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Title: How the performance rationales of organisations providing farm advice explain persistent difficulties in addressing societal goals in agriculture.

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1 Abstract

2 *This article posits that an economic analysis of the full diversity of organisations providing agricultural*
3 *advice is needed to explore how societal issues related to environment and occupational health are*
4 *addressed in the provision of such advice. Our theoretical framework draws on existing research in*
5 *institutional economics applied to services, in particular to Knowledge Intensive Business Services*
6 *(KIBS). The methodology is based on a case study, the French seed potato supply chain. The results*
7 *consider all the KIBS suppliers that deliver advice to farmers in the supply chain. They demonstrate*
8 *the importance of organisations (linked to upstream and downstream industries) that are often*
9 *neglected in studies on the pluralism of farm advisory services. Four main types of KIBS are described:*
10 *client-owned advisory organisations; integrated services where service are developed primarily to*
11 *accompany a commercial activity; consultancy firms; and parastatals. Each of them design both*
12 *front-office and back-office service activities, according to their own profitability objectives. The*
13 *analysis of the performance rationale of these different types of KIBS organisations provides an in-*
14 *depth understanding of their economic strategies and the reasons why they address – or ignore – the*
15 *possible adverse effects of their activity on occupational health and the environment. In such a*
16 *context, public policy seems necessary to frame collective action and integrate environment and*
17 *human health issues into farm advice. The conditions of efficiency of such interventions are discussed.*
18

19 Key words: farm advisory services; knowledge-intensive business services; pesticides; potato;
20 health; France

1 1. INTRODUCTION

2 Advisory services for farmers employ hundreds of thousands of advisors worldwide
3 (Swanson and Rajalahti 2010). They contribute to innovation and knowledge creation for
4 agricultural and rural development (Leeuwis and van den Ban 2004), and are considered a key
5 asset for meeting the many challenges facing agriculture in both the global South (Faure et al.
6 2012) and the global North. In particular, the need to feed a growing population and to
7 address new societal issues such as environmental and health is generating a strong demand
8 for technical support for farmers. A case in point is pesticide reduction in the European Union
9 (EU), where there is mounting evidence of the harmful effects of pesticides on both human
10 health and on the environment. Advisory services are expected to contribute to the reduction
11 of the use of pesticides in various regulations at EU, national and regional scale.

12 In this context, we need a better understanding of how these objectives are being pursued by
13 the increasingly diverse economic actors investing in advisory services (Birner et al. 2009,
14 Knierim et al. 2017). Extensive debate exists as to the effect of this pluralism on the supply of
15 services, between “fragmentation and creative diversity” (Garforth et al. 2003). Recently,
16 various researchers have contributed to a better understanding of the implications of this
17 pluralism of advisory service suppliers. They provide insights on how the coexistence of these
18 actors play on farmer’s access to services (Labarthe and Laurent 2013a), on the relationship
19 between advisors and farmers (Sutherland et al. 2013), on the quality of services (Prager et al.
20 2016), or on the relations between advisory organisations (Klerkx and Proctor 2013,
21 Compagnone and Simon 2018). We aim to contribute to this stream of research by
22 strengthening it in two respects.

23 First, the research mentioned above are focused on organisations specialised in the supply of
24 advisory services (public extension services, private consultants, chambers of agriculture,

1 farmers' associations, etc.), and overlooks the contribution of other organisations within
2 supply chains. Thus, while some studies include in their analysis the role of cooperatives and
3 intermediaries in farmers' decisions and the exchange of knowledge, for example through
4 contracts and associated quality requirements (Cholez et al. 2017), other upstream and
5 downstream industries are often overlooked, with the exception of a few studies (Klerkx and
6 Jansen 2010). In other contexts, such as the US, researchers have demonstrated that
7 corporations in the pesticide or seed industries play a growing role in farmers' decision, thus
8 raising many issues in the integration of societal and environmental issues (Wolf 1995, Wolf
9 and Nowak 1999). We posit that such actors are also transforming the supply of farm advisory
10 services in the EU.

11 Second, many of the studies on the plurality of farm advisory services are sociological studies
12 that document the micro-level of interactions between farmers and advisors (e.g. Cerf and
13 Hemidy 1999), or the transformation of agricultural advisors' profession (e.g. Nettle et al.
14 2018). There are fewer economic analyses at the level of the organisations. We posit that the
15 economic resources and strategies of advisory organisations determine the very content of
16 advice.

17 Our hypothesis is that an economic analysis of the full diversity of organisations providing
18 agricultural advice in the supply chain is needed to discuss the integration of societal issues in
19 the provision of advice. Such an analysis will reveal the interests of stakeholders that are
20 currently neglected in analyses of the pluralism of agricultural advice providers, even though
21 they influence overall technical choices.

22 In order to test this hypothesis, we propose a conceptual framework to describe the whole
23 spectrum of farm advisory service suppliers (Section 2). We built on existing research in
24 institutional economics applied to services, and more precisely to Knowledge Intensive and
25 Business Services (KIBS). Section 3 presents the methodology and explains why the research

1 focuses on a case study, the French seed potato supply chain. The results section first provides
2 a typology of farm advisory suppliers (Section 4.1), then analyses the performance rationale
3 of these different types of KIBS organisations (Section 4.2) and highlights their consequences
4 on the integration of societal issues (section 4.3). Section 5 discusses the heuristic value of
5 this analytical framework and the policy implications of the results.

6 **2. UNDERSTANDING THE PERFORMANCE OF A** 7 **DIVERSITY OF KIBS SUPPLIERS**

8 By definition, KIBS are services in which knowledge production is the most important
9 component. Miles et al. (1995: 18) define KIBS as "*services that involve economic activities*
10 *which are intended to result in the creation, accumulation or dissemination of knowledge*". In
11 this paper, we use the term KIBS to refer to the organisations providing such services. Den
12 Hertog (2000: 505) defines them as organisations or companies that frequently use
13 professional knowledge, whether related to a specific (technical) discipline or a (technical)
14 domain, generating intermediary knowledge businesses (products or services). They can be
15 considered as a group of companies that find solutions for other companies, based on specific
16 knowledge (see J-Figueiredo et al. 2017 for a review). The KIBS literature has already been
17 applied to agricultural advisory services. It has enabled a better understanding of the role of
18 intermediaries acting as knowledge brokers within complex or fragmented advisory systems
19 (Klerkx and Leeuwis 2008). It has also made it possible to specify the profile of independent
20 consultants in contexts where farm advice has been privatised, such as the Netherlands and
21 the UK (Klerkx and Proctor 2013). Yet the application of the KIBS framework to the
22 agricultural sector has been restricted to specific types of organisation: mostly private
23 companies (consultants) specialised in the delivery of services for farmers. We need to go one

1 step further because in many situations, farm advisory services are only a portion of the
2 overall activity of economic organisations, which may also sell farm inputs or technologies
3 such as seeds, fertilisers, pesticides, and GPS, or buy farm commodities. KIBS include
4 farmers' cooperatives as well as private companies (with upstream or downstream activities).
5 Such organisations are key players of advisory services in countries like France (Labarthe
6 2014). In this paper, we use the KIBS analytical framework to analyse the activity of those
7 actors, regardless of the aim and legal status of the organisation.

8 **2.1. Using KIBS literature to propose an analytical framework for** 9 **classifying suppliers of farm advice**

10 Agricultural advisory services fit the theoretical definition of KIBS. Farm advice is provided
11 by organisations that co-produce knowledge with farmers. It helps them devise solutions to
12 various problems relating to production, health, and/or environmental objectives. In
13 particular, it helps farmers change their practices and comply with new regulations. This
14 definition of course hides a wide range of practices and degrees of co-production of services,
15 from in-depth co-construction of services between farmers and advisors to more top-down or
16 injunctive advice with less interactions, depending on the level of complexity of the problem
17 to be solved and on the suppliers' performance rationale (Laurent et al. 2006).

18 Recently, several typologies of farm advisory organisations were proposed in the debates
19 about the privatisation of farm advice. Most of them focus on the legal status of organisations
20 (public, private, non-profit associations, farmer-based organisations, etc.) and on their sources
21 of funding (Birner et al. 2009). They often differentiate between organisations in terms of
22 public, private, non-governmental (NGOs) or farmer-based (FBOs) (Knierim et al. 2017).
23 However, they do not allow us to explain the reasons for organisations' investment in
24 advisory services, nor the exact nature of the services they provide. The literature on KIBS

1 proposes guidelines to better define the variety of farm advisory services providers and to
2 describe their economic strategy.

3 A first added value of KIBS literature is to enable a distinction according to the nature of the
4 product of service providers. There is a long series of debates about how to define that
5 product (Hill 1999, Gadrey 2000). Miles et al. (1995) proposed to distinguish between, on the
6 one hand, KIBS that predominantly rely on specific competences of consultants, and on the
7 other hand, cases where the services are delivered with the dissemination of technologies,
8 mostly Information and Communication Technologies (ICT). The agricultural sector is
9 characterised by this duality of services, with services based either on the sole competences of
10 advisors or provided with digital technologies (software, decision support tools, smartphone
11 applications, etc.).

12 A second added value of the KIBS literature is to integrate into the typology of KIBS
13 providers the patterns of clients' engagements in service relationships (Muller and Doloreux
14 2009). Different patterns of client engagement co-exist (Brodie et al. 2011), from independent
15 enterprises where clients are involved only in front-office exchanges, to situations in which
16 clients own the whole enterprise and have a say in its strategies. All of them will be
17 considered in our analysis. Gadrey (1990) has emphasised that service relationships are
18 embedded in social relations that may determine not only the process of service production,
19 but also the very content of advice. Understanding who controls this service relationship
20 (through ownerships, contracts, etc.) is very important to understand the strategy of
21 construction of the supply (both front- and back-office). One might expect that a greater
22 control by clients could lead to a better integration of the societal issues faced by these clients.
23 In particular, a greater control of advice by farmers could lead to a better integration of the
24 health issues facing them. Understanding who controls advisory organisations may also have
25 some consequences on farmers' access to services, as service markets are described as

1 network markets, where the belonging to a specific social group can determine access to
2 services (Sauviat 1994).

3 The combination of this literature on KIBS with recent work on the plurality of farm advice,
4 has spawned new classification principles to describe KIBS organisations in agriculture. Five
5 key criteria can structure the analysis: i) the organisation's status (Are clients legally
6 associated in the organisation, e.g. as investors for a private firm, or on the board of an
7 association?); ii) the organisation's activity; iii) the purpose of the organisation's investment
8 in services (What is the share of services in the overall activity of the organisation? Why does
9 it invest in such activities?); iv) the types of relationship with clients (How do clients – here,
10 farmers – finance the service: through contracting, contributions, other methods?); and v) the
11 nature of the product of services (services based either on the competences of advisors or on
12 digital technologies, e.g. software, decision support tools, smartphone applications).

13 Faced with distinct constraints and types of client interaction, the various types of KIBS
14 organisations may display different economic behaviours and conceptions of the performance
15 of services.

16 **2.2. Using KIBS literature to understand the performance** 17 **rationales of farm advisory suppliers**

18 Academic debates on performance measurement of services abound, and are supported by
19 frameworks in different disciplines and case studies from many sectors (Loveman 1998). In
20 economics, the debates primarily deal with the limitations of traditional productivity
21 measurement. Standard productivity and growth indicators used in industry exclude several
22 dimensions of service firms' performance, in particular those linked to the relational
23 dimension of the co-production of services (Coombs and Miles 2000, Gadrey 1996,
24 Bettencourt et al. 2002). However, productivity improvement is part of the typical strategy of

1 service providers, as attested by efforts to standardise services (Tether et al. 2001). This issue
2 is also found in agricultural advisory services, which may have important standardised
3 components (collective advice, production of standardised decision support tools, etc.) or,
4 alternatively, be considered as an activity exclusively centred on face-to-face relationships. To
5 overcome this difficulty, we propose a qualitative analysis of the performance rationale of
6 farm advisory suppliers. This analysis can be based on two core principles.

7 First, the performance rationale relates to how suppliers mediate between front-office and
8 back-office activities (Labarthe and Laurent 2013b). Front-office corresponds to interactions
9 between the service provider and the client. Back-office work supports the building of the
10 service supply and takes place in the absence of the client. It can include scientific and
11 technological monitoring, advisor training, management of technical references (e.g. the
12 construction and use of databases), and even the production of original knowledge (through
13 experimentation and R&D). KIBS organisations are caught in a dialectic between
14 “standardisation and particularisation” (Tether et al. 2001): they need to contextualise
15 knowledge in order to solve specific problems and integrate farmers’ specific needs, but at the
16 same time they also need to build on codified and validated knowledge (Toivonen 2004). This
17 twofold imperative is reflected in the distinction between front- and back-office activities.
18 Many studies seek to describe the effects of different front-office configurations on the
19 quality of services (e.g. Gremler and Gwinner 2000). This focus on the micro-level front-
20 office interactions between service employees (e.g. advisors) and their clients, and the lack of
21 research on back-office, is not peculiar to agriculture. It has for instance been extensively
22 discussed by Sousa and Voss (2006) in the case of e-services. We argue that back-office
23 activities are an essential component of KIBS providers’ strategies. In order to fully
24 understand these strategies, the analysis must fully consider both front-office and back-office
25 activities.

1 Second, the performance rationales are multi-dimensional (Gallouj et al. 2009). Various
2 authors (Djellal and Gallouj 2010, Viitamo and Toivonen 2013, Janeschek et al 2013) have
3 indeed pointed out that a multi-criteria analysis is the most appropriate method for analysing
4 advisory services' performance rationales, and highlight the trade-off between front- and
5 back-office dimensions. The idea of this multi-criteria analysis is to understand how KIBS
6 suppliers justify the performance of their services according to different dimensions, different
7 “registers of justification” (Boltanski and Thévenot 2006). Five such dimensions will be taken
8 into account in our study:

9 - a **financial dimension** that corresponds to the profitability of the service activity, that
10 is, the ratio between the operating profit and the capital invested to implement the advisory
11 activity;

12 - a **technical dimension** associated with the conception of productivity of the advisors’
13 labour. This may be related to the number of clients assigned to each advisor, and to the rate
14 of success of advisory operations;

15 - a **relational dimension** that concerns the front-office aspect of services and the
16 quality of the client’s engagement within the service (Hennig-Thureau et al. 2002);

17 - an **innovation dimension** that relates mostly to back-office activities and to the
18 capability to supply the KIBS with new knowledge, including through service-specific R&D
19 (Djellal et al. 2003);

20 - a **civic dimension** pertaining to the ability to address social issues such as
21 environment, including occupational health and related regulation in the case of farm advice.

22 Consideration of these five dimensions should help us to understand the KIBS suppliers’
23 performance rationale and how it affects back-office orientation and knowledge production.

24 In this framework, client’s engagement is not restricted to the individual perspective of their

1 satisfaction or to their access to a co-production of services. The patterns of clients'
2 engagement are concretely embodied in the five dimensions of performance rationale and can
3 impact both front- and back-office dimensions of services.

4 **3. METHOD**

5 This work is based on a case study approach in order to better define the effects related to
6 context and those related to the studied mechanism (Yin 2003, Siggelkow 2007). The
7 methodology of the analysis of the performance rationales in different types of KIBS
8 providers draws on former research work in institutional service economics (Djellal and
9 Gallouj 2008).

10 **3.1. The case study**

11 We chose to focus the analysis on a case study of KIBS operating in a specific sector of
12 activity, the production of seed potato in France. This case study (Dhiab 2016) helped us to
13 disentangle the internal determinants of the KIBS suppliers' performance rationales from a
14 variety of contextual and historical elements: relations between suppliers and certain groups
15 of farmers, public policies framing the nature of farm advisory services, etc.

16 We chose the seed potato production for two reasons. First, it is confronted with a variety of
17 societal issues associated with the use of pesticides. On the one hand, production of high-
18 quality, disease- and pest-free seed potatoes is essential, in order not only to protect seed
19 producers' crops and to comply with international trade regulations within the supply-chain,
20 but also to protect the final user of the seed: the farmers producing potatoes for food and non-
21 food uses (e.g. starch, ethanol). On the other hand, seed potatoes are subject to strong pest
22 pressures that can cause the entire crop to be lost. Seed producers therefore use high levels of
23 pesticides to counter these risks (the "Treatment Frequency Index" is one of the highest of all

1 crops). As result: i) a reduction in the amount of pesticides used can generate specific
2 production and marketing risks and thus specific demands for agricultural advice; and ii) the
3 producers operates in a sensitive area as regards societal issues related to pesticides
4 (environment, consumers' health and occupational health issues).

5 The second reason for choosing the seed potato production is that a wide range of actors are
6 involved in providing advice (producer organisations, chambers of agriculture, pesticide
7 firms, seed potato companies, private consultants, etc.). Yet, given that this supply chain is
8 essentially small and well delimited, it was possible to identify the exhaustive list of advisory
9 organisations.

10 **3.2. The sample**

11 In France, the seed potato production is concentrated in three areas (the northern part of France,
12 Brittany, and the "Centre" region). We first worked with key informants to identify the
13 organisations playing a role in the provision of farm advisory services. For the purposes of
14 our research, KIBS organisations were identified through an analysis of the supply chain and
15 a snowball sampling technique (Atkinson and Flint 2001). The snowball methodology was
16 required as there is no directory to identify *ex-ante* the KIBS actors active in that production.
17 Intermediary results were presented to the actors of the supply chain to ensure that all types of
18 advisory suppliers had been considered. The actors interviewed are presented in Table 1.

19

1 **Table 1. General presentation of the organisations of the sample (2012 Data)**

Organisations studied		Turnover million €	Total staff	Number of advisors	Number of clients	Major activities	Status	Main sources of Financing	Type of KIBS
Producers' Organisation with certification activities (PO)	PO1	[10-20[	[50-75]	[15-30[	[400-500[	Control and certification; <i>Agricultural advice</i> ; Research and experimentation; Plant breeding	Association	Annual membership fees paid by producers; sales	CO-KIBS
	PO2	[1-5[	[25-50[	[15-30[	[200-300[
	PO3	[1-5[	[10-25[	[1-3[	[100-200[
Other Producers' Organisations (PO)	PO4	n≤1	[1-3[	[1-3[	n<100	<i>Agricultural advice</i> ; Research and experimentation; Plant breeding	Association	Subsidies (organic farming); sale of potato seeds	CO-KIBS
	PO5	n≤1	[1-3[	[1-3[	n<100			Membership fees	CO-KIBS
Potato seed company (CE)	CE1	[35-45[	[50-75]	[3-10[	[100-200[	Production, collection and dispatching of seed potatoes; <i>Agricultural advice</i>	Private	- Sale of seed potatoes - Royalties	IN-KIBS
	CE2	[35-45[	[10-25[	[3-10[	[100-200[
	CE3	[35-45[	[25-50[	[3-10[	[100-200[
	CE4	NA	[1-3[	[1-3[	n<100				
Pesticide firm (PF)	PF	[300-400[	[300-400[	[95-105[	NA ^a	Production and commercialisation of crop protection products and seeds; plant breeding, etc.; training advisors; <i>agricultural advice</i>	Private	- Sale of pesticides and seeds	IN-KIBS
Consultancy companies (CC)	CC1	n≤1	[1-3[	[1-3[	[200-300[	<i>Agricultural advice</i>	Private	Sale of advisory services	CC-KIBS
	CC2	[1-5[	[10-50[	[10-15[	n>3500				
Chambers of Agriculture Department (CA)	CA1	NA	[75-100]	[10-15[	[800-900[	<i>Agricultural advice</i> ; R&D; Training	Parastatal	- Tax on unbuilt land, public subsidies;	PS-KIBS
Chamber of Agriculture Region (CA)	CA2	NA	[10-50[	NA	NA	Coordination of the <i>agricultural advice</i> activities of the chambers of agriculture (NUTS3 level); R&D; Training of advisors		- Public funding of research projects - Sale of services	

2 Methodological note. Interval limits were set in order to secure the confidentiality of the information collected during the interviews.

^a NA = not available

1 The analysis presented here is based on interviews conducted with the use of a semi-
2 structured questionnaire with representatives of 14 organisations (n = 16 interviews), as well
3 as with key informants for the sector (n = 6 interviews). The 14 surveyed organisations
4 included all the major farm advisory suppliers for seed potato production in France.

5

6 **3.3. The survey**

7 The interviews included questions pertaining to the general description of the organisation
8 (date of establishment, status, membership numbers, etc.), a more specific description of the
9 advisory service offer (number of advisors, service format and options, themes, number of
10 clients, etc.), questions about the front-office organisation (frequency of visits, service format
11 and options), and questions about the configuration of the organisation's back-office (back-
12 office activities, team, themes, governance, etc.).

13 The interviews were transcribed in full and used to fill in an analytical grid that enabled us to
14 apply the multi-criteria framework regarding the performance rationale of KIBS
15 organisations, as presented in the previous section. The data were analysed through qualitative
16 pattern matching (Miles & Huberman 2003). The framework was inspired by the work of
17 Gallouj et al. (1999). As noted above, five dimensions of performance justification were
18 considered (financial, technical, relational, innovation, civic). These five dimensions were
19 translated into a set of indicators (see Table 2).

20

1 **Table 2 – Analysis framework for advisory service performance**

Registers	Indicators
Financial	*Profitability of the advisory service - Added value of advisory services and how that value is generated
Technical	*Productivity of the advisory service in terms of time -Ratio of farmers/advisor -Surface areas under crops/advisor -Quantity of seed potatoes sold/advisor *Level of standardisation of services - standardisation vs personalised message *Rate of dysfunctions - measurement of dysfunctions and recovery measures (service evaluation system)
Relational	Relationship between the advisor and the farmer *Personalisation (quality of the relationship in order to identify and meet farmers' needs) -Frequency of visits -Duration of visits *Client loyalty -Turnover of producers -Turnover of advisors *Nature of the contract (standard, personalised).
Innovation	Back-office. Organisation's capacity to invest in knowledge acquisition, production and renewal Share of the total budget devoted to the back-office *Number of back-office staff *Back-office activities -Experiments -Databases -Scientific monitoring -Training
Civic	Organisation's capacity to integrate values of equity or other societal issues * Taking into account controversies over the use of pesticides - Environment - Occupational health - Consumer health

2
 3 These different dimensions of performance cannot be thought of independently; there
 4 are synergies and tensions among them. The relations between these dimensions draw patterns
 5 that make it possible to identify the performance rationale of various organisations.

6

7

8

1 **4. RESULTS**

2 **4.1. A Typology of KIBS providers in the seed potato supply chain**

3 Four types of advisory service could be identified: CO-KIBS (client-owned KIBS: producer
4 organisations, and centres for agricultural studies), IN-KIBS (integrated KIBS: services
5 proposed by seed or pesticides companies), CC-KIBS (private consultants), and PS-KIBS
6 (parastatal KIBS, in this case chambers of agriculture). A summary of the typology is
7 presented in Table 3 below.

1 **Table 3. Typology of KIBS**

Type of KIBS	Status	Activity (share of KIBS in the total activity)	Goal	Relations with clients	Nature of product sold (Miles 1995)
					P-KIBS / T-KIBS orientation
Client-owned advisory organisations (CO-KIBS)	<i>Farmers' association</i>	Services = 100% of the activity	<ul style="list-style-type: none"> - Solving problems of clients/farmer-owners - Contributing to the individual (or collective) performance of farms 	<ul style="list-style-type: none"> - Farmers pay a contribution (membership fee) that is pooled for front- and back-office activities; this fee is a pooled investment in advisory services (front- and back-office) - Additional services may be invoiced individually 	<ul style="list-style-type: none"> - Service relationship and advisors' competences at the heart of the services (what is sold is above all the advisors' working time) (P-KIBS dominant) - A growing role of ICTs in the supply of services, with a number of decision support tools
Integrated services (IN-KIBS)	<i>Private firm or cooperative</i>	The delivery of advisory services are integrated with the supply of agricultural inputs or outputs	<ul style="list-style-type: none"> - Improving sales of goods (quantity, quality) by providing clients (farmers) with services - Trend towards considering advisory services as a revenue stream in their own right 	<ul style="list-style-type: none"> - Services included in commercial contracts for inputs and outputs (farmers do not pay directly for services) - A new trend of charging clients directly for services; there is a tendency to separate the offer of these services from transactions on goods 	<ul style="list-style-type: none"> - Service relationship and advisors' competences at the heart of the services (what is sold is above all the advisors' working time) (P-KIBS dominant) - A growing role of ICTs in the supply of services, with a number of decision support tools
Consultancy companies (CC-KIBS)	<i>Private company</i>	Service = 100% of the activity	<ul style="list-style-type: none"> - Making profits via the commercialisation of services 	<ul style="list-style-type: none"> - Commercial and contractual relations between farmers and advisors (farmers buy services from the company) 	<ul style="list-style-type: none"> - Service relationship and advisors' competencies at the heart of the services (what is sold is primarily the advisors' working time) (P-KIBS dominant) - Increasing role of ICTs and decision support tools in the supply of services
Parastate organisations (PS-KIBS)	<i>Chamber of agriculture</i>	Service = 100% of the activity	<ul style="list-style-type: none"> - Implementing public programs related to farm advice (including societal issues: health, environment) - Recovering costs via the commercialisation of services 	A mixed delivery of services: <ul style="list-style-type: none"> - free delivery supported by public funds and public programs - commercial and contractual relations for other services 	<ul style="list-style-type: none"> - Service relationship and advisors' competencies at the heart of the services (what is sold is primarily the advisors' working time) (P-KIBS dominant) - A growing role of ICTs and decision support tools in the supply of services

1 **The first type is client-owned advisory organisations (CO-KIBS).** These are farmers'
2 associations (or companies belonging to farmers) created to provide services to solve clients'
3 problems or improve the performance of members' farms, without seeking any other form of
4 profit. The beneficiaries of these services belong to the association, to which they pay a
5 membership fee. This contribution represents a collective investment by farmers in advisory
6 activities (both front- and back-office). Additional services may be invoiced individually.
7 Such organisations play a key role in the supply of services to farmers in many European
8 countries (Knierim et al. 2017). In the seed potato industry in France, CO-KIBS include two
9 sub-types: producers' organisations with certification activities, providing advisory service as
10 an ancillary activity, and producers' organisations whose main goal is to provide advice.
11 There are three major producer organisations (PO), to which all seed potato producers have to
12 belong: one for producers in the Nord-Pas-de-Calais, Upper Normandy, Picardie,
13 Champagne-Ardennes and Île de France regions; a second for producers in the Centre region;
14 and a third for producers in Brittany. All three provide advisory services to members and are
15 funded primarily by producers' membership fees. Other CO-KIBS active in the supply chain
16 include the CETA (centres for agricultural studies), collective organisations (or 'clubs')
17 funded by farmers to provide them with contextualised advisory services, or to deal with
18 specific issues (e.g. organic farming).

19

20 **The second type includes integrated services (IN-KIBS)** providers developed primarily as a
21 secondary service to accompany a commercial activity concerning a good: usually either the
22 sale of inputs (seeds, chemical, fertilisers, machinery) or the marketing of agricultural
23 commodities (cereals, wheat, meat, fruits and vegetables). The primary objective of these
24 services is to improve the sale of goods (quantity and/or quality) by providing farmers with
25 relevant services (Goulet and Le Velly 2013). The cost of services used to be systematically

1 included in commercial transactions with farmers for inputs or outputs (farmers did not pay
2 directly for services), but advisory services are increasingly being charged to farmers directly.
3 These KIBS services are grounded on the skill of advisors and direct interactions with them,
4 and services based on new technologies. IN-KIBS include both private firms and
5 cooperatives. Some are international. In the seed potato sector two major kinds of enterprise
6 in this type were identified and investigated:

7 - Private seed potato companies producing and commercialising potato seeds. They sign
8 contracts with the farmers who produce seed potatoes for them. They offer advisory services
9 free of charge to these farmers in order to ensure that they use recommended practices to
10 provide the quantity and quality of seed potatoes required.

11 - Private firms producing pesticides and fertilisers that combine advisory services (to
12 extensionists and farmers) with the sale of their products.

13
14 **The third type includes consultancy companies (CC-KIBS).** Advisory organisations of this
15 type are private firms whose activity consists exclusively in selling advice to farmers. They
16 are for-profit organisations engaged in commercial and contractual relations with farmers
17 (farmers buy services from the firm). Their activity is mainly based on service relationships
18 and advisors' competencies. ICTs and decision support tools are nevertheless increasingly
19 present in their activities, both front- and back-office. Former research has shown that they
20 are more prevalent in some countries than in others, being common in the UK (Sutherland et
21 al. 2013, Klerkx and Proctor 2013), Germany (Knuth und Knierim 2013), and the US
22 (Knutson and Outlaw 1994), for example. Several small-scale private consultancy companies
23 commercialising services to farmers could be identified in our case. Although they were
24 providing advice to seed potato producers, most of their advice was targeted at other aspects
25 of the production system.

1
2 **The fourth type, parastatal organisations (PS-KIBS)** comprises organisations owned by
3 farmers but benefiting from public funding at the national or regional levels. Their core (and
4 often exclusive) activity is to deliver services to farmers in accordance with public programs
5 (often with goals related to societal issues: health, environment). They thus offer a mixed
6 delivery of services combining free programs supported by public funding, with some
7 commercial and contractual relations for other services. Service relationships and advisors'
8 competencies are central, but ICTs are also used in providing decision support tools. The key
9 example of such organisations is chambers of agriculture, which are active in the supply of
10 farm advisory services for farmers in several EU countries (e.g. France, Austria, Germany,
11 Hungary).

12
13 A striking fact is that all these **different types of KIBS organisations differ radically in**
14 **how they engage farmers within their organisational structure.** All provide services that
15 mix professional features (where the key factor is advisors' specific competencies) with
16 technological ones (investments in ICTs and the development of decision support tools). They
17 may provide advice on similar topics and may be in competition with one another for
18 providing services to farmers (e.g. Compagnone et Golé 2011). However, some have
19 exclusively commercial relationships with farmers, selling services to them (CC-KIBS) or
20 services together with inputs (IN-KIBS), whereas others are directly governed by farmers,
21 either partly (PS-KIBS, which are also under the control of public actors) or fully (CO-KIBS).
22 Some authors argue that the ability to interact and coproduce knowledge with clients has
23 become a key factor in the competition to provide services (Lusch et al. 2007); and there is a
24 growing consensus that clients contribute to the co-creation of the value of services (Gadrey
25 2000). Yet little is known about how clients' engagement in turn affects the KIBS back-office

1 or how it may alter the orientation of knowledge production and further technological choices
2 at that level. An analysis of the performance rationale of each type of KIBS provides insights
3 into this issue.

4

5 **4.2. The diversity of performance rationales**

6 **4.2.1. Client-Owned KIBS' performance rationale (producer organisations)**

7

8 The high sanitary quality of seed potatoes is a competitive advantage for the French
9 producers. Seed potato farmers have created special producers' organisations (PO) to meet
10 this challenge. These organisations provide them with technical support via specific advisory
11 services. The POs are funded through annual membership fees. They also receive some
12 support from the State. Farmers assess the profitability of this collective investment against
13 the contribution of these advisory services to secure their income, by guaranteeing them
14 healthy crops, from sowing to the storage and certification stage. This is their main aim.

15 POs' strategy is essentially based on the relational and innovation dimensions. The number of
16 producers per advisor is low (18 in the case of PO1). The frequency of front-office
17 interactions is high compared to figures reported in other research (Prager et al. 2016). Face-
18 to-face relationship between advisor and producer (front-office) is central. The service is
19 therefore highly personalised. This strategy is in some respects similar to that of consultancy
20 companies, as described by Labarthe et al. (2013).

21 In the case of CO-KIBS, the membership fee is pooled into a collective investment. The aim
22 is to develop any and all advisory activities (front- and back-office) relevant to the purpose of
23 the whole association. Thus, the added value of the services is not conceived only at the
24 individual level of the interactions between a farmer and an advisor, as might be the case for
25 small consultancy companies. The assessment of advisors' activity takes into account both

1 front- and back-office activities; the two types of activity complement each other. Direct
2 interactions with clients feed back-office activities by better specifying the producers'
3 problems.

4 The innovation dimension likewise occupies a central place in the POs' strategies. Their back-
5 office activities are many: R&D, experimentation, monitoring of scientific and regulatory
6 developments, training, and so on. They devote significant financial and human resources to
7 them. They have a wide range of research activities, including major investments for testing
8 new varieties in experimental plots, development of new methods of pest control, genetic
9 improvement of resistance to pests, agronomic practices (fertilisation, production techniques),
10 and economic and regulatory aspects (particularly with regard to new pesticides). They are
11 also part of formal and informal networks involving public and private research institutes.
12 This allows them to up-date their knowledge base. The advisors also take part in training, both
13 in-house and when organised by the research institutes.

14 The POs' advisory services' performance rationale is thus centred on the relational and
15 innovation dimensions. It is based on joint investments in front- and back-office activities.
16 The advisor-farmer relationship orientates the back-office investments. The outcome of these
17 investments is in turn at the heart of the solutions proposed to farmers.

18

19 **4.2.2. Integrated-KIBS' performance rationale (seed and pesticide** 20 **companies)**

21 The core business of seed potato companies is to create new varieties and/or to commercialise
22 them. They therefore need a regular production of seed potatoes of high sanitary quality. To
23 this end they propose advisory services to farmers, based on a standardisation rationale. These
24 companies' strategy is to reduce front-office expenditures and to invest in back-office work to
25 produce technical references and standards. Their justification is thus formulated in technical

1 rather than relational terms. Unlike the POs, the role of quantitative outputs is important in the
2 assessment of advisors' activities. Both the content and the form of services are standardised
3 (standardised technical forms to fill in, software, decision support tools, technical message
4 service, standard service package, etc.). To some extent, this standardisation of front-office
5 activities frees up financial and human resources for back-office activities (science
6 monitoring, R&D, creation of databases, training), even though the ability to have direct
7 interaction with farmers remains strategic. Justification in terms of innovation is also
8 important. Standardised technical references are the main products disseminated by advisors,
9 and additionally play a significant commercial role for these companies. They include
10 profitability objectives per se, which may not correspond to the expectations of farmers
11 receiving the services but will be useful for other purposes. These technical references serve
12 to describe the agronomic potential of new seeds and to characterise optimal modes of
13 production for these varieties. This knowledge is then used by these firms in their business to
14 commercialise the varieties and to conquer new markets and new areas of application (crisps,
15 chips, etc.).

16 The case of the pesticide firm is different. Rather than offering advisory services to farmers, it
17 caters to PO technicians who act as intermediaries between the company and many farmers,
18 especially by organising training sessions for farmers. Back-office work is oriented towards
19 testing the effectiveness of pesticides in order to produce and disseminate knowledge to
20 maximise pesticide sales. This approach also corresponds to a rationale of standardisation, but
21 through the formatting of knowledge on the effectiveness of pesticides.

22 For all these companies, the performance of their advisory services depends on their ability to
23 standardise their offer by producing technical references enabling them to reduce the front-
24 office expenses and maximise the profit of their core activity by meeting the companies'
25 overall marketing objectives.

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4.2.3. CC-KIBS' performance rationale (consultancy companies)

CC-KIBS suppliers are independent consultancy companies whose aim is to develop and sell advice to farmers. They supply services in the form of software, a decision support tool, a recommended technique, and so on.

These consultants' profitability depends on the sale of technical solutions to farmers. To ensure this profitability, CC-KIBS grant importance to back-office activities. They invest in the acquisition of new technical references enabling them to broaden their network of service sales. To this end, they develop various R&D activities: experimental field trials, science and regulations monitoring, databases creation, software development and so on. This back-office work includes several themes: e.g. testing of the pesticide treatment programmes, fertilisation programmes, and soil-management techniques. In one particular case (CC1), farmers are provided with Internet access to technical and regulatory databases. They also receive a technical manual distributed by the advisors at the beginning of the agricultural year. Another company (CC2) develops software and decision support tools for managing fertilisation and irrigation.

This variety of activities and topics enables them to enlarge their service offer.

Investment in knowledge production is a priority for these firms, but the cost is high. This has impacts for the technical and relational dimensions, with the former given priority over the latter. Technical results are considered very important (125 farmers per advisor in the case of CC1). The direct face-to-face advisor-farmer relationship is not central: advice is either collective or delivered remotely via information technology tools. This makes it possible to reduce front-office expenses. Saved time and resources can be invested in back-office.

1 The performance rationale of these CC-KIBS is based on the innovation and technical
2 dimensions. It is driven by back-office work to create new references and to sell solutions to
3 farmers. This rationale has similarities with the service quality issues experienced by service
4 companies employing virtual channels, as described by Sousa and Voss (2006). Nevertheless,
5 keeping direct personal relations with farmers remain very important for these consultancy
6 firms, both for upgrading their tools and for benefiting from the externalities of farmers'
7 networks.

8

9 **4.2.4. PS-KIBS performance rationale (chambers of agriculture)**

10

11 We classify French chambers of agriculture as parastatal organisations (PS-KIBS): farmers'
12 representatives cooperate with the public authorities in promoting agricultural development.
13 Their main goal is to provide advice to farmers. They assist farmers in several respects:
14 technical, economic, and regulatory.

15 The performance strategy of these PP-KIBS lies at the interface between the innovation and
16 the technical dimensions. However, the innovation dimension is at the heart of their
17 agreement with the State. Back-office work is the core activity of the chambers of agriculture
18 surveyed in our case study.

19 Over the past two decades public funding of farm advisory services has gradually been
20 reduced (Laurent et al. 2006). This has had an impact on front office operations, with an
21 increasing marketing of the advice provision that farmers used to receive free of charge (Petit
22 et al. 2011).). The chambers of agriculture in our survey have sought to develop other sources
23 of funding, along with a commercial range of standardised services (standard packages).
24 These services are now delivered for a fee. They are based on collective advice via Internet
25 messaging, with limited direct interaction with farmers. As front-office running costs are

1 reduced accordingly, the chambers of agriculture can carry on investing in back-office
2 activities.

3 In collaboration with “technical institutes” (national technical associations financed by public
4 and private funds in addition to farmers' contributions), they implement various types of
5 activities (experimentation, science monitoring, training, etc.). These activities include several
6 topics, in particular research on new pest and disease control techniques and development and
7 monitoring of decision tools. This research is undertaken under national or local programmes
8 in partnership with public institutions (Ministry of Agriculture, French National Institute for
9 Agronomic Research, regional authorities, etc.). The main purpose is to produce agronomic
10 knowledge, often in the line with societal issues.

11 The back-office activities of the chambers of agriculture enable them to meet national and
12 regional objectives, and to inform the front-office activity. But maintaining these back-office
13 activities has been to the detriment of the front-office. Front-office work is increasingly
14 standardised to save financial and human resources, and technical direct interactions between
15 farmers and advisors are very much reduced.

16

17 **4.2.5. Divergences between the objectives of KIBS suppliers**

18 Advisory providers' performance rationales vary considerably depending on the type of actor
19 and the choice between standardisation or particularisation of services (Tether et al. 2001).

20 They have a strong impact on back-office investment choices. The Client-Owned KIBS
21 orientate their investments towards knowledge acquisition to ensure that competitive
22 advantages are sustained at the national level (in the French seed potato supply chain) and to
23 guarantee the quality of both the seed potatoes and the soil. On the other hand, back-office
24 investment choices of Integrated KIBS' are determined above all by the objective of moving
25 into new markets, including internationally, by creating new varieties for which there is a

1 demand. In the case of Consultancy Companies, the performance rationale is designed to
2 produce new solutions and to increase the number of clients. In the case of Parastatal KIBS, it
3 is the institutional arrangement with the State that guides back-office investment choices,
4 orientating them towards investment in R&D projects to achieve national or regional policy
5 goals. On the other hand, no matter how standardised the front office and how much emphasis
6 is placed on the back office, none of the KIBS in the survey plans to no longer co-produce
7 solutions with them.

8 **4.3. Types of KIBS, performances rationales and societal issues**

9 The reduction of pesticide harm on human health and the environment is becoming an
10 important societal issue in many countries. Pesticide contaminations (in food, the air, the soil
11 and the water) are denounced. Excessive exposure of farm labour to pesticides, and the
12 adverse health effects, is reported in various arenas in France (Jouzel and Prete 2014, Inserm
13 2013, Laurent et al. 2016). These concerns are taken into account in different ways,
14 depending on the type of KIBS and its performance strategy (Table 4).

15

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1 **Table 4-**
 2 **Specific actions**
 3 **taken in the**
 4 **Back-office of**
 5 **the KIBS**
 6 **regarding**
 7 **pesticides**
 8 **reduction and**
 9 **societal**
 10 **implications**

Type of KIBS		Occupational Health (1)	Pesticide residues (1)	Environmental issues (1)	Experiments to determine crop protection strategies' effectiveness	Anticipating future product restrictions
CO- KIBS Producer organisations	PO1	NO	NO	YES (1)	YES	YES
	PO2	NO	NO	YES (1)	YES	NO
	PO3	NO	NO	YES (1)	NO	NO
	PO4	YES	YES (3.1)	YES (3.1))	NO	YES
	PO5	YES (2)	YES	NO	YES	YES
IN-KIBS Potato Seed companies	CE1	NO	YES	NO	NO	NO
	CE2	NO	YES (3.2)	YES (3.2)	YES	YES
	CE3	NO	NO	NO	NO	NO
	CE4	NO	NO	NO	NO	NO
IN-KIBS Phyto-sanitary firm	FP	YES (2) (4)	YES (4)	YES (4)	YES(4)	YES (4)
CC-KIBS Consultancy firm	CC1	NO	NO	NO	YES	YES
	CC2	NO	NO	NO	NO	NO
PS-KIBS. Chambers of agriculture	CA1	YES (5)	NO	YES (5)	NA	YES
	CA2	YES (5)	YES	YES	YES	YES

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3 **Methodological note:** In France, it is mandatory for every advisory organisation selling pesticides or advising about their use to provide advisors with a
4 compulsory 2-day training called Certiphyto (that includes half a day on occupational health). Complying with this compulsory training is not considered here as a specific
5 action of the studied organisations. Nor is complying with the regulation to reduce CMR products.

6 (1) E.g. seeking alternative methods to reduce pesticide use such as mechanical weeding.

7 (2) E.g. delivering general recommendations on pesticide formulation (to favour liquid against powder formulation).

8 (3) Developing organic production (3.1) or trials of organic production (3.2).

9 (4) Farmers' occupational health mentioned as part of a comprehensive corporate social responsibility plan that is presented during interviews and in reports.

10 (5) Developing R&D to decrease adverse effects of pesticide use (Ecophyto projects).

1 **The results vary for client-owned KIBS.** All of them mention pesticide reduction issues in
2 their back-office investments, but the issue is tackled in very different ways. For four of them
3 (n=4/5), environmental issues are included in the objectives of their in-house R&D projects
4 and their projects with outside partners. They aim at decreasing the level of pesticide use.
5 They conduct research on new disease control techniques, on the creation of new disease-
6 resistant varieties, and so on. However, only one of them (PO4) develops organic farming
7 technical itineraries. Substitution by new pesticides is also tested in partnership with the
8 pesticides producers, in order to comply with regulations and anticipate product bans. The
9 integration of these issues into their back-office strategies is justified by their relations with
10 plant producers and with the entire supply chain, as guarantors of the sanitary (disease-free)
11 quality of both the soil and the seeds. These KIBS are financed by producers and they are not
12 compelled to show profits or to have any objectives other than devoting their resources to
13 R&D and seeking solutions to producers' problems; the volume of these investments depends
14 on the size of the organisation.

15 Note however that occupational health seems to be absent from the strategies of the
16 organisations focussing on control and certification (PO1, PO2, PO3: Table 1). They do not
17 mention concerns about workers' health, although the health of their members might be
18 directly concerned, and although the relative proportion of salaried workers on French farms
19 is steadily increasing (Depeyrot et al. 2019), they could be held accountable as employers.
20 The situation is different with the two POs whose main activity of farm advisory services.
21 PO4 aims at developing organic farming, and both mention the need to reduce occupational
22 exposure to pesticides, and to protect the environment. Both have specific actions related to
23 this issue.

24

1 **The seed potato companies (IN-KIBS, CE1,2,3,4)** do not either present societal pesticide-
2 reduction issues as a major concern for their strategies. They prioritise commercial objectives
3 and invest in the creation and testing of new varieties to meet the different needs of various
4 segments of the market. When specifically asked about safety at work and the use of
5 pesticides, only one of them mentions specific actions to reduce the use of the more
6 dangerous substances (those classified as carcinogenic, mutagenic or toxic for reproduction –
7 CMR). However, this is a legal obligation; it cannot be considered as significant progress. The
8 situation is different in the case of the pesticide producer (IN-KIBS, FP), which emphasises
9 its investments in research to develop new products that are less dangerous for human health
10 (for instance, replacing powders with liquid products). These investments are fully integrated
11 into its commercial strategy and serve as sales arguments to counter criticism and controversy
12 over pesticide use.

13
14 **The CC-KIBS** invest very little in developing services integrating the issue of the pesticide
15 use reduction, as they do not foresee a potential for the commercial development of such
16 services. Thus, as pesticide reduction is not a priority for them or their clients, they instead
17 dedicate their resources to issues more directly related to the profitability of their clients’
18 farms. Regarding safety at work, this lack of monitoring of the adverse effects of pesticides
19 results in statements that are quite concerning when they reflect misleading assessments of the
20 risk and may generate inappropriate advice. For instance, one advisor stated that “*Regarding*
21 *the protection of pesticides users, we don’t have more recommendations for one product or*
22 *another. Anyhow, whatever the operation with a product, the user’s protection is always the*
23 *same*”. This contradicts the current recommendations concerning the use of crop protection
24 products. In particular, the regulation specifies that the protection (including personal

1 protective equipment) has to be chosen according to the category of product and its level of
2 toxicity (Garrigou et al. 2020).

3
4 **Chambers of agriculture (PS-KIBS)** prioritise investments in the production of agronomic
5 references to reduce pesticide use. This is justified mainly for environmental reasons, but
6 occupational health issues are also driving these strategies. The investments are part of the
7 institutional arrangements between the chambers of agriculture and the State. They are made
8 in the framework of national or local research projects, in partnership with institutions in both
9 the public sector (the Ministry of Agriculture, the public research institutes, etc.) and the
10 private sector.

11
12 **Thus, clients' control of the performance rationale of advisory organisations does not**
13 **necessarily result in a type of advice that would better protect farm labour health.** Yet,
14 one might imagine that the Client-Owned KIBS would develop specific actions to better
15 guarantee producers' health, by seeking to reduce risks of exposure to toxic products during
16 treatments or during re-entry phases. This is not the case, however, of organisations whose
17 primary activity is focussed on certification. In fact, only KIBS that are both farmer-owned
18 and whose main activity is farm advisory services integrate these concerns.

19 This result is logical. In these organisations it is legitimate to deal with non-economic aspects
20 of the farming operation, as it will not directly compete with the profitability objectives of
21 other activities. In addition, all these KIBS are developing important back-office activities
22 that make it possible to address new societal issues. But such KIBS represent only a small
23 proportion of the total offer of farm advice in this sector. They have a small number of
24 advisors (Table 1). This result also stresses that the functions performed by different types of

1 KIBS are not at all similar. In other words, the findings on farmer-based organisations
2 specialised in advisory services delivery cannot be extrapolated to all types of KIBS.

3

4 **5. Discussion: Plurality of KIBS organisations in agriculture and generation of** 5 **knowledge for addressing societal issues**

6 The fact that there is a plurality of organisations involved in farm advisory services is not
7 new. It has been well documented following the privatization movement that has transformed
8 this area of activity since the 1990s (Faure et al. 2012). The results produced through the
9 methodology used to describe all KIBS providers involved in a supply chain corroborate the
10 findings of these studies and complement them. In addition, an analysis of the performance
11 rationales allows us to go further. It allows a systematic study of all organisations involved in
12 agricultural advisory services in the supply chain, and provides a better understanding of how
13 societal issues are considered in farm advisory services.

14 **5.1. Variety of KIBS and overarching economic objectives**

15 Financial, relational and technical dimensions have a high visibility and are often taken into
16 account (though with other theoretical stand points) in analyses of farm advisory services. The
17 innovation dimension, on the other hand, is seldom analysed. Yet the investments made to
18 support innovation generate a large part of advisors' back-office work (scientific monitoring,
19 R&D, databases, etc.). This has two important analytical consequences.

20 First, back-office investments focus on areas that differ from one KIBS provider to another,
21 according to the overall performance goal of the organisation. Each gives priority to building
22 up high-level evidence that is relevant to its own profitability objectives. In their societal
23 dimension, these objectives may be contradictory, depending on the market segment targeted:

1 for example, the effectiveness of certain pesticides *versus* the effectiveness of organic farming
2 practices.

3 Second, a knowledge base is a resource whose cost is as crucial for organizations as the cost
4 of any other factor of production. Yet, as researchers have been pointing out for many years,
5 organisations have very unequal capitalisation logics and investment capacities (e.g. Knuth
6 and Knierim 2013). Thus, for a large part of their activity, small enterprises can either rely on
7 peer-to-peer networks (Klerkx and Proctor 2013, Prager et al. 2016), on freely available
8 knowledge or enter the sphere of influence of a larger organisation, for example by
9 supervising effectiveness trials for new pesticides or new seed varieties.

10 Advisors' work is therefore oriented by their assigned area of intervention, based on the
11 performance rationale of the KIBS employing them and the knowledge base available to
12 them. Some studies emphasise the personal qualities expected of advisors, in particular the
13 skills required to steer the sustainable transition of agriculture (Ingram and Morris 2007,
14 Sutherland et al. 2013). An analysis of the performance rationale of the KIBS providers
15 produces complementary information and makes it possible to specify the framework within
16 which the advisors' activities take place. It provides information on the broad objectives to be
17 achieved through their interventions and the resources available to them, irrespective of their
18 personal qualities, their level of competence and the type of interpersonal relationship they
19 have with the farmers with whom they work.

20 The analysis of performance rationales also helps to avoid misleading shortcuts, for the
21 priority objectives that frame the activity of advisors cannot be directly deduced from the type
22 of KIBS provider that employs them. For instance, some KIBS-owned clients do integrate the
23 issue of occupational health into their performance rationale, but not all of them do, contrary
24 to an initial intuition. Another case is consultancy companies (CC-KIBS): while former
25 research stressed their focus on front-office, to the detriment of back-office (Prager et al.

1 2016), we found organisations that opted for a performance logic based on the idea of giving
2 access, on a commercial basis, to part of their back-office to clubs of farmers.

3 5.2. Knowledge resources for farmers

4 In theory everyone is in favour of a sustainable agriculture without health effects on the farm
5 labour force. In some limited areas of advice where information is public and free, a new type
6 of independent advisory service may emerge, for example to better advise about occupational
7 health and safety regulations (Nettle et al. 2018). But such situations remain limited. In
8 practice, the various KIBS providers attach very different degrees of importance to the
9 creation of knowledge that can be used for advice taking full account of societal objectives.
10 This confirms the difficulties of embedded advisors in providing adequate sustainable farm
11 management advice (Klerkx, Jansen 2010). Moreover, certain shortcuts designed to reduce
12 the costs of advisory activities can work against these objectives. This is the case when
13 technical references drawn up for seed potato production with high pesticide use are used for
14 advice on consumption potato production where the sanitary standards of the supply chain no
15 longer justify such a level of inputs. Such results are convergent with findings of Vanloqueren
16 and Baret (2008) about the role of advice in the lock-in of resistance seeds in the wheat supply
17 chain in Belgium.

18 Farmers, on the other hand, are faced with a very heterogeneous range of advice, the quality
19 of which is practically impossible to control. There is nothing such as a perfect market for
20 farm advice, with a free interplay of supply and demand, and a perfect knowledge of all the
21 players in all the issues that frame the activity of advisors (Hanson and Just 2001). Instead,
22 farmers are confronted with a kind of "market menagerie" (Srinivas 2012) in which divergent
23 economic interests and performance rationales, complex regulatory issues, information
24 asymmetries and power relationship between one segment of the industry and another are
25 intertwined.

1 Therefore, there is no reason why the observed plurality of KIBS should generate advice that
2 best meets the environmental or health goals of public policy when these goals are distinct
3 from the performance objectives of the same KIBS.

4 5.3. Public policies

5 Public intervention therefore seems necessary to secure the course of an overall economic
6 development that respects the environment and occupational health.

7 The analytical dichotomy between "public goods" and "private goods", and its political-
8 administrative use (Lataste 2014), are now commonplace to address such issues. In this logic,
9 the knowledge and profits associated with the production of varieties requiring the use of
10 pesticides would fall under "private goods". They can be appropriated by a limited group of
11 people and should benefit from advice on how to maximize this impact. On the other hand,
12 the costs associated with the adverse effects of this production for society (environmental and
13 health impacts and advice on these issues) should be borne by all because they are "public
14 goods". But the analysis of the performance rationale of KIBS shows that it is also at the very
15 level of the design of the innovation, upstream of production, that the issue of adverse effects
16 should be addressed. Thus, it is impossible to consider that public action should be confined
17 to action on "public goods": its efficiency presupposes that its objectives are integrated in the
18 very design of the KIBS performance rationales, particularly in the innovation register.

19 The results show however that several elements would be jointly necessary for efficient public
20 policies in this area:

21 - A coherent multi-stakeholder institutional arrangement which sets out rules but also carries
22 out controls and sanctions so that the cost of possible adverse effects is internalised from the
23 conception of the innovation. Control institutions are a key component to frame the renewal
24 of skills in an economy or a sector, based on arrangements between public and private actors

1 as emphasised by Thelen (2004). In France, such a system, which would be necessary for the
2 emergence of a genuine collective action (Commons 1950), remains to be built.

3 - An independent knowledge base, providing relevant evidence to inform public decision-
4 making and the public (including farmers and advisors) in this policy area. In Quebec, tools
5 for such a system have been invented. For example, the public authorities have financed an
6 independent, open-access database, "Sage Pesticide" (CRAAQ 2020), which allows farmers
7 and advisors to compare the dangerousness for the environment and for workers of various
8 crop protection treatment solutions for a given production segment. In France, the path taken
9 so far is rather the opposite, since plant health monitoring bulletins that assess regional
10 phytosanitary risks and prescribe treatments that were previously drawn up by the Ministry of
11 Agriculture are now drafted with the participation of various partners, including pesticide
12 manufacturers (Compagnone, Simon 2018).

13 - A team of advisors receiving their instructions from the public authorities and employed by
14 a KIBS organisation whose objective would be to support public policies in this area.
15 However, following the wave of privatization that began in the 1990s, the number of advisers
16 with no link to the commercial interests of actors in the agricultural sectors has been
17 considerably reduced. Consequently, in order to implement advice on the use of pesticides,
18 the idea explored in France is to prescribe a legal disconnection (in term of control of the
19 capital of advisory organisation) between the provision of strategic advice on this use on the
20 one hand, and commercial operations (particularly pesticide sales) on the other. However,
21 observation of the performance rationales of KIBS providers shows that the advisors act
22 within a framework shaped by the economic objectives of their employer, on the basis of the
23 knowledge they make available to them. In the French case, the nature of these employers and
24 their degree of dependence on parent companies remains a matter of debate.

25 6. Conclusion

1 This research focused on a limited case study demonstrates the heuristic value of analysing
2 the performance rationale of KIBS providers in order to understand and try to overcome the
3 difficulties currently faced by the farm advisory services.

4 New societal expectations vis-à-vis agriculture are being confirmed and reinforced. Logically
5 they should lead to more integrated forms of advice, taking into account the environmental
6 and health dimensions of production. In the immediate future, however, the frameworks for
7 action of agricultural advisers will not necessarily converge towards such a pattern.

8 “Farm advisory service provision” is not a sector of activity as defined by institutional
9 economics, that is, a set of actors who share the same productive goals. The concept of such a
10 sector, driven mainly by the objectives of disseminating knowledge to farmers, based on the
11 logic of the public mechanisms of the 1970s, is both erroneous and misleading. In the case
12 study country, as in many other geographical contexts, advisors with no commercial link to
13 economic actors have become a very small minority. It is the economic interests of the actors
14 in the supply chain employing advisors that are most prevalent.

15 Services provided by farmers’ organisations closely connected to up- and down-stream
16 industries tend to play an important role. This is partly related to their ability to benefit from a
17 high level of client engagement, with an emphasis on the relational dimension. Such
18 engagement is supposed to give clients more say in the orientation of back-office activities.
19 However, when the core activity of these organisations is production and not farm advice, this
20 pattern does not lead to better control of the hazards linked to pesticide use. There is no
21 reason why farmers’ organisations should be more virtuous than other companies in
22 environmental and social terms since the shared objective is above all economic. Farmers'
23 participation cannot in and of itself be a guarantee that the civic dimension will be better
24 taken into account.

1 Therefore, there is no reason why the observed plurality of KIBS should generate advice that
2 best meets the environmental or health goals of public policy, when these goals are distinct
3 from the performance objectives of the same KIBS. This is a logical reason why, as our study
4 shows, only KIBS providers specialised in agricultural advisory services that receive public
5 financial support and are accountable for their actions in relation to these societal issues, are
6 committed to this approach.

7

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13

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