



**HAL**  
open science

# Does FILEG operate as a Mission-oriented Innovation System?

Hippolyte Lion da Silva Aguiar

► **To cite this version:**

Hippolyte Lion da Silva Aguiar. Does FILEG operate as a Mission-oriented Innovation System?. Life Sciences [q-bio]. 2023. hal-04670481

**HAL Id: hal-04670481**

**<https://hal.inrae.fr/hal-04670481v1>**

Submitted on 12 Aug 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



ISARA  
23 rue J. Baldassini  
69364 LYON CEDEX 07

Da Silva Aguiar Hippolyte Lion  
ISARA student  
51st Promotion

Educational tutor: David Christophe



INRAE  
Campus d'Auzeville  
24 Chemin de Borde Rouge  
31320 Auzeville Tolosane

Thesis director:  
Magrini Marie-Benoit (IRHC, HDR  
economic sciences)

## **Does FILEG operate as a Mission-oriented Innovation System?**

An analysis of a regional non-profit organization for grain legume development.

14/08/2023



As this document was produced by ISARA Engineering Students within the framework of an agreement with the INRAE Occitanie-Toulouse center, any mention, communication or distribution must state the ISARA origin.

## **Acknowledgements**

This expanded research article was produced during an internship funded by INRAE, as part of the MACHICOULIS project (2022-2024) of MP CLIMAE coordinated by Sophie Plassin, and from the Occitanie region, as part of the KING project (2021-2024) coordinated by Marie-Benoit Magrini.

Special thanks are made to Pierre Labarthe (senior scientist in economics at UMR AGIR) and Muriel Gineste (Sociologist from CISALI) for their participation in the monitoring committee. We also recognize the contribution of Pierre Triboulet (Scientist in economics at UMR AGIR) and Sophie Plassin (Scientist in agronomy at UMR AGIR) to the conception of the work.

Finally we thank the association FILEG, and especially its coordinator, Cyrielle Mazaleyrat, for her availability, openness and trust, allowing this internship to take place in good conditions and facilitating the contact with interviewees.

## Summary

<b>1. Introduction</b> .....	5
<b>2. Theoretical background</b> .....	7
2.1 Mission Oriented Innovation Systems and its functions .....	7
2.2 Formal networks and MIS .....	9
2.3 Synthesis of our framework.....	10
<b>3. Agricultural lock-in and legumes lock-out</b> .....	11
3.1 The importance of legumes for sustainable and healthy agroecosystems and diets .....	11
3.2 The evolution of the legume sector .....	12
3.3 Sectoral current situation and creation of FILEG.....	14
<b>4. Methodology</b> .....	14
<b>5. Results</b> .....	18
5.1 Document desk research.....	18
5.2 Results from the questionnaire addressed to all FILEG members .....	21
5.3 Interviews with members .....	26
<b>6. Discussion</b> .....	35
6.1 Resource mobilization, legitimacy creation and guidance of the search.....	35
6.2 Knowledge development and diffusion.....	36
6.3 Market formation, ethics of commercial relationships and environmental engagement .....	37
6.4 Entrepreneurial activities and the future of the sector .....	38
6.5 Recommendations for FILEG .....	38
6.6 Limitations of the study and future research .....	39
<b>7. Conclusion</b> .....	39
<b>8. References</b> .....	40
<b>Annexes</b> .....	45

## 1. Introduction

European agrifood sector is challenged to find sustainable paths of development (Röös *et al.*, 2022). There is an increasing pressure to reduce CO<sub>2</sub> emissions and adapt production to climate change and, at the same time, match consumer preferences, making the sector more resilient while preserving resources (EEA, 2022). The current agri-food regime is organized around a specialized agricultural system that is strongly dependent on external inputs (Horlings, Marsden, 2011). It could be highly benefited, for example, by longer crop rotations that include legume crops for human and/or animal feed (Renard, Tilman, 2021; Magrini *et al.*, 2018). In particular, scenarios have been made to highlight benefits of an increase of legumes in European cropping systems and human diets (Cusworth *et al.*, 2021a). They are based on agronomical and environmental benefits of increasing legume cultivation, as well as health benefits of its consumption (Magrini, Julier, 2019; Zander *et al.*, 2016).

Increasing legume cultivation and consumption in Europe has proven to be difficult to achieve. The way European agriculture co-evolved with other related sectors, such as chemical and machinery industries as well as food processing industries, resulted in a system locked by a set of routines and technologies. This paradigm gives little place for agroecological practices based on higher crop biodiversity with legumes. A historical process that privileged cereal cultivation in short crop rotations and imported animal feed, in detriment of legumes, created path-dependency and lock-in mechanisms (Goldstein *et al.*, 2023; Magrini *et al.*, 2019). This inertia is present in the European agricultural system in such a way that each potential change faces decades of R&D, organized supply chain, established routines in feed and food markets aligned with major crops, resulting in lower competitiveness for legumes (Magrini *et al.*, 2022; 2019; 2016). Now, change is needed to increase the presence of legumes and innovation can be an engine to it (Magrini *et al.*, 2018; 2016).

The study of innovation is crucial to understand how changes in the agrifood socio-technical systems can be achieved and how to promote them. The innovative process has a systemic character, being influenced by many different actors and the relationships existing between them. The innovation systems (IS) literature has been strongly developed over the last decades, highlighting innovation as both an individual and a collective action (Edquist, 2001). Those systems are constituted by a set of institutions (the ‘rules of the game’) and economic actors that are related to the development of innovations. The direction of socio-technical change in society is the result, rather than by the competition of different technologies, by the competition of different IS (Hekkert *et al.*, 2007). The agrifood sector can be seen, hence, as composed by many IS, of different sizes and stages of development that interact with each other and compete. The innovations they produce, however, tend to be aligned with the dominant routines of the incumbent agricultural regime. Radical coupled innovations, oriented through several socio-technical interactions between agents, must take place all along the sector to conduct it towards new paths of sustainability (Magrini, 2023).

An IS analysis concerns the study of actors (inter)actions to produce and diffuse innovation. To analyze an IS, different starting points can be taken in order to delineate its boundaries. The focus of this paper is to analyze a formal network of actors using the Mission Oriented Innovation System (MIS) approach (Hekkert *et al.*, 2020). Differently of national, sectoral and technological IS, MIS have as a central point a societal mission to accomplish. The criteria to place the IS framework is not a specific country, economic sector or technology, but an aim to tackle a societal problem. Being socio-technical change a dynamic process, a functional approach is the most adequate to better understand the dynamics of MIS. Starting from this principle, Hekkert *et al.* (2007) analyzed various groups of functions that had been proposed in the literature to be used to describe and analyze any IS, and synthesized them in a set of seven functions. Those functions are materialized by activities performed in the system that are important to foster innovation and promote technological development and diffusion. An adaptation of this framework was proposed by Magrini (2023), who suggested two complementary functions to study specifically the mission-oriented dimensions for the agrifood sector. Those extra functions are related to two challenges of the sector: ethics on commercial relationships and environmental engagement. By

understanding how an IS operates and what kind of activities foster or hamper innovations, it may be possible to intentionally shape the innovation process (Hekkert *et al.*, 2007).

We, and recently applied by Cholez et Magrini (2023), to understand innovation dynamics in legumes-based value chains. In their work, they highlight the difficulty that exists, from the actor's perspective, to achieve system building or, in other words, to influence the development of an IS actively. Due to the complexity of innovation, instead of acting alone, individuals cooperate with each other, for example, through formal networks of innovating firms. Their work focuses on how those formal networks can contribute to system building, by using a resource-based view (RBV). In the RBV, resources can be understood as tangible and intangible assets owned and controlled by an organization, network or system. When joining a formal network, actors make available to some extent their own resources and, over time, new resources are created at the network level that can strongly contribute to system building. A formal network, hence, is important to support innovating firms, but also to contribute to system building, in a different way that individuals alone could do. By studying several legume value chains in Europe, Cholez and Magrini (2023) observed that formal links between actors through crop production contracts also foster both material and human investment.

To analyze and draw on the role of formal networks in system building, we applied the MIS concept and its functions to study the legume sector in the French region of Occitanie. This region has the largest French agricultural area of grain legumes. To better understand how innovation for legumes could be fostered by collective action, we look at a regional local initiative: FILEG, which is a multi-stakeholders non-profit organization created in 2022. The organization has the purpose of federating stakeholders of the value chain's up and downstream and coordinating collective actions towards a sustainable and ethical development of legumes. Its history begins in 2017 as a project led by several public institutions engaged in helping legume development. Those organizations achieved to gather interested economic actors and define a common set of objectives and activities (CISALI, 2021). In February 2022, the organization was constituted and today (2023) it brings together more than 70 stakeholders of the agrifood sector (FILEG, 2022). To guide our case study, the following research question was adopted:

“How does FILEG organization perform the Mission Oriented Innovation System (MIS) functions?”

To answer to this question, our analysis is divided into several sub-questions: what are the main functions that, according to its members, can be performed by FILEG? In what way could these functions be performed? How the network can contribute to system building? By studying FILEG, our aim was to analyze the network of actors using the MIS framework through the functions proposed by Magrini (2023) following Hekkert et al. (2007). More precisely, we wanted to understand what functions FILEG has been fostering and its members' visions about the role of the network concerning each MIS function. By doing it, we wanted to get insights on what is the role of FILEG in the development of the regional legume sector and experiment how the MIS framework could operate to reveal innovation dynamics at local level, providing a strategic analysis for collective action. To structure our thoughts about this process of system building, we also used the RBV perspective advanced by Musiolik et al. (2020; 2012).

The remaining of the paper is organized as follows. Section 2 presents the theoretical background of MIS functions and RBV from which we establish our analytical framework. Section 3 presents the current context of legumes in the European, French and regional agrifood sector, which resulted from an historical process of lock-in. Section 4 presents our methodology of investigation. Section 5 presents the results and, section 6, a discussion and limits of the study. Section 7 concludes.

## 2. Theoretical background

The understanding about the nature of innovation has progressively moved towards a systemic approach regarding actors involved or influencing it. In opposition to what was thought in early stages of the innovation theory, innovations do not follow a ‘linear model’ of demand-pull or supply-push, with a unidirectional order of events from R&D activities to commercial diffusion. Rather, a systemic character is largely acknowledged to it nowadays, in which innovation constitutes a complex and co-evolutionary process resulted from the interactions of different stakeholders. Evolutionary economics theories explained how different actors and institutions interact in innovation systems, particularly for information exchange and knowledge development (Dosi, Nelson, 2010; 1994). Choices are made with not only an orientation of maximizing profits, but are the consequence of incomplete information available and the inherent uncertainty of innovation (Greenacre *et al.*, 2012). In this systemic approach, actors’ actions in the economic world provide mutual feedback that will influence new actions to be taken. Not only are important the firms that create new technology, but also the final users, suppliers, support services and the institutional background. This set of actors and institutions influencing both rate and direction of innovation is called an Innovation System (Lundvall, Edquist, 1993) and constitute the social groups that shape the rules prevailing in any sociotechnical regime (Geels 2004). The interactions of those social groups in sociotechnical systems, viewed as innovation system, lead to produce and change collective rules. In this section, we present the main concepts from the innovation systems literature that are guiding our research.

### 2.1 Mission Oriented Innovation Systems and its functions

Innovation Systems (IS) can be studied from a range of different perspectives. First approaches were developed regarding National Innovation Systems (NIS). Their focus was finding the key institutional drivers of innovation at the national level by comparing the IS of different countries. The Sectoral Innovation Systems (SIS) approach, in its turn, examines the innovation happening within a particular sector and the agents related to it, sometimes transcending geographical delimitations (Malerba, 2004). A Technological Innovation System (TIS) approach specifies even more the study starting point, focusing on a particular technology and in the technological transition (Greenacre *et al.*, 2012). More recently, a new approach has been developed: the Mission-oriented Innovation Systems (MIS). This framework comes from the idea that innovation is increasingly expected to tackle societal challenges. As proposed by Hekkert *et al.* (2020, p. 76), “MIS consists of networks of agents and a set of institutions that contribute to the development and diffusion of innovative solutions with the aim to define, pursue and complete a societal mission”. The missions may come up from a supply-push (policies, science or business), from a demand-pull (consumers, citizens and social movements), or a combination of both (Klerkx, Begemann, 2020). They can also be directly related to the deployment of a specific technology and, in this sense, the concepts of MIS and TIS may be similar. The difference is that MIS are an IS in which actors want to coordinate innovation activities to meet an objective. Because of it, in MIS, the selection of new socio-technical solutions is likely to be a much more “politically and normatively laden process” (Hekkert *et al.*, 2020, p. 78).

As highlighted by Hekkert *et al.* (2007), attributing a systemic character to innovation, as in the IS approach, is useful to understand technological change because it explains why change is often a very slow and hard to influence process. The direction and rate of change is not only determined by the simple competition of technologies, but by the competition of different IS. Those IS can get inertia, leading to situations of lock-in and rigid socio-technical trajectories. The process of socio-technical change is the object of the Multi-Level Perspective (MLP) proposed by Geels (2002). According to this model, socio-technical change can be analyzed in three levels. The *meso*-level is constituted by socio-technical regime (ie. the grammar of rules shaping a sector) and it refers to the IS developed around the dominant technology. Regimes are composed and influenced by societal issues, policies, knowledge, consumer preferences, social norms, etc. Those constitute the landscape in which is the *macro*-level. The *micro*-



level can be understood as innovation niches or emergent IS created by individuals or firms and protected to a certain extent from market competitiveness. Transition would happen when changes in *macro*-level configuration push *micro*-level innovations (emergent IS) to establish themselves in the *meso*-level and hybridize or supplant the current regime. *Macro*-level modifications can be caused/accelerated by crises, events that are able to open opportunities for “reorganization, regeneration and renewal” (Cusworth *et al.*, 2021b, p. 128).

A functional approach in the study of IS considers that the inner competitiveness of the *micro*-level niches is related to the activities they develop. In other words, the success of the activities within the system could explain the capacity of the niche to innovate and modify the regime. Those activities, therefore, could allow the establishment of the IS and its rise to the *meso*-level. According to Hekkert *et al.* (2007), however, studying all those activities is not feasible, because there are too many occurring inside an IS. They proposed, hence, a set of seven functions to map the essential activities and analyze the dynamics of any Technological IS. This set of functions was transposed to the MIS approach by Hekkert *et al.* (2020) and by Magrini (2023) for a special regard to the agrifood sector. In Magrini (2023), two additional functions are suggested, related directly to the challenges of the sector: ethics on commercial relationships and environmental engagement. According to the author, these two extra dimensions are fundamental to the establishment of responsible MIS in agrifood value chains as well as coordination between actors. Such coordination could be materialized by a sectoral organization, common engagement charters, collective R&D projects or specific contractual relationships. Table 1 summarizes all the functions proposed by Hekkert *et al.* (2007) and the additional functions proposed by Magrini (2023).

**Table 1** - Definitions of the MIS functions and their influence in the innovative process

Function	Definition	Influence on innovation
Entrepreneurial activities	Appearance in the system of new activities, such as new entrants, new products put into the market, diversification of the production, exploration of new commercial partners ...	Through experimentation on new activities, knowledge on how innovation functions under different circumstances can be acquired and possibilities are explored. Hekkert <i>et al.</i> (2007) considered this function as the first and prime indication of performance of an IS.
Knowledge development	Creation of new knowledge, through internal R&D projects, investment on external R&D, and development of patents.	Knowledge development creates new perspectives of fields that can be explored by entrepreneurs. It also improves the functioning of existing methods.
Knowledge diffusion	Measures taken to make knowledge available within the entire system, expressed by activities such as workshops, conferences, diffusion of information in publications, social media...	All of the system parts are connected and influence each other. To work together in a cohesive way, all actors must have the same level of knowledge.
Guidance of the search	Measures taken to the reinforcement or clarification of a common vision among actors.	Resources are limited and, to efficiently use them and achieve successful innovation, it is important that the system follows a coherent path and has a common vision of future.
Market formation	Measures taken to form and structure markets	The formation of markets is important to keep actors innovating.

Resources mobilization	Mobilization of sufficient resources to carry out all the system activities.	Human and financial resources are necessary to all activities in a MIS.
Legitimacy creation	Activities that promote and improve the image of innovations to external actors and society, such as external communication, creation of brands and adoption of certifications, and lobbying with public authorities	The development and adoption of an innovation is linked to its societal acceptance. The innovation must be legitimate to get investment from external actors and used by final consumers.
Ethics in commercial relationships	Common will and search for fairness in commercial trades	Ethics in commercial relationships and environmental engagement are key challenges for the agrifood industry. They are, then, functions that the MIS also needs to render.
Environmental engagement	Engagement on avoiding, reducing or compensating environmental impacts, as well as a constant effort to reinforce the sustainability of practices	

Adapted from Magrini *et al.* (2023) and Hekkert *et al.* (2007).

## 2.2 Formal networks and MIS

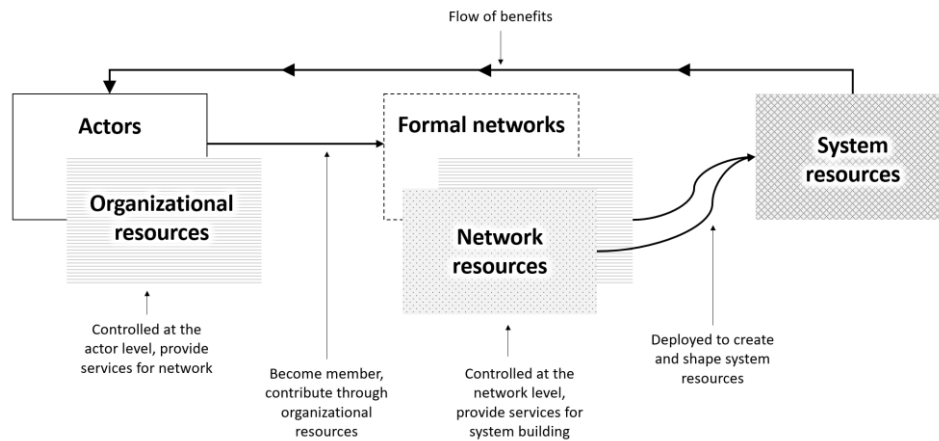
An important point while studying IS is the role of individual agency, meaning the capacity of individuals to act and produce results. Musiolik *et al.* (2012, p. 1035) focused on this aspect and proposed the concept of Innovation System Building, defined as “the deliberate creation or modification of broader institutional or organizational structures in a technological innovation system carried out by innovating actors”. They also proposed the adoption of a resource-based view (RBV) to analyze actors and networks contribution to system building. According to this view, resources are tangible (like equipment and financial assets) and intangible assets (such as expertise, norms and mutual trust) held by an organization, network or a system to enable the accomplishment of its aims. The deployment of organizational and network resources contribute to the creation of resources at the system level or, in other words, to the process of system building (Musiolik *et al.*, 2012). The challenge for the analyst is to understand how those resources could be created and developed in the IS. Table 2 present the main differences between organizational and network resources and Figure 1 schematizes the resources dynamics.

**Table 2** - Resources involved in system building

	Organizational resources of network members	Network resources
Creation	Created at the firm level	Created within the network
Control	controlled by the members, access may be withdrawn by member exit	Not under the control of single members, access cannot be withdrawn
Examples	Fees of members; shared facilities owned by specific members; members power, influence and reputation.	Network R&D programs; network governance; trust and stabilization of members; network reputation

Adapted from Musiolik *et al.* 2012

**Figure 1** – Analytical framework of Musiolik *et al.* (2012) (adapted).



Deepening the understanding about individual agency and the coordination of actors in system building, Musiolik *et al.* (2020) distinguished two major ways of IS formation and change. On the one hand, systems can show an emergent formation pattern, in which actors are coordinated by informal institutions, such as collective expectations. In this case, effects on the system level are the result of the aggregation of dispersed organizational decisions and activities. On the other hand, actors can also coordinate themselves in an explicit and strategic way. This can happen by the creation of intermediary structures that orchestrate the organizational decisions and activities. While in the former case agency is distributed and uncoordinated, in the latter agency is coordinated and system building is managed. The coordination mode of system builders depends on the availability of resources and their distribution inside the system. If resources are available and concentrated in one single organization, this actor is able to directly shape system resources, constituting what Musiolik *et al.* called “single mode”. If resources do exist, but are distributed between organizations, alliances of partners may be formed to deploy them, constituting the “partner mode”. However, if resources do not exist and they may be developed, an “intermediary mode” is constituted, in which actors form a network to create missing resources (Musiolik *et al.*, 2020).

Those works highlight the importance of formal networks to system building. We can see such networks as a way of linking the system builder (actors that commit themselves in the building of an innovation system) to the broader innovation system through strategically created intermediary structures (Musiolik *et al.*, 2020). Formal networks are even more important when considering long value-chains. Indeed, Van de Ven (2005, p. 365) explains that organizations are more and more becoming nodes in the value chain and do not have the “resources, power or legitimacy to produce change alone”. Then, to organize actors and coordinate their strategies in an emerging innovation system, supportive structures are needed, and their creation and configuration is the result of actors’ effort and commitment (Musiolik *et al.*, 2012). Magrini (2023) also highlights the importance of formal networks to the development of an IS. According to her, MIS functions can have a better performance (fostering radical coupled innovations along the agrifood sector), when a collective effort and share of risks is reinforced by long-term contracts. Those contracts secure the supply chain and the investments of actors along the value chain. In such a context, the sociotechnical interactions between actors would allow knowledge exchange and sharing, supporting the innovation process. Hence, new forms of coordination could be more easily put in place, such as a formal network that federates all the stakeholders, common projects and R&D programs.

### 2.3 Synthesis of our framework

Based on the considerations above, we chose to approach our case study using the Mission Oriented Innovation Systems (MIS) framework and its functional perspective by following the set of

functions proposed by Hekkert et al. (2007) and Magrini (2023). Our discussion will also be guided by the RBV of Musiolik et al. (2012, 2020) and their thoughts on innovation systems emergence and building. Before explaining our methodology of data collection and analysis, some precisions are needed regarding the context of the study. In the next section we present briefly the interest of studying innovation in the legume sector and its evolution through key economic concepts that have guided our reasoning.

### **3. Agricultural lock-in and legumes lock-out**

The focus of our analysis is the FILEG case and how this system of actors perform MIS functions contributing to system building. The organization federates stakeholders aiming to promote the development of the legume sector in the Occitanie region. As explained in Cholez and Magrini (2023), the legume sector is a relevant case study to analyze system building process as it has been historically marginalized and available resources for innovation are scarce, especially knowledge. In this section, we sum-up the importance of legumes for a sustainable agricultural model aligned with healthy diets, which creates a context favorable for MIS building such as FILEG organization (3.1). We show briefly the evolution of the legume sector from a co-evolutionary point of view to clarify some concepts, like increasing returns of adoption (IRA), path dependency and lock-in, which are important for the understanding of the IS framework. We also want to explain why, in spite of the numerous benefits of increasing their cultivation and consumption, legumes are still little cultivated in France and Europe, and then which is the importance of the structuration of legumes IS to lock-out (3.2). Finally, we precise the current national and regional context in which FILEG is born (3.3).

#### **3.1 The importance of legumes for sustainable and healthy agroecosystems and diets**

The word ‘legume’ is used to indicate any plant belonging to the Fabaceae (or Leguminosae) group, the third largest botanical family of flowering plants regarding the number of species (up to 20.000). Many of these species are edible and used as human food and animal feed all over the world, being a source of proteins, fiber, vitamins, and minerals (Harvard University, 2019). According to their use, legumes are put into different groups. The FAO classification defines the term “pulses” as legumes harvested for dry grain only and not used for oil. Common beans, lentils, peas and chickpeas can be considered as pulses, in opposition to soybean or peanuts, which are oilseeds, and alfalfa, which is a fodder crop. However, all those species belong to the legume family in the botanical sense. Also in the FAO classification, legumes harvested green for consumption are considered vegetables (FAO, 2023).

All legume groups are important for the sustainability of agroecosystems if combined with good management, such as the choice of adapted species, crop rotation and low use of pesticides (Notz *et al.*, 2023; Schneider, Huygue, 2015). Most legumes do not need nitrogenous fertilizers since they have a symbiotic relation with microorganisms able to fix atmospheric nitrogen, which can stay available in the soil for the next crops, increasing their production. Values between 130 and 153 kg N ha<sup>-1</sup> of system internal outputs have been observed, as well as yield enhancements of subsequent crops, of 0.2 to 1.6 t ha<sup>-1</sup> in cereals (Peoples *et al.*, 2019; Zander *et al.*, 2016). Those increases can also be attributed to other benefits promoted by legume cultivation such as improvement of soil fertility, and phosphorus mobilization. Biodiversity enhancement, reduced agrochemical and fertilizer costs, as well as less greenhouse gases (GHG) emissions are also benefits recognized from inserting legumes in crop rotations (Peoples *et al.*, 2019; Foyer *et al.*, 2016; Magrini *et al.*, 2016; Zander *et al.*, 2016). Some modeling studies also point that a significant augmentation in the use of legumes in European agriculture would have several positive impacts, such as a decrease in the need of synthetic inputs and in the deforestation caused by cultivation of soybean in Latin America. They estimate a decrease of 40% in GHG emissions by 2050 (compared to 2010) essentially via a lower use of fertilizers and decreased livestock activities, in a scenario where legumes are much largely cultivated and people follow more flexitarian diets (Magrini, Julier, 2019). However, in spite of their advantages, legumes are considered less profitable

than major crops and too unstable in terms of productivity, occasioned by diseases, weeds competition and hydric and heat stress (Cusworth *et al.*, 2021b).

Concerning human consumption, legumes are also essential for healthy diets. They are a source of fiber, proteins, low glycemic index carbohydrates, minerals, vitamins, carotenoids and polyphenols. They have benefits against chronic diseases and their risk factors, as well as positive effects to the human microbiome and in the insulin regulation (Semba *et al.*, 2021; Foyer *et al.*, 2016). However, to have a significant impact on health, the general recommendations are a minimal legume consumption of 30g per day per person but, in 2021, the French average was only around 7g per day per person (Agreste, 2022; Magrini, Julier, 2019). Nevertheless, people are starting to question their eating habits (excess of meat consumption) and environmental awareness is emerging. Ecosystem services given by legumes are better known, the nitrogen cycle better understood, and work is progress to bypass technical limitations, encouraging their cultivation. Scientific knowledge on the importance of legumes in human diets has also been progressing (Magrini *et al.*, 2016) and the rise of legumes consumption is a key in any food study to reduce animal-based consumption. All the previous observations converge to a scientific consensus: legumes' development is an important lever for action regarding agroecological transition.

### 3.2 The evolution of the legume sector

Contradictorily, even if legumes have a very old history of use, their consumption and cultivation in Europe has been falling down since the second half of the 20th century. A decline in grain legume cultivation, from 5.8 to 2.1 M ha, has been observed between 1961 and 2021 (Cusworth *et al.*, 2021a; Eurostat, 2021; Zander *et al.*, 2016). Also, the production of grain remains only a small part of the European and French plant protein needs (33% and 54% following this order). The productivity is also far lower than that observed in major cereals, highlighting an unequal knowledge and technological development (Zander *et al.*, 2016), as it was only recently that legumes have been awakening an interest in society and research. The productivity of the main legume crops decreased, from around 4.5 t h<sup>-1</sup> in 1985 to 2.7 t h<sup>-1</sup> in 2020 for pea, from 4 t h<sup>-1</sup> to 1.9 t h<sup>-1</sup> for faba bean, and remained around 2.2 t h<sup>-1</sup> for soybean (Terres Univia, 2021). Soft winter wheat productivity, as a cereal counter example, has increased from 6.2 t h<sup>-1</sup> to 7.1 t h<sup>-1</sup> during the same period (Agreste, 2022), showing a huge difference in the technological development of legumes and cereals. Why is there such a mismatch between their recognized potential and the current reality?

The current situation of legumes in Europe can be understood as a consequence of a technological lock-in, occasioned by low investments in those crops. A societal lack of interest in researching and developing legumes left them a gap in terms of productivity and economic performance, making them unattractive for producers and consumers. (Magrini *et al.*, 2016). The concept of lock-in was shaped by the American economist W. Brian Arthur (1989) while studying how new technologies come up. He argues that some technologies are subject to increasing returns of adoption (IRA), meaning that the more the technology is chosen, the more other actors are likely to choose it. It creates a situation of path dependency, in which initial choices can promote an initial 'boost' to a technology, which will grow and eventually reach a point of lock-in. At this point, the technology is stable in a mainstream position, even if it is not necessarily the best option among those available. The fact that legumes have been put aside in the European agricultural system after the Second World War is strongly related to the rise of the current agricultural regime, based on low crop biodiversity and high inputs to optimize crops productivity. The practices composing this regime passed through an IRA path and became more and more adopted, reaching a state of locked-in. Some crops, such as cereals gained important competitiveness and now the gap between those major crops and the minor ones is difficult to catch up. The current system has reached such a point where any suggested change (increasing the use of legumes in crop rotations, for example) meets the resistance of decades of R&D, organized supply chain, and feed and food markets developed conjointly with major crops. Because of this resistance, for example,

legumes planted area has not increased even if crop subsidies have been implemented and new varieties launched have been little adopted (Magrini *et al.*, 2019; 2016; Meynard *et al.*, 2018).

This phenomenon is the consequence of a co-evolutionary process, and its comprehension needs a deep look into the post-war agricultural history. Jepsen *et al.* (2015) studied the land management regimes along European history. According to them, since the end of the Second World War, an industrialization regime has dominated the Western Europe. This regime lasted until the end of the 80's with the rise of a new environmental awareness regime. Both of them were characterized by high input agricultural systems and specialized farms, even if a growing awareness about environmental impacts was present in the latter (Jepsen *et al.*, 2015). The place of legumes in those regimes remained scarce and some factors can be highlighted to explain it, such as the availability of pesticides and chemical fertilizers, allowing cereal massive production in simplified crop rotations (Magrini *et al.*, 2016).

An important historical event that shaped the European agricultural system was the birth of the Common Agricultural Policies (CAP), in the beginning of the 60's. Those policies came from a willingness to achieve wheat, sugar and meat sovereignty in Western Europe and becoming a huge exporter. Price support for cereals was implemented and a trade agreement with the United States was established, allowing the entry of unlimited amounts of oilseeds without custom duties. Those measures resulted in an almost exclusive focus on cereals cultivation and development in Europe, as well as massive entries of foreign soybean and a strong dependency of livestock on it (Thomas *et al.*, 2013). The cultivation of local grain legumes for feed became unattractive because they were less competitive than the imports. Without interest from farmers side, and neither from consumer side, who food choices became more animal-based with wages increase, there was no demand for research and technology development on legumes (Magrini *et al.*, 2016).

In 1973, the United States temporarily banned the export of soybean, fearing a shortage of the product in the internal market due to weather conditions. This measure strongly affected Europe, which became aware of its dependency and created different protein plans to restore the production of protein rich plants adapted to the local climate. As soybean cropping was forbidden in Europe due to international treats, the focus was the development of dried peas. Legume production, and especially pea production, had then some increases until the late 80's. In 1992, the CAP changed and price support was replaced by direct aid payment to farmers. The objective was to reduce the budgetary costs and regulate a surplus of European wheat in the world market. In order to protect its cereal production, Europe accepted to keep in place the importations of soybean without custom duties, as well as to limit the oilseeds subsidized area at 5.1 M h. The mad cow crisis, along with the interdiction of animal-based feed, strengthened the European dependency on imported feed proteins. During all the 2000's the EU maintained this strategy and only in the 2010's a new protein plan was created (Hache, 2015). However, legumes were still little cultivated, the lock-in process became crystallized (Magrini *et al.*, 2016).

A systemic co-evolution of technology and institutions can be observed: a combination of high supported prices available for cereals and cheap imported animal feed were a perfect policy landscape for developments in agricultural practices and technology towards cereals and intensive livestock. In addition, subtracting legumes from the crop rotation was only possible due to the availability of mineral nitrogen inputs, reducing the need for legumes' nitrogen fixation. From the customer side, a general post Second World War increase in wealth and income directed the European calorie and protein consumption more and more to animal products and cereals (Cusworth *et al.*, 2021b). In the words of Cusworth *et al.* (2021b, p. 3), "Farm practices and their business models became dependent on high-yielding and intensive systems for cereals, oilseed, specialist dairy, pork, beef production, [...] [making legumes] financially untenable and socially undesirable". Nowadays, two reasons for the legume lock-out can be evoked, that are partially explained by the historical process: a lack of economic interest of those cultures (less profitable than major crops such as wheat) and too unstable productivity occasioned by diseases and hydric and heat stress (Cusworth *et al.*, 2021b). Those problems are reinforced by a low R&D investment, which could provide solutions to them.

### 3.3 Sectoral current situation and creation of FILEG

The legume sector remains currently underdeveloped in Europe and France. According to data provided by Terres Univia (2021), the country is the second largest producer of grain legumes in Europe (including pulses and soybean) with 1.1 M t (millions tons) produced, remaining only behind Italy, with 1.2 M t. However, legumes represent only about 4% of the field crops planted area in France. This area more than doubled comparing to 2013, representing now 539.7 thousands ha. Nevertheless, as shown before, grain legumes productivity has been diminishing with a current tendency of lower yields in every French region (Terres Univia statistics). A deficit in the French protein-rich plants production for feed is estimated in 46% when comparing to the consumption. This deficit is of 66% at the European level because France developed rapeseed meals as a by-product of rapeseed oils. If we zoom into the Occitanie region, our field of study, a similar situation is observed. Located in the French south-west, Occitanie has a historical appreciation for grain legume crops such as beans, peas and chickpeas. Around 20% of the regional agricultural surface is labeled organic or in conversion, highlighting the territorial interest in environmentally friendly practices (Agence Bio, 2023). Today the region is the major producer of grain legumes in France, with 19% of the national grain legume area. Comparing to other crops, grain legumes represent 10% of the field surface. Half of this surface is under soybean, crop used mainly in the soyfood industry, which process 33% of the regional soy production (Chambres d'Agriculture Occitanie, 2022a). Even if the legume sector in Occitanie seems to be more developed than other French regions and European countries, several issues hinder or even threaten the sectoral growth, such as tensions in fertilizers markets, prices volatility, weather conditions and farms financial capacity to invest (Chambres d'Agriculture Occitanie, 2022b).

Terres Univia, the French grain legume and oil crops interbranch organization, animates at the national level the current protein plan for sectoral structuration. In the regional level, through its technical institute, Terres Inovia, the organization fosters local initiatives. In 2017, after positive feedback gathered during the participatory meetings of 2016 (the UNO “pulses year”), Terres Inovia with several other institutions in region initiated what would be called in the future the FILEG project. The project was carried out with a set of actors involved in agricultural research and knowledge transfer (organizations, institutes, research centers) and supported by the regional public power. Gathering economic actors interested in the development of the sector, FILEG became a non-profit organization in 2022, accounting in 2023 more than 70 members. Its aim is to promote the conditions necessary for partnership between upstream and downstream actors, with a mission to foster the sustainable development of the regional grain legumes sector. FILEG can be considered, hence, a formal network and a MIS acting in the construction of a bigger innovation system: the regional legume sector. Its will can also be seen as an agent modifying the current agricultural regime, by fostering the cultivation and use of legumes. In the next section, we present the methodology we used to deploy our framework in the study of the organization, including our data collection and analysis methods.

## 4. Methodology

Based on our framework, the research question guiding this analysis is: “How does FILEG perform the Mission Oriented Innovation System (MIS) functions?” This research question is supported by the following sub-questions: “What are the main functions that, according to its members, can be performed by FILEG?” “In what way could these functions be performed?” “How the network is contributing to system building?” Table 3 summarizes the assumptions we are making related to each research question. Our MIS boundaries will be constrained to FILEG actors and the functions they may perform. This choice was made because these actors are organized around a clear mission of developing the regional legume sector. As written in its constitution, the purpose of the organization is to “*contribute to the development of a legume value chain in the region of Occitanie. That one must be sustainable,*

*territorialized, structured, creator of added value with the aim of an equitable value share between actors, endowed with a research, development and share dynamics, financed collectively*". We acknowledge that not all the interactions and actors of the sector are present in this MIS delineation, given the other stakeholders that do not participate to the FILEG initiative. Because of this, our study is also interested in how FILEG activities contribute to system building, when considering the broader system of the regional legume sector. Based on our analytical framework, we operationalize the MIS functions adapted from Magrini (2023) and Hekkert et al (2007) to study the FILEG case and also consider the RBV approach of Musiolik et al. (2020; 2012) to discuss our findings as regards system building dynamics.

**Table 3** - Research questions and assumptions made in the study

	Research question	Assumptions related to the research question
Main research question	"How does FILEG perform the Mission Oriented Innovation System (MIS) functions?"	FILEG is a formal network of actors united around a common mission. Looking at the MIS formed by those actors, we assumed that the network can contribute to the performance of the MIS functions and we were interested in how this contribution can happen.
	"What are the main functions that, according to its members, can be performed by FILEG?"	The actions taken at the network level depend on members' will and understanding of what is necessary and important to do. We assumed that members give different importance to each function concerning the network actions.
Sub-questions	"In what way could these functions be performed?"	Each MIS function can be represented by different types of activities. We wanted to gather members' opinions about actions that can be taken contributing to each function.
	"How the network can contribute to system building?"	Based on the members' perceptions about each function, we wanted to get insights about the roles the network can perform in the regional legume sector.

Data collection was made through three main sources: A document desk research based on documents of activities carried out by the organization; an objective questionnaire addressed to all members in February 2023; and semi-directive interviews with 15 members (Table 4).

**Table 4** - Summary of data collection methods, their objective and the population studied.

Data collection method	Objective	Population
Document desk research	Find actions in FILEG's history that have already contributed to MIS functions	Documents provided by the association and websites
Questionnaire	Collect from a big number of members their opinions related to MIS functions and FILEG possibilities of action	All members
Interviews	Collect detailed perceptions and suggestions of actions for FILEG	15 interviewees



The desk research aimed to find in the history of FILEG the activities that were linked to MIS functions. To do so, we looked for any action carried by the organization that directly promoted some MIS function. For example, participating in a workshop was considered by us as an action that fostered the knowledge diffusion and, a press release, the legitimacy creation. We considered as an action any event originated from FILEG agency that was explicitly shown in the documents analyzed. We considered all actions as punctual, even if they or their consequences lasted for some time. An action can be translated, hence, by a verbal noun with a complement, such as ‘the initiation of something’, ‘the approval of something’ or the ‘participation in something’. The classification of actions into functions was made by following the functions’ definition given in the theoretical background section. Then, we analyzed the activity of FILEG since the project creation (considered in 2017) by asking ourselves if actions fostering each function were present or not in intervals of one year.

By using this approach, our aim was not to count the activities and obtain quantitative data, since the ‘action-to-function’ classification is interpretative. Rather, we were searching for any evidence of actions taken by FILEG directly related to each MIS function along the years. In the same way, this approach did not allow us to compare functions’ impact or importance, but only helped us to organize the events of FILEG’s history according to the MIS framework and to see into which functions FILEG seems to put energy and in which order. The list of actions also helped us to see what resources FILEG created to contribute to system building and deepen our discussions on the subject. We organized the actions in a story line, which will be presented in the results section, highlighting the moments where actions fostering MIS functions were taken.

Even if the FILEG project is some years old, the organization is recent (created around one year before this study). Therefore, analyzing the system only by the few actions already taken will not allow us to draw much conclusions. To complement this document analysis approach, a questionnaire was conceived and diffused to all members for asking them about their position in the network and the capacity of FILEG to perform each function in the mid and short run. To analyze the results, we followed the organization’s classification of its members, composed by groups of actors according their position in the value-chain: college 1 (plant breeders, producers, collectors, and technicians), college 2 (conditioners, transformers, and transporters), and college 3 (distributors, final users and consumer representors). There is also the “associated members” group, to which belong private and public structures that do not carry legume based economic activities, but are engaged in the organization, sharing their knowledge or funding activities (such as technical institutes, research centers, public powers, other inter-branch organizations, educational centers, etc). We decided to keep this classification in our questionnaire analysis because it allowed us to see if, in the organization, up and downstream actors perceive in the same manner the sector and the functions FILEG can perform (Table 5).

**Table 5** - Types and number of structures belonging to each FILEG college.

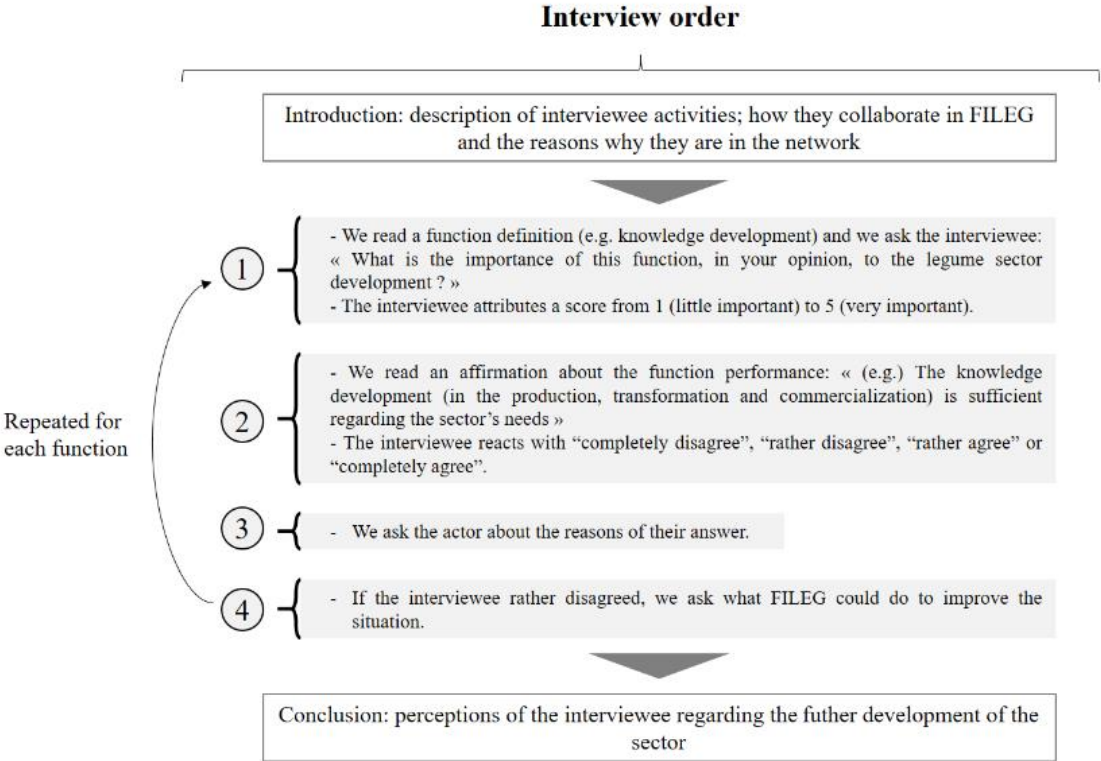
	College 1	College 2	College 3	Associated members	
Type of structures	plant breeders, producers, collectors, and technicians	conditioners, transformers, and transporters	distributors, final users and consumer representors	Technical institutes, research centers, public powers, other inter-branch organizations, educational centers, etc	Total
Total number of structures	40	9	8	19	76

Not all members of the organization answered the first questionnaire and, to be able to generalize the tendencies of answer of the different groups, we did statistical tests. We used two different goodness-of-fit tests:  $\chi^2$ , used when all absolute frequencies of answer were higher than five, and fisher exact tests,

used when a less than five absolute frequency of answer was present. The use of both tests was necessary because  $\chi^2$  tests only generate trustful p-values when all the absolute frequencies tested are higher than 5, which was not the case in all our questions. We generated a first p value ( $p_a$ ) testing if there was any difference in the proportions of answer (e.g. proportions of ‘yes’, ‘no’ and ‘don’t know’). A second p-value was also generated ( $p_p$ ), testing the interrelatedness of the variables ‘answers’ and ‘groups’ (e.g. colleges answer differently the same question). We then compared those results to our interviews, which helped us to propose explanations for the numbers observed and enrich the discussion.

After the questionnaire, we selected some members for open-ended interviews. The interviews’ aim was to deepen the understanding of members’ perceptions. Thirteen interviews were made, accounting a total of 15 stakeholders interviewed. The choice of interviewees was collectively made with FILEG animators to meet some central actors and new ones in the network, of all colleges. Likert scales were used as a tool to start a set of open-ended questions in order to facilitate the beginning of the interview and get more uniform types of answers. All IS functions were first explained to the interviewed person with a printed document (Annex 1, in French) and after the interviewees had to indicate the importance of each function to them, through another Likert scale. Then, they should express their level of agreement to a statement concerning the current performance of each function. From this reaction, questions such as “why do you think that?” and “what FILEG could do about it?” were asked (see Figure 2). The aim was to collect the interviewee perceptions about i) the importance of the function to the sector; ii) if the function performs currently well in the sector; and iii) what is the role of FILEG concerning this function and what actions can be carried out (see an example in Figure 2). That information was important to us because we assume that what a network ‘will be’ and ‘will do’ is directly related to what its members think it ‘should be’ and ‘should do’, since those network members are the system builders. Questions about past actions of the actor and the network were not asked, because we considered them useless as the organization is recent and some actors just joined it, being easier to talk about the present and future.

**Figure 2** - Standard interview order and topics



The three forms of data collection were complementary regarding the type of information gathered and the questions this information was able to answer. The desk research allowed us to show which functions FILEG's actions have been focused on while the questionnaire and the interviews were interested in the network directionality, its role in the system and its priorities for action. In the next section we present our main findings in each step of the work.

## **5. Results**

### **5.1 Document desk research**

We analyzed different available documents concerning FILEG activities. They encompassed its constitution, charter of commitment, white paper, general assembly reports, newsletters, articles on websites and social media. Those documents were indicated to us by FILEG coordinators and/or found in websites of the organization and related structures. They allowed us to retrace important events in FILEG's history. We classified each action in one or more MIS functions and we showed them in the storyline below.

FILEG's history began in 2016, the international pulses year, after the successful experience of the participatory meetings "Légumineuses Grand Sud". Those meetings were organized by a set of actors involved in agricultural research and knowledge transfer (organizations, institutes, research centers), supported by the regional public authorities. This event had a strong participation, assembling various economic actors from the regional legume sector. It motivated the organizers, headed by Terres Inovia, to create a collective project to structure the sector and, in 2017, they started to interview several stakeholders that could be interested in it. We chose to start our functional analysis at this point, because we considered that those interviews were the first root action related specifically to the idea of a legume-based collective project at the regional level. The functions legitimacy creation and guidance of the search could be observed, since the organizers aimed to realize if there was a collective interest, motivation and necessity from the economic actors' side to form the network of actors that would be later called FILEG. In the end of the year, because of the positive feedback received, a former group of nine structures (all of them related to research and knowledge transfer on the topic) created a formal sectoral project, subsidized by regional public authorities (the Region and the water protection agency). It is the first step of the function "resources mobilization". This project was discussed during the year of 2018 with the economic actors, assembling those that were up to participate. In October 2018, the francophone meetings of legumes took place, co-organized by INRAE, CIRAD, Terres Univia and Terres Inovia. Those meetings reassembled the main stakeholders interested in legumes' sectoral development and, during them, a collective consensus emerged to pursue a regional project: the first phase of the FILEG project was launched with an ambition of federating actors from the sector and carry collective actions to promote grain legumes development.

FILEG phase 1 (2018 – 2019) was marked by several collective meetings and workshops between the organizers and economic actors potentially interested to participate (actions related to the functions resources mobilization and legitimacy creation). They served as a mean of sharing needs, problems and expectations of the up and downstream value chains. From them were defined the major axis of work and an individual letter of engagement (function guidance of the search). FILEG also created its first social media page (used to knowledge diffusion), made a press release (to increase its legitimacy) and, through the work of its member CISALI, shared a first study carried out about legume innovation (developing and diffusing knowledge). During the phase 2 (2020 – 2021), FILEG was still financed by public authorities as a sectoral project (the search of funding representing resources mobilization) and continued strengthening the network. A common charter of engagement was created (guidance of the search) and the first "operational" work group (WG) began in 2021, in which members could mutualize resources and expertise to address the lack of technical knowledge available (knowledge development and diffusion). Actions taken in Phase 1 were led by the public institutions for

the various stakeholders, as a kind of think tank. The WG of Phase 2 was delineated by stakeholders themselves to work on specific themes that emerged from Phase 1. The main theme of Phase 2 WG was technical knowledge on legume production. Another important theme at this phase concerned contracting topic: a seminar and a guide about contracting had been conceived and shared. FILEG white paper was organized and shared during this phase too (Functions knowledge diffusion and legitimacy creation) in partnership with some associated members. A project to make FILEG a non-profit organization and the plan of its future governance were also approved in FILEG Phase 2 (Guidance of the search).

FILEG started its phase 3 in February 2022, when the constitutive assembly took place, formalizing its ‘non-profit organization’ status, structure and governance (Functions legitimacy creation and guidance of the search). The members have since then been divided into two groups. The first one is composed by private and public structures carrying out economic activities in the legume sector. This group is divided into three colleges according actor’s position in value chain stream (upstream, transformation and downstream) and its members have to pay an annual fee. The second group is the “associated members”, which is formed by private and public structures that are engaged in the organization, sharing their knowledge or funding activities without right of vote. The organization’s governance is composed only by members of the first group, from the three colleges and elected by vote. To facilitate the implementation of projects and creating links between actors, FILEG hired a full-time animator, who is paid by Terres Inovia thanks to subscriptions from members and subsidies from public authorities (resources mobilization). The organization governance is presented in annex 2 (In French).

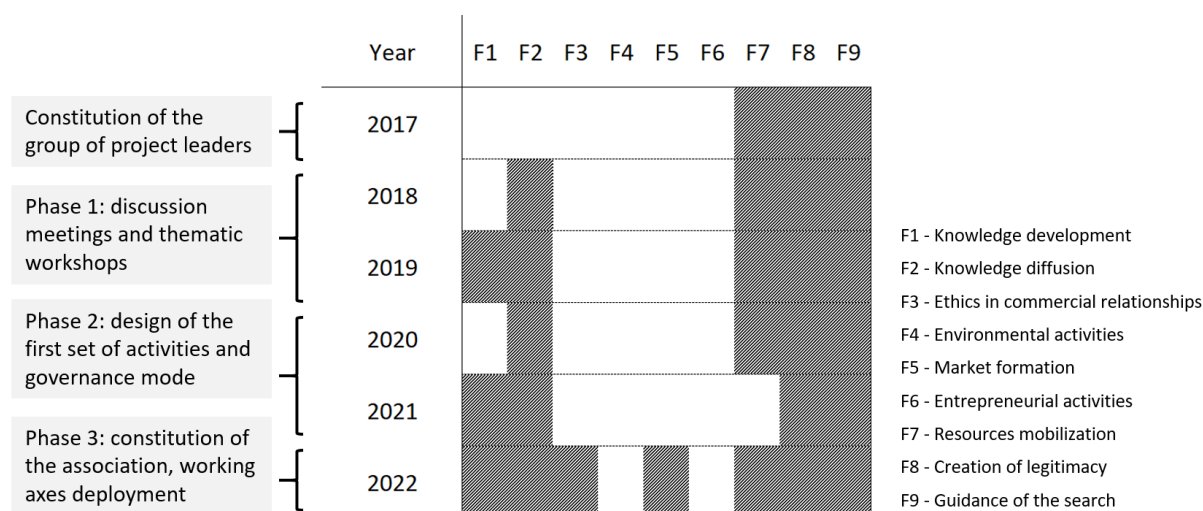
During its first year of functioning as a non-profit organization, FILEG put in place some collective actions organized around work axis of economics, production, human food, animal feed and communication. For the production axis, a technical committee was created, gathering information about the main difficulties for legume cropping and raising the actors’ expectations in terms of knowledge related to it. A set of field experiments have been put in place and reunions, field visits and webinars have been organized (knowledge development and diffusion). Terres Inovia (technical institute) is an actor that was present in almost all the actions carried out in this axis. In the human food axis, a summary of the products and practices of the regional chefs, for both collective and private catering, has been created as well as a community of experts (knowledge development and diffusion). A WG related to the *Projets Alimentaires Territoriaux* (Territorial Food Projects), has also been created in the organization but its activities have not started yet in 2022. For the animal feed axis, a project called Livestock Protein Self Sufficiency (LPSS), has been carried out aiming the valorization of meat coming from farms that are self sufficient in legume production, through linking farmers with interested butchers (developing knowledge and, for the first time, creating markets and fostering ethical commercial relationships). The idea behind the project was to promote the legume cultivation inside the farms by having a market that valorizes those practices. In the axis communication, FILEG participated to different professional and consumer shows and developed a newsletter and communication channels (diffusing knowledge and creating legitimacy). Table 6 presents FILEG’s work axis and WG in 2022, and Figure 4 summarizes all functions observed in the period between the beginning of the project (2017) and the first year of functioning of the organization (2022).

**Table 6** – FILEG work axis and work groups in 2022

Work axis	Objective	Name of the work group (WG)*
Production	Create and deploy a service of knowledge acquisition and share concerning production aspects and practices.	Technical Committee for References Acquisition (TCRA)
Human food	Create communities of experts of the downstream and acquire knowledge concerning legume uses	Collective catering and PAT
Communication	Communicate and promote legumes and the organization	
Economics	Build an economic observatory providing annual statistics	Economic observatory
Animal feed	Support collective actions related to the protein self-sufficiency of livestock farms	Livestock Protein Self Sufficiency (LPSS)

\* Work groups are groups of members that work together around a certain subject related to a work axis

**Figure 3** - Functions observed in FILEG from 2017 to 2022



We can see that, in the beginning, the first functions FILEG leaders concentrated their efforts on were the mobilization of resources, the legitimacy creation and the guidance of the search (F7, F8, and F9). This was the case because, as an emergent initiative, FILEG needed, above all, enthusiastic participants, organized around a common ideal, and resources to start its actions. To do so, the group of leaders organized interviews (2017), and workshops (phase 1) to meet actors and mobilize them into a project of sectoral structuration, while legitimizing the initiative and gathering funds. Once the formal project was launched (2018 - 2021), F1 and F2 could be initiated. Those functions are linked, because knowledge creation has always been accompanied by its diffusion. Nevertheless, F2 sometimes took place without F1, when sharing already existing knowledge (in social media or events, for example). Finally, we observe the beginning of activities related to market formation (F3) and ethics in commercial relationships (F5) when the organization is born (2022), related to the activities of the animal feed axis.

Activities related F4 to and F6 were not found in the document analysis. Concerning entrepreneurial activities (F6), none of the actions found in the document analysis clearly aimed to directly improve or facilitate entrepreneurship. A similar situation is observed in F4. The development of the legume sector (FILEG's mission), can be considered as an environmental engagement in a broader

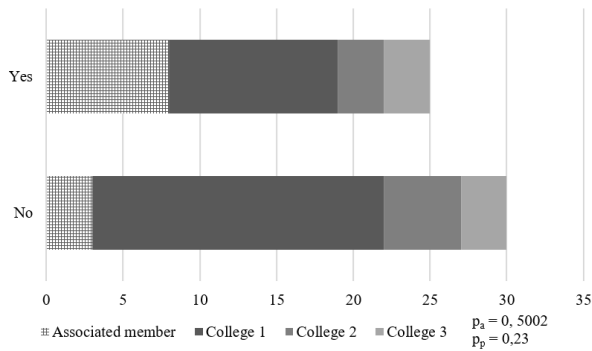
perspective. However, no action directly targeting the environmental impacts of the activities of the organization and its members has been carried out. As our analysis considers FILEG itself as a MIS, it also considers that those two functions were not tackled yet by the organization through specific actions even if sustainable development is an aim advanced by the organization (in its constitution, see Methodology section). However, the fact that those kinds of activities were not fostered at the beginning of the project does not mean that they will not be in the near future, especially because the organization is quite recent. To better understand the directionality of FILEG and actors' perceptions, we conducted the questionnaire and the interviews. Their results as presented in the following items.

## **5.2 Results from the questionnaire addressed to all FILEG members**

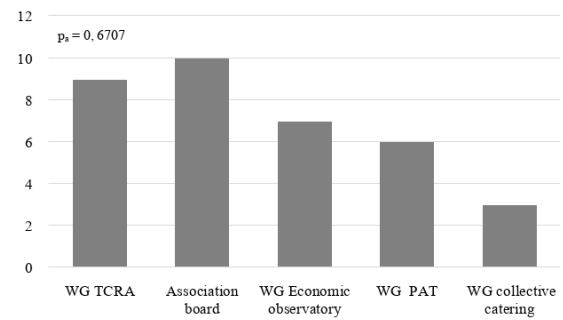
The questions of our questionnaire concerned the members' participation in the organization, their needs and perceptions concerning the functions, and FILEG's possibilities of action. By asking those questions, our aim was to have a first glance to understand the potential future contribution of FILEG to the MIS functions. We adapted our vocabulary when asking questions concerning some functions to facilitate actor's understanding (for example, talking about 'common ambitions', 'common guidelines' and 'common direction' rather than 'guidance of the search'). Whenever it was possible, we calculated two p-values (see in methodology section).  $p_a$  is related to the differences in the proportions of answers (such as 'yes' and 'no'), while  $p_p$  is related to differences between groups (for example, if different colleges answer differently the same question). The lower are the p values, the less likely it is that the observed difference in proportions is a result of chance or small sampling.

Because FILEG is composed by a huge diversity of members, they are separated in two groups: the first one is represented by three colleges of the up-, mid- and downstream (college 1, 2 and 3, in this order). The second group are the associated members, who do not carry economic activities related to grain legumes, but participate in and support the organization (for more details see the section methodology). We got 55 answers in our questionnaire, 30 from college 1, 8 from college 2, 6 from college 3 and 11 from the associated members. Those answers were considered representative, since they corresponded to 50% of the structures belonging to college 1, 56% of those in college 2, 75% in college 3 and 47% of the associated members. The majority of the questionnaire respondents declared to follow FILEG activities (75% follow social media and 67% the newsletter). However, only 45% declared to be engaged in at least one activity, englobing the organization board and work groups (WG Economic observatory, Territorial Food Projects (PAT), and collective catering). The associated members are those who declared participating the most (75% are involved in at least one activity). The activities with the highest number of participants involved in are the WG of the production axis (called "technical committee for references acquisition", TCRA), with 9 respondents, and the organization board, with 10 respondents. The work groups with lower participation are also those where we observe a stronger interest to participate, which can be due to the fact they are younger than the others are and not completely initiated (Figures 5, 6 and 7).

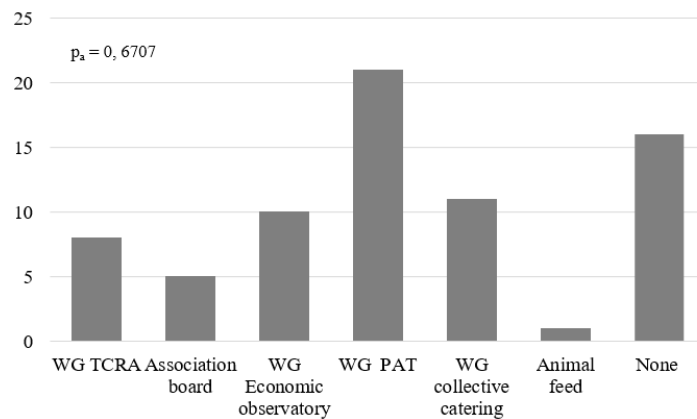
**Figure 4** –Members participating to at least one FILEG activity (work groups or governance).



**Figure 5** - Quantity of respondents participating in each FILEG activity

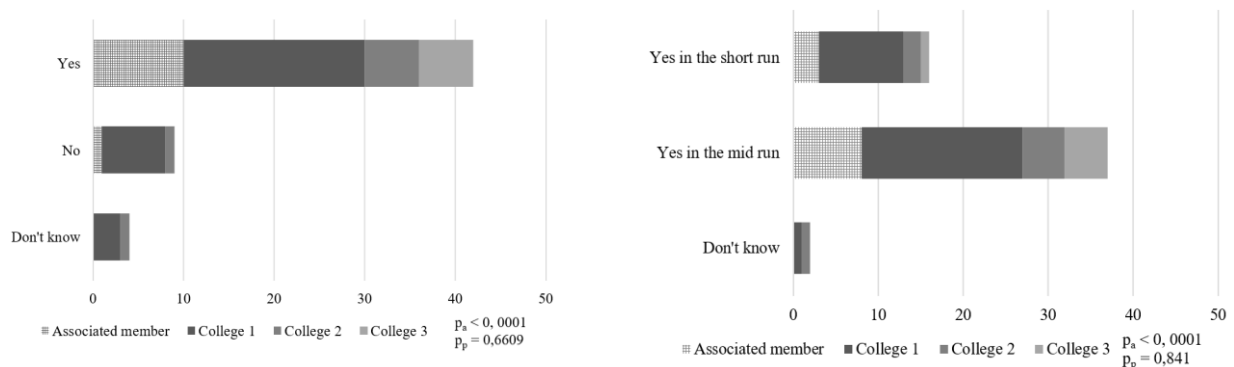


**Figure 6** - Quantity of respondents interested in participating in each FILEG activity

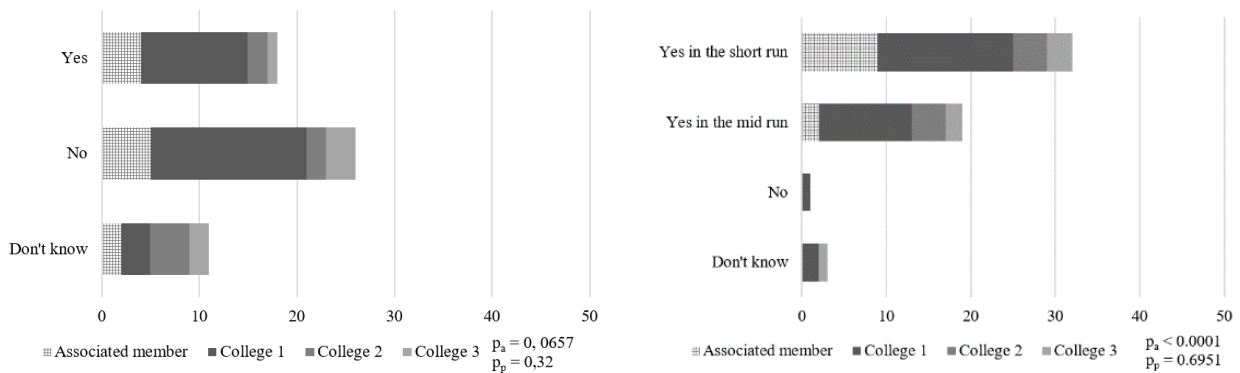


Concerning the function knowledge development, the majority of the members answered that they need to develop their own knowledge about legumes and that FILEG can help this development in the mid-run. No clear statistical difference was found between the answers of different groups of participants in both questions asked (Figure 8). In relation to the knowledge diffusion function, the respondents did not show a clear tendency when answering if the existing knowledge related to legumes is easily accessible. However, the majority agreed that FILEG could contribute to increase this accessibility, especially in the short run (Figure 9).

**Figure 7** – Members’ answers when asked if they need to develop their knowledge related to legumes (left) and if FILEG can contribute to this development (right).

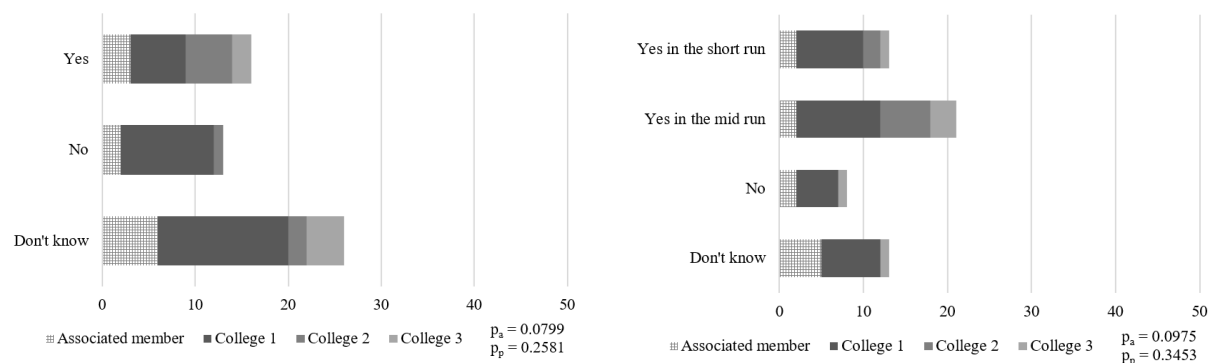


**Figure 8** – Members’ answers when asked if the knowledge is accessible enough in the legume sector (left) and if FILEG can contribute to this accessibility (right).

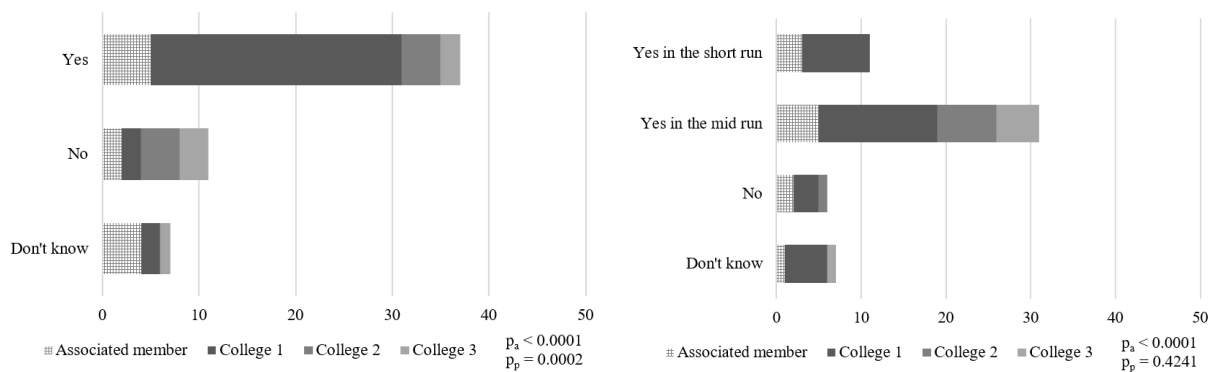


When answering about ethics in commercial relationships, the respondents showed no clear tendency of answer (Figure 10). However, a clear preference can be seen concerning market formation. The majority of the respondents consider that they need new markets to develop their activities related to legumes, especially the college 1 (upstream actors). FILEG could allow them to access those markets in the mid-run (Figure 11).

**Figure 9** – Members’ answers when asked if commercial relationships tend to equity in the sector (left) and if FILEG can contribute to this equity (right).



**Figure 10** – Members’ answers when asked if they need new markets to develop their legume activities (left) and if FILEG can contribute to create these markets (right).

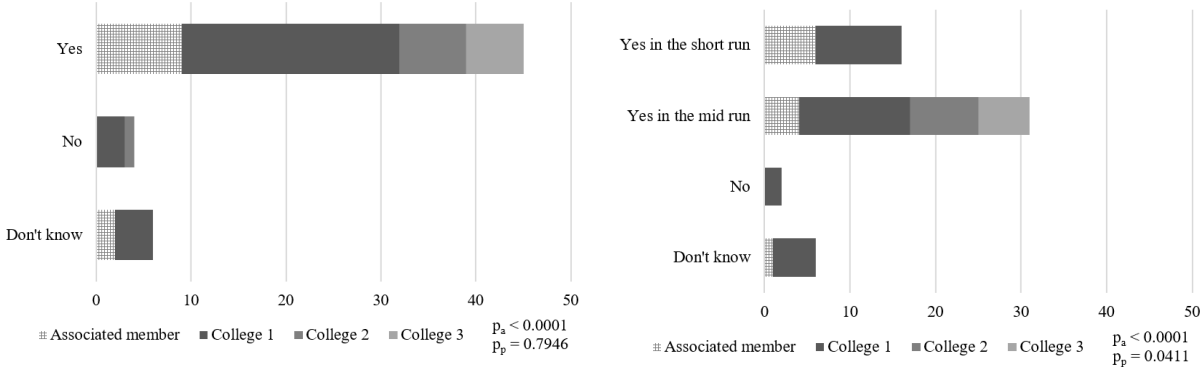


The majority of the respondents considers that new activities concerning production, transformation or services (function entrepreneurial activities) are needed in the sector for its development. They have also answered that FILEG could act in the short run to support the creation of

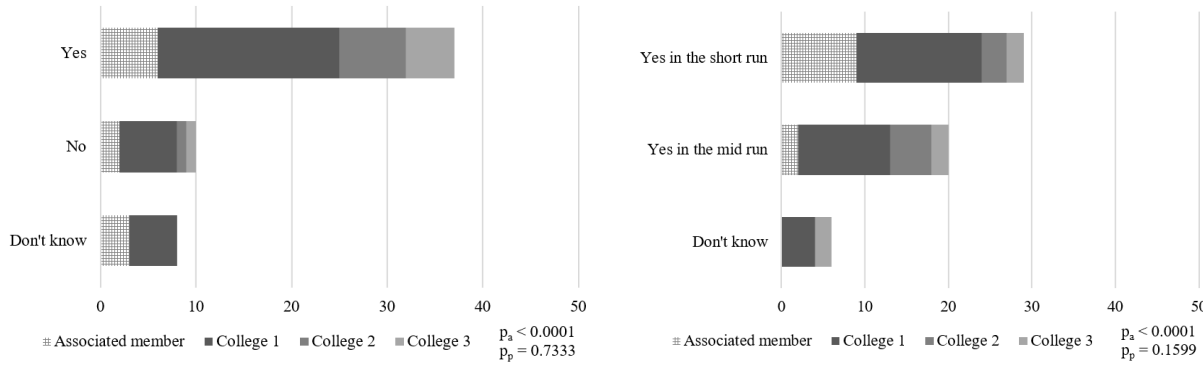


new activities. However, college 1 and the associated members group seem to be divided between short and mid run (Figure 12). The respondents also answered that they need new resources (function resources mobilization) to develop their activities. The majority think that FILEG could help to mobilize those resources, especially in the short run (Figure 13).

**Figure 11** – Members’ answers when asked if new activities are needed to develop the regional legume sector (left) and if FILEG can contribute to their development (right).

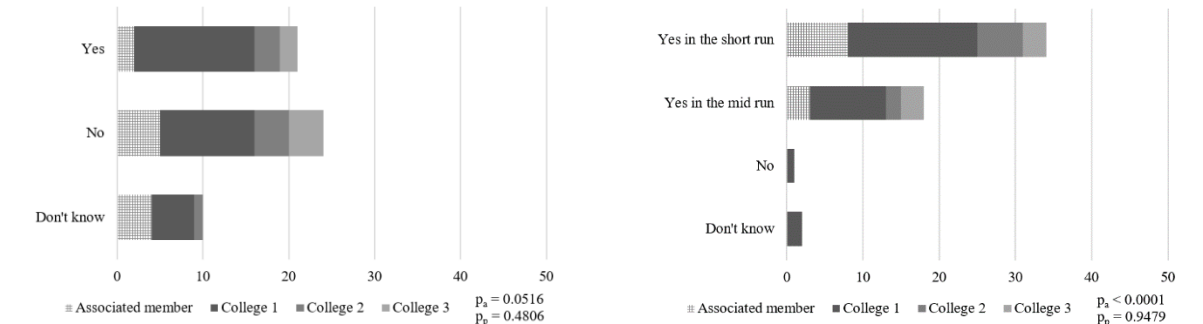


**Figure 12** – Members’ answers when asked if they need new resources to develop legume related activities (left) and if FILEG can help to mobilize them (right).

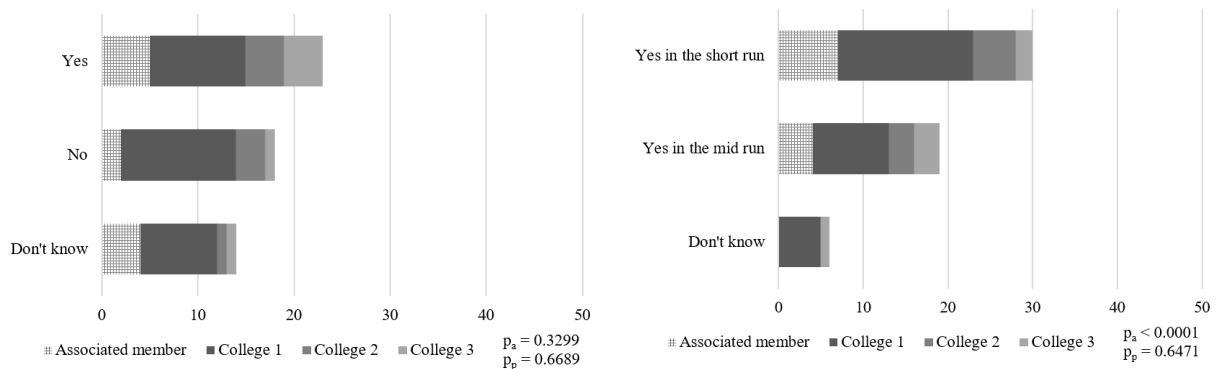


Related to the function legitimacy creation, there is no clear tendency of answer when members were asked if society has a sufficiently positive image of legumes. Nevertheless, the vast majority of respondents declared that FILEG can contribute to this image, especially in the short run (Figure 14). In the same way, there is no clear tendency of answer when members are asked if the actions guiding the sector (guidance of the search), such as the national and regional plans, are creating common ambitions. However, the respondents mostly think that FILEG can reinforce the cohesion of those ambitions, especially in the short run (Figure 15).

**Figure 13** – Members’ answers when asked if the society has a sufficiently positive image of legumes (left) and if FILEG can contribute to this image (right).

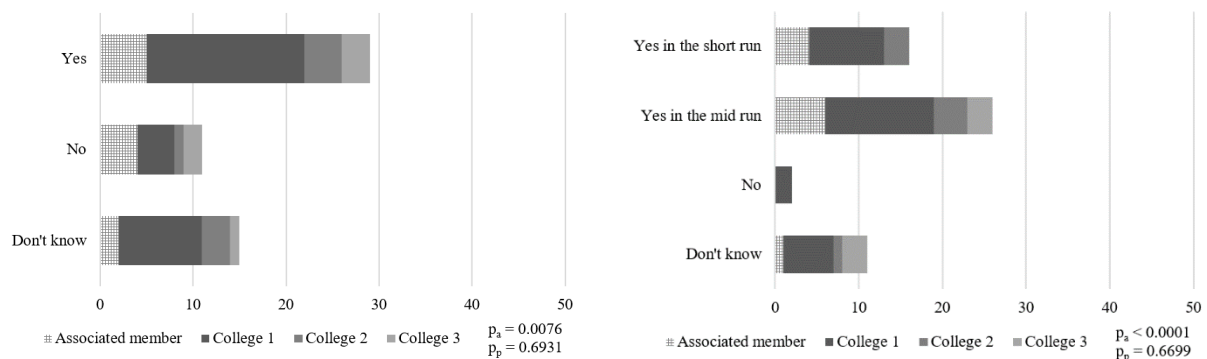


**Figure 14** – Members’ answers when asked if the actions guiding the sector create common ambitions (left) and if FILEG can contribute to create these common ambitions (right).



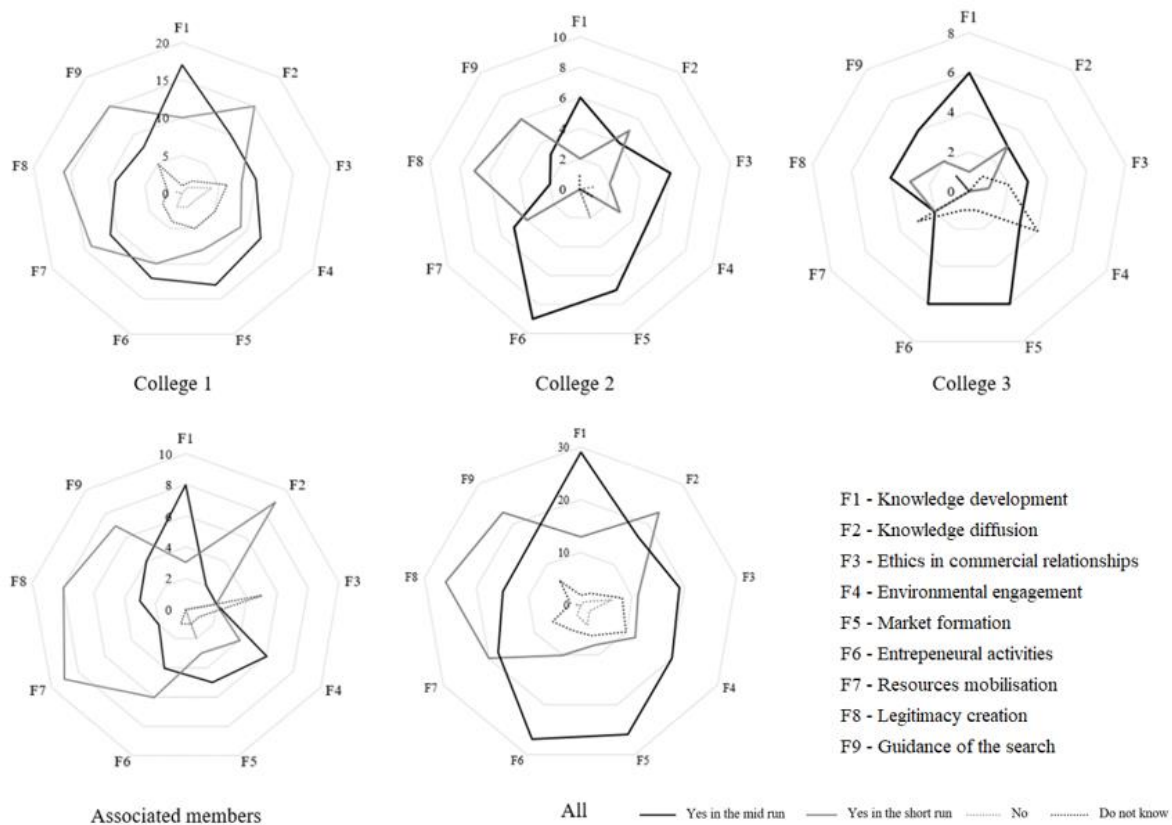
Finally, concerning environmental engagement, the majority of the respondents think that legume cropping and transformation practices are sustainable enough. They also think, nevertheless, that FILEG can contribute to the sustainability of these practices, mostly in the mid run (Figure 16).

**Figure 15** – Members’ answers when asked if legume cropping and transformation practices are sustainable enough (left) and if FILEG can contribute to the sustainability of these practices (right).



All the answers obtained from the questions related to FILEG’s possibility to contribute to MIS functions are represented in the radar charts of Figure 16. We can observe that the proportion of answers stating that FILEG can act in the “short run” clearly varies between groups, visually represented by the area inside the light gray line. A low p value ( $p = 0.0015$ ) was found when testing the independence of the variables ‘type of answer’ and ‘member group’. The associated members group and college 1 are those that, proportionally, gave the greatest amount of “short run” answers (Figure 16).

**Figure 16** - Members answers concerning FILEG capacity to contribute to each function development.



Those results obtained through the questionnaire were capable of showing general tendencies about the network and actors' perceptions. However, to be able to capture in detail their representations, reasons and suggestions of action for FILEG, we conducted open-ended interviews with some members. The results obtained by this third data collection method is presented in the next item.

### 5.3 Interviews with members

We interviewed a total of 15 actors, from 12 companies and 1 public organization, whose selection was done with the help of FILEG's coordinator. An information notice was written and sent to each actor to inform them about the study and their rights as interviewees. Table 3 summarizes the types of actors and the colleges to which they belong and Tables 4 and 5 summarize the answers to the Likert scales. Not all actors reacted to all Likert scales statements due to mainly time constraints during the interviews. Because of this, the number of actors sharing their perceptions to each function varied. Nevertheless, it has not been considered a problem, since the main objective of the interviews were to gather perceptions and qualitative data. The interviews were recorded and transcribed with the assistance of a tierce person and the translations were done by the author. All the original verbatim in French are available in Annex 3. Specific information and the verbatim presented in the following texts are associated to an anonymous identifier (Id) for each actor interviewed (shown between parentheses). The Ids are formed by a character unique to each actor and a number indicating the actor's group (Table 3). Whenever the words 'many' or 'majority' are used we also indicate between parentheses the number of actors concerned by the statement. In the next items we present the main trends in actors' answers when asked to justify the score given to Likert scales, suggestions for FILEG, and their perceptions concerning the future of the sector. The same as in the questionnaire, some vocabulary adaptations were done

concerning some functions. Based on those interviews, we analyzed each function role from the point of view of those actors.

**Table 9** – The 15 interviewed actors and their Id codes related to college membership.

Id*	Type of structure	College
a4	Interbranch organization	Associated member
b3	Collective catering	College 3
c1	Seed company	College 1
d1	Seed company	College 1
e1	Cooperative	College 1
f1	Cooperative	College 1
g3	Collectivity	College 3
h3	Collectivity	College 3
i2	Processing	College 2
j3	Collectivity	College 3
k1	Cooperative	College 1
l3	Cooperative	College 3
m2	Processing	College 2
n2	Processing	College 2
o2	Processing	College 2

\*1 = College 1; 2 = College 2; 3 = College 3 ; 4 = Associated member

**Table 7** – Number of actors that associated each function to each score concerning function’s importance when thinking the current development of the regional legume sector (score 5 = very important to score 1 = not important)\*.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	
Score 5	4	5	3	5	2	2	4	4	7	F1 - Knowledge development
Score 4	5	4	6	4	4	5	3	6	1	F2 - Knowledge diffusion
Score 3	5	2	2	3	0	4	5	2	3	F3 - Ethics in commercial relationships
Score 2	0	3	1	1	3	3	1	0	2	F4 - Environmental engagement
Score 1	0	0	0	0	2	0	0	1	0	F5 - Market creation
										F6 - Entrepreneurial activities
										F7 - Resources mobilization
										F8 - Legitimacy creation
										F9 - Guidance of the search

\*Scores with decimal numbers have been rounded off to their preceding integer.

**Table 8** –Number of actors’ reactions to statements related to the functions being currently well performing in the regional legume sector.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	
Agree	0	1	0	4	4	5	1	2	0	F1 - Knowledge development
Rather agree	4	4	1	8	6	5	5	3	3	F2 - Knowledge diffusion
Rather disagree	8	7	8	0	1	3	4	4	4	F3 - Ethics in commercial relationships
Completely disagree	1	0	0	0	2	0	2	4	3	F4 - Environmental engagement
Do not know	0	0	4	1	0	0	0	0	1	F5 - Market creation
										F6 - Entrepreneurial activities
										F7 - Resources mobilization
										F8 - Legitimacy creation
										F9 - Guidance of the search

### 5.3.1 Knowledge development

The majority of the interviewees (n=11) highlighted that the sector has a deep need in knowledge to increase its performance. *“There is a lack of competitiveness of legumes compared to other crops, which is why farmers do not crop them”* (a4). The random harvest and low profitability levels observed on those crops (g3) are a reason for this lack. Gaps in technical knowledge are perceived concerning crop protection and crop rotations (k1), adaptation to climate change (n2) and local specificities of crops (h3). Much knowledge does exist, but it remains informal and uncharacterized by science (c1). *“There are still gaps in the technical recommendations. We do not know how to fight against certain diseases, whether in seed production or consumption”* (c1). *“There is not sufficient knowledge currently. We have to speed up [knowledge development]”* (k1). This feeling of insufficiency and lagging of knowledge development is also perceived in the processing stream. A lack of “know-how”, unawareness about facilities existing in the region and even a lack of technical knowledge on processing are highlighted (d1). The development of this type of knowledge, however, is perceived to be more problematic than in the upstream. Cropping practices are more or less the same for all farmers, and there is apparently not a concurrency problem on sharing knowledge. However, in the intermediary and final stream of the production chain, knowledge becomes a differentiation for companies and their products. A common effort to develop knowledge on processing is hence hampered by confidentiality and concurrency issues (d1, n2). *“The more we go to the market, the more complicated it is to share [knowledge]”* (d1).

Deficiency of knowledge has also been mentioned concerning the use of legumes. From the animal feed side, gaps seem to exist on how to substitute soybean by local legumes and compose meals for livestock (l3). From the human food side, lack of knowledge has been pointed as one of the causes of low consumption of legumes (i2). *“[consumers need to know] what are the benefits of legumes, what is the advantage of a legume compared to another, what is the advantage of a sprouted legume compared to an unsprouted one, and how they can be used!”*. For some actors, nevertheless, there is already much knowledge achieved and it is sufficient (e1, j3). For them, information incompleteness is inevitable and it may not prevent companies from creating activities (f1). *“If we wait to be at ‘five out of five’ of knowledge, we will never start”* (f1). Some actors also think that there is also enough knowledge about how to use legumes: *“We don't need a fancy legume, we just need a standard legume, so we don't necessarily need new knowledge. In fact, knowledge today, it exists and it is sufficient”* (b3). Those actors keep their openness to new knowledge, stressing only that its development is not a priority.

When asked about the role of public research on this function, actors share many different perceptions. For some, public research institutes (such as INRAE) have a complementary role with the legume technical institute, Terres Inovia. FILEG could be an intermediary, fostering the interaction between economic actors and public research (a4, h3, k1). *“They [public research] actually convey it [knowledge] to Terres Inovia, which adapts it. To Terres Inovia, to FILEG, which can [after] bring it to farmers”* (h3). Some actors stated that public research could focus more on agronomy subjects (g3, h3, k1). *“I think they [public research] have to come back [to focus on agronomic approaches]. FILEG [can] go knock on the door and say: here we are, we need basic agronomic research on those species”* (k1). Many different suggestions of specific research subjects have also been made concerning agronomic and social science approaches (f1, g3, j3, l3, m2). *“[A potential research topics could be] How the consumer appropriates legumes, how could they better appropriate legumes”* (j3).

Many actions have been suggested concerning how FILEG could improve this function. For many of the interviewees (n=7) FILEG can continue the work the organization has already been doing of linking interested actors to create common research projects through work groups. *“I do not think that the role of FILEG, directly, is to acquire knowledge. Its role is to connect people who are asking the same questions and so they can decide together what can be done, to be then broadcasted by FILEG”* (c1). Other suggestions, of more direct actions, also appeared, such as screening the different crop practices in the region to identify specific needs on knowledge (k1), a survey of the offer of regional legumes and actors of the value chain (e1), and testing product concepts (n2).

### 5.3.2 Knowledge diffusion

Actors' opinions about the current state of knowledge diffusion could be organized into three groups according to the actor's perception. The first one considers that there is a general problem concerning the access to the information in the sector. Information is splittled at many different places (c1) and much effort and motivation is required to find it (g3). This may make the diffusion of information difficult to farmers (concerning crop practices) and to citizens about the legume importance. *"[If] it is difficult to retrieve certain information when we know where to look, so a farmer, for him, it is almost impossible to find reliable, recent and regular information!"* (c1). In addition, there would be a problem on how information is diffused, mainly through documents. More workshops, meetings and technical training would facilitate the access to knowledge (j3). *"[There are] booklets, things like that, but we have to go beyond that, we have to go and meet these people, like cooks, and train them [to use legumes]"* (j3).

The second group stresses a problem of asymmetries in the diffusion of knowledge: there is a focus on some crops, subjects and/or publics (i2, a4, b3, e1). Because of it, gaps of information are formed. This is the case, for example, of information concerning economic data of some legume crops, which is considered imprecise and outdated. *"[The national statistics] will communicate prices of peas, but there is no difference made between outlets. If we are talking about the animal feed outlet or the human food outlet, if we talk about conventional or organic, the prices can be very different from each other"* (a4). Actors also related that the consumers would be those for whom knowledge is least distributed. *"If you put a pack of chickpeas [in front of an ordinary person], I think nine out of ten people, they don't know what to do with it!"* (e1).

The third group of interviewees does not see knowledge diffusion and accessibility to the information as a capital problem of the sector. Their argument is that the issue of knowledge development precedes knowledge diffusion. The channels to diffuse information that exist currently are effective, but there is simply not enough knowledge developed to diffuse (n2, l3, d1). This problem should be tackled by doing more research/ data collection, and not creating more campaigns/ platforms of diffusion. *"I think we have sufficient distribution channels [of information]. On the other hand, that does not mean that, once again, that all knowledge is acquired"* (d1).

Some actors suggested that FILEG could improve knowledge diffusion by acting on the channels of diffusion. The organization could organize workshops and demonstration plots (j3), link actors and promote exchange of expertise (b3, h3), and assemble all the dispersed knowledge in one platform (m2, c1). *"[The role of] FILEG is to communicate and to be kind of a center of information so that people seek information on chickpeas in Occitanie, whether it's how I sow it, where I buy it or what do I make of it, the referent, it will be FILEG!"* (c1). Those that stressed the importance of knowledge development over knowledge diffusion tended to make more general propositions, saying that the role of FILEG is to invest in the creation of knowledge and ensure that it will be correctly diffused inside the network. *"I believe more in mobilizing resources to seek, once again, knowledge, and then share it with the players in the sector who participate in FILEG"* (d1).

### 5.3.3 Ethics in commercial relationships:

Only one actor gave a positive answer when asked about the equity of commercial relationships. *"Today, we can build contracts of production, which are good, which are attractive; we can even [...] build it over several years. So afterwards, they are in line, I think, with what the market can do at a given time"* (k1). Some actors, in opposition, said that they do not perceive commercial relationships as equitable. The downstream may tend to be favored on commercial exchanges (g3, h3), having power to pressurize the upstream (d1), making higher margins (a4) and taking fewer risks (n2, f1). *"Sectors [such*

*as the legume sector] that are highly dependent on, or compete with, import products, tend rather systematically to pressurize the [local] upstream [due to imports low prices] and therefore to poorly distribute the value” (d1). “For me, the most appropriate term would be [share of risks][...], that the risk is not only on the producer [...]” (f1). Other actors considered that they do not know how the value is shared between actors and preferred not to give an opinion about the current situation of the sector (n=5).*

Concerning the possibility of FILEG to act and improve the function, three different visions could be noticed. The first one is of those that believe FILEG can have a direct role influencing commercial relationships, putting in place mechanisms of share of risks between actors such as insurances or equalization funds (n2) or setting principles of negotiation that must be followed (g3; h3). *“If FILEG integrates [equity of commercial relationships to its principles]”, [...], and then provides tools for contracting to the actors, the organization can have a role in the Occitanie [legume] sector” (g3). Another vision is that FILEG can influence the commercial relationships indirectly, promoting members acquaintance (a4), showing possibilities of contracting (a4, n2), creating work groups on it (l3) and creating indicators about production costs and final product price breakdown. “I think that one of the actions that FILEG can do is also to promote, let's say, mutual knowledge between upstream and downstream players. That the downstream players also have in mind the constraints related to the production, collection and processing of grain” (a4). It should not be, however, the role of FILEG to admonish or sanction its members (m2). Finally, the last group of opinions considers that FILEG cannot act on this function. According to them, an external agent cannot or should not control the share of value between actors (c1, e1). “FILEG can help to set up the sector. Afterwards, for a sector to survive, each stream must find its account [...], but FILEG will not have any direct action on the distribution value between the streams of the chain” (c1).*

### **5.3.4 Market formation**

Many actors (n=8) related that market formation corresponds to sectoral development. Demand is growing and market perspectives are positive (g3, m2, n2). The production is pulled, hence, by the consumers' needs (c1, d1, h3, n2). *“It's even a prerequisite! There is not a sectoral development that precedes the market development. It is the growth of the markets that develops the sector” (m2). Nonetheless, some actors perceive a more unbalanced situation currently in the sector. The demand is much higher than the offer because upstream is encountering technical and economic obstacles to produce and sell out at an acceptable price (e1, k1, o2, a4). “From my point of view, one of the major obstacles to the development of legumes is [...] to match supply and demand, particularly for pulses. We have seen, years ago, we were more in a context of overproduction, now we are more in a context of underproduction” (a4).*

The role of FILEG in market formation is perceived sometimes as indirect. By working on other functions, such as knowledge development, the stabilization of the supply would be a natural consequence (d1, g3, k1). FILEG could also promote legumes to the public and work on education, increasing indirectly the demand (i2, j3). *“FILEG is there, in fact, to structure the response to the demand. To structure and to promote!” (i2). Other actors suggested that FILEG can have a direct role, by developing quality specifications (n2), and helping actors of different streams to ‘match’ (b3, c1, m2). “[The organization] knows the actors who may be involved and users of the products of this sector, so the role of FILEG is to “match” the actors between them” (b3). However, that strategy could create a risk of favoring some specific actors in detriment of others (d1).*

### 5.3.5 Entrepreneurial activities

Concerning entrepreneurial activities, many actors (n=7) consider that there are many expectations from the demand side and it creates an attractive environment for new enterprises to develop new activities. Factors such as the industrial processing potentials of legumes (m2), its use as a cheap animal protein alternative (b3, c1) and societal claims concerning the environment (d1, h3, n2) can explain that attractiveness. *“There are quite high expectations from the manufacturers and consumers. It is a cheap product, which is an alternative to animal protein; there are more and more consumers [...] and the market is open to innovations”* (b3). The attractiveness of the sector, nevertheless, would only be something positive if entrepreneurs carry virtuous activities, such as sourcing at local markets (j3, a4). *“We will also have to convey the image and the idea that fair and local sectors are needed, because otherwise, what we risk doing is opening the markets, but markets with consumers who do not look at where the product comes from and its quality”*.

Some actors, however, have less optimistic perceptions of entrepreneurship in the sector. Farmers would not be attracted to crop legumes because of low profitability and remuneration: *“For the farmers [legumes are] clearly not [attractive], because there is no performance, there is no remuneration. From the feedback we have, it is not attractive at all. It is attractive in terms of potential outlets, but not attractive in terms of crop conditions”* (g3). Industrials, on their turn, encounter difficulties to secure supply: *“I think that companies that are a little reckless and want to grow in this sector. They are not attracted, because they will have trouble finding legumes [raw material]”*. (k1). Activities on animal feed would also hardly be developed, since the local markets are almost nonexistent (l3).

In this function, FILEG could have a role of linking start-ups and business incubators (j3), guiding the companies for the good sources of funding (a4), supporting them to find suppliers and outlets (b3, c1), and promoting them (c1). *“[FILEG could have] a role of monitoring and connecting, and [...] of making more fluid the establishment of new startups or whatever”* (c1). Globally, the attractiveness of the sector to new companies would come naturally as a consequence of working in other system components (d1, i2), such as improving knowledge development (a4), knowledge diffusion (m2) and education of citizens and companies (h3). *“FILEG has a role in raising people's awareness, in informing farmers, and that [the attractiveness of the sector] happens naturally”* (h3).

### 5.3.6 Resources mobilization

Two trends of answers could be observed concerning the mobilization of resources. To a first group (n=6), resources have been mobilized in a relative efficient way. A lack of human and financial resources is sometimes mentioned (a4, d1, j3). *“I think much more resources will be necessary! [...] It would take much more resources [to develop the sector]. But afterwards, we mobilize them I think in an efficient way [...]!”* (j3). *“From a human point of view, I think that we do a lot with few means!”* (a4). Some actors, however, think that there are currently enough resources mobilized in the sector: *“[The sector] is quite funded by the public authorities; there is also a political will to develop it, so I think that the resources are put in place”* (b3).

The second group (n=5), tended to relate that resources are not been mobilized efficiently. Either because resources are very limited, when talking about animal feed: *“In fact I'm going to strongly disagree [that resources are efficiently mobilized], because the sector does not mobilize the financial means when talking about breeding!”* (l3). Either because the distribution and mode of deployment of resources are inefficient. For some actors resources are too concentrated in some activities: *“I think that there are perhaps too many means, especially in the [hands of] economic actors, who are oriented towards logics of search for profit, efficiency, things like that. There is less [resources] in other questions, where it would be necessary to do more research, to take the time to search ...”* (g3). In addition, actors would tend to deploy their resources individually, and a lack of coordination would



hinder sectoral growth (c1, m2). *“It's at the level of companies [that resources are mobilized] [...]. But if we look at the sector in a more transversal way, we have no sectoral mobilization that will say 'well, we need this quality, or this quality, or this product' [...]. [And the sector] does not necessarily work together”* (c1).

Some actors perceive this problem of sectoral incoordination in the deployment of resources as out of the scope of FILEG actions. The resources mobilization would be driven by the market (h3), and it is only up to actors to decide if they will cooperate or not (m2) and use their resources (k2). *“And do the other actors in the sector mobilize their resources well? That is their problem”* (k2). *“I feel like it's a bit beyond FILEG! [...] I have the impression that it's a bit the consequence of [the existence of] a market behind, if it is something [financially] attractive or not [...]”* (h3). Nonetheless, other actors have more optimistic visions, imagining a scenario in which FILEG knows the main sectoral needs of funds (g3) and act as a spokesperson of the sector, using its voice to mobilize public resources (a4, d1, k1). *“The importance of a vehicle like FILEG is to say, 'Look, we are grouped together, we are coherent, we work technically, we have identified promising markets...' and therefore it assures financiers, whether public or private, on the fact that there is a [collective] dynamic and a 'cluster'”* (d1).

FILEG actions concerning resources mobilization could also be focused on the individual companies. Interviewees who suggested this kind of action, perceive FILEG as a facilitator in the procurement of funds. The organization could guide project leaders to the good sources of funding (a4, c1) and legitimate their demands (i2). *“[...] (FILEG can say if) the project is viable, if it can be improved. With this feedback, finally, it is easier to go see a banker. [...] The banker will quickly say 'yes' [for a funding], with his eyes closed, because there is FILEG [behind]”* (i2).

### 5.3.7 Legitimacy creation

Some interviewees think that society is globally convinced of legumes importance, even if not completely. The advantages of legumes are known in the agricultural world (a4), public authorities and the public opinion are persuaded that legumes are the future (c1, i2, o2) and the positive trend of the market proves that there is a dynamic around legume-based products (d1, l3). Some marketing campaigns are also already in place (e1). *“Today, if we take the national guidelines, you are told that you have to eat legumes twice a week! [...] But it is because we (the society) are interested in the subject”* (i2). *“I think there is a whole section of society that is very aware of this (legumes importance), and a whole section that is very distant, for various and varied reasons”* (d1). Other interviewees, however, are less convinced about ‘society’s awareness’ concerning legumes. According to them, ordinary people do not know why legumes are important (b3, h3, j3) and have several misconceptions about them (g3). *“There is a big lack of knowledge [...]. Concerning the production, the benefits, the ... the 'what is a legume' [people do not know it]!”* (h3).

Many actors (n=9) perceive working on general public communication and education as measures that FILEG can take. The organization could participate in consumer shows (a4, l3), communicate on social media and mobilize chefs to create recipes (c1, l3), communicate at schools (g3, k1), develop tools/templates for communication (g3), and create partnerships with the territorial collectivities (b3). *“For me, one of the main roles of FILEG is to communicate. [...] Communicate and federate”* (c1). *“[FILEG can do] many things on education, for example! Games, exhibitions, improving knowledge [...] in events, in schools...”* (g3). Some interviewees, however, tend to consider that communication should not be a priority of action for FILEG. *“I don't think it's up to FILEG to worry about that [general public communication]. [...] [The organization should worry about] suitable products, how we make local production available, how we correctly distribute the value to make the sector sustainable, solid and efficient”* (d1). For them, communication should be done at the national level (d1), which could be acquired by a common project of all legume organizations (n2). *“It would make sense [for the regional organizations], to combine resources at the national level. The regional*

level, it seems to me [insufficient], [...] because the returns on investment will be limited” (d1). Finally, some actors highlight the importance of lobbying public power (b3, n2) to influence public policies, the medical speech and research (m2). “It must be a lobbying. Well, there is lobbying for cigarettes and for alcohol, I think we can lobby for legumes. That will hurt no one!” (m2).

### 5.3.8 Environmental engagement

The majority of actors (n=11) declared to perceive the sector answers the current environmental challenges since legumes are intrinsically good for the environment. “We work with species that fix nitrogen, so that need less fertilization. Among legumes and pulses, there are also many species rather tolerant to drought, chickpeas in particular, and there are quite a few Mediterranean species” (c1). Some actors have acknowledged that even if legumes cultivation has many advantages, the sector cannot be automatically considered sustainable (e1, g3, j3). Each farmer and enterprise have their own practices that are more or less sustainable (m2, n2) and the sector will be in a good path when not only the economic perspective will be driving it (h3). “There are lots of different value chains: there can be some that are completely disconnected, exporting for example, which are not necessarily environmentally (good), even if the crop is” (j3). “Compared to corn or crops like that, just in terms of production, [the legumes are] much more sustainable. But we must be careful that economic issues do not take over.” (h3). Attention should be paid, according to some actors, to the fact that the advantages of legume crops are context dependent (f1, l3). “Not all legumes are necessarily self-sufficient in nitrogen. [...] [Some legumes also need] irrigation and it will be the same thing [as corn], but fixing much less carbon than corn” (f1).

Concerning this function, FILEG could have a role of communicating legumes benefits to the public (c1, k1, o2) and public authorities (a4), and clarifying misconceptions (i2). “The cultivation of legumes is sustainable. In fact, it is just a question of making it known and of explaining it” (k1). FILEG would not have, hence, a role of admonishing the actors concerning their practices (l3). “I really see FILEG as an organization that allows [legumes] promotion. I do not see the organization putting constraints by saying, [...] ‘watch out for the good practices!’ This is more the role of the technical institutes” (l3). Other actors, however, think that the organization could have an active role in improving practices. This could be done by education and raising actors’ awareness (d1, j3) or by the creation of a charter of practices defining clear principles to be followed (b3, g3, h3). “[FILEG can] raise awareness. This is where the limit is perhaps a little difficult, because it must not be intrusive [...] into individual business strategies” (d1). “[FILEG can] work, for example, on the establishment of a charter of practices to farmers that are members [of the organization]” (b3). “[FILEG must ensure that legumes] will not only go to feed big agri-food companies, which only want to make profit [no matter the means]...”

### 5.3.9 Guidance of the search

Actors have expressed many different perceptions concerning the function guidance of the search. Some evoked that a certain common vision is present in the sector, manifested by the fact that almost everyone agrees that legumes are beneficial (a4) and that there is a certain structure of strategic plans built nationally (g3). However, the deployment of this vision would vary to each actor, and that variation may hinder cooperation (e1). “Even if the vision is common, the way to get there or the timing to get there is not necessarily the same. A distributor he must satisfy a very varied clientele, not necessarily the same as a processor based in Occitanie or a producer who will be in a few product families...” (e1). In addition, the existence of many different regional organizations would weaken a bigger national common vision (k1). “I think that it [the existence of many different organizations] will dilute the discourse and the impact that we can have on research institutes, on the State, on a whole

*bunch of actors*” (k1). Other actors clearly declared that a common vision is non-existent: “*There is no guideline, yet, where everyone knows exactly how the products are going to be used, for what purposes, by whom, in what quantities, with what logistics circuits...*” (b3). “*A vision is [to say], no matter what, this year we’ll make three thousand tons of chickpeas! [...] And the next year, we’ll make three thousand five hundred, and the next year, we’ll make four thousand. That is a vision! [But] today, there is no vision...*” (m2).

The importance given to a common vision in the sector also varies according to each actor. There are those who perceive it as essential for sectoral development. “*[Having coherent ambitions is important] to avoid getting into a war of competition, [and assure] the distribution of value precisely...*” (f1). “*Having a common vision at the national level allows communication and promotion actions [...] that are reflected at the local level*” (i2). Others think that such a sectoral common vision is not necessary, or even impossible. “*I don’t know if it [a common vision] is necessary! Because the legume sector is very broad... [...] Certainly, [the actors have] enough points in common, but also a lot of differences [...] [Actors’ activities can be] very, very different, and no, there is no common vision. I think that’s a bit utopian!*” (d1). “*It is not necessary that everyone goes in the [same] direction, since there are many different markets and many different orientations*” (c1).

Many opinions can also be identified concerning the role of FILEG developing actors’ common vision. For some, FILEG is itself an initiative that allows the building of a common vision (a4, n2) as a natural consequence of the organization’s actions on linking actors (c1; k1). “*It is the functioning of the organization that gives us a common vision. Since everyone can vote on the FILEG’s priorities of action*” (a4). Some actions could be taken by FILEG to improve the guidance of the search, such as a research work to centralize the needs of all streams and collectively discuss how to answer them (b3) and lobby public authorities (m2). The organization should also keep an adequate member number of all streams to avoid overrepresentation of some visions (d1) and extremist thinking (l3). “*[FILEG] must not fall into the [extremism]... [...] [if FILEG says] to increase the consumption of legumes simply replacing meat with grain legumes. [...] We would no longer have a common vision [with breeders]*” (l3).

Finally, to effectively create a common vision and guidance for the sector, some actors stress that actions should be taken at the national level. FILEG could work together with other regional legume organizations (c1) or eventually become itself a leader and a spokesperson at the national level (k1). “*[FILEG could] maybe knock on the door of [other legume] organizations, from other regions, to say ‘we could have a common congress, or a common reflection’*” (c1). “*Well I think that FILEG should be the spokesperson for the legume sector in France! [...] And say ‘here we are, we are the voice of the legume sector, and it is us! And if you have a problem, it’s us [you must see]!’*” (k1).

### **5.3.10 The future of Occitanie’s legume sector**

Many actors (n=9) are optimistic concerning the evolution of regional grain legume planted area, that may increase in the next years. The reasons evoked for this englobe climate change (a4, g3, m2) and the growing demand for grain legumes (g3). “*I think it will increase, the share of legumes in field crops, there will be no choice to adapt in relation, also, to demand, to climate change, to the issues of pollution of rivers [...]*” (g3). Only one actor answered that the current planted area is optimal (j3) and one that the area will tend to decrease (f1). For the latter, this could be explained by a decrease in soybean planted area, today representing 50% of the total grain legume planted areas, due to climatic changes and water restrictions (f1). “*I think the grain legumes area will decrease. Because of soybeans, I see them decreasing in the years to come, for irrigation reasons. Difficulties concerning irrigation costs, irrigation means and water availability [...]*” (f1). Some actors also stressed a certain conditionality for the growth of legume production: it will depend on the vision and coordination of actors (a4, c1, d1). “*If all the lights are green and we manage to develop communication,*

*entrepreneurship and all of that that, maybe a doubling of chickpea areas, a tripling of lentil areas [will be possible]... ” (c1).*

When asked about the different grain legumes species, only positive or neutral comments were made concerning the future of dried peas and faba bean, which can be cropped during the winter season (k1, b3) and are potential sources of innovation for the human food (n2, c1) and animal feed markets (c1, l3). *“I imagine it's mostly winter varieties [that will develop]. Faba beans must be used mainly in organic systems, either for cover or for animal feed” (a4).* An increase of production could also occur with chickpeas and lentils, perceived as highly adapted for the changing regional climatic conditions (a4, b3, f1, m2) and their importance to human food (b3, c1, g3, n2). *“I think that if the water problems continue, naturally, the legume will take up more space in the rotation: not necessarily soybeans, which are very water-intensive, but chickpeas, and lentils [...]” (m2).* Soybean cultivation could be threatened due to changes in the rainfall regime and a higher need of irrigation (a4, c1, f1, k1, l3, n2, m2). Soybean would also have difficulties to develop due to consumers misconceptions concerning the crop (n2). Common beans, on their turn, are perceived as holding much potential for the human food markets (c1, g3, k1, l3), but could also be negatively affected by climatic changes and water restrictions (c1). Other species are also cited that could be developed in future, such as cowpea (c1) and peanut (l3). *“Now peanut butter is starting to grow in France. Is there a possibility [of developing a local supply]?” (l3).*

The interviewees were also interrogated about the future of grain-legumes outlets. Concerning human food markets, different trends have been pointed, such as flours and protein concentrates (a4), low processed food (c1) and high processed food (e1, l3). *“It will be rather products of second, even third transformation [...]. With a French origin or not, depending on the markets, the productions...” (e1).* The development of the human food outlet is considered good for the environment (g3, m2) and is aligned with public policies trends (m2). The animal feed markets also have some potentials, such as using by-products of the food industry (l3, y3) and improving the protein autonomy of livestock farms (g3). *“I hope transformation products [of human food industry will increase], which allows to have by-products for animal destination which are economically coherent” (l3).* However, much more issues are perceived to their development, like low prices (n2), insufficiency of the production (a4), tendency of grass-feed livestock (c1) and the intrinsic environmental impacts of breeding (g3, h3). *“For the animal feed part, I think one of the obstacles is the fact that we don't produce enough of it; than livestock feed manufacturers, they still need large volumes, so the less we make, the more complicated it will be for them to use it” (a4).*

## **6. Discussion**

This work focused in answering the following research question: “How does FILEG organization perform the Mission Oriented Innovation System (MIS) functions?” As well, it is also guided by the three sub-questions: “What are the main functions that, according to FILEG members, can be performed by FILEG?” “In what way could these functions be performed?” “How the network can contribute to system building?” To go deeper in the discussion of the results obtained from all data collection methods and get insights on those questions, we chose to divide the discussion sub-sections in groups of functions that we considered closely related. A reasoning about the role of the functions in FILEG and the role of FILEG in the sector is presented based on Musiolik *et al.*'s (2020; 2012) RBV reasoning (see Section 2). Suggestions for FILEG, the limitations of the study and suggestions for future research are discussed in the end of this section.

### **6.1 Resource mobilization, legitimacy creation and guidance of the search**

We could observe in the desk research that those three functions were the first ones in which FILEG concentrated its activities. It happened because, in the network's beginning, the interest of the

former group was to convince a first set of actors (creating legitimacy), around a shared objective (guidance of the search), to create and carry a common project (and mobilize resources). Activities carried out by the organization concerning those functions allowed the creation of some network resources, such as the mobilization of collective public funds, formalized engagements and the creation of the organization and its governance. For this reason, those three functions can be seen as the first FILEG's core activities, being fundamental to structure the network and, hence, the studied MIS success. Concerning resource mobilization, the organization is expected to act through a 'sectoral easing', by becoming the 'collective voice' of the actors when mobilizing public funds and helping individual actors to find financing. This role is deeply linked with the legitimacy the organization has to perform it and the fact that all actors are organized through a common ideal.

Regarding legitimacy creation, the role of FILEG is less clear. Some members see the organization as an entity that may promote the legumes to the whole society through different means. Others do not think it is up to the organization (or at least not to the organization alone) to take this kind of action. An 'identity conflict' is observed (when looking at that and other functions) about what the organization should be. For some, it is a 'back office' that is only meant to ease interactions between actors. For others, FILEG should lead the image of the sector and of legumes for the whole society. This conflict, consequence of a still unclear network strategy, is related to the types of resources actors expect the organization to create. For the first group, which is in a logic of 'sectoral easing', the only network resources that should be created are those that favors interactions between members. For the second group, however, the organization has a supplementary role of creating a 'good image of legumes', a resource that exceeds the network and reaches the system level.

A variety of opinions can also be observed concerning the function guidance of the search. Globally, network members are not sure if there is a common vision in the sector. Having such a vision is not even considered important for all actors. The question that seems to underline those perceptions is, in fact, to what extent the network and the sector should share a common vision. It is impossible for all actors to share the same opinions, and differences must be acknowledged to a certain point. In the network scale, FILEG, as written on its constitution, offers clear guidelines about what is expected as an out-put of the organization: "*contribute to the development of a legume value chain in the region of Occitanie. That one must be sustainable, territorialized, structured, creator of added value with the aim of an equitable value share between actors, endowed with a research, development and share dynamics, financed collectively*". However, *how* to accomplish those objectives is something that members are still figuring out. A risk, if this process takes too long, is of a dispersion of organizational and network resources in many different actions not strategically coordinated. According to Musiolik *et al.* (2020), the mode of coordination of actors in a system depends on the resources available to each of them individually. When resources are missing in the system, a formal network may emerge, where actors can 'join forces' to the creation of those missing resources. However, our findings suggest that there is a step preceding the creation of resources by the network that is not negligible: the common agreement about what resources the network should create. As FILEG's mission is quite large, the resources the network will build are not defined 'by default', in such a way that actors may join the network having many different expectations. The output of FILEG's network resources, coming from the combination of members' organizational resources, and their deployment in the system level depends, hence, on the compatibility of members' expectations.

## **6.2 Knowledge development and diffusion**

Knowledge development and diffusion is the second 'block' of functions in which FILEG started to act in. Those functions are intrinsically linked, since, by its nature, the network is expected to diffuse to its members every knowledge that may be developed. There is a general agreement that those functions are important for the sector and FILEG should invest itself in them. Those findings corroborate the reasoning of Becker and Dietz (cited in De Faria *et al.*, 2010), stating that firms search knowledge beyond their boundaries in order to complement their capabilities in a context of increased knowledge

complexity. However, during the interviews, an important point has been raised: knowledge can be a resource for the firm which determines its competitiveness. Some actors could be less prone to participate in common research programs or share their own knowledge when they perceive that it would impact the performance of their own business.

Considering the RBV view (Musiolik *et al.*, 2012), knowledge can be both an organizational resource (if held by a single firm) or a network resource (if available to the whole network). We can also consider that, if the knowledge is also available for anyone in the system, it can constitute a system resource. During the interviews, actors' opinions about the role of FILEG on developing and diffusing knowledge varied when situating knowledge at the organizational, network or system level. For some, there is specific knowledge (concerning product development in the downstream) that is hard to develop commonly and share, since the competitors are also members of the organization. This kind of perception characterizes knowledge as purely an organization resource. According to another type of reasoning, the organization could share to the whole sector any knowledge developed (but especially concerning crop practices), making it a system resource. Finally, knowledge could also be developed commonly, but diffused only inside the network, becoming a network resource and a competitive advantage for its members. The decision concerning what resource level (organizational, network or system) a given knowledge will be put in is, again, dependent on the collective agreement of the members and the guidance of the network.

### **6.3 Market formation, ethics on commercial relationships and environmental engagement**

Actions related to market formation and ethics of commercial relationships have been initiated at the same time by the organization after its constitution. This is the case because, due to the organization's mission, ethics in commercial relationships is one obligatory aspect of the activities the organization may carry out concerning market formation. Currently, the majority of actors perceive them as mid-run priorities, even if their perception about the current state of the market varies. For some actors, the sector is under a dynamic of demand pull, with desirous consumers creating an attractive market and pulling the sectoral development. For others, however, the pulling force is too strong. The upstream has not been able to answer the demand due to lack of competitiveness compared to cheap imported markets and enterprises are encountering problems in finding/adopting local supply. In addition, the production risks are only on the farmer's side, which creates inequalities in commercial relationships and hinders entrepreneurial activities. Concerning the role of FILEG in this situation, two views have been presented. The former reasons that the creation (or the regulation) of markets and the equity are not possible to be achieved intentionally and are, hence, the consequence of the performance of other functions, with no direct measure FILEG could take. For the latter FILEG could have an active role of linking buyers and sellers to secure the production flow, lowering uncertainty related inequalities and gradually increasing the supply (network resource). Such a measure, however, could have a negative effect of favoring some actors to the detriment of others.

No action fostering environmental engagement was found in the document research and, for the majority of actors, FILEG could act in this function mainly in the mid-run. This 'inertia' can be related to actors' perception that the sector does answer the environmental challenges because of the intrinsic environmental value of legumes. According to the organization mission, FILEG must work to the development of a 'sustainable' sector, but the meaning of the word 'sustainable' is varied and very subjective. If the sector is considered 'sustainable' because of the raw materials it is based in, no action must be taken in relation to this function. Some actors, however, have highlighted that the sector can be sustainable depending on the actors' choices. For them, sustainability is not only a consequence of working with legumes, but the outcome of all system practices.

Environmental engagement, as well as ethics in commercial relationships, are functions that are different from the others in the sense that they are normative. They do not come from an attempt of mapping activities that drive neutral innovation (functions of Hekkert *et al.*, 2007). Rather, they map activities that tackle specific problems of the agrifood sector that have been defined from social

expectations. Their presence and shape in the system depends, hence, on the degree the actors share those expectations. The two functions are part of the system's mission and the normative process that selects the potential innovations to be adopted or not (Hekkert *et al.*, 2020). As they are normative, actors have different visions about how much those norms should constrain their activities. For some, FILEG would have a direct role in improving those functions by a charter of practices and clear principles to be followed by all members. For others, the role of the organization is indirect, by doing education and diffusion of knowledge about alternative practices, without constraining or admonishing its members. Reasoning in terms of the RBV, actors also have to pass through a step of 'agreement' concerning how limited they are prone to be in order to conceive and deploy normative network resources.

#### **6.4 Entrepreneurial activities and the future of the sector**

Actions concerning this function have not been found during the document research, however, during the interviews, it was possible to observe that FILEG has contributed to the development of some entrepreneurial activities. This contribution was represented by helping new entrants to find funds or facilities and happened informally through, for example, phone calls. The phenomenon of informal exchange of know-how is also an important driver of the innovation process (Pyka, 2000). According to Rank (2008), informal cooperative ties are created alongside formal ones and helps the structuration of a formal organization. No study has been found in literature concerning the role of formal/informal relationships in MIS functions, however an informal component can be expected to exist. In our case of study, the actions contributing to entrepreneurial activities, either formal or informal, can easily be classified in terms of other functions (for example resources mobilization). Also, during the interviews, the role interviewees tended to attribute to FILEG concerning this function was indirect. It can be due to the fact that the function itself should be interpreted as a consequence of the performance of other functions. Increasing the entrepreneurship of a system, *in fine*, is a matter of improving the conditions in which entrepreneurs will play.

Many actors highlighted that the future of the sector, and hence of the future of sectoral entrepreneurship, will be strongly linked to climate changes. This is the case because the main grain legume produced in Occitanie is irrigated soybean, a crop whose production is expected to be regionally reduced due to rainfall regime changes. Nevertheless, actors have many different visions concerning the way other legume crops could develop and which outlets would be preferred (human or animal consumption, low or high processed products). As put by Cusworth *et al.* (2021a) there exist many narratives around the future of legumes. All of them, however, agree that legumes can help to reduce the current reliance on nitrogenous fertilizers, reduce GHG emissions and be an important component of healthy diets. This is globally the case of FILEG, in which actors believing in different narratives are still united around those common points to work together.

#### **6.5 Recommendations for FILEG**

The use of MIS functions concept allowed us to map a huge variety of FILEG's activities. It can be used by the organization as a management tool to guide the future directions the network will take. Our analysis highlight the importance of the establishment of good guidance to an efficient creation of network resources (such as collective projects). To ensure this guidance, the organization leaders could promote a meeting with (ideally) all members and define clearly what the network role into each function should be. Having this role clear is important to align actors' expectations and facilitate cooperation. This would allow FILEG to go one step beyond its constitution and precise a bit more the *how* the organization's mission will be pursued.

## 6.6 Limitations of the study and future research

This study provided many insights concerning innovation dynamics in legume sector, however they remain linked to one single case. In order to strengthen the tendencies observed and generalize the concepts, similar cases should also be analyzed using a similar methodology. This could be done by replicating the study with the other French regional legume organizations such as LEGGO organization in Brittany region or PACAleg initiative in South of France. By doing so, we would also be able to identify the regional specificities and have a better picture of the IS at the national level. A second limitation concerns methodological aspects. The document research allowed us to understand *a part of* FILEG's history, but not *all* FILEG's history. Gaps in the activities mapped may exist concerning actions that are not documented, especially informal ones. Those actions, as we perceived during the interviews, may have an important impact in the network functions. A final limitation of the study concerns the analytical framework. We chose to focus in the functional approach without much consideration to the structure of the IS. However, the study of the network structure through, for example, a Social Network Analysis could reveal how actors' bonds (formal and informal) also influence the functioning of the MIS, and would enrich this research analysis.

## 7. Conclusion

This study built and used a framework based on MIS-functions and RBV concepts to analyze the collective actions of a formal network (FILEG) in the regional legume sector of Occitanie. Through the mobilization of three data collection methods (document desk research, questionnaire and interviews), we were interested in how FILEG currently performs and can perform in the future the MIS functions. We found that in FILEG's history, the functions have been 'activated' gradually in a specific order. Guidance of the search, legitimacy creation and mobilization of resources are those that FILEG concentrated its efforts firstly. They have quickly been followed by knowledge diffusion and knowledge development. Once the network became an organization, the functions market formation and ethics in commercial relationships could also be mobilized. Currently, the organization can promote actions directly impacting all functions, excepting the entrepreneurial activities. Acting in the sectoral entrepreneurship seems rather to be an indirect process that can be influenced through acting in other functions (helping entrepreneurs, for example, to mobilize resources, develop knowledge and enter in the market). For the other functions, FILEG can act, in the mid or short run, through the creation of resources at the network level, to benefit network members, and their deployment at the system level, to benefit the whole system. The type of resources created and the level in which they will be placed (organization, network or system) will depend on the guidance of the network and on the 'agreement' level actors arrive at. FILEG's constitution mission offers a guideline concerning the output the network is expected to produce, but the resources needed for this output are not specified and still have to be figured out collectively. Finally, our findings show that the combination of the MIS functions and the RBV framework is very useful when analyzing formal networks around innovation dynamics. MIS functions allow the mapping of a large range of network actions and the analysis of how those actions are shaping resources in a RBV perspective. The knowledge created of this 'resource shaping process' can be used by the FILEG organization as a tool for decision making and improvement of guidance, helping it, in particular, to avoid scenarios in which actions are taken uncoordinatedly and resources are dispersed. A future "open-science" document that explain IS-functions must be written as a reflexive guide for FILEG association and other regional initiatives for thinking about their collective action.



## 8. References

- AGENCEBIO, 2023. Observatoire de la production bio. *Agence Bio* [en ligne]. 2023. [Consulté le 2 août 2023]. Disponible à l'adresse : <https://www.agencebio.org/vos-outils/les-chiffres-cles/observatoire-de-la-production-bio/observatoire-de-la-production-bio-nationale/observatoire-de-la-production-bio-sur-votre-territoire/>
- AGRESTE, 2022. *GraphAgri* [en ligne]. 44. Paris : Ministère de l'Agriculture et de la Souveraineté alimentaire Secrétariat général Service de la statistique et de la prospective. [Consulté le 14 février 2023]. ISBN 978-2-11-162022-3. Disponible à l'adresse : <https://agreste.agriculture.gouv.fr/agreste-web/disaron/GraFra2022Integral/detail/>
- ARTHUR, W. Brian, 1989. Competing Technologies, Increasing Returns, and Lock-In by Historical Events. *The Economic Journal*. 1989. Vol. 99, n° 394, pp. 116-131. DOI 10.2307/2234208.
- CHAMBRES D'AGRICULTURE OCCITANIE, 2022a. *Grandes Cultures* [en ligne]. 2022. [Consulté le 31 mars 2023]. Disponible à l'adresse : [https://occitanie.chambre-agriculture.fr/fileadmin/user\\_upload/National/FAL\\_commun/publications/Occitanie/Productions\\_tech\\_niques/agricopie-grandes-cultures-crao2022.pdf](https://occitanie.chambre-agriculture.fr/fileadmin/user_upload/National/FAL_commun/publications/Occitanie/Productions_tech_niques/agricopie-grandes-cultures-crao2022.pdf)
- CHAMBRES D'AGRICULTURE OCCITANIE, 2022b. *Panorama de la conjoncture* [en ligne]. 2022. [Consulté le 1 mars 2023]. Disponible à l'adresse : [https://occitanie.chambre-agriculture.fr/fileadmin/user\\_upload/National/FAL\\_commun/publications/Occitanie/Chambre\\_agriculture/NoteConjoncture2022.pdf](https://occitanie.chambre-agriculture.fr/fileadmin/user_upload/National/FAL_commun/publications/Occitanie/Chambre_agriculture/NoteConjoncture2022.pdf)
- CHOLEZ, Célia et MAGRINI, Marie-Benoit, 2023. Knowledge and network resources in innovation system: How production contracts support strategic system building. *Environmental Innovation and Societal Transitions*. juin 2023. Vol. 47, pp. 100712. DOI 10.1016/j.eist.2023.100712.
- CISALI, 2021. *Livre Blanc FILEG* [en ligne]. 2021. [Consulté le 14 février 2023]. Disponible à l'adresse : <https://www.cisali.org/single-post/livre-blanc-de-fileg>
- CUSWORTH, George, GARNETT, Tara et LORIMER, Jamie, 2021a. Legume dreams: The contested futures of sustainable plant-based food systems in Europe. *Global Environmental Change*. juillet 2021. Vol. 69, pp. 102321. DOI 10.1016/j.gloenvcha.2021.102321.
- CUSWORTH, George, GARNETT, Tara et LORIMER, Jamie, 2021b. Agroecological break out: Legumes, crop diversification and the regenerative futures of UK agriculture. *Journal of Rural Studies*. décembre 2021. Vol. 88, pp. 126-137. DOI 10.1016/j.jrurstud.2021.10.005.
- DE FARIA, Pedro, LIMA, Francisco et SANTOS, Rui, 2010. Cooperation in innovation activities: The importance of partners. *Research Policy*. octobre 2010. Vol. 39, n° 8, pp. 1082-1092. DOI 10.1016/j.respol.2010.05.003.
- DOSI, Giovanni et NELSON, Richard R., 1994. An introduction to evolutionary theories in economics. *Journal of Evolutionary Economics*. 1 septembre 1994. Vol. 4, n° 3, pp. 153-172. DOI 10.1007/BF01236366.
- DOSI, Giovanni et NELSON, Richard R., 2010. Chapter 3 - Technical Change and Industrial Dynamics as Evolutionary Processes. In : HALL, Bronwyn H. et ROSENBERG, Nathan (éd.), *Handbook of the Economics of Innovation* [en ligne]. North-Holland. pp. 51-127. Handbook of The Economics of Innovation, Vol. 1. [Consulté le 3 juillet 2023]. Disponible à l'adresse : <https://www.sciencedirect.com/science/article/pii/S0169721810010038>

EDQUIST, Charles, 2001. The Systems of Innovation Approach and Innovation Policy: An Account of the State of the Art. In : *Nelson-Winter Conference* [en ligne]. Aalborg, Denmark. 12 juin 2001. [Consulté le 30 mars 2023]. Disponible à l'adresse : [https://www.researchgate.net/publication/228823918\\_The\\_Systems\\_of\\_Innovation\\_Approach\\_and\\_Innovation\\_Policy\\_An\\_Account\\_of\\_the\\_State\\_of\\_the\\_Art](https://www.researchgate.net/publication/228823918_The_Systems_of_Innovation_Approach_and_Innovation_Policy_An_Account_of_the_State_of_the_Art)

EEA, 2022. Serious challenges in Europe's agri-food systems. *European Environment Agency* [en ligne]. 2022. [Consulté le 31 mars 2023]. Disponible à l'adresse : <https://www.eea.europa.eu/highlights/serious-challenges-in-agri-food>

EUROSTAT, 2021. Légumes secs et cultures protéagineuses pour la production de grains (y compris semences et mélanges de céréales et de légumes secs) par superficie, production et humidité. *Eurostat* [en ligne]. 2021. [Consulté le 8 février 2023]. Disponible à l'adresse : <https://ec.europa.eu/eurostat/fr/web/agriculture/data/main-tables>

FAO, 2023. Crops Statistics - Concepts, Definitions and Classifications. *Food and Agriculture organization of the United Nations* [en ligne]. 2023. [Consulté le 30 janvier 2023]. Disponible à l'adresse : <https://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/>

FILEG, 2022. Structurer ensemble une filière légumineuses en Occitanie. *FILEG* [en ligne]. 2022. [Consulté le 15 février 2023]. Disponible à l'adresse : <https://www.fileg.org/projetfileg>

FOYER, Christine H., LAM, Hon-Ming, NGUYEN, Henry T., SIDDIQUE, Kadambot H. M., VARSHNEY, Rajeev K., COLMER, Timothy D., COWLING, Wallace, BRAMLEY, Helen, MORI, Trevor A., HODGSON, Jonathan M., COOPER, James W., MILLER, Anthony J., KUNERT, Karl, VORSTER, Juan, CULLIS, Christopher, OZGA, Jocelyn A., WAHLQVIST, Mark L., LIANG, Yan, SHOU, Huixia, SHI, Kai, YU, Jingquan, FODOR, Nandor, KAISER, Brent N., WONG, Fuk-Ling, VALLIYODAN, Babu et CONSIDINE, Michael J., 2016. Neglecting legumes has compromised human health and sustainable food production. *Nature Plants*. août 2016. Vol. 2, n° 8, pp. 16112. DOI 10.1038/nplants.2016.112.

GEELS, Frank W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*. décembre 2002. Vol. 31, n° 8-9, pp. 1257-1274. DOI 10.1016/S0048-7333(02)00062-8.

GOLDSTEIN, Jenny E., NEIMARK, Benjamin, GARVEY, Brian et PHELPS, Jacob, 2023. Unlocking "lock-in" and path dependency: A review across disciplines and socio-environmental contexts. *World Development*. janvier 2023. Vol. 161, pp. 106116. DOI 10.1016/j.worlddev.2022.106116.

GREENACRE, Philip, GROSS, Dr Robert et SPEIRS, Jamie, 2012. Innovation theory: a review of the literature. [en ligne]. 2012. [Consulté le 30 mars 2023]. Disponible à l'adresse : [https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/icept/Innovation-review---ICEPT-working-paper-version-\(16.05.12\).pdf](https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/icept/Innovation-review---ICEPT-working-paper-version-(16.05.12).pdf)

HACHE, Emmanuel, 2015. Géopolitique des protéines. *Revue internationale et stratégique*. 2015. Vol. 97, n° 1, pp. 36-46. DOI 10.3917/ris.097.0036.

HARVARD UNIVERSITY, 2019. Legumes and Pulses. *The Nutrition Source* [en ligne]. 28 octobre 2019. [Consulté le 30 janvier 2023]. Disponible à l'adresse : <https://www.hsph.harvard.edu/nutritionsource/legumes-pulses/>

HEKKERT, Marko P., JANSSEN, Matthijs J., WESSELING, Joeri H. et NEGRO, Simona O., 2020. Mission-oriented innovation systems. *Environmental Innovation and Societal Transitions*. mars 2020. Vol. 34, pp. 76-79. DOI 10.1016/j.eist.2019.11.011.

HEKKERT, M.P., SUURS, R.A.A., NEGRO, S.O., KUHLMANN, S. et SMITS, R.E.H.M., 2007. Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change*. mai 2007. Vol. 74, n° 4, pp. 413-432. DOI 10.1016/j.techfore.2006.03.002.

HORLINGS, L.G. et MARSDEN, T.K., 2011. Towards the real green revolution? Exploring the conceptual dimensions of a new ecological modernisation of agriculture that could 'feed the world'. *Global Environmental Change*. mai 2011. Vol. 21, n° 2, pp. 441-452. DOI 10.1016/j.gloenvcha.2011.01.004.

JEPSEN, Martin Rudbeck, KUEMMERLE, Tobias, MÜLLER, Daniel, ERB, Karlheinz, VERBURG, Peter H., HABERL, Helmut, VESTERAGER, Jens Peter, ANDRIČ, Maja, ANTROP, Marc, AUSTRHEIM, Gunnar, BJÖRN, Ismo, BONDEAU, Alberte, BÜRGI, Matthias, BRYSON, Jessica, CASPAR, Gilles, CASSAR, Louis F., CONRAD, Elisabeth, CHROMÝ, Pavel, DAUGIRDAS, Vidmantas, VAN EETVELDE, Veerle, ELENA-ROSSELLÓ, Ramon, GIMMI, Urs, IZAKOVICOVA, Zita, JANČÁK, Vít, JANSSON, Ulf, KLADNIK, Drago, KOZAK, Jacek, KONKOLY-GYURÓ, Eva, KRAUSMANN, Fridolin, MANDER, Ülo, MCDONAGH, John, PÄRN, Jaan, NIEDERTSCHEIDER, Maria, NIKODEMUS, Olgerts, OSTAPOWICZ, Katarzyna, PÉREZ-SOBA, Marta, PINTO-CORREIA, Teresa, RIBOKAS, Gintaras, ROUNSEVELL, Mark, SCHISTOU, Despoina, SCHMIT, Claude, TERKENLI, Theano S., TRETVIK, Aud M., TRZEPACZ, Piotr, VADINEANU, Angheluta, WALZ, Ariane, ZHLLIMA, Edvin et REENBERG, Anette, 2015. Transitions in European land-management regimes between 1800 and 2010. *Land Use Policy*. 1 décembre 2015. Vol. 49, pp. 53-64. DOI 10.1016/j.landusepol.2015.07.003.

KLERKX, Laurens et BEGEMANN, Stephanie, 2020. Supporting food systems transformation: The what, why, who, where and how of mission-oriented agricultural innovation systems. *Agricultural Systems*. septembre 2020. Vol. 184, pp. 102901. DOI 10.1016/j.agsy.2020.102901.

LUNDEVALL, Bengt-Åke et EDQUIST, Charles, 1993. Comparing the Danish and Swedish Systems of Innovation. In : *National Innovation Systems*. ISBN 978-0-19-507617-2.

MAGRINI, Marie-Benoit, 2023. Interactions sociotechniques de filière et fonctions des systèmes d'innovation responsable : une mise en perspective à partir d'enjeux de transition des filières agricoles. *Innovations*. janvier 2023. N° 70, pp. 181-207. DOI 10.3917/inno.070.0181.

MAGRINI, Marie-Benoit, ANTON, Marc, CHARDIGNY, Jean-Michel, DUC, Gerard, DURU, Michel, JEUFFROY, Marie-Helene, MEYNARD, Jean-Marc, MICARD, Valerie et WALRAND, Stephane, 2018. Pulses for Sustainability: Breaking Agriculture and Food Sectors Out of Lock-In. *Frontiers in Sustainable Food Systems*. 24 octobre 2018. Vol. 2, pp. 368525. DOI 10.3389/fsufs.2018.00064.

MAGRINI, Marie-Benoit, ANTON, Marc, CHOLEZ, Célia, CORRE-HELLOU, Guenaelle, DUC, Gérard, JEUFFROY, Marie-Hélène, MEYNARD, Jean-Marc, PELZER, Elise, VOISIN, Anne-Sophie et WALRAND, Stéphane, 2016. Why are grain-legumes rarely present in cropping systems despite their environmental and nutritional benefits? Analyzing lock-in in the French agrifood system. *Ecological Economics*. juin 2016. Vol. 126, pp. 152-162. DOI 10.1016/j.ecolecon.2016.03.024.

MAGRINI, Marie-Benoit, BÉFORT, Nicolas et NIEDDU, Martino, 2019. Technological Lock-In and Pathways for Crop Diversification in the Bio-Economy. In : *Agroecosystem Diversity* [en ligne]. Elsevier. pp. 375-388. [Consulté le 16 février 2023]. ISBN 978-0-12-811050-8. Disponible à l'adresse : <https://linkinghub.elsevier.com/retrieve/pii/B9780128110508000248>

MAGRINI, Marie-Benoît et JULIER, Bernadette, 2019. Quelle place pour les légumineuses dans une Europe agroécologique ? *Économie rurale*. 31 décembre 2019. N° 370, pp. 125-129. DOI 10.4000/economierurale.7110.

MAGRINI, Marie-Benoît, SALORD, Tristan et CABANAC, Guillaume, 2022. The unbalanced development among legume species regarding sustainable and healthy agrifood systems in North-America and Europe: focus on food product innovations. *Food Security* [en ligne]. 27 août 2022. [Consulté le 17 janvier 2023]. DOI 10.1007/s12571-022-01294-9. Disponible à l'adresse : <https://link.springer.com/10.1007/s12571-022-01294-9>

MUSIOLIK, Jörg, MARKARD, Jochen et HEKKERT, Marko, 2012. Networks and network resources in technological innovation systems: Towards a conceptual framework for system building. *Technological Forecasting and Social Change*. juillet 2012. Vol. 79, n° 6, pp. 1032-1048. DOI 10.1016/j.techfore.2012.01.003.

MUSIOLIK, Jörg, MARKARD, Jochen, HEKKERT, Marko et FURRER, Bettina, 2020. Creating innovation systems: How resource constellations affect the strategies of system builders. *Technological Forecasting and Social Change*. 1 avril 2020. Vol. 153, pp. 119209. DOI 10.1016/j.techfore.2018.02.002.

NOTZ, Inka, TOPP, Cairistiona F. E., SCHULER, Johannes, ALVES, Sheila, GALLARDO, Leonardo Amthauer, DAUBER, Jens, HAASE, Thorsten, HARGREAVES, Paul R., HENNESSY, Michael, IANTCHEVA, Anelia, JEANNERET, Philippe, KAY, Sonja, RECKNAGEL, Jürgen, RITTLER, Leopold, VASILJEVIĆ, Marjana, WATSON, Christine A. et RECKLING, Moritz, 2023. Transition to legume-supported farming in Europe through redesigning cropping systems. *Agronomy for Sustainable Development*. 17 janvier 2023. Vol. 43, n° 1, pp. 12. DOI 10.1007/s13593-022-00861-w.

PEOPLES, Mark B., HAUGGAARD-NIELSEN, Henrik, HUGUENIN-ELIE, Olivier, JENSEN, Erik Steen, JUSTES, Eric et WILLIAMS, Michael, 2019. The Contributions of Legumes to Reducing the Environmental Risk of Agricultural Production. In : *Agroecosystem Diversity* [en ligne]. Elsevier. pp. 123-143. [Consulté le 27 février 2023]. ISBN 978-0-12-811050-8. Disponible à l'adresse : <https://linkinghub.elsevier.com/retrieve/pii/B978012811050800008X>

PYKA, Andreas, 2000. Informal networking and industrial life cycles. *Technovation*. janvier 2000. Vol. 20, n° 1, pp. 25-35. DOI 10.1016/S0166-4972(99)00083-8.

RANK, Olaf N., 2008. Formal structures and informal networks: Structural analysis in organizations. *Scandinavian Journal of Management*. juin 2008. Vol. 24, n° 2, pp. 145-161. DOI 10.1016/j.scaman.2008.02.005.

RENARD, Delphine et TILMAN, David, 2021. Cultivate biodiversity to harvest food security and sustainability. *Current Biology*. 11 octobre 2021. Vol. 31, n° 19, pp. R1154-R1158. DOI 10.1016/j.cub.2021.06.082.

RÖÖS, Elin, MAYER, Andreas, MULLER, Adrian, KALT, Gerald, FERGUSON, Shon, ERB, Karl-Heinz, HART, Rob, MATEJ, Sarah, KAUFMANN, Lisa, PFEIFER, Catherine, FREHNER, Anita, SMITH, Pete et SCHWARZ, Gerald, 2022. Agroecological practices in combination with healthy diets can help meet EU food system policy targets. *Science of The Total Environment*. novembre 2022. Vol. 847, pp. 157612. DOI 10.1016/j.scitotenv.2022.157612.

SCHNEIDER, Anne et HUYGUE, Christian, 2015. *Les légumineuses pour des systèmes agricoles et alimentaires durables* [en ligne]. 2015. Quae. [Consulté le 3 juillet 2023]. Disponible à l'adresse : <https://agriculture.gouv.fr/sites/default/files/legumineuses-ouvrage-quaе-2015.pdf>

SEMBA, Richard D., RAMSING, Rebecca, RAHMAN, Nihaal, KRAEMER, Klaus et BLOEM, Martin W., 2021. Legumes as a sustainable source of protein in human diets. *Global Food Security*. mars 2021. Vol. 28, pp. 100520. DOI 10.1016/j.gfs.2021.100520.

TERRES UNIVIA, 2021. *Chiffres clés : plantes riches en protéines* [en ligne]. 2021. [Consulté le 14 février 2023]. Disponible à l'adresse : <https://www.terresunivia.fr/sites/default/files/chiffres%20cl%C3%A9s/TU-CC20-plantes-riches-en-proteines2.pdf>

THOMAS, A., SCHNEIDER, A. et PILORGÉ, E., 2013. Politiques agricoles et place du colza et du pois dans les systèmes de culture. *Agron. Environ. Soc.* 2013. Vol. 3, pp. 65-74. Scopus

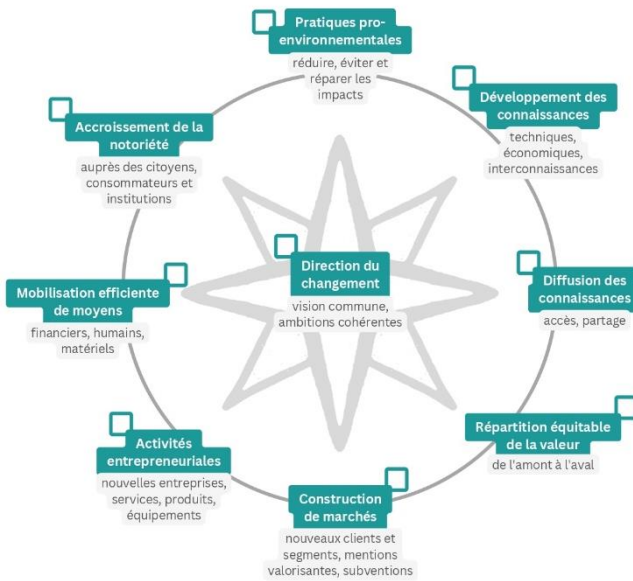
VAN DE VEN, Andrew, 2005. Running in Packs to Develop Knowledge-Intensive Technologies. *MIS Quarterly*. 1 juin 2005. Vol. 29, pp. 365-378. DOI 10.2307/25148683.

ZANDER, Peter, AMJATH-BABU, T. S., PREISSEL, Sara, RECKLING, Moritz, BUES, Andrea, SCHLÄFKE, Nicole, KUHLMAN, Tom, BACHINGER, Johann, UTHES, Sandra, STODDARD, Fred, MURPHY-BOKERN, Donal et WATSON, Christine, 2016. Grain legume decline and potential recovery in European agriculture: a review. *Agronomy for Sustainable Development*. juin 2016. Vol. 36, n° 2, pp. 26. DOI 10.1007/s13593-016-0365-y.

# Annex 1 – Visual schemes and Likert scales used during the interviews

## Les neuf fonctions d'un Système d'Innovation Responsable

Pour analyser la dynamique d'innovation que l'association FILEG est susceptible de créer autour des légumineuses en Occitanie, nous mobilisons le cadre des « Systèmes d'Innovation Responsable ». Ce cadre vise à cartographier un système d'acteurs et à analyser sa capacité à générer des activités qui favorisent le développement d'innovations. Ces activités sont regroupées en fonctions, présentées ci-dessous. La mise en œuvre des activités permet le bon fonctionnement du système d'innovation, mais certaines sont plus faciles que d'autres à initier. Elles peuvent être, donc, plus ou moins essentielles au démarrage du collectif d'acteurs.



### Construction de marchés

La croissance et développement des marchés des légumineuses accompagne le développement de la filière.



### Activités entrepreneuriales

La filière des légumineuses est attractive pour que des entreprises développent des nouvelles activités.



### Mobilisation efficiente de moyens

La filière mobilise de manière efficiente les moyens (financiers, humains et matériels) nécessaires à son développement.



### Développement de nouvelles connaissances

Le développement de nouvelles connaissances sur les légumineuses (production, transformation et commercialisation) est suffisant par rapport aux besoins de la filière.



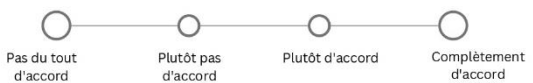
### Diffusion de connaissances

Les informations/connaissances techniques et économiques sur les légumineuses sont facilement accessibles.



### Répartition équitable de la valeur

Il y a une juste répartition de la valeur, de l'amont à l'aval, dans la filière des légumineuses.



### Accroissement de la notoriété

La société est convaincue de l'importance des légumineuses et de l'intérêt de leur développement.



### Activités pro-environnementales

La filière des légumineuses répond aux enjeux de la durabilité environnementale.



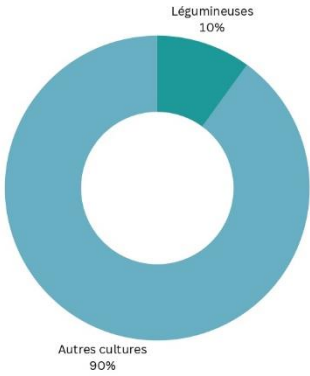
### Direction du changement

La filière des légumineuses a une vision commune de son évolution en France.



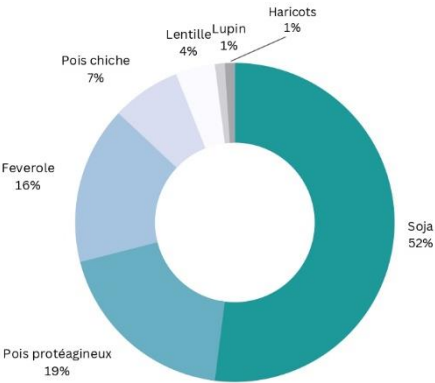
Partie occupée par les légumineuses de la SCOP (Surfaces en Céréales, Oléagineux et Protéagineux)

100.000 ha de légumineuses à graines cultivés en Occitanie



Author: Hippolyte da Silva

Répartition des surfaces LAG en Occitanie



## Annex 2 – FILEG’s Governance in 2023



Source: FILEG



## Annex 3 – Original verbatim in French

### Knowledge development

« Et il y a un manque de compétitivité des légumineuses par rapport à d'autres cultures, qui fait que les agriculteurs ne se tournent pas vers elles » (a4).

« Il y a encore des lacunes sur les itinéraires techniques. On ne sait pas lutter contre certaines maladies, que ça soit en production de semence ou en conso » (c1).

« On n'a pas de suffisance sur les connaissances actuelles. Il faut accélérer [son développement] » (k1).

« Plus on va vers le marché, et plus c'est compliqué de partager [les connaissances] » (d1).

« [Les consommateurs ont besoin de savoir] quels sont les bénéfices de la légumineuse, finalement quels peuvent être l'intérêt d'une légumineuse par rapport à une autre, quels peuvent être l'intérêt d'une légumineuse germée par rapport à une non germée, comment elles peuvent être utilisées ! » (i2).

« Si on attend d'être à cinq sur cinq, entre guillemets, de connaissances, on ne se lance jamais » (f1).

« La légumineuse, on n'a pas besoin d'une légumineuse sophistiquée, on a juste besoin d'une légumineuse standard, donc notre connaissance ; on a pas nécessairement besoin de nouvelles connaissances. En fait, la connaissance aujourd'hui, elle est existante et elle est suffisante » (b3).

« Eux [la recherche publique] le transmettent [les connaissances] effectivement à Terres Inovia, qui l'adapte ; à Terres Inovia, FILEG, qui eux le retransmettent aux agriculteurs » (h3).

« Je pense qu'il faut qu'ils [la recherche publique] reviennent [à son focus sur l'agronomie]. FILEG [peut] d'aller taper à la porte et de dire : voilà, nous on a besoin de recherche agronomique fondamentale sur telle ou telle espèce » (k1).

« [Un sujet de recherche pourrait être] Comment le consommateur s'approprie ces légumineuses, quels sont les leviers pour qu'ils s'approprient mieux les légumineuses » (j3).

« Après, je ne pense pas que le rôle de FILEG, directement, soit de l'acquisition de connaissances. Donc, le rôle est de mettre en relation des gens qui peuvent se poser les mêmes questions et décider ensemble [ce qui peut être fait] qui pourront ensuite d'être diffusées par FILEG » (c1).

### Knowledge diffusion

« [Si] on a du mal à récupérer certaines infos alors que nous savons où aller chercher, donc un agriculteur, pour lui, c'est quasiment impossible de trouver de l'information fiable et récente et régulière ! »

« [il y a] des livrets, des choses comme ça, mais il faut passer au-delà de ça, faut aller les rencontrer ces gens-là, les cuisiniers, les former [pour utiliser les légumineuses] » (j3).

« [Les statistiques nationales] vont communiquer des prix sur les pois, mais il n'y a pas de différence qui sont faites entre les débouchés, alors que pour les légumineuses, si on parle du débouché alimentation animale ou du débouché alimentation humaine, si on parle de conventionnel ou de bio, les prix peuvent être supers différents les uns des autres » (a4).

« Vous lui mettez un sac de pois chiche [devant une personne], je pense que neuf personnes sur dix, elles ne savent pas quoi en faire ! » (e1).

« Je pense qu'on a les canaux de diffusion suffisant. Par contre, ça ne veut pas dire que, encore une fois, que toutes les connaissances sont, elles, acquises » (d1).

« [Le rôle de] FILEG, c'est de communiquer les informations et d'être un peu une centralisation d'informations pour que les gens cherchent l'info sur le pois chiche en Occitanie, que ça soit comment je le sème, où je l'achète et qu'est-ce que j'en fais, entre guillemets, le référent, ce sera FILEG ! » (c1)

« Je crois plus à mobiliser des ressources pour aller chercher, encore une fois, des connaissances, et ensuite les partager avec les acteurs de la filière qui se sont inscrits dans FILEG » (d1).

## **Ethics in commercial relationships**

« Aujourd'hui, on a des leviers pour construire des contrats, en production, qui sont bien, qui sont attractifs, on peut même [...] les construire sur plusieurs années. Donc après, ils sont en adéquation, je pense, avec ce que le marché peut faire, à un moment donné » (k1).

« Sur des filières qui du coup sont fortement dépendantes aussi, ou concurrencées par des filières d'importation, ça a plutôt systématiquement tendance à pressuriser l'amont (local par les bas prix), et donc à mal répartir la valeur » (d1).

« Pour moi, ce serait le terme le plus adéquat [répartition des risques] [...], que le risque ne soit pas que sur le producteur [...] » (f1).

« Si elle intègre aussi [l'équité des relations commerciales à ses principes], [...] et quelle donne des outils pour la contractualisation, des choses comme ça, pour les acteurs, là, elle peut avoir un rôle sur la filière [des légumineuses en] Occitanie » (g3).

« Je pense qu'une des actions que FILEG peut faire, c'est aussi de favoriser on va dire l'interconnaissance entre les acteurs de l'amont et de l'aval, et que les acteurs de l'aval aient aussi en tête les contraintes liées à la production, la collecte et le travail du grain » (a4).

« FILEG aidera à monter des filières, après, pour qu'une filière survive, il faut que chaque maillon y trouve son compte, [...] mais FILEG n'aura pas d'action directe sur la répartition, une répartition de la valeur équitable entre les maillons de la chaîne » (c1).

## **Market formation**

« Mais c'est même un prérequis ! Il n'y a pas de développement de la filière pour développer un marché. C'est le développement de marchés qui développe la filière » (m2).

« De mon point de vue, un des gros freins au développement des légumineuses c'est [...] l'adéquation entre l'offre et la demande, notamment pour les légumes secs, parce qu'on a vu, il y a des années, on était plus dans un contexte de surproduction, en ce moment, on est plus dans un contexte de sous-production » (a4).

« FILEG est là, en fait, pour finalement structurer la réponse à cette demande. Pour structurer et pour promouvoir ! » (i2).

« [L'association a] a une connaissance des acteurs qui peuvent être impliqués et utilisateurs des produits de cette filière, donc le rôle à jouer de FILEG c'est de mettre en, fin de faire « matcher » les acteurs entre eux » (b3).

## **Entrepreneurial activities**

« Il y a une attente quand même assez forte de la part des industriels et des consommateurs. C'est un produit peu cher, qui est une alternative à la protéine animale ; il y a quand même de plus en plus de consommateurs [...] et le marché est à l'écoute, en fait, d'innovations » (b3).

« Il faudra aussi qu'il véhicule l'image et l'idée qu'il faut des filières équitables et locales, surtout, parce que sinon, ce qu'on risque de faire, c'est d'ouvrir les marchés, mais des marchés de consommateurs qui ne regardent pas d'où vient le produit et sa qualité » (j3).

« Pour les agris, non, [les légumes ne sont] clairement pas [attractifs], parce qu'il n'y a pas le rendement, il n'y a pas la rémunération. Donc eux, des retours qu'on a, ce n'est pas attractif du tout quoi. Fin, c'est attractif au niveau débouchés potentiels, mais pas attractif au niveau conditions culturelles » (g3).

« Donc je trouve que les entreprises qui sont un peu téméraires et qui veulent se développer sur cette filière, elles ne sont pas en attraction, parce qu'elles vont avoir du mal à trouver de la graine quoi » (k1).

« [FILEG pourrait avoir] un rôle de veille et de mise en relation, et [...] de rendre plus fluide la mise en place de nouvelles startups ou autre, et voilà » (c1).

« FILEG elle a plus un intérêt, un rôle sur la sensibilisation des gens, sur l'information des agriculteurs, et ça [l'attractivité du secteur], en fait, ça se fait naturellement » (h3).

## **Resources mobilization**

« Je pense qu'il faudra encore plus de moyens ! [...] Faudrait beaucoup plus de moyens quoi [pour développer le secteur]. Mais après, on les mobilise je pense de manière efficiente [...] » (j3).

« D'un point de vue humain, je trouve qu'on fait beaucoup avec peu de moyens ! » (a4).

« [La filière] est quand même assez financé par les pouvoirs publics, il y a quand même une volonté politique de développer la filière, donc je pense que les moyens sont mis » (b3).

« En fait je vais mettre pas du tout d'accord, parce qu'elle n'a pas les moyens financiers par rapport à l'élevage ! » (l3).

« Je pense qu'il y a peut-être trop de moyens, surtout sur les acteurs économiques, qui sont orientés vers des logiques de recherche de bénéfice, d'efficacité, de choses comme ça. Et moins [de ressources] sur d'autres questions où il faudrait faire plus de recherche, prendre le temps d'aller vers ça ... » (g3)

« C'est au niveau de structures [que les ressources sont mobilisées. [...] Mais si on regarde la filière de manière plus transverse, on a pas de mobilisation de filière qui va dire « bien, faut telle qualité, ou telle qualité, ou tel produit ». [...] [Et la filière] ne travaille pas forcément ensemble. » (c1).

« Et est-ce que les autres acteurs de la filière mobilisent bien leurs moyens ? C'est leur problème » (k2).

« J'ai l'impression que ça dépasse un peu FILEG ! [...] j'ai l'impression que c'est un peu la conséquence d'est-ce qu'il y aura un marché derrière, est-ce que c'est quelque chose [financièrement] attractif ou pas [...] » (h3).

« L'intérêt d'un véhicule comme FILEG, c'est de dire « regardez, on est regroupés, on est cohérents, on travaille techniquement, on a identifié des marchés porteurs... » et donc ça permet de rassurer les financiers, qu'ils soient publics ou privés, sur le fait qu'il y a une dynamique et un cluster » (d1).

« [...] [FILEG peut dire si] le projet est viable, est-ce que le projet peut être amélioré. Avec ce retour-là finalement il est plus facile d'aller voir un banquier. [...] Le banquier tout de suite il va dire oui les yeux fermés parce qu'il y a FILEG [derrière] » (i2).

## **Legitimacy creation**

« Aujourd'hui, si on repart du national on vous dit qu'il faut manger des légumineuses deux fois par semaine ! [...] Mais c'est parce qu'on s'intéresse au sujet » (i2).

« Je pense qu'il y a toute une frange de la société qui en a bien conscience [de l'importance des légumineuses], et toute une frange qui est très éloignée, pour des raisons diverses et variées » (d1).

« Il y a un gros manque de connaissances [...] Rien que sur la production, sur les bienfaits, sur... Sur qu'est-ce que c'est » une légumineuse ! » (h3).

« Pour moi, un des rôles principaux de FILEG, c'est de communiquer. [...] Communiquer et fédérer. » (c1).

« [FILEG peut faire de l'] animation d'éducation par exemple ! Sur des jeux, sur des expositions, sur de la connaissance ... » (g3).

« Je ne pense pas que ce soit à FILEG de se préoccuper de ça [communication pour le grand public]. [...] [L'association devrait] plutôt se préoccuper de comment on crée des produits adaptés, comment on met à disposition des productions locales, comment on répartit correctement la valeur pour que ces filières soient durables, solides et performantes » (d1).

« Ça aurait du sens [pour les associations régionales] de mettre des moyens communs au niveau national. [...] Parce qu'encore une fois, le retour, là, sur investissement, sera limité, de mon point de vue » (d1).

« Oui, il faut que ça soit un lobbying, tout à fait ! Ben il y a des lobbyings pour la cigarette et pour l'alcool, je pense qu'on peut mettre un lobbying pour les légumineuses, ça ne fera de mal à personne quoi ! » (m2).

## **Environmental engagement**

« On est quand même sur des espèces qui fixent l'azote, donc qui ont besoin de moins de fertilisation, parmi les légumineuses et les légumes secs, il y a quand même beaucoup d'espèces qui sont plutôt tolérantes au sec, pois chiches notamment, il y a pas mal d'espèces méditerranéennes » (c1).

« Pour moi, il existe plein de filières différentes : il peut y avoir des filières qui sont complètement déconnectées, hors-sol, exportatrices par exemple, qui ne sont pas forcément environnementales, même si la culture l'est » (j3).

« Par rapport à un maïs ou des choses comme ça, rien que sur le terme de la production, ça va être beaucoup plus durable. Mais il faut faire attention qu'il n'y ait pas les enjeux économiques qui prennent le dessus » (h3).

« Toutes les légumineuses ne sont pas forcément autonomes en azote. [...] En irrigation, ça va être la même chose, et ça va fixer beaucoup moins de carbone qu'un maïs » (f1).

« La culture des légumineuses elle est durable. En fait, après, il s'agit juste de le faire savoir, et de l'expliquer » (k1).

« Je vois vraiment FILEG comme une association qui permet de faire la promotion [des légumineuses]. Je ne la vois pas mettre des contraintes en disant « attention, là c'est pas prévu pour ! » ou « attention aux enjeux ! » [...] c'est plutôt le rôle des instituts techniques » (l3).

« [FILEG peut] dire « attention... ». Et c'est là où la limite est peut-être un peu difficile, parce qu'il ne faut pas que ça soit intrusif [...] dans les stratégies individuelles d'entreprises » (d1).

« En travaillant, par exemple sur la mise en place d'un cahier des charges avec les exploitations adhérentes de FILEG » (b3)

« [FILEG doit faire en sorte] que ça n'aille pas alimenter encore des grosses entreprises agroalimentaires, qui vont faire du bénéfice, du bénéfice... » (g3).

## **Guidance of the search**

« En fait, si la vision est commune, la manière d'y arriver ou le timing pour y arriver n'est pas forcément le même. Et puis un distributeur, il doit satisfaire une clientèle très variée, pas forcément la même qu'un transformateur basé en Occitanie ou qu'un producteur qui va être sur quelques familles de produits... » (e1).

« Je pense que du coup, [l'existence de plusieurs organisations régionales] ça va diluer un peu le discours et l'impact qu'on peut avoir sur les instituts de recherche, sur l'État, sur tout un tas d'acteurs quoi » (k1).

« Il n'y a pas de ligne directrice, encore, où tout le monde sait exactement comment les produits vont être utilisés, à quelles fins, par qui, en quelles quantités, avec quels circuits logistiques... » (b3).

« Une vision, c'est [de se dire] quoi qu'il arrive, cette année, on fera trois mille tonnes de pois chiches ! [...] Et l'année d'après, on fait trois mille cinq cents, et l'année d'après, on en fait quatre mille. Ça c'est une vision ! Là, il n'y a pas de vision ... » (m2).

« [avoir des ambitions cohérentes est important] pour éviter de rentrer dans une guerre de concurrence, [et assurer] la répartition de la valeur justement... » (f1).

« Le fait d'avoir une vision commune à l'échelle française permet des actions de communication et de promotion [...] ça rejaillit aussi au niveau local » (i2).

« Je ne sais pas si c'est nécessaire ! Parce que la filière des légumineuses, c'est très large... [...] Certes, [les acteurs ont] suffisamment de points communs, mais aussi beaucoup de différences quoi très, très, ; [...] [Les activités des acteurs peuvent être] très différentes, et non, il n'y a pas de vision commune, si ce n'est... Je pense que c'est un peu utopique ! » (d1).

« Il n'est pas nécessaire que tout le monde aille dans le [même] sens, vu qu'il y a plein de marchés différents et plein d'orientations différentes » (c1).

« Pour moi, c'est plus le fonctionnement même de l'association, en fait, qui fait qu'on porte une vision commune. Puisque chacun peut voter les priorités d'action de l'association » (a4).

« [FILEG] il ne faut pas qu'elle tombe dans le [extrémisme] ... [...] [Si FILEG dit de] monter la consommation des légumineuses à graines, remplacer la viande par les légumineuses à graines tout simplement [...] je pense, on n'aurait plus une vision commune [avec les éleveurs] » (l3).

« [FILEG pourrait] peut-être toquer à la porte des [autres] associations [légumineuses], des autres régions, pour dire « on pourrait faire un congrès commun, ou une réflexion commune » » (c1).

« Oui, ben je pense moi qu'il faudrait que FILEG soit le porte-parole de la filière légumineuses en France ! [...] Et dire « voilà, nous, nous sommes la voix de la filière légumineuse, elle est là en France, c'est nous ! » » (k1).

## **The future of the sector**

« Je pense que ça va augmenter, la part des légumineuses dans les grandes cultures, il n'y aura pas le choix de s'adapter par rapport, aussi, à la demande, au changement climatique, aux enjeux de pollution des cours d'eau [...] » (g3).

« Moi je pense que les soles légumineuses à graines vont diminuer. Parce que le soja, moi je le vois diminuer dans les années à venir, pour des questions d'irrigation. De difficultés de coûts d'irrigation, de moyens d'irrigation et de disponibilité en eau [...] » (f1).

« Si tous les feux sont au vert et qu'on arrive à développer la communication, l'entrepreneuriat et ça, voilà, peut-être un doublement des surfaces de pois chiches, un triplement des surfaces de lentilles [sera possible] ... » (c1).

« J'imagine que c'est surtout des variétés d'hiver [qui vont se développer]. La féverole ça doit être surtout dans des systèmes bio, soit pour du couvert soit pour de l'alimentation animale » (a4).

« Je pense que si les problèmes en eau se perpétuent, naturellement, la légumineuse prendra plus de place dans l'assolement : pas forcément le soja, qui est très gourmand en eau, mais le pois chiche, et la lentille [...] » (m2).

« Aujourd'hui, le beurre de cacahuète commence à se développer en France, je me dis, est-ce qu'il y a possibilité [de développer une filière locale] ? » [I3].

« Ce sera plutôt des produits de deuxième, voire troisième transformation [...]. Et plutôt en origine France, ou pas, en fonction des marchés, des productions... » (e1).

« Ce que j'espère d'autres produits de transformation [de l'alimentation humaine vont augmenter], qui permette d'avoir des sous-produits à destination animale qui soient cohérents économiquement » (I3).

« Pour la partie alimentation animale, je pense qu'un des freins, c'est le fait qu'on en produise pas assez ; que les fabricants d'aliments pour le bétail, ils ont besoin quand même de volumes conséquents, donc moins on en fait, plus ce sera compliqué pour eux d'en utiliser » (a4).

---

**FILEG opère-t-elle comme un Système d'Innovation Responsable ?**

Une analyse d'une association régionale pour le développement des légumineuses à graines

**Does FILEG operate as a Mission-oriented Innovation System?**

An analysis of a regional non-profit organization for grain legume development.

---

**Mots-clés** : Système d'Innovation Responsable; Légumineuses; Filière; Réseaux d'acteurs; Action collective  
**Key-words** : Mission-oriented Innovation System; Legumes; Value chain; Formal networks; Collective action

---

**Résumé :**

Le développement des légumineuses est fondamental pour des systèmes agricoles et alimentaires sains et durables. Face aux multiples verrous freinant leur développement en Europe, l'action collective est un levier majeur. Nous avons utilisé les approches des Systèmes d'Innovation Responsables (SIR) et *Resources Based View* pour étudier la contribution d'un réseau formel d'acteurs, construit en région Occitanie, à la dynamique d'innovation de la filière des légumineuses. Notre cas d'étude est l'association FILEG, qui a pour but la structuration et développement durable de la filière légumineuses, en fédérant les acteurs des différents maillons de la filière essentiellement en région. Nous avons mené une recherche documentaire, un questionnaire et des entretiens semi-directifs auprès de ces acteurs pour dresser un état des lieux de cette dynamique d'innovation collective. Les résultats montrent que les actions de l'association contribuent aux fonctions des SIR en suivant un certain séquençage. L'association peut contribuer, directement ou indirectement, à toutes les fonctions. Ses actions, néanmoins, restent conditionnées à sa capacité à coordonner le déploiement des ressources disponibles aux différents niveaux (organisation, réseau et système). La combinaison des approches théoriques mobilisées s'est montrée pertinente pour l'étude et éclairante pour l'association. Une analyse plus poussée des liens entre acteurs renforcerait la compréhension de la dynamique d'innovation collective structurant le réseau FILEG.

**Abstract:**

The development of legumes is fundamental for healthy and sustainable agricultural and food systems. Regarding the multiple obstacles hindering their development in Europe, collective action is a major lever. We used the Mission-oriented Innovation Systems (MIS) and Resources Based View approaches to study the contribution of a formal network of actors, built in the Occitanie region, to the innovation dynamics of the legume sector. Our case study is FILEG, an association aiming to structure and sustainably develop the sector by bringing together regional actors from up and down stream. We conducted a document desk research, a questionnaire and semi-structured interviews with these actors to map the dynamic of network innovation. The results show that the actions of the association contributed to the MIS functions by following a certain order. Currently, the association can contribute, directly or indirectly, to all functions. Its actions, however, remain conditional on its ability to coordinate the deployment of available resources at the different levels (organization, network and system). The combination of the theoretical approaches used proved to be relevant for the study and enlightening for the association. A more in-depth analysis of the links between actors could strengthen the understanding on the dynamics of collective innovation structuring the FILEG network.

**Nombre de pages du document final : 54**

<p><u>Demandeur (entreprise, organisme...) :</u> CENTRE INRAE OCCITANIE-TOULOUSE</p>
--