibitions and workshops jointly organized by the members of CNABIO.

It can be observed from the above results that all the three FOs, regardless of their goal of promoting agroecological innovations, realized the importance of performing the two main innovation intermediaries' functions. FOs' knowledge intermediation usually follows the classic extension method of technology dissemination (by organizing group training and field demonstrations), but also include farmers' participation in the knowledge generation process since one of the case study (i.e. AIDMR) is also encouraging the promotion of farmer to farmer knowledge exchanges. FOs innovation intermediation embraces the performance of broader innovation support services by connecting and collaborating with different types of actors. These connections are essential for the continuity of FOs' provision of the technical and economic services necessary for stimulating their farmers' implementation of agroecological innovations.

Table 4.2 Innovation intermediaries' functions performed by three FOs to foster farmers' implementation of agroecological innovations

	UNPCB	AIDMR	UGCPA
Knowledge intermediation			
1. Supporting learning	Provided technical training on organic cotton technology	Organized group training of ecologically-based techniques	Provided technical training on organic *hibiscus* technology; Organized group meeting to show (through the use of video) the environmental issues related to the use of pesticides and the recommended ecologically-based agricultural techniques
2. Supplying information for problem-solving and responding to farmers' needs	Organized farmers-advisors exchanges on issues encountered in the organic cotton farming	Facilitated farmers-advisors exchange sessions at the beginning of the rainy season	Conducted a participative selection of sorghum varieties
Innovation intermediation			
3. Demand articulation and stimulation	Provided credits-inputs for organic cotton; Explored opportunities of organic certified cotton rotation crops (sesame, soybean); Discussed farmers' needs	Provided inputs subsidies; Assessed and discussed farmers' needs	Searched for market opportunities of organic *hibiscus* and provided credits-inputs to farmers concerned; Provided inputs credits and subsidies (e.g. bio-gas materials and Faidherbia seedlings obtained from supportive partners); Assessed farmers' needs
4. Network brokering	Established relationships with wholesalers (exporters) of other organic products such as sesame, soybean, and shea nut	Integrated the platform of civil society actors promoting market legislation of products grown based on ecological principles	Communicated (to attract potential supportive partners) farming issues encountered by farmers in the area of FO' operation to the participants of the peasant innovation fair
5. Innovation process monitoring	Managed the certification of organic products	Started the collective certification (under the participatory guarantee system) of fruits collected from the training center and the nearby village farms	Managed the certification of organic *hibiscus*

Source: Own analysis based on information obtained from FOs' interviews

4.5 Discussions and conclusion

The goal of this study was to provide empirical evidence on the role of FOs in agroecology in Africa, which is still limited, and more broadly contribute to literature on FOs as innovation intermediaries and facilitating actors in agroecology transitions. We will now discuss key results and contrast them to the extant literature on the topic. Also, we will provide some implications for policy.

The results demonstrate the contribution of FOs as the main intermediary actor facilitating the agroecological innovations process in Burkina Faso. This is illustrated by their establishment of multiple relationships with various actors of the agroecological innovations domains, and this is consistent with the earlier results of (Yang et al. 2014) who studied intermediation roles of FO in China. However, contrary to the Yang et al. (2014) results, the FOs in this study are mostly engaged in "many-to-many" relationships. This can be due to the knowledge-intensive characteristic of agroecological innovations. As in many other developing countries (cf. Altieri and Toledo 2011; Mier et al. 2018; Schiller et al. 2020a), the agroecological innovations actors in Burkina Faso are also dominated by the presence of many NGOs. These NGOs provide resources (such as technical knowledge and funds) to FOs in line with their wider objective of supporting small-scale farmers confronted with the increasing economic and ecological challenges. FOs, in their turn, organize the management of resources (obtained from NGOs as well as other innovation domain actors) to provide support services necessary to the stimulation of farmers' implementation of agroecological innovations. This corresponds with the argumentation of Bakhuijs (2013) on the contribution of innovation intermediaries' in bringing resources from many sources to many farmers, and findings elsewhere that intermediaries operate in a wider 'ecology' with other organizations that also provide intermediary roles (Kivimaa et al. 2019). In this case, the NGOs which in a sense act as a knowledge intermediary to the FOs (following Goldberger 2008) who subsequently translate it to farmers.

FOs thus bring resources to farmers by translating acquired knowledge into technical recommendations and providing other economic services, and connected farmers to different service providers (e.g. trainers, certifiers (cf. Gboko 2020)) and each other (peer learning groups). This confirms the observations of Yang et al. (2014) regarding the multi-functionality of FOs in bringing compatibility between technical and economic dimensions of farming, and those of Kilelu, Klerkx and Leeuwis (2017) that these are both horizontal and vertical linkages. However, it could be noted from this study that some FOs (namely those promoting subsistence crops) are more engaged in facilitating participatory and joint learning (Kiptot and Franzel 2019) through the organization of multiple interactions with farmers than others (i.e. those promoting commercial crops). This is due to the incremental and experiential characteristics of agroecological innovations which are usually developed through the consideration of farmers' knowledge (Altieri and Toledo 2011; D'Annolfo et al. 2021).

The economic services provided to farmers include credits, incentives, and marketing facilities. While credits and incentives are provided to stimulate farmers' interest towards specific agroecological innovations (e.g., organic cotton techniques and/or compost); marketing facilities are provided for helping both the FOs (for increasing the economies of scale) and their farmers in getting the overall benefits of the promoted innovations. This resonates with what other innovation intermediaries studies (cf. Bakhuijs 2013; Howells 2006) concluded on the importance of commercialization functions for intermediaries as these support them to obtain the overall benefits from their products and innovations.

In conclusion, this study has provided insights into the innovation intermediaries' functions of FOs in supporting farmers' implementation of agroecological innovations. These are reflected from their fulfillment of two broad innovation intermediaries' functions identified in the literature i.e. the knowledge and innovation intermediations which may contribute to what has been called 'transformative agroecology learning' (Anderson et al. 2019b). Though earlier work has found that technical and economic functions of FOs, as well as horizontal and vertical intermediation, are complementary (Yang et al. 2014; Kilelu, Klerkx and Leeuwis 2017; Kiptot and Franzel 2019), this study has deepened knowledge on this and argues that these may contribute to a broader transition since they can address several barriers in the agricultural innovation system (as per Schiller et al. 2020a). Here the FOs act as a facilitator for the introduction and/or development of complementary agroecological innovations over longer periods of the time as they get more and more involved in the promotion of these innovations according to the evolution of their partnership with external partners. In the context of Burkina Faso, the FOs' development of these innovations is related to the continuity of their active performance of many agriculture development activities. It can also be noted that they do this with different foci and agroecology paradigms in mind as some of which (especially the one promoting mainly subsistence crops) may be more divergent from the mainstream conventional systems than the others.

This study also has limitations, in the sense that it has looked at knowledge and innovation intermediation functions, and not centrally focused on lobbying and other change agency roles of FO which also contribute to agroecology transitions (Mier et al. 2018; Anderson et al. 2019b; Mangnus and Schoonhoven-Speijer 2020). Future research regarding the farmers' implementation of agroecological innovations could thus examine the overall farmers' implementation situations and unravelling all key factors that influence their agroecological behaviors and how this may transform agri-food systems. Thus, future research may look into how transformative the contribution of FO is, also in view of their focus and espoused agroecology paradigm, and what is the scope of transformation, as stimulating certain agro-ecological practices does not necessarily lead to a full-blown transformation (as per Schiller et al. 2020b).

In terms of policy recommendations, although FOs are considered as an important actor in the development of agroecological innovations, they still depend on the support provided by external funding sources (namely NGOs) and their donors to better stimulate their members' implementation of agroecological innovations, which may call for increased investment in agroecology (cf. Pimbert and Moeller 2018). Additional support from national policy actors could therefore contribute to reducing the FOs' dependence on NGOs for the development of agroecological innovations, though this will require a coherent agroecological transformation policy (as per Anderson et al. 2019b; Schiller et al. 2020b). This support could be by subsidizing the access to agroecological inputs and setting specific policy incentives for agriculture products grown based on agroecological principles (e.g. public food procurement programs). Furthermore, increasing the promotion of farmer-to-farmer exchanges (at the level of the FOs) could also improve the farmers' access to agroecological knowledge and thus stimulate their implementation of agroecological innovations.

Chapter 5

Making decisions about agroecological innovations: perspectives from members of farmers' organizations in Burkina Faso

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Abstract

There is a growing promotion of agroecological techniques in many Sub-Saharan African countries as a response to the current climatic variability challenges. In the case of Burkina Faso, a number of studies have mentioned the role of agroecological techniques in the restoration of degraded land. And these techniques are mainly promoted by Farmers' Organizations (FOs) as the main intermediary organizations very active in connecting farmers with rural institutions. Although previous studies have highlighted the central role FOs as innovation intermediaries facilitating the promotion of agroecological innovations, more detailed studies on the effectiveness of their intermediation activities and especially those focusing on the way the FOs influence farmers' agroecological innovations decisions are still scarce. This study addresses this gap by providing the answer to the question of what drives farmers' decisions for implementing agroecological innovations and how do their FOs influence these decisions? The study is based on data collected from 44 farmers, members of 3 different Burkinabè FOs. The results show the existence of a spectrum of farmers' implementation of agroecological innovations ranging from the highest to the lowest implementation situations. Farmers' implementations of these innovations are largely influenced by their FOs' actions on at least two of the three drivers of their decisions: farmers' instrumentality, farmers' valence, and farmers' expectancy. These actions are centered on setting-up demonstration plots for reinforcing farmers' knowledge about the outcomes of the application of agroecological innovations, contributing to the increase of farmers' profits, and improving farmers' skills. Finally, the study calls for policy actors to increase funding support to FOs for widening their continuous provision of agroecological innovations development activities.

Keywords: Sahel, Systems perspectives, Innovation brokers, Sustainable agriculture, Soil restoration

5.1 Introduction

Agroecology is increasingly recognized by many agricultural development actors as a promising solution to the persistent food security and ecosystem degradation issues (Bellwood-Howard & Ripoll 2020; Bottazzi & Boillat 2021). Initially considered as a scientific application of ecology in agriculture, agroecology is now also viewed as a movement for food sovereignty or a practice based on farmers' production of their own inputs (Van Hulst et al. 2020; Wezel et al. 2009). Agroecological techniques are usually developed by taking into account farmers' existing knowledge and practices (Mier et al. 2018; D'Annolfo et al. 2021; Altieri 2002). These techniques can include crop associations/rotations, crop-livestock integration, biological control of pests and diseases, organic fertilization and anti-erosion measures (Ameur et al. 2020; Altieri & Toledo 2011; Wezel & Silva 2017; Slingerland & Stork 2000). There is a growing promotion of agroecological techniques in many Sub-Saharan African countries as a response to the current climatic variability challenges (Gliessman 2021; Haggar et al. 2020; IPES-Food 2020).

As the International Panel of Experts on Sustainable Food Systems (IPES) report argues, agroecological techniques are important in strengthening farmers' resilience to climatic variability as they encourage farmer-to-farmer knowledge sharing in order to produce their own inputs (Gliessman 2021). There are several agroecological techniques currently promoted in many semiarid and sub-humid West African countries with the aim of helping these farmers to increase their agriculture production in a sustainable way (Debray et al. 2019). In the case of Burkina Faso, a number of studies (cf. Zorom et al. 2013; Dugué & Girard 2009; Andrieu et al. 2015; Toillier et al. 2021; Inter-réseaux 2015; Iyabano et al. 2023) have mentioned the role of agroecological techniques in the restoration of degraded land. These techniques are usually promoted by farmers' organizations (FOs) where these serve as connection bridges between farmers and agricultural development institutions (Lamy 2005; Iyabano et al. 2021; Konate 2013).

This can be traced back to the last stage of colonial times and was later reinforced (in the 1990s) with the advent of the structural adjustment reforms of the World Bank and the International Monetary Fund (Zett 2013; DSDR 2015). Following the implementation of these reforms, most of the Burkinabè FOs started to go beyond serving as connection bridges between farmers and development institutions by getting more involved in the organization of many agricultural development activities (Konate 2013; Zett 2013). FOs' activities include the provision of input credit, technical training, product processing and collective marketing. They are thus playing the functions of innovation intermediaries (see Kilelu et al. 2011; Yang et al. 2014; Iyabano et al. 2021). While previous studies have highlighted the importance of FOs as innovation intermediaries for Burkinabè agricultural development in general (see e.g., Arcand 2004; Kaminski et al. 2011; Zett, 2013) and the promotion of agroecological

innovations[31] in particular (cf. Bancé 2013; Iyabano 2021; Métouolé et al. 2018), more detailed studies on the effectiveness of these intermediation activities (at the farmer level) – especially those focusing on the way the FOs influence farmers' decisions – are still scarce.

Understanding farmers' agroecological innovations decisions is particularly relevant for agricultural development actors such as policymakers and NGOs, as it can provide valuable information necessary for supporting the smallholder farmers' transition to agroecology. Furthermore, understanding farmers' decisions about these innovations can also contribute to the ongoing debates related to the influence of the structural elements (i.e. actors, institutions, interactions, and infrastructure, cf. Hekkert et al. 2007; Kebebe et al. 2015) of the innovation systems on farmers' innovation behavior. This is because many studies on farmers' innovation behavior tend to focus on the individual in isolation (Leeuwis & Aarts 2020). According to Shang et al. (2021) and Engler et al. (2019), systems perspectives tend to center on the dynamic of the interactions between institutions and actors in analyzing farmers' decisions about innovations by acknowledging that farmers' behavior is likely to be influenced by the existing institutional rules and arrangements (Shang et al. 2021; Engler et al. 2019). Also, institutions favor the creation of resources and incentives that may modify farmers' innovative behavior in multiple ways (Leeuwis & Aarts 2020). For example, the availability of innovation infrastructure such as input credit, knowledge and training facilities are positively influencing farmers' innovation decisions (Ochieng et al. 2021; Métouolé et al. 2018; Ndah 2015).

In the context of developing countries, Yang et al. (2014) and Iyabano et al. (2021) have noted that these innovation infrastructure are provided mainly by FOs since they are one of the main types of intermediary organizations (see Esman & Uphoff 1984) actively involved in managing agricultural development activities. Thus, the aim of this study is to analyze the factors that influence farmers' decision-making regarding agroecological innovations in order to unravel the influence of FOs' activities on these decisions. Following this introduction section, the next sections present a conceptual framework for analyzing farmers' decision-making processes about agroecological innovations with a particular focus on FOs and the research methods employed. Then follows the section that presents the results of the study. The last section discusses the key points from the results and concludes by highlighting some implications for theory and policy.

5.2 A conceptual framework for analyzing FOs' influence on farmers' implementation of agroecological innovations decisions

Systems perspectives (see Damtew et al. 2018) are recently gaining more consideration in the study of farmers' decisions regarding innovation (Ndah 2015; Engler et al. 2019). Systems thinking approaches such as the Agricultural Innovation Systems (AIS) (cf. Klerkx et al. 2012; World Bank 2006)

[31] In this study, agroecological innovations are considered to be all types of agricultural techniques developed by integrating ecological principles, referred to here as agroecological techniques or ecologically-based techniques.

perspective consider farmers' innovation decisions or behavior change as a collective process involving multiple interrelated actors (Ndah 2015). Such perspectives imply the identification of various coordination mechanisms and policies/components in the agricultural innovation development processes (Ibid). The innovation systems analysis distinguishes both the structure, i.e. four system elements (actors; institutions; interactions; and infrastructure), and the functions, i.e. types of activities conducted in supporting the development and implementation of innovation (Schiller et al. 2020a; Hekkert et al. 2007; Kebebe et al. 2015).

The structural elements of the systems include actors (i.e. farmers, FOs, government agencies, knowledge and research institutes, donor organizations, etc.); institutions (see North 1990), i.e. the rules and arrangements (such as policies, standards and regulations orienting actors' interactions); interactions (for resource leverage and knowledge sharing among actors); and infrastructure (i.e. the availability of assistance such as input credit, subsidies, equipment, knowledge or marketing facilities) (Schiller et al. 2020a; Hekkert et al. 2007; Kebebe et al. 2015). The effective operation of these elements largely determines the dynamics of the development and spread of innovations (Kebebe et al. 2015). Such dynamics are usually examined by mapping the key innovation activities or functions performed by different elements of the system. These functions can cover resource mobilization, knowledge development, knowledge diffusion and market formation (Schiller et al. 2020a; Hekkert et al. 2007).

The combination of functional and structural innovation systems analysis (cf. Kebebe et al. 2015), helps to identify various actors and the existing institutional arrangements that enable the development and implementation of innovations. The prevailing policies (such as those related to credit, subsidies, pricing systems, knowledge and information) and regulations (such as certification standards) have significant effects on farmers' decisions to innovate or not (Ndah 2015; Leeuwis & Aarts 2019; Shang et al. 2021). They affect farmers' aspirations or values by altering their assessment of trade-offs between multiple goals (Leeuwis & Aarts 2020) depending on their interactions with the overall system. FOs can play an important role in several such interactions (Kilelu et al. 2017; Yang et al. 2014). FOs are very active in connecting farmers with diverse innovation system actors so as to better organize the provision of innovation infrastructure (Cerf et al. 2017; Kivimaa et al. 2019; Mangnus and Schoonhoven-Speijer 2020; Groot Kormelinck et al. 2019). Therefore, the focus in this study is on FOs in order to understand farmers' decisions about agroecological innovations and the way these decisions can be influenced by the actions of their FOs. Farmers' decisions were analyzed specifically on the three main components of Vroom's expectancy equation of motivation (Vroom 1964). As Herath (2010) has pointed out, motivation is essential for understanding farmers' behavior with respect to agricultural innovation.

Vroom's equation states that an individual's motivation is a product of his or her instrumentality (i.e. the knowledge of the relationship between work efforts and desired behavior or outcome), valence (which is the value attached to the outcomes and the extent to which the outcomes are desirable) and expectancy (which is the individual's belief in his or her ability to perform the work successfully) (Vroom 1964; Suciu et al. 2013; Chen et al. 2016). Vroom's equation of motivation was further operationalized by linking its components to some categories of determinants affecting innovation behavior identified by Leeuwis and Aarts (2020): individual knowledge, aspiration or values, and ability. Figure 1 presents the framework developed for analyzing the FOs' influence on farmers' decisions about agroecological innovations. This framework will be used to answer the following questions: What role do FOs play within the broader structural elements of the Burkinabè agroecological innovation system? What do farmers' situations for implementing agroecological innovations look like in each FO studied? What drives farmers' decisions about agroecological innovations and how do their FOs influence these decisions?

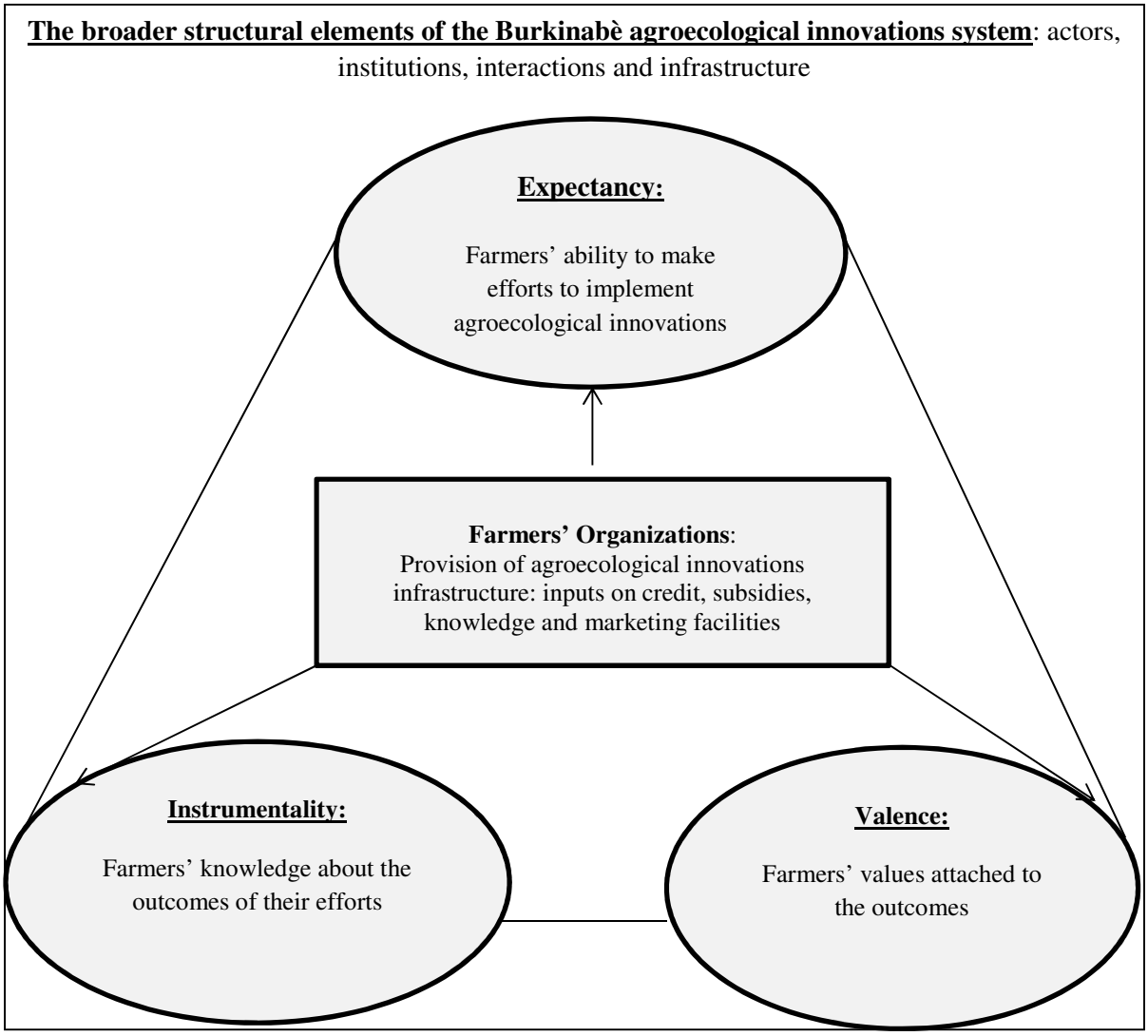

Figure 1: A conceptual framework for analyzing FOs' influence on farmers' decisions about agroecological innovations. **Source**: Own elaboration based on Vroom (1964); Leeuwis & Aarts (2020); Engler et al. (2019); Shang et al. (2021); Schiller et al. (2020a) and Kebebe et al. (2015).

5.3 Methods: data collection and analysis

This study is based on data collected from both primary and secondary sources. Primary data were collected directly from farmers through semi-structured interviews method. The interviews were conducted by the first author between February and May 2018 with a total of 44 farmers. These farmers were selected from three cases of Burkinabè FOs (see Table 5.3 in Appendix B for the description of these FOs) actively involved in promoting agroecological innovations with three distinct goals. The goals of the selected FOs included to enhance commercial crop productivity (which was the case of the *Union Nationale des Producteurs du Coton du Burkina Faso*–UNPCB), to improve subsistence farmers' resilience (in the case of the *Association Inter-zones pour le Développement en Milieu Rural*–AIDMR) and to enhance both the commercial crop productivity and subsistence farmers' resilience (in the case of the *Union des Groupements pour la Commercialisation en commun des produits agricoles de la Boucle du Mouhoun*–UGCPA).

Farmers were selected with the aim of covering a large diversity of agroecological innovations implementation situations in order to unravel the influence of FOs on their decisions about these innovations. This selection was facilitated with the assistance of the administrators and advisors in the three FOs. Almost all the interviews were conducted in local languages (*Mooré* or *Dioula* depending on the farmer's location within the agroecological zones of the country) with direct translation into French by the field assistants (FOs' advisors). Information obtained from interviewees included the general description of farmers (according to their gender, farm size, types of inputs used and cropping system); the types of agroecological innovations implemented; and the outcomes and benefits derived from implementing these innovations. The information in the interviews focused on farmers' explanations for the relationship between their decision to implement agroecological innovations and their FO's provision of training, credit, subsidies and marketing facilities.

Besides interviews, document research also helped to gather information for the description of the landscape of the Burkinabè agroecological innovation system. All the collected data were analyzed using both quantitative and qualitative approaches. The quantitative approach was used to describe farmers' agroecological innovations implementation situations. This was based on the frequency of the types of agroecological innovations implemented by these farmers. The qualitative approach was used to obtain meaningful information from the data so as to elucidate the key role of FOs in the Burkinabè agroecological innovation system and the way the FOs influenced the farmers' decision-making about agroecological innovations. The FOs' influence was analyzed by focusing on the FOs' actions on their

farmer members' instrumentality, valence, and expectancy (cf. Figure 1 in Section 5.2). The analysis mainly concerned 12 cases of farmers out of the 44 farmers sampled. The 12 farmers were selected because they were those showing the highest and the lowest agroecological innovations implementation situations (see Section 5.4.3). Quotes were also used to show some of the farmers' explanations of their agroecological innovations decisions in this analysis.

5.4 Results

This section starts with the presentation of the landscape of the agroecological innovation system of Burkina by emphasizing the central role of FOs within the system. There follows the description of farmers' situations for implementing agroecological innovations. The last section focuses on the farmers' explanations for implementing agroecological innovations by showing the influence of FOs on the three main drivers of their decisions: instrumentality, valence, and expectancy.

5.4.1 The central role of FOs within the Burkinabè agroecological innovation system

The study (Table 5.1) shows the existence of all the agroecological innovation system structural elements (see Section 5.2) that favor or constrain the development and implementation of agroecological innovations in Burkina Faso. These elements include actors, institutions, interactions and infrastructure. Weaknesses in one of these elements will constrain the development of such innovations. The main actors in Burkinabè agroecological innovation system are farmers, FOs, NGOs, knowledge and research institutes, agro-companies and market actors. NGOs are the dominant type of actors supporting the development of agroecological innovations in Burkina. This started during the two droughts periods (in the 1970s and '80s) that struck the country and later increased during recent decades with the introduction of organic niche markets (Roose et al. 1999; Iyabano et al. 2021). NGOs' activities are organized around the provision of technical and financial assistance to farmers grouped into various types of FOs.

These FOs were created to structure the agricultural value chains and/or to promote community development activities. As intermediary organizations (between farmers and other system actors), FOs[32] are very active in stimulating their members' agroecological behavior[33]. They do so to fulfill their broader goal (i.e. enhancing commercial crop productivity; improving subsistence farmers' resilience; enhancing both commercial crop productivity and subsistence farmers' resilience) by

[32] See Iyabano (2021) for more insights into the diversity of FOs involved in promoting agroecological innovations in Burkina Faso. See also Iyabano et al. (2021) for detailed explanations of some selected FOs' development of agroecological innovations.

[33] It is important to note that – except for AIDMR, which promoted only ecological agriculture – UNPCB and UGCPA are involved in promoting both conventional and ecological agriculture.

performing many activities such as resource mobilization, knowledge development, knowledge diffusion and market formation. FOs are mobilizing resources mainly by establishing linkages and collaborations with NGOs. Besides collaborating with NGOs, some FOs (namely those promoting commercial crops such as UNPCB and UGCPA in this study) are also involved in establishing relationships with an agro-company (i.e. the cotton FO) and/or local microfinance organizations for securing additional resources.

FOs support the development of agroecological knowledge by organizing group training to facilitate knowledge exchange (among farmers and/or between farmers and the FOs' advisors) and by setting up some demonstration plots (Iyabano et al. 2021). Frequently, topics discussed during training activities include the requirements of organic agriculture technology and the overall ecologically-based agricultural techniques. These techniques are usually promoted as a set of recommendations developed by the FOs' advisors through the technical assistance of their supporting partners' teams. This can be a joined team composed of advisors from NGOs and a national research institute (concerning the value-chain-based FOs) or a single team of NGOs' advisors (regarding the community-development-based FO, i.e. AIDMR in this research).

In addition to knowledge, some FOs also provide incentives such as subsidies (e.g., compost-making tools, bio-gas equipment, Faidherbia seedlings) and input credit, e.g. in the form of improved seeds or biopesticides (Iyabano et al. 2021). The latter is mostly seen in the value-chain-based FOs (i.e. UNPCB and UGCPA), as they are those concerned with the production and marketing of organic products (e.g., cotton, hibiscus, sesame and soybean). Examples of the types of input credit (provided by one of the FOs involved in promoting agroecological innovations) include the provision of organic cotton seeds and commercial biopesticides (commonly known as *Batik*). The FO deducts the cost of the inputs directly from the revenue obtained from selling organic cotton. The commercial biopesticides are usually promoted to complement those made by farmers (by processing neem seeds) for controlling organic cotton pests and diseases attacks. Moreover, the inputs on credit can also come through the financial assistance of their supporting NGO partners (such as the Catholic Relief Services for UNPCB and *Oeuvre leger* for UGCPA) in the form of subsidies.

Table 5.1 Overview of the structural elements of the Burkinabè agroecological innovation system

Structural elements	Key features
Actors	The key actors are small-scale farmers (grouped into FOs), FOs and NGOs. NGOs are the main actors in charge of mobilizing resources necessary for farmers' development of agroecological innovations.
Institutions	There are established (in some FOs) credit and subsidy policies, as well as predefined standards for organic products that aim to encourage farmers' agroecological behavior.
Interactions	These deal with the overall actions of FOs as the intermediary organizations in charge of establishing linkages with several agroecological innovations actors. These linkages help to ensure the flow of innovation-supportive infrastructure from diverse actors (which can be from NGOs to FOs or from FOs to farmers) and the marketing of farmers' products.
Infrastructure	These are investments made by FOs (with the support of NGOs) regarding the organization of provision of knowledge, input credit, subsidies and marketing facilities necessary for stimulating their members' agroecological innovations behavior.

Source: Adapted from Iyabano et al. (2021)

5.4.2 Description of farmers' situations for implementing agroecological innovations

The results of the study revealed the existence of various situations of farmers in implementing agroecological innovations (cf. Table 5.2). These situations differ from FO to FO and sometimes between farmers within the same FOs depending on their members' cropping system and (to some extent) their use of chemical inputs. Differences in farmers' situations for implementing ecologically-based techniques can be grouped into five categories.

The first category is composed of men and women farmer members of UNPCB involved in producing organic cotton. These farmers are located in both north and south agroecological zones of Burkina with farm sizes usually varying between 1 and 2ha. These farmers are managing their soil and crop health by only applying agroecological techniques (i.e. compost, manure, biopesticides, etc).

The second category is composed of men farmer members of AIDMR who grow mostly subsistence crops (i.e. sorghum-cowpea and sesame) with farm sizes ranging between 0.5 and 5ha. This category has only men farmers because they are the ones traditionally responsible for producing household cereals; this is the dominant type of farmers (including non-members of the FOs) found in northern Burkina (i.e. the sub-Sahelian and north-Sudanian agroecological zones). The region is characterized by persistent land degradation (due to the extensive droughts) causing many farmers to engage in implementing agroecological techniques such as composting, manuring and making *zaï* pits and stone-bunds.

The third category is composed of men and women farmer members of AIDMR who grow mostly sorghum (primarily the men farmers), cowpea and sesame through implementing many agroecological techniques. Their farm sizes vary between 0.5 and 5ha, like those of Category 2 farmers. Besides growing subsistence crops, some of the Category 3 farmers (especially those located near water sources such as dams) are sometimes involved in commercial production of irrigated vegetables. They grow the vegetables by applying chemical pesticides in combination with manure and/or compost for controlling farm soil fertility and pest attacks.

The fourth category includes men farmer members of UGCPA who grow cereals (i.e. maize and sorghum), with an average farm size of 5ha. This category is composed mainly of men farmers because they are the ones with the largest farms in the Boucle du Mouhoun region, which is located within the north and south Sudanian agroecological zones. These farmers are involved in producing both subsistence and commercial crops (i.e. cereals and cowpea) by using chemical inputs (fertilizers and pesticides) as well as applying manure and/or compost (mostly for their maize farms).

The fifth category is composed of men and women mixed sorghum-cowpea farmers (members of UGCPA) with an average farm size usually less than 5 ha. Like Category 4 farmers, these farmers also apply both chemical and ecological inputs in their farms. Moreover, some of the Category 5 farmers are sometimes involved in producing organic hibiscus, depending on the market demand. They grow hibiscus on plots far from their conventional plots of cereals and cowpea to reduce possible contamination of the organic hibiscus with residues of the chemical inputs.

Overall, the results in Table 5.2 show that all the farmers, regardless of their FO and the above-mentioned category they belong to, are all involved in implementing some ecologically-based soil management techniques such as manuring and composting. This can be due to the fact that some of these farmers are constantly faced with land-degradation issues as observed with members of AIDMR and, in some cases, UGCPA. The case of UGCPA mostly concerned the farmers located in the north Sudanian agroecological zone, as they are the ones who are always challenged with problems of depleted soil fertility. This explains the combined use of both chemical and organic (i.e. manure/compost) fertilizers observed among the Category 4 farmers. The use of compost/manure by UNPCB farmers (Category 1) is rather connected to their involvement in producing organic products, which do not allow the use of chemical fertilizers.

Table 5.2 Description of farmers' situations for implementing agroecological innovations

FO	Farmer categories	Cropping system	Level of chemical input use	Frequency of implemented agroecological innovations		
				Soil fertility management	Pest and disease management	Soil and water conservation measures
UNPCB	Category 1 (n=14)	Organic cotton (rotation with soybean and/or sesame)	0	Compost (74%), manure (49%), cotton rotation with soybean (62%), mulching (42%)	Biopesticides (100%), trap crop (100%), improved seeds (100%)	-
AIDMR	Category 2 (n=10)	Mixed sorghum-cowpea and sesame	0	Manure (93%), compost (93%), mixed sorghum with cowpea (93%)	Improved seeds (60%), biopesticides (26%)	*Zaï* (93%), stone-bunds (93%), d*emi-lune* (6%)
	Category 3 (n=5)	Mixed sorghum-cowpea; sesame and irrigated vegetables (cucumber, watermelon, carrot, okra, etc.)	+			
UGCPA	Category 4 (n=5)	Maize (sole crop) and mixed sorghum-cowpea	++	Manure (86%), compost (20%), mixed sorghum-cowpea (66%), sorghum-cowpea rotation (40%), mulching (13%)	Improved seeds (100%)	Tree preservation: *Faidherbia* and sheanut (93%)
	Category 5 (n=10)	Mixed sorghum-cowpea, organic hibiscus, and cowpea	+			

0= No use of chemical inputs; += Average use of chemical inputs; ++= High use of chemical inputs.

Source: Own analysis based on data obtained from 44 farmers interviewed in 2018

5.4.3 Instrumentality, valence and expectancy as the main drivers of farmers' agroecological innovations decisions

This sub-section presents farmers' explanations for their decisions to implement agroecological innovations by focusing on the FOs' influence on the three main drivers of their decisions. The explanations are focused mainly on 12 cases of farmers purposively selected from the three FOs. These farmers were selected because they were those identified as showing the highest (i.e. farmers F1, F2, F3, F4, F5, F6, F7 and F8) and lowest (i.e. farmers F9, F10, F11 and F12) degree of implementation of agroecological innovations. The selection of these cases enabled the unravelling of the role of FOs in influencing farmers' decisions about agroecological innovations. All the selected farmers (regardless of their implementation situations) belong to one of the categories mentioned in the second sub-section of the results: the first category concerns farmers F1, F2, F9 and F10; the second category concerns farmers F3, F4, F5, F6 and F7; the third, fourth and fifth category concern farmers F11, F8 and F12, respectively.

- **Farmers' instrumentality for agroecological innovations**

Farmers' instrumentality for agroecological innovations is mainly connected to their knowledge about the outcomes of their efforts related to implementing agroecological techniques. All the farmers interviewed have recognized that their farms' performance largely depends on the application of some agroecological techniques. Examples of these include the application of compost (which concerned farmers in all the three FOs), biopesticides (which was observed with UNPCB's farmers and one farmer in AIDMR) and improved seeds (which is observed with one UGCPA farmer). Concerning compost, most of the identified farmers stressed its efficiency in enhancing crop productivity. Examples are shown in the following quotes: "*if we don't apply compost, we will not have good yield*" (farmer F2, member of UNPCB) or "*compost gives well, whereas chemical fertilizers require a lot of water; that is why I use the chemical ones for my irrigated crops*" (farmer F6, member of AIDMR).

Similar to farmers F2 and F6, farmer F8 (member of UGCPA) also highlighted the importance of compost for crop productivity and further mentioned its positive effects in reducing Striga infestation of his maize farm. Apart from the farmers' personal experiences on their farms, the farmers have also reinforced their interest in making compost after participating in training sessions organized by their FOs. The compost produced during this training is directly applied in the demonstration plots usually managed by the FOs' advisors. By looking at the demonstration plots, the farmers could compare the quality of their self-made compost with that of the compost produced by their FO and could contact their FO's advisors for further clarifications.

Besides compost, the demonstration plots are also helping the FOs' advisors to show farmers the outcomes of implementing some agroecological techniques such as sole-crop cowpea variety, *zaï* and stone-bunds and biopesticides as observed in UGCPA, AIDMR, and UNPCB respectively. Concerning the cowpea variety promoted by UGCPA, most of the members acknowledge its high production of seeds and leaves (which also serve as animal feeds) despite its high sensitivity to pests and diseases. Similar to UGCPA farmers, AIDMR and UNPCB farmers also believe in the relationships between the implementation of techniques like *zaï* and stone-bunds (concerning AIDMR), and biopesticides (regarding UNPCB and in some cases AIDMR) and the increased production of their respective farms. They (farmers) mainly emphasized their effectiveness in restoring degraded lands and controlling (organic cotton and vegetable) pests and diseases attacks.

- ## Farmers' valence for agroecological innovations

Farmers' valence for agroecological innovations is the value they attached to the outcomes of the implementation of agroecological techniques. We find that different categories of farmers emphasize different values, varying from profit (which was more observed with UNPCB's members, i.e. farmers F1, F2, F9 and F10), restoration (which mainly concerned AIDMR's members, i.e. farmers F3, F4, F5, F6, F7 and F11), autonomy (concerning UNPCB's members), food security (which was more witnessed with UGCPA's members, i.e. farmers F8 and F12 and AIDMR's members). Farmers derived profits by selling organic cotton and sometimes the rotation crops such as sesame and soybean, depending on the market demand for these products. Farmers' profits are usually higher for organic cotton because of the purchase price differences between organic and conventional cotton. The prices given by UNPCB (in 2018) for a kilogram were 335 Franc CFA (the currency of several francophone African countries) for organic cotton and 224 CFA for conventional cotton. It is important to note that the price of organic cotton largely depends on the types of international buyers (who always propose a higher price than conventional cotton) from the FO after harvesting and primary processing the organic cotton.

Besides prices, the high profits observed in organic cotton farming also come from farmers' production of their own inputs (i.e. compost and biopesticide from neem) with low demand for input credit (except for organic cotton seeds and sometimes *Batik* in the absence of subsidies from external support) from their FO. An example of input autonomy as an explanation is illustrated in the following quote from farmer F2: "*I gain more with organic cotton…There are no credit-related issues* (for getting chemical fertilizers and pesticides in conventional cotton) *with organic cotton*". The social value of the outcomes of implementing agroecological innovations is mostly related to the increase in crop production for food security. The majority of farmers (members of AIDMR) with this value are primarily growing crops such as sorghum, millet, sesame and cowpea to satisfy their household needs. They do so by applying many soil and water conservation measures to restore their degraded land. An

example of a farmer's explanation for the reduction in land degradation is illustrated in the following quote: "*My objective is to never abandon a land; it is always necessary to work on that land in order to restore it*" (farmer F3). Although these farmers focus on subsistence crops, the results show they can sometimes sell (to the local markets or nearest neighbors) some of their crops, especially cowpea and sesame, in the case of urgent need of cash (e.g. for paying hospital bills or for children's school fees). Lastly, the combination of profit and autonomy values of the outcomes of implementing agroecological innovations is principally associated with the dual aim of increasing food production and profits. This was the case of UGCPA's members, who are gaining profits from selling some part of their harvested maize and cowpea. The FO (UGCPA) supports the marketing of farmers' products by negotiating prices with potential buyers (wholesalers). Overall, the results show that although some farmers have attention for autonomy and sustainability (this example of restoration), most of them are driven by other values such as profits and food security.

- **Farmers' expectancy with respect to agroecological innovations**

Farmers' expectancy is mostly related to the belief in their individual ability to make necessary efforts to implement agroecological techniques. This ability differs according to the existing practical constraints associated with the implementation of different types of agroecological techniques. These constraints include lack of skill, lack of labor (for collecting manure and making compost, collecting neem seeds for the production of own biopesticides), and poor availability of neem-based products and improved cowpea seeds in the market. The FOs are reducing some of these constraints by organizing skills training necessary for improving members' ability to implement labor-intense techniques such as compost and *zaï*. They (FOs) are doing that with the aim of helping farmers to comply with the standards of organic certification (concerning UNPCB) or strengthen the farmers' integration of ecological principles in their farm management strategies (which was observed with UGCPA and AIDMR). The promoted techniques are based on the improvement of existing farmers' traditional practices such as the production of compost in pile (which is less labor demanding as compared to the techniques of compost pits) and the disposition of *zaï* in an equilateral triangle shape (which optimizes water retention).

The compost produced by the application of updated techniques, therefore, helped the farmers to restore their degraded land by applying them in *zaï* pits which was the case with AIDMR's members. The produced compost also helps organic cotton growers (in UNPCB) and maize growers (in UGCPA) to ameliorate the soil fertility of their farms. Although the FOs-promoted techniques are helping farmers to reduce the labor constraints associated with compost production, the results show that some farmers are experiencing other labor constraints that also hamper their time investment in compost production. This was mainly observed with farmer F10 (member of UNPCB) and farmer F11 (member of AIDMR). Farmer F10 only believes in her ability to only collect and apply manure (which

is also in line with the organic certification standards) in her cotton farm since she already invested her time and labor in walking long distances searching for manure around the village. Farmer F11 mentioned the physical layout of her farm (which is located in a swampy area), as a limiting factor for producing her own compost because of the time investment in soil preparation and irrigation of commercial irrigated okra.

Besides the provision of training the updated less-labor intense soil fertility management techniques, FOs like UNPCB and AIDMR are also improving their farmers' ability towards ecological management of crop health techniques by providing skills training for biopesticides production. A typical example of a skill acquired by farmers was explained by farmer F4, a member of AIDMR, who mentioned his ability to now apply self-made biopesticides (from a mixture of neem and bark of cailcedrat in his irrigated vegetable farms) following his participation to a training session organized by his FO. Farmers, in both FOs, have acknowledged the high demand for the labor associated with the production of biopesticides since this requires a time investment for collecting and ginning neem seeds. In the case of UNPCB, the labor constraints associated with the production of biopesticides are sometimes reduced by the FO's provision of ready-made commercial biopesticides in subsidies (depending on the availability of funding from external partners). The provision of subsidies was also very helpful in reducing UGCPA farmers' constraints related to access to improved cowpea seeds. This variety is promoted by UGCPA to complement to the less productive existing varieties (that farmers usually grow in association with sorghum) through the technical and financial assistance of *Oeuvre leger* (an NGO).

5.5 Analysis and discussions

It becomes clear from the above results that farmers' agroecological innovations decisions are a result of the combination of their instrumentality, valence and expectancy. A farmer can decide to implement agroecological innovation if he/she sees a clear link between his/her farm performance and the application of these techniques; and the extent to which this performance is desirable for him/her; and he/she is convinced about the ability to make efforts to apply agroecological techniques. As the results show, farmers' decision-making is widely influenced by the actions of their FOs on at least two of the three above-mentioned drivers (see Figure 2). The action of FOs on farmers' instrumentality is related to the setting up of demonstration plots (at selected members' farms) to enable their farmers to see the relationship between the application of agroecological techniques such as compost, biopesticides, and improved cowpea seeds discussed (by the advisors) during training sessions and the actual farms' performance (i.e. the demonstration plots).

The action of FOs on farmers' valence is mainly linked to their contribution to the increase in farmers' profits (for UNPCB and UGCPA) and autonomy (concerning UNPCB). Both UNPCB and UGCPA are involved in the collective marketing of their farmers' products. They do so by always seeking buyers who can offer higher prices for their farmers' organic products, i.e. cotton, sesame or soybean in the case of UNPCB and hibiscus in the case of UGCPA. The action of FOs on farmers' expectancy is seen mainly in their constant improvement of farmers' skills to apply efficient agroecological techniques such as the less labor-intensive composting techniques and techniques that optimize water harvesting such as the equilateral triangle for *zaï* positioning. Besides improving skills, the FOs are also providing (depending on the availability of financial partners' assistance) some inputs on credit and/or subsidized such as commercial biopesticides (*Batik*) or cowpea seeds to strengthen their ability to apply agroecological techniques.

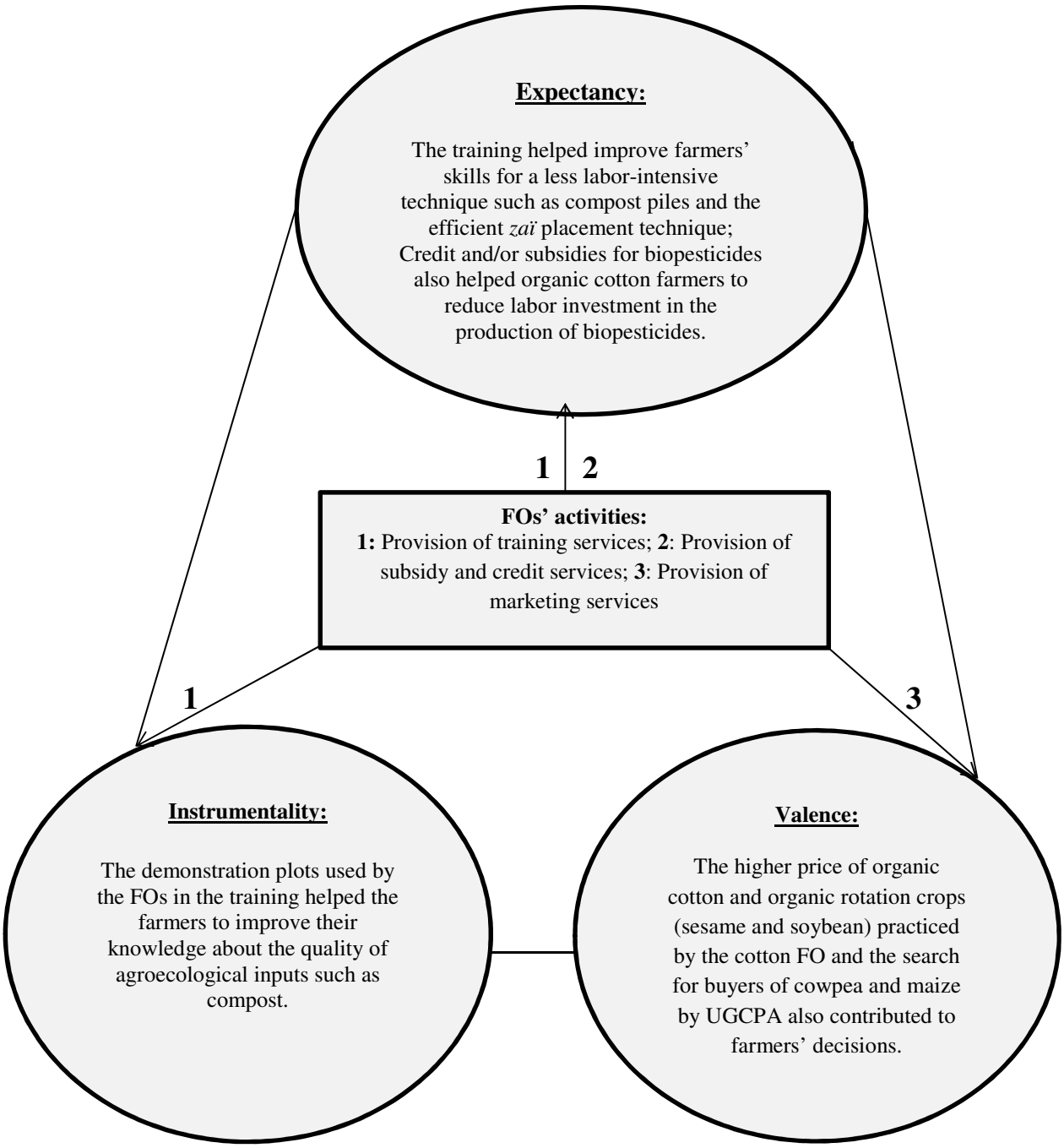

Figure 2: The influence of FOs' activities on the main drivers of farmers' agroecological innovations decisions

Source: Own analysis

The results show the existence of a spectrum of farmers' implementation of agroecological innovations ranging from the highest to the lowest implementation situations. And also some farmers are pragmatic as they use agroecological innovations when it suits them, but they also use conventional practices (using chemical inputs) if that is to their advantage. The results support the idea that the FOs as the main intermediary organizations (Iyabano et al. 2021) play a central role in the

promotion and implementation of agroecological innovations since farmers' agroecological innovations decisions are largely shaped by the actions of their FOs on at least one of the three drivers (i.e. instrumentality, valence, and expectancy) of their decisions. FOs are thus acting on these drivers by establishing policies that favor the organization of agroecological training activities, the promotion of higher prices for organic products, and access to incentives such as subsidies and credit.

On the one hand, the FOs are establishing these policies as part of their strategy to encourage their members' engagement towards agroecology (this concerns all the three FOs regardless of the type of crops they are promoting). On the other hand, the FOs (namely those partially or fully involved in the promotion of organic crops) are establishing the above-mentioned policies to help their organic farmers comply with the global standards of organic certification. Among these policies, the availability of incentives appears to be among the main influencers of farmers' decisions in favor of agroecological innovations. This can be due to the fact that some FOs are offering higher prices for organic products and this encouraged many conventional farmers to take such opportunities by shifting from conventional to organic cotton farming (which relies on the full application of ecologically-based techniques).

These results confirm what Ndah (2015) has argued regarding the influence of incentives on farmers' innovation decisions. This also resonates with the argumentation of Engler et al. (2019) on the relationship between individual farmers' innovation decisions and the existing institutional arrangements, and observations elsewhere that institutional settings broadly influence farmers to produce in a specific manner (Leeuwis & Aarts 2020). The results also show that all the actions of FOs were not isolated from their external environment, as these depend on their interactions with the wider agroecological innovation system actors. Prominent among these actors are NGOs and international buyers of organic products. Changes in these interactions would likely affect farmers' decisions to implement agroecological innovations. For example, any decrease in the demand for organic products (in the international market) can reduce the purchase price of these products. This will alter price incentive practices by FOs and thus influence farmers' interest to grow organic crops, thereby affecting their decisions to implement many agroecological innovations.

Similarly, a longtime absence of NGO support can also affect the FOs' provision of some training facilities and subsidies to their farmers. This may have an effect on farmers' implementation of some agroecological innovations since the actions of FOs play an important role in reinforcing their decisions in favor of these innovations. This shows the existence of interdependencies (Leeuwis and Aarts 2020) between individual farmers' agroecological innovations decisions and the wider institutional environment of the agroecological innovation system. These results are in line with other system thinking conclusions (cf. Kebebe et al. 2015; Schiller et al. 2020a) regarding the importance of

the functions of all the system structural elements (i.e. actors, institutions, interactions and infrastructure) in the development and implementation of innovations.

However, contrary to the results of Kebebe et al. (2015) showing the poor interaction among dairy innovation actors in Ethiopia, this study rather demonstrates that the development of agroecological innovations in Burkina Faso is facilitated by the construction of multiple linkages among system actors through the intermediation of FOs (see also Iyabano et al. 2021). Finally, while efforts were made to capture the diversity of farmers' situations for implementing agroecological innovations and the broader influence of the institutional environment on farmers' decisions, this study has some limitations related to the methodology employed. The limitations mainly concerned the small number of farmers sampled on account of the time limitations for fieldwork.

5.6 Conclusion

In conclusion, this study has examined the way FOs influence farmers' decisions to implement agroecological innovations. This was done mainly by demonstrating the actions of FOs on the main driving forces of farmers' decision-making: expectancy, instrumentality and valence. These actions were materialized by setting-up demonstration plots for reinforcing farmers' knowledge about the outcomes of the application of agroecological innovations, contributing to the increase of farmers' profits by practicing favorable price for organic products, and improving farmers' skills on the available efficient agroecological techniques. While farmers are the final decision-makers, this study shows that their decisions are largely shaped by the availability of incentives and less by their convictions with regard to agroecology. These incentives usually come from their interactions with the agroecological innovation system actors through the intermediation of their FOs. The study has contributed to an improved conceptual understanding of farmers' innovation decisions as a dynamic process resulting from the interactions of the individual farmers with their broader institutional setting. It is therefore important to look beyond the individual argumentative (cf. Leeuwis and Aarts 2020) in order to better understand farmers' reasons for implementing agroecological innovations. These results call for reflection on policies are meant to encourage smallholder farmers to transition towards agroecology. This could be by calling for increased funding support to actors such as FOs to widen their provision of agroecological innovations development activities in order to stimulate more farmers' implementation of these innovations.

Chapter 6

General discussion and conclusions

6.1. Introduction

This thesis has explored and examined the positions, roles, motivations, and agency (i.e. their ability to take action) of FOs and farmers in the promotion and implementation of agroecological innovations in Burkina Faso, taking different angles at this topic. Insights were yielded by providing the answers to the following questions: a) How has the place of FOs in the agriculture policy of Burkina Faso evolved over time? b) Why and how do the current FOs become involved in the promotion of agroecology, and how do the FOs and farmers define the term agroecology or agroecological techniques? c) How do FOs stimulate their members' interests towards practicing agroecology? d) What is the effectiveness of FOs' stimulation on farmers' agroecological innovations decisions? In this last chapter, I bring together the findings from the different empirical chapters of the thesis and discuss the crosscutting issues emerging from the findings of these chapters. Also, I discuss the overall theoretical and practical implications of the thesis. Section 6.2 provides a summary of the main findings that answer the different research questions addressed in this study. Section 6.3 discusses crosscutting issues and provides a broader reflection by linking them to a system perspective, namely the agroecological innovation system (see Iyabano et al. 2021; Schiller et al. 2020a). Sections 6.4 and 6.5 briefly highlight the theoretical, policy and practical implications of the study. The outlook for further research and some final remarks are provided in Sections 6.6 and 6.7, respectively.

6.2. Overview of the main findings of the empirical chapters

To understand the positions, roles (functions and evolution), motivations, and agency of FOs and farmers in the promotion and implementation of agroecological innovations, in Chapter 2 I first presented a historical overview of the place of FOs within the agriculture policy in Burkina Faso. This study indicates the evolution of the FOs' functions (including the provision of economic, technical and advocacy services) in the Burkinabè agricultural development activities. This is by showing the existence of both continuity (i.e. in the consideration of FOs being instrumental for introducing and disseminating innovations) and discontinuity of the place of FOs in the country's agriculture policy. The discontinuity is mostly witnessed with the increased active involvement of FOs in the provision of economic, technical and, in some cases, advocacy services. This was mainly due to the country's involvement in the implementation of the World Bank reforms in Burkina Faso like in many other developing countries. This led to the establishment of FOs legislation based on value chains known as *loi 14* in addition to the existing community development association law called *loi 10*. The effect was that *loi 10* FOs in agricultural development activities are focused on the provision of economic and technical services with limited participation in the formulation and orientation of the country's agriculture policy, as compared to those of *loi 14* FOs, which have stronger involvement in policies. The implications of *loi 14* are mainly shown through the FOs' active negotiations in having quality inputs used for conventional farming at reasonable prices. The study, therefore, recommends the

integration of *loi 10* FOs in the national agriculture policy debate to reflect the diversity of the Burkinabè agriculture situations.

Chapter 3 explores the diversity of the current FOs involved in the promotion of agroecological innovations in Burkina Faso in order to provide the answer to the question of why and how do the current FOs get involved in the promotion of agroecology, and how do FOs and farmers define the term agroecology or agroecological techniques? The study identified eight cases of FOs involved in agroecology with three distinct goals: the enhancement of commercial crops' productivity; the improvement of subsistence farmers' resilience; and the enhancement of both commercial crops' productivity and subsistence farmers' resilience. The study reveals that the majority of agroecological innovations promoted by FOs are based on the improvement of the existing farmers' traditional practices except for those related to crop protection, which were introduced by NGOs as part of their strategy to support the promotion of agroecology (in the northern regions) or the promotion of organic crops (throughout the country). This is because many Burkinabè farmers, especially those located in the northern regions, were already implementing agroecological innovations in the management of their soil fertility. The study also shows that the overall promotion of agroecological innovations by FOs is largely shaped by the frequency of their interactions with external partners (mainly NGOs) to obtain the necessary support regardless of their geographical location. As for the interpretation of agroecology terms, the findings show that most of the FOs' meanings and explanations were linked to their goal of promoting these innovations as detailed below. Examples of terms used by FOs include organic agriculture or the use of compost or '*Kokol Zanga Koobo*' (which can be translated into English as agriculture of protection) in the case of FOs with the goals of 1) enhancing commercial crops' productivity; 2) improving subsistence farmers' resilience; and 3) enhancing commercial crops' productivity and subsistence farmers' resilience, respectively. The increase of commercial (for income ambitions) and/or subsistence crops' production played a very important role in farmers' definitions of agroecological terms, while ecological considerations were less prominent (even with members of FOs primarily focused on the ecological protection).

After providing an overview of the place of FOs in agricultural development of Burkina Faso and zooming in on the diversity of those promoting agroecological innovations, the thesis detailed the innovation intermediation functions performed by FOs in stimulating their farmers' implementation of agroecological innovations in Chapter 4. As innovation intermediaries, FOs are very active in the establishment of multiple relationships with other actors of the agroecological innovation system to gain access to (technical and financial) necessary for the provision of the innovation infrastructure (such as input credit, knowledge and training facilities) to their farmers. As the study shows, the FOs are actively providing both the knowledge and innovation intermediary functions in line with the aim of fulfilling their broader goal of promoting agroecological innovations. While the knowledge intermediation functions mainly focus on the organization of individual (through exchanges between

farmers and advisors) and group (at the FOs' location and/or during field demonstrations) training activities; the innovation intermediation functions rather center on the provision of many innovation support services such as inputs subsidies, and credit and marketing facilities. This indicates that FOs as intermediary organizations are the main facilitators of the introduction and/or expansion of complementary agroecological innovations in Burkina Faso according to the evolution of their partnership with external actors.

The last empirical Chapter 5 details the effectiveness of FOs' intermediation functions by analyzing how these FOs influence farmers' agroecological innovations decision processes. The study shows that farmers' agroecological innovations decisions are related to the combination of three main drivers: the instrumentality (i.e. the link between his/her farm performance and the application of agroecology -based techniques), the valence (i.e. the extent to which this performance is desirable for him/her) and the expectancy (i.e. his/her ability to make efforts to apply agroecological techniques). As the findings show, the overall farmers' agroecological innovations decision-making is largely influenced by their FOs' provision of innovation infrastructure (in the form of input credit, subsidies, training and marketing facilities, etc.) and this shapes the above-mentioned three drivers. The FOs are mobilizing this infrastructure by interacting with the overall agroecological innovation system actors. The actions of FOs in shaping farmers' instrumentality is mostly connected to their establishment of demonstration plots, which enable their members to clearly see the relationship between the application of ecologically-based techniques like compost-making techniques and improved cowpea seed on farm performance. The action of FOs in shaping farmers' valence is linked to their contributions to farmers' profits making by ensuring the collective marketing of their products. The action of FOs in shaping farmers' expectancy is mainly related to their constant quest to improve farmers' agroecological skills by proposing the most efficient available ecologically-based techniques. Some of the FOs are also providing subsidies and/or inputs on credit to strengthen their ability to implement ecologically-based techniques. This indicates that the farmers' agroecological innovations decisions are complex processes resulting from the interactions of their FOs with individual farmers on the one hand, and from the interactions of their FOs with the actors in the broader innovation system on the other hand.

6.3. Discussion of crosscutting issues from the chapters

The findings of the empirical chapters bring up several crosscutting issues that contribute to the discussion about the agency of FOs and farmers in the promotion and implementation of agroecological innovations in Burkina Faso. This section discusses three crosscutting themes that arise from the linking of different empirical chapters: 1) the specificity of the Burkinabè agroecology promotion and the key role of FOs in supporting this promotion; 2) opportunistic dynamics of FOs' promotion and expansion of agroecological innovations; 3) the influence of FOs on farmers' implementation of some agroecological innovations. These themes are all related to the agroecological

innovations intermediation activities of FOs (as shown in Figure 6.1), which include facilitating the flow of economic and technical services from agricultural development institutions and organizations to farmers and connecting farmers with diverse types of system actors.

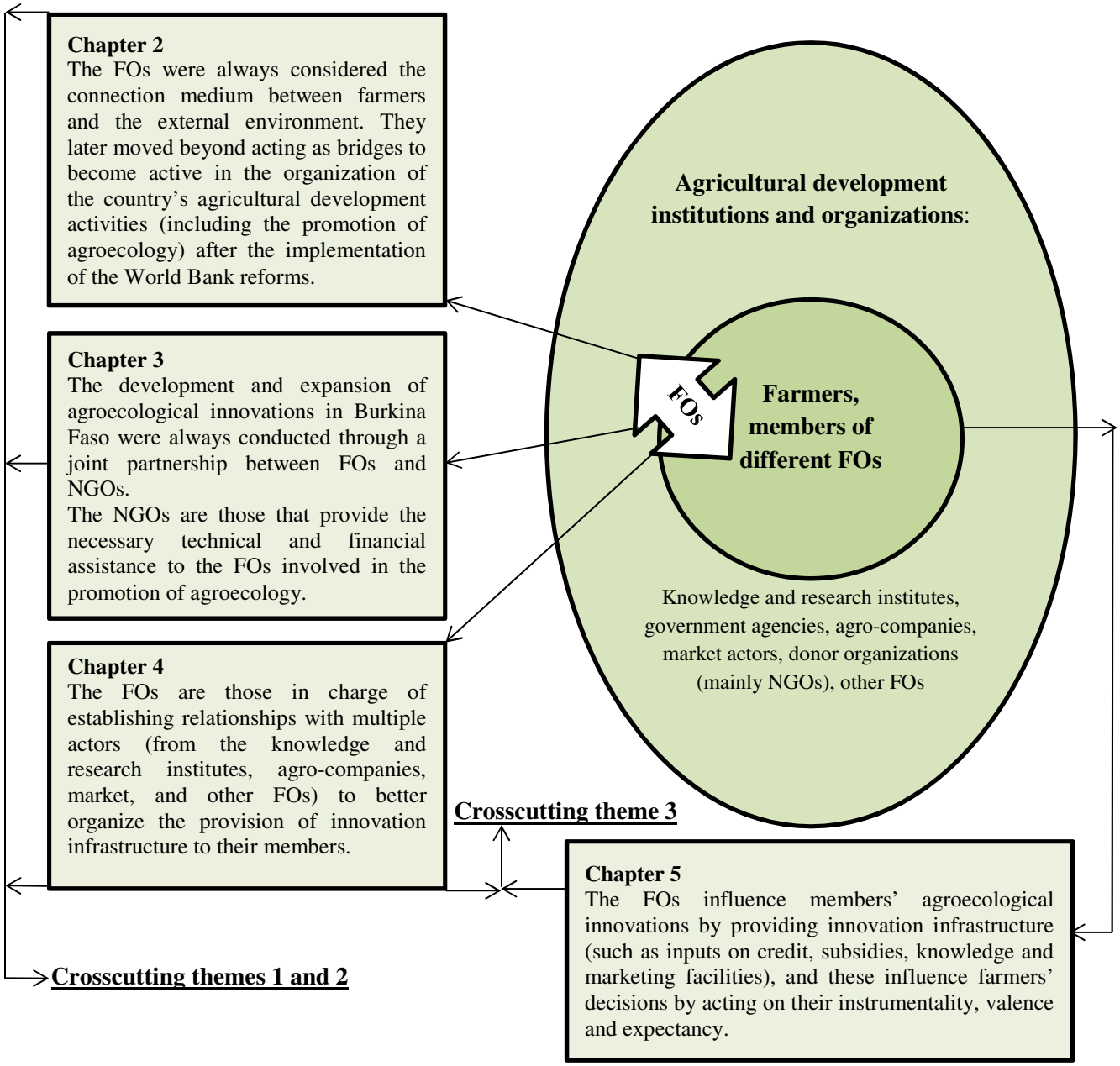

Figure 6.1 FOs as intermediary organizations between farmers and the broader agroecological innovation system actors

6.3.1. The specificity of the Burkinabè agroecology promotion and the key role of FOs in supporting this promotion

Chapters 2 and 3 show that, contrary to the more recent increasing attention to agroecology (during the last decades) in many African (Ameur et al. 2020; Boillat et al. 2021; Bottazzi and Boillat 2021; Gliessman 2020; Pimbert and Moeller 2018) and Latin American (Rosset et al. 2019) countries, the promotion of agroecology in Burkina Faso is a very old activity which can be traced back to the early 1970s when it started as bottom-up farmer/FOs activity. This activity was mainly related to the fight against extensive drought that struck the northern regions of Burkina Faso during which NGOs partnered with local FOs called *Naam* to conduct a participative selection and dissemination of efficient agroecological soil restoration techniques practiced by some farmers (Chapter 3). An important finding from these chapters is that the promotion of agroecology in Burkina Faso has always been conducted through a joint partnership between different types of FOs (i.e. community development-oriented FOs and value chains-oriented FOs) and NGOs. This dual FOs system emerged because many Burkinabè FOs were already involved in connecting farmers with institutions in charge of agricultural development activities (Chapter 2).

The partnerships between FOs and NGOs were further spread in other regions of the country during the early 2000s with the promotion of certified organic products during which some value chains oriented FOs started the promotion of agroecological techniques to help their farmers to control soil and plant health. The promotion of agroecology in Burkina is thus characterized by the existence of both joint external–local initiatives (which concerns the cases of community development FOs) and external initiatives (regarding the cases of FOs strongly focused on certified organic agriculture such as the value chains-oriented FOs). These conditions are different from other West African countries (such as Benin and Senegal for example) since the intensive promotion of agroecology in Burkina Faso started with the introduction of organic agriculture technology "from outside" (Boillat 2021; Tapsoba et al. 2020) during which many NGOs supported the structuration and constitution of FOs involved in the production of organic certified crops.

It can be noted from these findings that the Burkinabè FOs are mainly promoting agroecological innovations by interacting with donor organizations (mainly NGOs) and, in some cases, research institutes to gain access to technical knowledge and financial support (Figure 6.1). The FOs further channel this support to their members by organizing technical training sessions and providing subsidies (depending on the availability of external support). Besides training and subsidies, the study also shows that some FOs (mainly those promoting commercial crops) are also establishing relations with market actors and agro-companies to organize the collective marketing of members' products and obtain some funding needed for supplying inputs on credits (Chapter 4). The Burkinabé situation regarding the diversity of the FOs' support activities in promoting agroecology is mainly connected to

the evolution of their innovation intermediation functions. Such evolution is materialized by the involvement of both FOs registered under the community development association (since the droughts in the 1970s and '80s) and FOs registered under the value-chain development laws (which started in the early 2000s and later amplified with the continuous land degradation issues) depending on the dynamics of their relationship with NGOs. Consistent with the study of Lancelloti (2019), the contributions of NGOs were always central in the development of a so-called "francophone agroecology" in the West African drylands regions, with Burkina Faso as the focal point for the experimentation and dissemination of these innovations. More reflection will be given on the role of FOs as innovation intermediaries in the next section.

6.3.2. Opportunistic dynamics of FOs' promotion and expansion of agroecological innovations

As noted in Chapter 1 and above, Bancé (2013) points out that the Burkinabè promotion of agroecology is characterized by the connection of NGOs with FOs. Findings from Chapters 3 and 4 show the existence of two contrasting situations where, on the one hand, some FOs are genuinely interested in the principles underlying agroecology while, on the other hand, other FOs are promoting agroecology as an opportunistic response to gain access to incentives provided by donor organizations (Figure 6.1) and/or to grasp the opportunities offered from the collective marketing of organic products. The analysis reveals that the majority of those convinced about the principles of agroecology are mainly the types of FOs registered under the community development association law (see Chapter 2). They are those showing the joint interpretations of agroecology as a set of practices and a movement (as per Wezel et al. 2009) by employing the term agriculture of protection. These FOs were already familiar with the promotion of agroecological innovations (especially those connected to soil fertility preservation and restoration) prior to their recent interactions with many NGOs (Chapters 3 and 4). They constantly search for opportunities from supportive NGOs to either improve and/or expand their promotion of agroecology.

The analysis also highlights the key role of NGOs in the initial and intensive promotion of agroecological innovations (Chapter 3) with FOs registered under value chain development law. This corresponds to the analyses by Mockshell and Kamanda (2018) and Mier et al. (2018) regarding the donor influences in funding the development of agroecology. Moreover, these findings also provide evidence to confirm the propositions of Klerkx et al. (2009) regarding the importance of FOs as innovation intermediaries in facilitating the development of innovation through searching for funding opportunities and linking farmers with agroecological innovation system actors (Groot Kormelinck et al. 2019; Kilelu et al. 2011; Yang et al. 2014; Yang 2013). These findings are also in line with the idea that intermediaries operate in a wider 'ecology' with other organizations that also perform intermediary roles (Kivimaa et al. 2019). However, contrary to Yang's (2013) study of FOs'

intermediation in China, this thesis shows that FOs have enough space to make use of resources obtained from partners and thus invest in relevant production and marketing services for their members. This explains their engagement in multiple relations with diverse actors in the agroecological innovation system; this is in contrast to earlier conclusions by Yang et al. (2014) regarding the difficulties of FOs to fulfill the intermediation roles at system level. The engagement in these relations, therefore, enables the FOs to better perform their intermediation roles by operating with other organizations that also provide agroecology intermediary roles (Kivimaa et al. 2019; Iyabano et al. 2021; Groot Kormelinck et al. 2022) within the broader landscape of the agroecological innovation system.

6.3.3. Differential farmers' interests in agroecological innovations are shaped by the activities of innovation intermediaries

Although all the FOs studied are actively striving to stimulate their members' interest in agroecology (Chapter 4), the findings (Chapter 5) reveal some disparity regarding farmers' interests in the implementation of agroecological innovations. While all the farmers are convinced about the importance of soil fertility management techniques (regardless of the actions of their FOs), other implemented techniques (such as improved seeds and biopesticides) were rather induced by their FOs' provision of incentives. In both cases, we see that the innovation intermediation activities of FOs are very effective in influencing farmers' agroecological innovations decisions and that all the farmers' interpretations of agroecological terms were closely related to the definition of agroecology as a set of practices (Wezel et al, 2009). This is by reinforcing their skills on the updated ecologically-based soil fertility management techniques and/or inducing their ability for implementing other forms of agroecological innovations through the provision of various resources and incentives (Chapters 4 and 5). This is in line with what Klerkx (2014) mentioned concerning the importance of resources in determining individuals' ability to take certain actions. This links to other findings showing how FOs are strengthening farmers' capacities to develop and implement agroecological innovations (López-García et al. 2021; Ollivier et al. 2018). Furthermore, it can be noted in these findings that the FOs' influence on farmers' decisions is also related to their continuous interactions with the wider institutional environment of the agroecological innovation system (as per Schiller et al. 2020a): knowledge and research institutes, donor organizations, market actors (see Figure 6.1). These interactions are essential for access to resources and incentives necessary for continuity in organizing their innovation intermediation activities.

6.4. Implications for theory

This thesis has adopted a system thinking perspective to investigate the agency of FOs and farmers in the promotion, expansion and implementation of agroecology. This thesis demonstrates that some of the FOs' agroecology actions and farmers' agroecological innovations decisions are largely determined by the outcomes of their interactions with the wider system environment. Such interactions help the FOs to grasp available opportunities provided by system actors (namely supportive partners) to start and/or intensify the promotion of agroecological innovations through their provision of diverse innovation support services to members. These support services have also contributed to improving the capacity of some women farmers to start cotton farming since it a crop that is usually grown by men farmers. The involvement of these women is due to their FO's promotion of organic cotton. This promotion requires the establishment of special support services which is in line with the idea of (Klerkx 2020) regarding the existence of different pathways and support services for innovation.

This thesis makes contributions to the debates on actors' agency in the development and implementation of agroecology by unravelling the existence of actively forged and maintained interrelations between FOs and other system actors (see Figure 6.1) on the one hand and between farmers and their FOs on the other hand, showing that the intermediary organizations like FOs are very important in connecting system actors. The existence of these interrelations can be explained by the fact that the development of agroecological innovations is a highly knowledge-intensive activity (Gliessman et al. 2017; D'Annolfo et al. 2021) and this calls for the mobilization of knowledge from both local and scientific actors. These interrelations can also be connected to the continuous flow of some incentives (such as subsidies and inputs on credit...) that are very essential in improving farmers' and FOs' capacity for promoting and implementing agroecological innovations. However, we can note from this thesis that the FOs' agency for agroecology was mostly focused on establishing and forging links with multiple system actors (e.g., donor organizations and market actors...) but with limited connections with the actors of national agricultural policy.

The thesis deepens the conceptualization of FOs as innovation intermediaries for agroecology. This is by showing the existence of several "localized forms of agroecology" and that, in countries like Burkina Faso, there are several drivers that make FOs engage with more comprehensive forms of agroecology and more pragmatic forms. These drivers are centered on the availability of donor organizations for accessing incentives and the location of FOs within the four phytogeographical zones of the country. While the comprehensive form of agroecology (i.e. the genuine interest in agroecology principles) was witnessed with FOs located in areas frequently affected by extensive droughts (such as those located in the sub-Sahelian and north-Sudanian zones), the pragmatic forms of agroecology (i.e. the opportunistic responses to incentives) was rather observed with FOs involved in the promotion of commercial crops (including the organic certified crops).

The thesis also shows that the FOs are not neutral intermediaries (Yang et al. 2014) as they may take more normative or more technocratic roles in promoting agroecology depending on the types of relations they are engaged in. This corresponds with the argumentation of Kilelu et al. (2011); Kivimaa et al. (2019) and Groot Kormelinck et al. (2022) on the role of systemic intermediaries in mobilizing relations with heterogeneous system actors for stimulating innovation and that they are sometimes "niche intermediaries" and sometimes "regime intermediaries". As systemic intermediaries, the FOs in Burkina are, thus, involved in the establishment of multiple relations with diverse system actors so as to achieve their goal of promoting agroecological innovations (i.e. improving the productivity of members' commercial crops and/or the resilience of members who are growing subsistence crops). In contrast to what Groot Kormelinck et al. (2022) found in Uruguay, we do not find that systemic intermediation role results in tensions and conflicts with regard to the representation of members' interests.

6.5. Implications for policy and practice

From the above sections, several policy and practical implications can be formulated:

National policy actors

Although Burkina Faso has a long history in the promotion of agroecology, there are limited dynamics from the national policy actors in the overall process since they tend to focus more on the promotion of conventional agriculture, thereby facilitating farmers' access to quality chemical fertilizers and pesticides. To reduce the environmental degradation due to the effects of climatic variability (mostly observed in the northern regions) coupled with the intensive use of chemicals (for the production of commercial crops), there is a need to mainstream agroecology in the national policy actors' agenda. This could be done by jointly inviting the two types of FOs (i.e. the value chains-oriented and the community development-oriented FOs) in the formulation and orientation of the national agriculture policy document. Another implication is related to the calling for more national policy actors' investment of various FOs involved in the promotion of agroecological innovations by facilitating their access to subsidized agroecological inputs which will represent the current diversity of the country's agriculture landscape.

Farmers' Organizations and donor organizations

Furthermore, the study calls for FOs to increase the diversity of their promotion of crops grown based on ecological principles. This can be done by calling for more members to engage in the production of both subsistence and commercial crops. Doing so can help the FOs to gain some extra profits from the commercialization of certified organic (usually sold on the international markets) or ecological (which are mainly sold on the domestic markets) products of their members. And this could help to reduce

their financial dependency on donor organizations for continuity in organizing some agroecological innovations support services like the provision of incentives and the setting up of demonstration plots. Acknowledging the existence of several "localized forms of agroecology" in Burkina, the study calls for donor organizations of the FOs inclined towards more comprehensive forms of agroecology to support and facilitate their integration into the global agroecology movement like the transnational farmer-led movement called '*La Via Campesina'*. Such integration could help these FOs to actively defend (at both national and international levels) their members' right to food security and to share updated knowledge and ideas on the available efficient land-restoration practices.

6.6 Limitations of the thesis and outlook for further research

Although diverse data-collection approaches were employed to analyze the agency of FOs and farmers in the development and implementation of agroecological innovations, our study reveals some methodological limitations related to the small sample size of farmers interviewed. Future studies could therefore enlarge the sample of interviews so to provide more quantitative evidence on the role of FOs in stimulating farmers' agency towards agroecology. To understand the effectiveness of FOs' agency in reinforcing farmers' capacities to implementing agroecology, future research could examine the extent to which the innovation intermediation roles of FOs address the issues of gender inclusion. Another interesting area for further research could closely examine the outcomes of FOs' involvement in promoting commercial crops grown based on ecological principles as a partial funding source for the provision of knowledge and innovation services to their farmers. As Howells (2006) indicates, the provision of these services is essential for improving the performance of innovation intermediaries in the innovation development process.

6.7 Final reflections

This thesis aimed to understand the agency of FOs in stimulating their farmers' implementation of agroecological innovations in Burkina Faso. By adopting a system thinking perspective, we contribute to FO studies by examining the way they interact with various agroecological innovation system actors. This is by demonstrating the existence of a strong relationship between FOs' interactions with system actors and their provision of farmers' agroecological innovations support services. This relationship is established by FOs for gaining access to the technical and financial assistance necessary for the stimulation of their farmers' decisions about agroecological innovations. The findings of the chapters demonstrate how the FOs' agency is actively improving farmers' capacities to implementing agroecological innovations. Both FOs' and (some) farmers' actions were largely related to the outcomes of their interactions with other agroecological innovation system actors. The insights from this thesis are that the promotion of agroecology in Burkina Faso is an interactional activity that constantly depends on the dynamics of the relationships between the FOs, the farmers and the broader

agroecological innovation system actors. These relationships explained the specificity of a country like Burkina Faso, where there are agroecology initiatives coming from both local and external actors. From these findings, several practical implications were listed to improve the FOs' intermediation role in the development and implementation of agroecology in Burkina Faso. One of the main important implications is the call for national policy actors to pay more attention to agroecology by providing some support to the FOs involved in this dynamic. Another implication is the call for donor organizations to support the FOs in joining the transnational agroecology movement in order to improve their political agency in promoting agroecology. Finally, the study suggests an outlook for future research concerning the analysis of gender inclusion in the innovation intermediation activities and evaluation of the efficiency of FOs' funding source derived from the promotion of agroecological commercial crops.

Summary

Understanding the potential role of agroecology as a promising solution to the current agriculture development challenges (such as low productivity and rapid depletion of natural resources) is crucial for many sub-Saharan countries, including Burkina Faso. This is because agroecology has always played an essential role in conserving and restoring highly degraded lands in many Sahelian regions. The promotion of agroecology in a country like Burkina was driven by the extensive drought periods of the 1980s and 70s on the one hand and the introduction of organic agriculture technology during the early 2000s on the other. The main actors supporting the promotion of agroecology are NGOs and farmers organizations (FOs). These actors promote agroecology by establishing joint relations where the NGOs assist FOs to disseminate sets of agroecological techniques to their members. This thesis investigates the role of FOs as innovation intermediaries for agroecology in Burkina. This is done by explicitly unravelling their agency in promoting and expanding agroecological innovations.

Chapter 1 is the general introduction which starts with setting the scene of the justification of research choices. It then describes the research background by stressing the current challenges facing sub-Saharan agriculture and the consideration of agroecology as a potential solution for overcoming these challenges. The chapter also presents the conceptual orientation that guided the elaboration of the research questions addressed in the empirical chapters. These questions are:

- How has the place of FOs in the agriculture policy of Burkina Faso evolved over time?
- Why and how do the current FOs become involved in the promotion of agroecology, and how do the FOs and farmers define the term agroecology or agroecological techniques?
- How do FOs stimulate their members' interests towards practicing agroecology?
- What is the effectiveness of FOs' stimulation on farmers' agroecological innovations decisions?

Chapter 2 presents a historical context of farmers' organizations in the agricultural development policy of Burkina Faso. The chapter is based on data generated from an extensive review of literature, policy documents, and interviews. The results show the evolution of the place of FOs in the agriculture policy of Burkina Faso. This evolution is, on the one hand, characterized by the continuous consideration of FOs (by various government regimes) as instrumental for introducing innovations, and on the other hand, the government transfers of some of the organization of agriculture development activities (i.e. provision of economic and technical services) to FOs. The latter was mainly due to the implementation of the structural adjustment reforms in Burkina, like in many other West African countries. The implementation of these reforms was facilitated by the establishment of legislation that encouraged

farmers to create FOs as a condition for receiving government subsidies. Most of the created and/or restructured FOs were registered under a so-called *loi 14* or value chains-oriented law. These FOs are different from those registered under the community development association law or *loi 10* since they are usually created to promote commercial crops as compared to those of *loi 10,* which are established to support the general agriculture and rural development of members.

Chapter 3 explores the diversity of FOs in the promotion of agroecology in Burkina to answer the question of why and how do the current FOs get involved in the promotion of agroecology and how do they (FOs and farmers) define the term agroecology or agroecological techniques? The chapter adopted a multiple case study approach to answer the above mentioned question. The FOs studied promote agroecology to fulfil one of these three goals: to enhance the productivity of commercial crops, to improve the resilience of subsistence farmers, and enhance the productivity of commercial crops and the resilience of subsistence farmers. The FOs are fulfilling these goals by receiving (technical and financial) assistance from supportive NGOs. Regarding the definitions of agroecological terms, the results show that most FOs' interpretations of these terms were linked to their goals mentioned above. This is because those promoting agroecology for the resilience of subsistence farmers tend to focus more on ecological aspects of agriculture (i.e. restoration and conservation of resources) than those (fully or partially) promoting agroecology for the development of members' commercial crops. Contrary to FOs, farmers' definitions of agroecology were primarily centered on the efficiency of some techniques in increasing (commercial and subsistence) crops' productivity with limited considerations of natural resource preservation.

Chapter 4 details the way FOs support their farmers' implementation of agroecological innovations. This is by unravelling the innovation intermediation functions they actively perform in this regard. The results show that the FOs are fulfilling both the knowledge and innovation intermediations functions in the process of their promotion of agroecology. The knowledge intermediation functions of FOs are centered on their provision of agroecology learning facilities by organizing various activities such as group training, field demonstrations, and knowledge exchanges between farmers and advisors. Besides knowledge, the FOs perform other innovation intermediaries like demand articulation/stimulation, network brokerage, and innovation process monitoring. Demand articulation focuses on supplying credits and inputs, and providing marketing facilities for farmers' products grown by integrating ecological principles. The FOs perform these functions by brokering networks with diverse agroecological innovation system actors to obtain necessary technical and financial assistance.

Chapter 5 assesses the effectiveness of the intermediation functions of FOs towards agroecology by analyzing the diversity of farmers' agroecological innovations implementation situations and unravelling the drivers of their decisions about these innovations. In this chapter, a system perspective

is applied to understand the influence of FOs' activities on the main drivers of farmers' decisions. The chapter is based on primary data from 44 farmers, who are members of the 3 FOs. The findings show the existence of a spectrum of farmers' implementation of agroecological innovations ranging from the highest to the lowest implementation situations. These situations are largely influenced by the actions of FOs on at least two of the three drivers of farmers' agroecological innovations decisions: farmers' instrumentality (i.e. the link between his/her farm performance and the application of ecologically-based techniques), farmers' valence (i.e. the extent to which this performance is desirable for him/her) and farmers' expectancy (i.e. his/her ability to make efforts for applying ecologically-based techniques). The findings also show that the FOs' provision of knowledge and training facilities have largely contributed to shaping farmers' instrumentality and expectancy concerning agroecological innovations. Besides knowledge, the FOs' provision of collective marketing and (in some cases) subsidies and/or credit have also contributed to shaping farmers' valence and/or expectancy concerning agroecological innovations. Furthermore, the findings indicate that the FOs' actions on farmers' drivers were not isolated from their external environment, and these come from their constant interactions with multiple actors within the agroecological innovation system.

Finally, Chapter 6 brings the findings from all the empirical chapters together and discusses cross-cutting issues and implications of the thesis. The chapter discusses three main cross-cutting themes. The first theme is related to the specificity of the Burkinabè promotion of agroecology which is characterized by the existence of partnership (between FOs and NGOs) initiatives coming from both local and external actors. The second theme concerns the opportunistic dynamics of FOs' promotion and expansion of agroecological innovations. These dynamics explained the existence of both FOs genuinely convinced about the principles of agroecology and FOs promoting agroecology as an opportunistic occasion to benefit from the outcomes of their interactions with external actors (e.g., donor organizations and market actors). The third theme is focused on how the FOs' intermediations activities shape differential farmers' interests in agroecological innovations. Some farmers started to get convinced about some agroecological techniques after receiving some incentives from their FOs. While our findings have demonstrated the agency of FOs as systemic intermediaries in the development and implementation of agroecology through their establishment and maintenance of interrelations with the wider system actors, they also have some limitations in forging relations with the national agricultural policy actors. From these findings, several policy and practical implications are made about improving the agency of FOs in agroecology. These implications are related to the need for integrating agroecology into the country's agriculture policy agenda and the call for donor organizations to support FOs genuinely interested in agroecology principles to join the transnational farmer-led movement such as '*La Via Campesina'*.

Résumé

Comprendre le rôle potentiel de l'agroécologie en tant que solution prometteuse aux défis actuels du développement agricole (comme la faible productivité et l'épuisement rapide des ressources naturelles) est crucial pour de nombreux pays subsahariens y compris le Burkina Faso. Ceci parce que, l'agroécologie a toujours joué un rôle important dans la conservation et la restauration des terres fortement dégradées des régions sahéliennes. La promotion de l'agroécologie dans un pays comme le Burkina a été motivée, d'une part, par les longues périodes de sécheresse des années 80 et 70 et d'autre part, par l'introduction de l'agriculture biologique au début des années 2000. Les principaux acteurs soutenant la promotion de l'agroécologie sont les ONG et les organisations paysannes-OP. Ces acteurs promeuvent l'agroécologie en établissant des relations partenariales où les ONG sont celles qui assistent les OP pour diffuser des ensembles de techniques agroécologiques à leurs membres. Cette thèse vise à étudier le rôle des OP en tant qu'intermédiaires de l'innovation pour l'agroécologie au Burkina en dévoilant spécifiquement leur agence dans la promotion et l'expansion des innovations agroécologiques. Le chapitre 1 est l'introduction générale qui commence par la mise en scène de la justification des choix de recherche. Il décrit ensuite le contexte de la recherche en insistant sur les défis actuels auxquels est confrontée l'agriculture subsaharienne et la prise en compte de l'agroécologie comme une solution potentielle pour surmonter ces défis. Le chapitre présente également l'orientation conceptuelle qui a guidé l'élaboration des questions de recherche abordées dans les chapitres empiriques. Ces questions sont :

- Comment la place des OP dans la politique agricole Burkinabè a-t-elle évolué au fil du temps?
- Pourquoi et comment les OP actuelles s'engagent-elles dans la promotion de l'agroécologie, et comment ces OP et leurs agriculteurs définissent-ils le terme agroécologie ou techniques agroécologiques?
- Comment les OP stimulent-elles l'intérêt de leurs membres pour la pratique de l'agroécologie ?
- Quelle est l'efficacité de la stimulation des OP sur les décisions des agriculteurs en matière d'innovations agroécologiques?

Le chapitre 2 présente le contexte historique des organisations paysannes dans la politique agricole du Burkina Faso. Le chapitre est basé sur des données générées à partir de la recherche bibliographique et des entretiens. Les résultats montrent l'évolution de la place des OP dans la politique agricole du Burkina Faso. Cette évolution se caractérise d'une part par la prise en compte continue des OP (par les différents régimes gouvernementaux) comme instrument d'introduction d'innovations, et d'autre part par le transfert par l'Etat d'une partie de l'organisation des activités de développement agricole (c'est-à-dire la fourniture d'appuis économiques et techniques services) aux OP. Cette dernière est

principalement due à la mise en œuvre des réformes d'ajustement structurel au Burkina comme dans de nombreux autres pays d'Afrique de l'Ouest. La mise en œuvre de ces réformes a été facilitée par la mise en place d'une législation incitant les agriculteurs à former des OP comme condition principale de recevabilité de subventions gouvernementales. La plupart des OP créées et/ou restructurées pendant cette période ont été enregistrées sous la loi dite 14 ou loi des OP par filière(s) agricole(s). Ces OP sont différentes de celles enregistrées sous la loi des associations de développement communautaire ou la loi 10 vu que celles-ci sont créées pour soutenir le développement général de l'agriculture sans se focaliser sur une ou plusieurs filières agricoles.

Le chapitre 3 explore la diversité des OP engagées dans la promotion de l'agroécologie au Burkina afin de répondre à la question de savoir pourquoi et comment ces OP s'impliquent-elles dans la promotion de l'agroécologie, et comment définissent-elles (OP et membres) le terme agroécologie ou techniques agroécologiques ? Le chapitre a adopté une approche d'études de cas multiples pour fournir la réponse à la question ci-dessus. Les OP étudiées promeuvent l'agroécologie pour répondre à l'un de ces trois objectifs : améliorer la productivité des cultures commerciales ; améliorer la résilience des agriculteurs de subsistance; et améliorer la productivité des cultures commerciales et la résilience des agriculteurs de subsistance. Les OP remplissent ces objectifs en obtenant l'assistance technique et financière des ONG. En ce qui concerne les définitions des termes agroécologiques, tous les résultats montrent que la plupart des interprétations de ces termes étaient liées à leurs objectifs susmentionnés. En effet, celles qui promeuvent l'agroécologie pour la résilience des agriculteurs de subsistance ont tendance à se concentrer davantage sur les aspects écologiques de l'agriculture (c'est-à-dire la restauration et la conservation des ressources) comparées à celles qui promeuvent (entièrement ou partiellement) l'agroécologie pour le développement des cultures commerciales des membres. Contrairement aux OP, les définitions des termes agroécologiques des agriculteurs étaient principalement centrées sur l'efficacité de certaines techniques dans l'augmentation la productivité des cultures (commerciales et de subsistance) avec des considérations limitées des aspects de préservation des ressources naturelles.

Le chapitre 4 détaille la manière dont les OP accompagnent la mise en œuvre d'innovations agroécologiques par leurs agriculteurs. Ceci spécifiquement en démêlant leurs fonctions d'intermédiation de l'innovation à cet égard. Les résultats montrent que les OP remplissent à la fois les fonctions d'intermédiation des connaissances et de l'innovation dans le processus de leur promotion de l'agroécologie. Les fonctions d'intermédiation des connaissances des OP sont centrées sur leur mise en place les moyens d'apprentissage d'agroécologie à travers l'organisation des formations de groupe, des démonstrations sur le terrain et des échanges (de connaissances) entre agriculteurs et conseillers. Outre les connaissances, les OP jouent également d'autres fonctions d'intermédiation d'innovation comme l'articulation/stimulation de la demande, le réseautage et le suivi du processus d'innovation. L'articulation de la demande se concentre sur la fourniture de crédits, intrants, et sur la commercialisation des produits écologiques de leurs membres. Les OP remplissent ces fonctions en

nouant des réseaux avec divers acteurs du système d'innovation agroécologique pour obtenir l'assistance technique et financière.

Le chapitre 5 évalue l'efficacité des fonctions d'intermédiation des OP pour l'agroécologie en analysant la diversité des situations de mise en œuvre des innovations agroécologiques de leurs agriculteurs et en décryptant les moteurs de décisions de ces agriculteurs. Dans ce chapitre, une perspective systémique est appliquée pour comprendre l'influence des activités des OP sur les principaux moteurs des décisions des agriculteurs. Le chapitre est basé sur des données primaires obtenues auprès de 44 agriculteurs, membres des 3 OP. Les résultats montrent l'existence d'un éventail de mises en œuvre d'innovations agroécologiques des agriculteurs, allant des situations de mise en œuvre les plus élevées aux situations les plus basses. Ces situations sont largement influencées par les actions des OP sur au moins deux des trois moteurs des décisions des agriculteurs en matière d'innovations agroécologiques: l'instrumentalité des agriculteurs (c'est-à-dire le lien entre la performance de leur exploitation et l'application de techniques fondées sur l'écologie), la valence (c'est-à-dire la mesure dans laquelle cette performance est souhaitable pour les agriculteurs) et l'attente des agriculteurs (c'est-à-dire leur capacité à faire des efforts pour appliquer des techniques fondées sur l'écologie). Les résultats montrent également que la mise à disposition de connaissances et de formations par les OP a largement contribué à façonner l'instrumentalité et les attentes des agriculteurs vis-à-vis des innovations agroécologiques. Outre les connaissances, la commercialisation collective et (dans certains cas) la fourniture de subventions et/ou de crédits a également contribué à façonner la valence et/ou les attentes des agriculteurs vis-à-vis des innovations agroécologiques. De plus, les résultats indiquent également que les actions des OP sur les moteurs des agriculteurs n'étaient pas isolées de leur environnement externe, car celles-ci dépendaient largement du résultat de de leurs interactions avec plusieurs autres acteurs du système d'innovation agroécologique.

Enfin, le chapitre 6 rassemble les résultats de tous les chapitres empiriques et aborde les thèmes transversaux et les implications de la thèse. Le chapitre aborde trois principaux thèmes transversaux. Le premier thème est lié à la spécificité de la promotion de l'agroécologie au Burkinabé. Laquelle spécificité se caractérise par l'existence d'initiatives partenariales (entre OP et ONG) venant aussi bien d'acteurs locaux qu'extérieurs. Le deuxième thème concerne les dynamiques opportunistes de promotion et d'expansion des innovations agroécologiques des OP. Ces dynamiques expliquent la double existence d'OP véritablement convaincues des principes de l'agroécologie et d'OP promouvant l'agroécologie comme une occasion opportuniste de bénéficier des résultats de leurs interactions avec les acteurs externes comme les bailleurs de fonds et les acteurs du marché. Le troisième thème est axé sur la façon dont les activités d'intermédiation des OP façonnent les intérêts différentiels des agriculteurs pour les innovations agroécologiques où certains agriculteurs ont commencé à être convaincus par (certaines) techniques agroécologiques après avoir reçu des incitations de leurs OP. Bien que nos résultats aient démontré l'agence des OP en tant qu'intermédiaires systémiques dans le

développement et la mise en œuvre de l'agroécologie à travers l'établissement et le maintien d'interrelations entre les OP et les acteurs du système au sens large, on constate que ces OP ont certaines limites concernant la mise en place de relations avec les acteurs nationaux de la politique agricole. A partir de ces résultats, plusieurs implications politiques et pratiques peuvent être faites concernant l'amélioration de l'agence des OP en agroécologie. Ces implications sont liées à la nécessité d'intégrer l'agroécologie dans l'agenda de la politique agricole nationale et à l'appel lancé aux bailleurs de fonds de supporter les OP véritablement intéressées par les principes de l'agroécologie à rejoindre le mouvement transnational dirigé par les agriculteurs comme celui de « *La Via Campesina*».

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Appendices

Appendix A

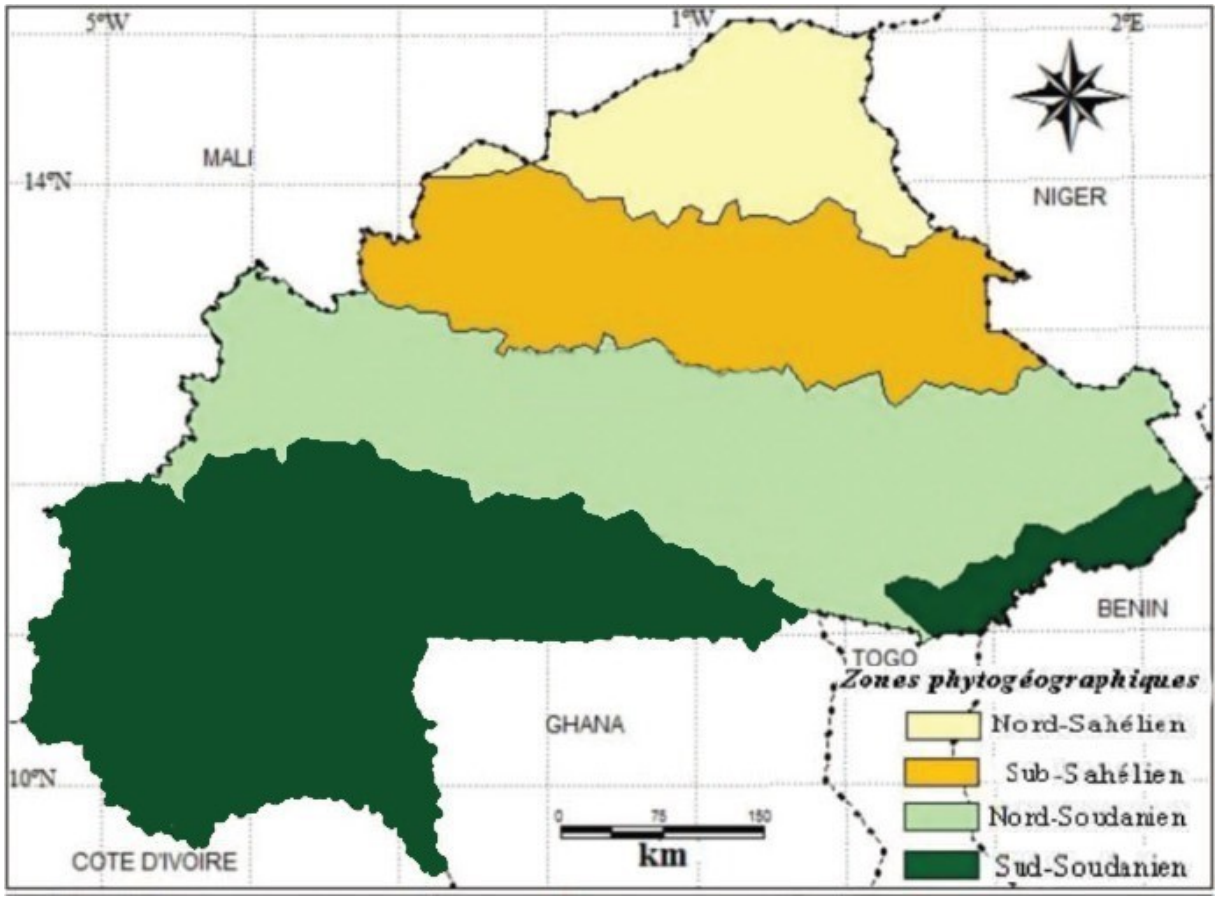

Figure 3.4 The phytogeographical zones of Burkina Faso. **Source**: (Fontès and Guinko 1995)

Appendix B

Table 5.3 Description of FOs' case studies[34]

FO	Date of establishment, objectives and number of members	Types of agroecological innovations promoted
UNPCB *Union Nationale des Producteurs du Cotton du Burkina*	Established in 1998 to ensure the organization of the cotton value chain through the provision of agriculture innovation infrastructure such as input credit, marketing facilities and technical training. The FO promotes both conventional and organic cotton with about 325,000 members grouped into many local farmers' groups.	**Soil fertility management:** Compost, mulching, manure, rotations and associations of cotton with nitrogen-fixing crop (i.e. soybean)
		Pest and disease management: Biopesticides and trap-crop (such as okra to attract cotton pests)
AIDMR: *Association Inter-zones pour le*	Established in 1993 to support the development of subsistence crops such as sorghum, millet and cowpea of village members of the center and	**Soil fertility management:** Compost, mulching, manure, mixed sorghum-cowpea (a nitrogen-fixing crop), and rotation sorghum-cowpea

[34] See Iyabano et al. (2021) for a detailed description of the structure and operation of the three FOs' case studies.

Développement en Milieu Rural	northern regions of the country. The FO is composed of about 700 farmers grouped into village associations.	**Pest and disease management:** Biopesticides and improved seeds
		Soil and water conservation measures: *Zai* (which is a technique that consists of digging planting pits to optimize the utilization of water and compost/manure), stone-bunds and *demi-lune* (half-moon basins) and agroforestry
UGCPA: *Union des Groupements pour la commercialisation en commun des produits agricoles de la Boucle du Mouhoun*	Established in 1993 to organizecollective marketing of surpluses of sorghum and millet, maize and cowpea in the Boucle du Mouhoun region. The FO is composed of 2700 members (grouped into various village groups) and later started the promotion of organic hibiscus.	**Soil fertility management:** Compost, mulching, manure, mixed sorghum-cowpea (a nitrogen-fixing crop), rotation sorghum-cowpea and improved cowpea seeds
		Pest and disease management: Improved sorghum seeds
		Soil and water conservation measures: *Zaï,* stone-bunds, *demi-lune* and agroforestry

Source: Own elaboration based on Iyabano (2021) and Iyabano et al. (2021).

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Iyabano Aboubakar,

Garoua, 20th April 2023.

Completed Training and Supervision Plan

Aboubakar Hayatou Iyabano
Wageningen School of Social Sciences (WASS)

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Qualitative Data Analysis: Procedures and Strategies (YRM-60806)	WUR	2014	3
Institutional and evolutionary economics	Université de Montpellier, France	2015	1
Agricultural advisory services	Montpellier SupAgro, France	2015	1.6
Niches in transition arenas: Critical perspectives	University of Lund, Sweden	2016	3
Writing A Scientific Paper Step By Step	Université de Montpellier, France	2016	1
COS-Seminar: Enabling optimal condition for social and technical innovation	PE&RC	2014	0.3
Writing research proposal	WUR	2016	6
Motivation and implication in everyday working tasks	Université de Montpellier, France	2018	1
B) General research related competences			
WASS Introduction	WASS	2014	1
Introductory course to doctorate research within agricultural development, food chains and innovation	University of Copenhagen, Denmark	2014	2
Participatory methods and action research for innovation in livelihoods and agricultural systems in developing country (the case of Uganda).	University of Copenhagen, Denmark	2015	6
'Farmers Organizations' position in the development of sustainable agriculture practices in Burkina Faso'	Tropentag conference, Boku University, Vienna, Austria	2016	1
'Unraveling the role of Farmers' Organizations in the promotion of agroecological techniques in Burkina Faso'	Agri4D 2021 conference, Swedish University of Agricultural Sciences, Sweden	2021	1
'The role of Farmers' Organizations as intermediaries in the diffusion and adoption of agroecological innovations in Burkina Faso'	Sustainable agriculture and rural transformation workshop, Center for Development Research (ZEF), University of Bonn, Germany	2021	1

Farmers organisations and Agro-ecology in Burkina Faso	Inter-réseaux Développement Rural, Ouagadougou, Burkina Faso	2015	0.5
Training of agroecological advisors	Terre et Humanisme, Ouagadougou, Burkina Faso	2015	1
Brain training	WGS	2020	0.3
Brain friendly working and writing	WGS	2018	0.3
Ethics for Social Sciences Research	WGS	2018	0.5
Scientific publishing	WGS	2017	0.3
C) Career related competences/personal development			
Reviewing a Scientific Paper	WGS	2017	0.1
Agrimundus master summer school teaching contribution	Montpellier SupAgro, France	2017	0.3
CIRAD scientific writing workshop	Cirad, UMR Innovation, Montpellier	2017	1
Career assessment	WGS	2018	0.3
Pedagogy of academic teaching for beginners	Université de Montpellier, France	2019	0.7
Publish for Impact	WUR Library	2017	0.1
Complex Systems - Simple Solutions? How to assess and operationalize diversity in smallholder farming systems	WUR/Farming System Ecology group	2016	0.1
Article review	Annals of Public and Cooperative Economics	2022	1
Total			**35.4**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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