AgriLink. Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation

Deliverable 2.2: Synthesis Country Report (Version 1.0)
Partner: INTIA

The role of advisory services in farmers' decision making for innovation uptake. Insights from case studies in *Spain*

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List of acronyms

AgriLink	Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation
AOS	Advisory Organisation Supplier
AKIS	Agricultural Knowledge and Innovation System
CAP	Common agricultural policy
DoA	Description of the Action
IPM	Integrated Pest Management
Micro-AKIS	Micro-level Agricultural Knowledge and Innovation System
NGO	Non-Governmental Organisations
NUTS	Nomenclature of Territorial Units for Statistics
R-FAS	Regional Farming Advisory System
TCM	Trigger-Cycle Model
WP	Work package

Executive Summary

This report is part of the WP2 of the Agrilink project. WP2 aims to understand why, how and from/with whom European farmers and farm managers gather and exchange information which underpins their decision-making process concerning the development and /or implementation of different types of innovation. A second aim of WP2 is to analyse the role played by advisors in such processes, taking into account the range of advisory services available in diverse focus regions across Europe.

In this case three innovation cases of three innovation areas were analysed: Alternative techniques to pesticides (Appropriate use and techniques of biological control organisms); direct marketing (Direct marketing and local markets) and innovation in dairy products (Retro-innovation" (re-creation, re-inventing, re-introducing traditional products/crops). All the cases have been focused in Navarra (ES220-NUTS3-Navarra), but in the case of dairy products and analysis in the nearby region (ES21- NUTS2-País Vasco).

The methodological framework used in the three case studies concerns a mixed-method strategy. Quantitative and qualitative data were collected via structured interviews, on the one hand, with farmers, aiming at the description of their micro-AKIS, and, on the other hand, key advice providers, aiming at the description of the R-FAS in relation with the selected innovations. In total 101 farmers were interviewed, including adopters, non- adopters and droppers, following a snowball approach. Representatives of the Public advisory service, local cooperatives, associations, local organizations, management centres, etc., were the key informants who facilitated the research process in each case.

Besides, various advice providers that were mentioned during the interviews were interviewed according to what farmers said.

The role of advice suppliers varies among the cases. In the case of biological pest control the innovation is in general driven by advisors. There is specific advice for crop protection and advisors support farmers in the decision making in their farm. In the case of direct marketing there is no specific advice and advisors do not create awareness regarding the innovation. Once farmers become aware of the innovation, they look for advice and there are various organisations that help them going ahead with the project, but there is no specific advice for direct marketing. In the third case (retro-innovation), advisors are key in the decision-making and in some cases, it is a research driven innovation (food technology centres who advice farmers about new dairy products). Other farmers are key informants about the innovation in all the cases (specially during the awareness phase).

Apart from the advice, in all the cases the curiosity, innovation profile and financial situation of the farmer have great influence in the decision-making.

1. Introduction

The general goal of WP2 (Innovation case studies in Focus Regions: micro to meso analysis) is twofold. Firstly, WP2 aims at understanding why, how and from whom European farmers and farm managers gather and exchange information to underpin their decision-making on development and /or implementation of different types of innovation. A second aim of WP2 is to analyse the role played by advisors in these processes accounting for the range of advisory services available in a series of focus regions across Europe. The Focus Region is a key concept adopted by AgriLink, and was defined as a farm census region supplying the socio-demographical and farm structural context that might help to explain the farmers' micro-AKIS diversity and its implications to innovation up-take and the role played by advisors.

The conceptual framework (Deliverable D1.1) underlying the implementation of these goals relied on three major assumptions. The first was that the diversity of farmers and farms leads to different decision-making processes and influences the type of advisors and the roles they play on them. Second assumption consisted in assuming that innovation might not be in convergence with the sustainable development purposes, meaning that innovation can affect negatively or be indifferent regarding the sustainability dimension. Hence our willingness to investigate both adoption and non-adoption situations. Finally, a third assumption establishes that the diversity and the transformation in advisory landscape in European countries and regions is a relevant variable explaining the role advisors play (or not) in the farmers' decision-making processes related with the innovation uptake.

AgriLink developed an integrated research framework (Deliverable D2.1) aimed at gathering empirical data for the micro-scale concept of AKIS (Agricultural Knowledge and Information System), the farmer micro-AKIS, and for the mesoscale concept of R-FAS (Regional Farming Advisory System), in relation with the up-take processes of diverse types of innovation by farmers across the EU. This deliverable (D2.2) prepared by the 13 partners involved in WP2 offers a synthesis of the qualitative insights on the farmers' micro-AKIS and the role played by advisors in the selected case studies. These were delimitated at the census region level and focused on a group of farmers representative of a specific innovation (e.g. biologic pest control), comprising both adopters and non-adopters.

Three innovation cases were selected concerning two innovation clusters:

1. The case of the Integrated Pest Management (IPM) in Navarra. This case study gathers information about the implementation (or not) of different IPM techniques in different crops of the region (fruit trees, vineyards and horticultural crops). It is an environmental innovation that in some cases, becomes also social, since it is promoted by local cooperatives and groups of farmers.
   The advisory challenges in this area are to increase the knowledge about the innovation and new techniques, improve the transference of this knowledge among farmers, demonstration of alternatives in practice, etc.

2. The case of Direct Marketing in Navarra. This case study analyses an innovation that has not had specific advice for many years. Different motivations have led farmers to assess this innovation highly linked to the family and the territory. This innovation encompasses various sustainability challenges (environmental, social and economic).

The challenges of the advisory services are: new needs related to food security and trade, support service in the creation of logistics networks to market the products, training and advisory needs of the transformation of products produced on the farm, food safety and training in sales and markets.

3. The case of Retroinnovation in Navarra and the Basque Country. This case analyses how farmers need to reinvent to develop new dairy products such as ice creams, yogurts, new types of cheese, etc. This innovation is also linked to the family and the territory and it encompasses economic, social and environmental sustainability challenges.
   One of the challenges of the advisory service is to boost the diversification of these dairy products, helping farmers with technical and administrative issues, sanitary and hygienic regulations, etc.

This report is structured in 8 sections. The second section gathers AgriLink key concepts and research questions. The third and fourth sections are focused on an overview of the AgriLink wp2 case studies, the metrological approach and the description of the Spanish selected cases. Section 5 shows the results of the farmers' survey and the outcome of the interviews with key AKIS actors in the selected regions. These results are discussed in section six, further elaborated by specific farmers' narratives, which are presented in section 7. The report concludes with key insights be presented in section 8.

2. AgriLink key concepts and research questions

AgriLink key concepts which are relevant for data collection in WP2 comprise the: Focus Region, farmers' micro-level Agricultural Knowledge and Information System (micro-AKIS), mesoscale concept of R-FAS (Regional Farming Advisory System), and the trigger-cycle model (TCM). These concepts were established in the AgriLink DoA and elaborated by the project conceptual framework (see Deliverable D1.1).

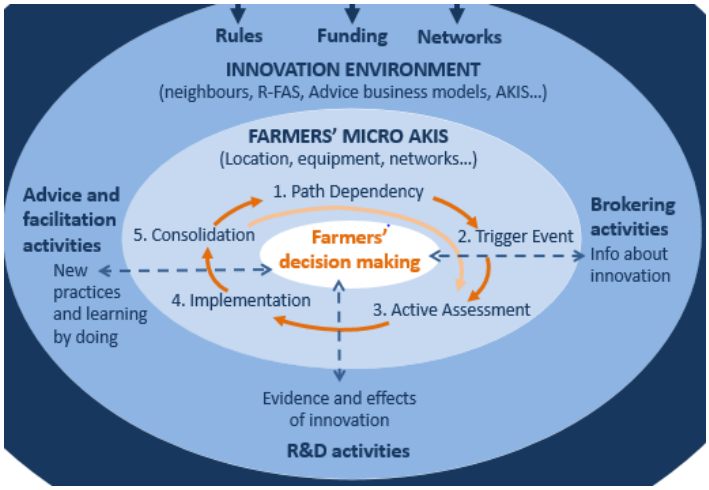
The Focus Region is as a farm census region that establishes the boundaries of the case study for data collection on micro-AKIS and R-FAS. Preferential geographical region is defined at NUTS 3, which is in certain cases replaced by NUTS 2 to achieve better case study delimitation.

The micro-AKIS describes the micro scale knowledge-system that farmers personally assemble, including the range of individuals and organisations from which they seek service and exchange knowledge with, the processes involved, and how they translate this into innovative activities (or not). Empirical uptake of this concept entails answering two questions: a) who influences farmers (and farm households) in decision-making on adopting or choosing to not adopt innovations; and, b) how, i.e., what are the processes describing the knowledge assemblage by the farmers and role played by the different sources involved (see D2.1)

AgriLink defines the R-FAS as the set of organisations that enable farmers to develop farm-level solutions, enhance skills and coproduce knowledge with advisors. These are envisaged by AgriLink in a pluralist view, including traditional advice providers (chambers of agriculture, public bodies, etc.), farmer-based organisations (unions, associations, cooperatives, etc.), independent consultants, NGOs, upstream or downstream industries, and high-tech sectors. Hence, R-FAS covers the full range of these organisations in a given region, and their connection to wider AKIS organisations, and as well as a range of services, including research, advice and brokering, meaning they can be active at different steps of the farmers' decision-making processes, and use different methods at these different steps.

The trigger-cycle model established that farmers' decision-making regarding the innovation uptake is driven by a triggering event that initiates a path-dependency break cycle composed by three main phases, that can be described to account for the advisors role: a) farmers' awareness of the innovation, encompassing brokering activities developed by advisors to disseminate the innovation and to (co-)create trigger events influencing farmers' decision-making processes; b) active assessing innovation entailing advisors assemblage of information on the innovation costs, benefits, and side-effects by developing and involving in R&D activities; c) supporting farmers in innovation implementation by delivering advice and carrying out facilitation activities. The Figure 1 offers an integrated view of the TCM and the key concepts that were implemented in WP2 through the case studies delimitation and the data collection at farm micro-level and at the R-FAS meso-level.

Figure 1: Integrated view of the TCM and AgriLink key concepts



Source: AgriLink

The research questions to be answered with the empirical approach of WP2 are synthesised in Box 1. The research questions aim at responding the WP2 goals through the empirical approach delineated in D2.1 build on the AgriLink conceptual framework (presented by the deliverable D1.1).

Box 1: AgriLink empirical research questions for WP2

1. ***What roles do advisory services play in the cycles of farmers' decision making?***
   - The cycles comprising the trigger-cycle model developed by the AgriLink conceptual framework to understand farmers' decision-making processes regarding innovation up-take and to describe respective micro-AKIS; Advisor's role is investigated at three phases of this model: a) Farmers' awareness of the innovation, encompassing brokering activities developed by advisors to disseminate the innovation and to (co-)create trigger events influencing farmers' decision-making processes; b) active assessing innovation entailing advisors assemblage of information on the innovation costs, benefits, and side-effects by developing and involving in R&D activities; c) supporting farmers in innovation implementation by delivering advice and carrying out facilitation activities.
2. ***What is the relationship between different types of farmer and advisory suppliers in the decision-making process?***
   - Comprising heterogeneity in farmers profile, farm structural features and farm business models; the nature of the innovation; regional context; R-FAS landscape and business models (including models associated to digitization of agriculture); role of advisory in different stages of farmers' decision making cycles and if these are creating new advisory supply opportunities and /or new functions, and as well as new forms of path dependency
3. ***How does the transformation of advisory suppliers landscape influence farmers' decision-making and uptake of innovation?***
   - Accounting for R-FAS history and on how new configurations of R-FAS (generally depicted as more fragmented and pluralistic) play on the relation between farmers and advice, and respecting this relation: a) allow for more creativity, triggers, and a diversity of knowledge and information channels for farmers; b) influence farmers' access to information and knowledge, and equity on farmers' information access.

Source: AgriLink

3. WP2 case studies overview and methodological approach

3.1. WP2 case studies selection

The case study delimitation in AgriLink was built through two dimensions. One of the dimensions was the spatial delimitation of the R-FAS boundaries at the focus region level, and the second the farmers selection in relation to the innovation type. **Table 1** presents the selected innovation according respective innovation type and the sustainability challenge addressed by innovation.

Table 1: Selected innovations and sustainability challenges

Type of innovation	Innovation cluster	Selection focus	Sustainability challenge addressed
Technological	Autonomous vehicles, robots, drones, intelligent sensors/Precision Farming	IT (Information technologies)	Climate change, Eco-efficiency, Pests & diseases
			Growth and jobs – Digitalization
			Food security – Biodiversity, Food provision
Process (farming practices)	Biological Pest Control	Integrated ecological farming	Climate change, Eco-efficiency, Pests & diseases
	Soil Improving cropping systems		Food security – Biodiversity, Food provision
Marketing and financing	Retro-innovation	Diversification	Growth and jobs – Business diversification, Social cohesion
	Introducing new crops		
	Direct marketing		Eco-efficiency
	Developing new activities		
Social and organisational	Natural resources common management	Collaborative organisations	Growth and jobs – Social cohesion, Digitalization
	Labour Innovative arrangements		Food security – Biodiversity
			Eco-efficiency, Pests & diseases

Source: AgriLink

The farmers' selection in each case study built on targeting groups of farmers amongst whom the innovation is already widespread, so that it would be possible to characterise the micro-AKIS supporting innovation up-take of adopters, as well as the micro-AKIS of non-adopters.

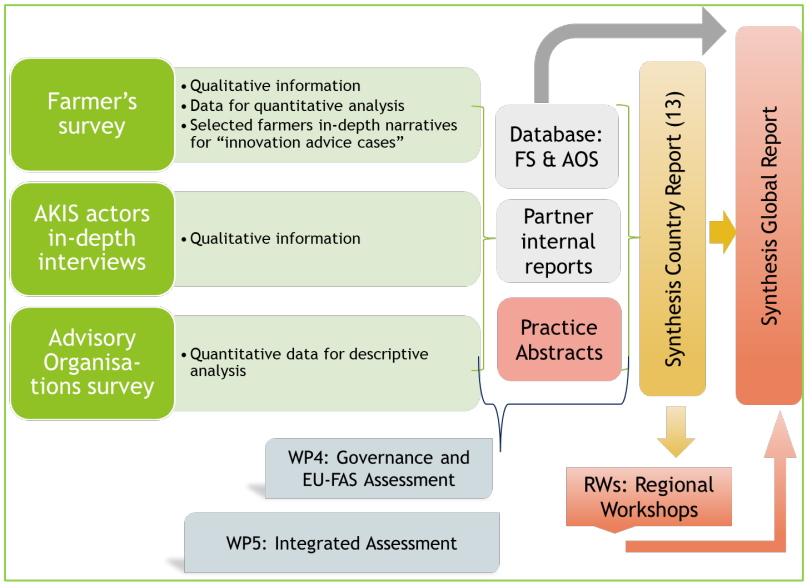
3.2. WP2 methodological framework

The methodological framework implemented in WP2 consists on mixed-method strategy (for a detailed description see WP2 research protocol in D2.1), combining case study approach with quantitative survey-

type data collection. It is implemented in three steps. Firstly the case studies selection, already described. Second step consisted on delineating and implementing two major surveys: a) to farmers to collect the data for describing the micro-AKIS and the role the advisory providers play on it; and, b) to advisory providers to enable describing R-FAS in relation with the innovation addressed by each case study.

Figure 2 depicts an overview of the WP2 data collection strategy, highlighting the intermediate outputs and the outcomes to be generated from the data analysis, including the inputs to subsequent WPs.

Figure 2: Overview of WP2 data collection and reporting



Farmers' survey was conducted through a question-guide comprising both open-ended and closed-ended questions intended to gather quantitative data on whom and how type of questions (who are the advisory services providers and how these are provided), along with qualitative data on the why and how type of questions allowing for in-depth understanding of farmers' micro-AKIS. Quantitative data from farmers' survey (FS) were entered on a database, while qualitative information and narratives descriptions were recorded and analysed in order to provide the descriptive and analytical insights. This deliverable, the synthesis country report, presents the outputs of both, the data analysis and description and the qualitative insights for each case study.

Farmers' survey was implemented through face-to-face interviews, conducted by members of research teams or duly trained students, following a question-guide including open, mixed and closed questions to collect data on the trigger events, the farmers' innovation evaluation, knowledge and information sources, flows and social networks, farmer profile and demographics, business model and farm structure. FS comprised a set of matrixes to gather data to describe farmer micro-AKIS for the three main stages of the TCM (awareness, active assessment and implementation of the innovation), and on the micro-AKIS used by the respondent for farm management in general, and as optional the household micro-AKIS for the family farms when family members show to be influential actors for information and knowledge flows assembled by farm decision-maker(s). Detailed information on the farmer survey and respective question-guide is available at the Deliverable D2.1.

The advisory organisation supplier's (AOS) question-guide builds mainly on closed-ended questions and addressed formal providers of advice (see Box 2), excluding informal providers. Formal advisory suppliers

comprise organisations providing advisory services as a secondary activity and /or providing them for free (e.g. associated with the supply of inputs or software). In-depth information on the R-FAS is gathered through complementary in-depth semi-structured interviews delivered to a small number of regional AKIS actors.

Box 2: Definitions on advisory for R-FAS survey

Advisory services
- A service activity that enable farmers to develop farm-level solutions, enhance skills and coproduce knowledge with advisors.

Advisory suppliers
- Any organisation that delivers advisory services to farmers.

Advisory organisations
- Traditional suppliers specialized in the supply of advisory services to farmers. This corresponds to former 'extension suppliers'

Source: AgriLink

The question-guide for advisory organisations comprised mostly closed questions and addressed data collection to: a) describe the organisation, including its ownership status, action level, advisory services supplied, funding resources and in-house R&D facilities; b) characterise its human resources, their distribution according to front-office and back-office activities, qualifications, certification and training, and on the methods they use for supplying advisory services; c) describe the type of advisory services clients and the main topics of these services; d) identify the national and regional public support to the advisory organisation, including funding and other type of support to back-office activities (training, R&D and networking activities); e) assess organisation benefit from current EU level policy instruments, such as EU-FAS, EIP-AGRI, and rural development programmes; f) describe the organisation advisory services supplied in relation with the innovation at stake in the case study, and the back-office activities undertaken by the organisation to support the supply of these services; and, g) collect the organisation's vision regarding the major challenges to be faced in the next years by the advisory suppliers, in the focus region, regarding the innovation development.

The in-depth interviews to AKIS key actors collected their knowledge on the innovation path in the region, on major innovation triggers, and on their evaluation on the farmers' knowledge and information needs and demands along the various stages of the innovation TCM and to what extent R-FAS is responding to these demands. The target number of interviews to key actors was established as five, whereas they can be lesser depending on the number of relevant actors is each case study.

The data analysis and qualitative insights obtained in each case study are also part of this deliverable, the synthesis country report. Detailed information on the advisory organisation supplier survey and respective question-guide is available at the Deliverable D2.1.

In addition, this deliverable comprises the description and the insights gathered from detailed narratives of farmers' decision-making processes regarding the uptake of the innovation build on the TCM and addressing the advisory supplier's role. Three narratives per case study were included in the data collection conducted by the WP2 to generate information for the integrated assessment to be carrying on by the WP5.

3.3. WP2 sampling strategy

The target population for sampling purposes was a group of farmers with similar technical-economic orientation amongst whom the innovation is already widespread, enabling to identify adopters and non-adopters that choose to not adopt the innovation. Hence the target population to be sampled is defined by two criteria: a) innovation adopters and (informed) non-adopters; with, b) a similar technical-economic orientation, whilst addressing farm structural heterogeneity among the targeted group of farmers, which might lead to the inclusion of farmers with different farm styles and/or business models. In addition, specific categories of non-adopters, such as droppers, or of adopters, such as partial adopters, were accounted for sampling purposes when found to be relevant in the targeted population.

A sample of 40 to 50 farmers was required by each case study. A snowball-type sampling procedure was adopted relying on the support of key-informants ('gatekeepers') familiar with the targeted group of farmers, which might include farmer associations, researchers, and other AKIS actors and experts. To avoid selection bias, different information sources need to be used and cross-checked (See Deliverable D2.1 for a detailed description of farmers sampling strategy).

The advisory organisations were sampled through a snowball process relying on diverse sources to ensure that the complete spectrum of advisory organisations supplying (or that could supply) advisory or related services is included in the sample. A minimum of 20 organisations was established for the cases were sampling was needed to cover the advisory diversity. In other cases, with little formal suppliers on the ground the strategy was to interview the maximum of existing organisations.

4. Country case-studies, farmers groups and advisory suppliers

4.1. The case studies and focus regions

4.1.1. Case study 1 – Biological pest control

During the last decades the use of IPM (Integrated Pest Management) techniques in Navarra (ES220) has been based on preventive measures such as crop rotation, varieties, etc. and the regional public advisory service has had a key role in this sense. In recent years, along with the publication of the Directive on the Sustainable Use of Pesticides, the use of other alternative techniques such as biological and biotechnological control, ecological infrastructures and alternative products to conventional pesticides has increased.

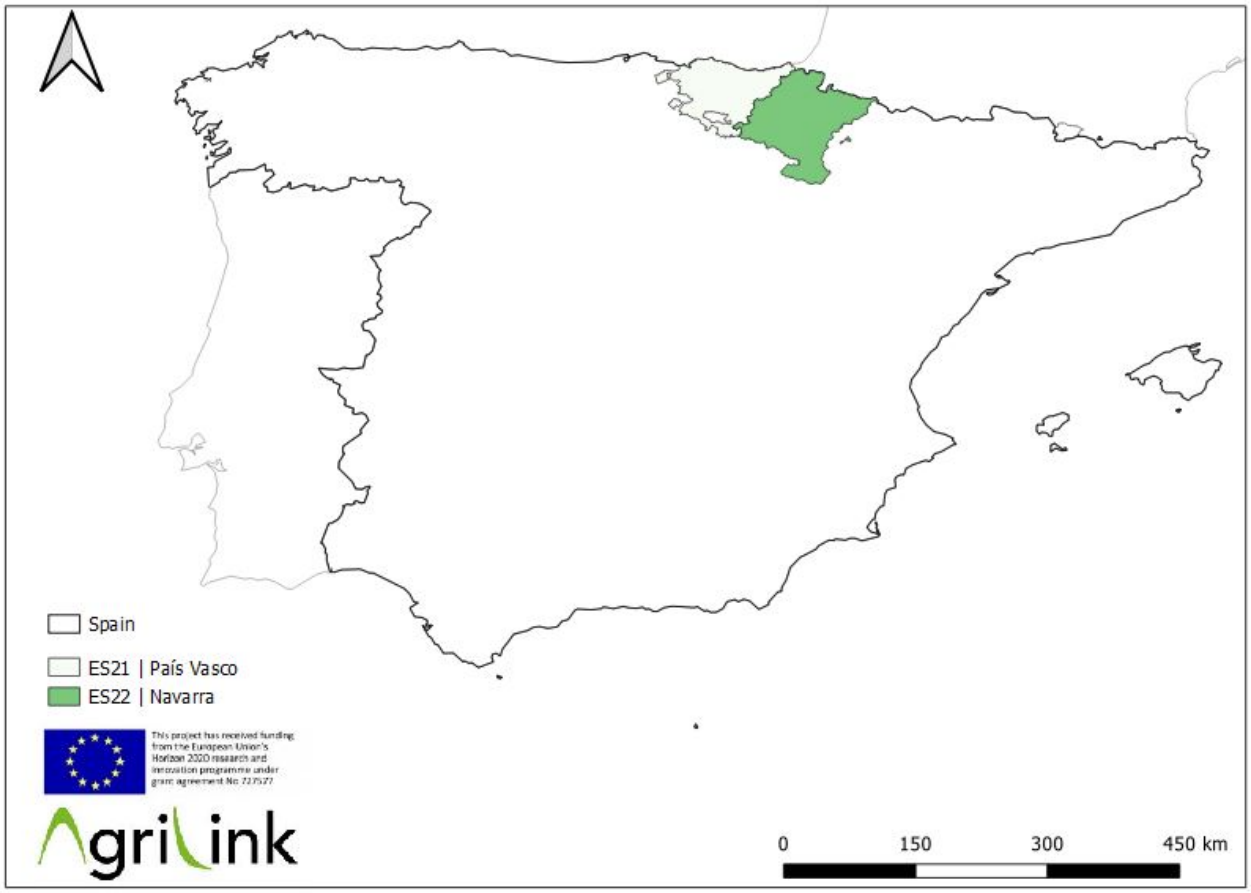


Figure 3: Biological pest control focus region (Navarra)

There is a growing demand of zero residue products that are more respectful with the environment and farmers demand more and more information about these innovative techniques. They are willing to reduce the use of pesticides in crops, increase biodiversity and beneficial organisms and offer zero residue products to their clients. However, they have to face technical issues, uncertainties, economic barriers, etc. The advisory landscape has changed and more advisory organisations have influence in this innovation area: input suppliers, advisors of cooperatives and the agri-food industry, wineries, etc.

The challenges for the advisory service in this region are to cooperate with different actors involved to try to transmit a unified message, increase the knowledge about alternative techniques (new techniques, new alternatives for diseases, etc.), to improve the transference of knowledge about alternative techniques and technologies with guarantees of success and profitability.

4.1.2. Case study 2 – Direct Marketing

Direct marketing has been a way of marketing that has not been developed in Spain. Since the 80s most of the agricultural and livestock products have been commercialised by the agro-food industry. In Navarra, direct sales have been made only in products such as sheep cheese and, to a lesser extent, horticultural products.

In this context, distributors have been key and prices have decreased, forcing farmers to increase their production if they wanted to obtain enough benefits to continue in the business.

For some years now, an offer of nearby, affordable and sustainable food products are being consolidating. This offers quality guarantee and at the same time, it helps to promote local development and the recovery of an agricultural and livestock network, affected by a constant decline in recent years.

The sustainable innovation analysed in this case study is based on the use of alternative marketing techniques for agricultural products (vegetables and fruits) and livestock products (milk, dairy products, meat, eggs). The challenge of the innovation area is to increase this type of short marketing channel to supply a growing consumer demand (markets, on-site sales, collective catering ...) and the aim of this case study is to analyse the situation of this innovation area in Navarra.

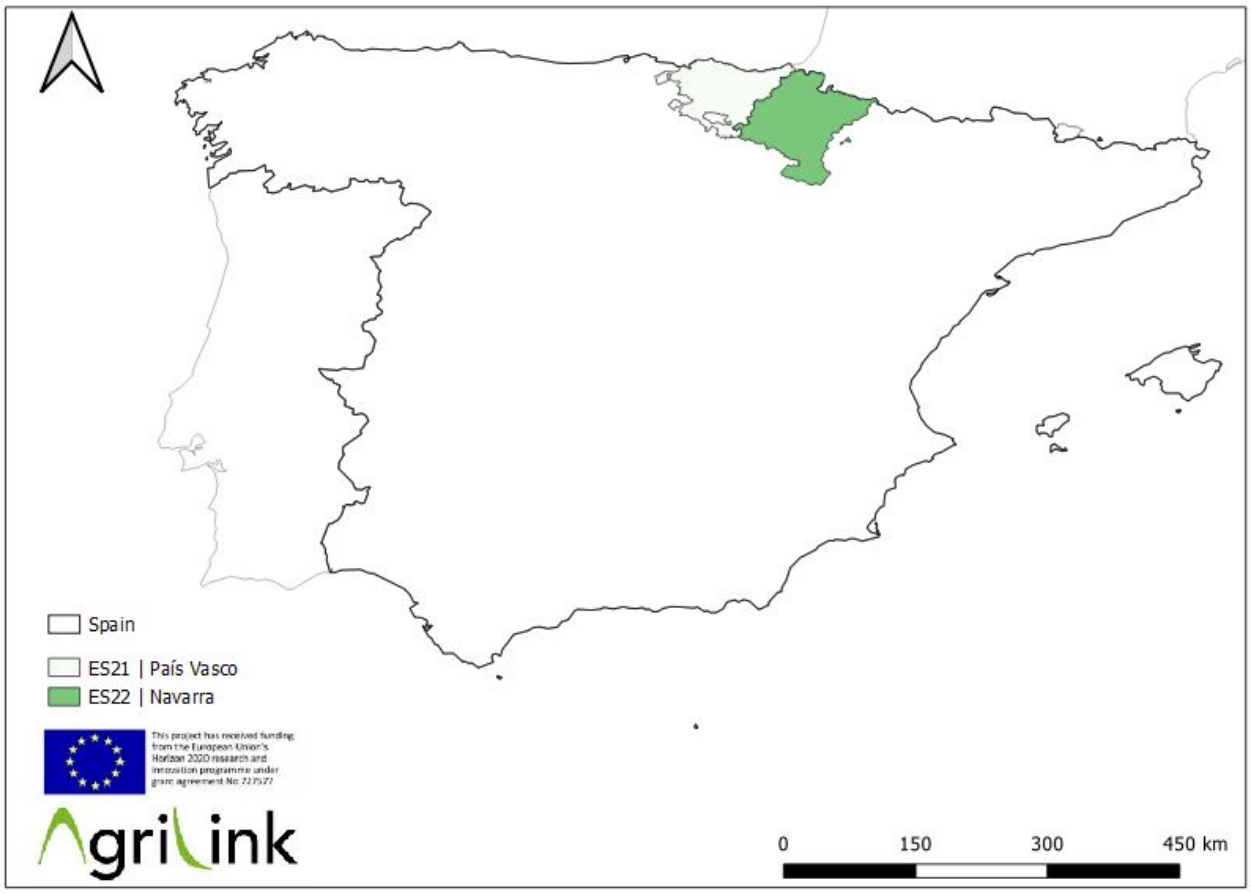


Figure 4: Direct marketing focus region (Navarra)

Some advisory organisations have influence in this innovation area: INTIA technical consultants, input suppliers... but there are no specialised advice on this issue and the help of other farmers and the family is very important.

The challenges of the advice in this area of innovation are to increase and transmit the knowledge of short commercialisation channels, to help structure the sector to supply the collective restoration.

4.1.3. Case study 3 – Retro-innovation

In the regions selected for this case study (Navarra and the Basque Country) sheep milk has been traditionally used to make a cheese with a prestigious designation of origin (Idiazabal) and curd. In contrast, in dairy cow industry there has not been transformation and the vast majority of farmers are part of a cooperative that sells the product.

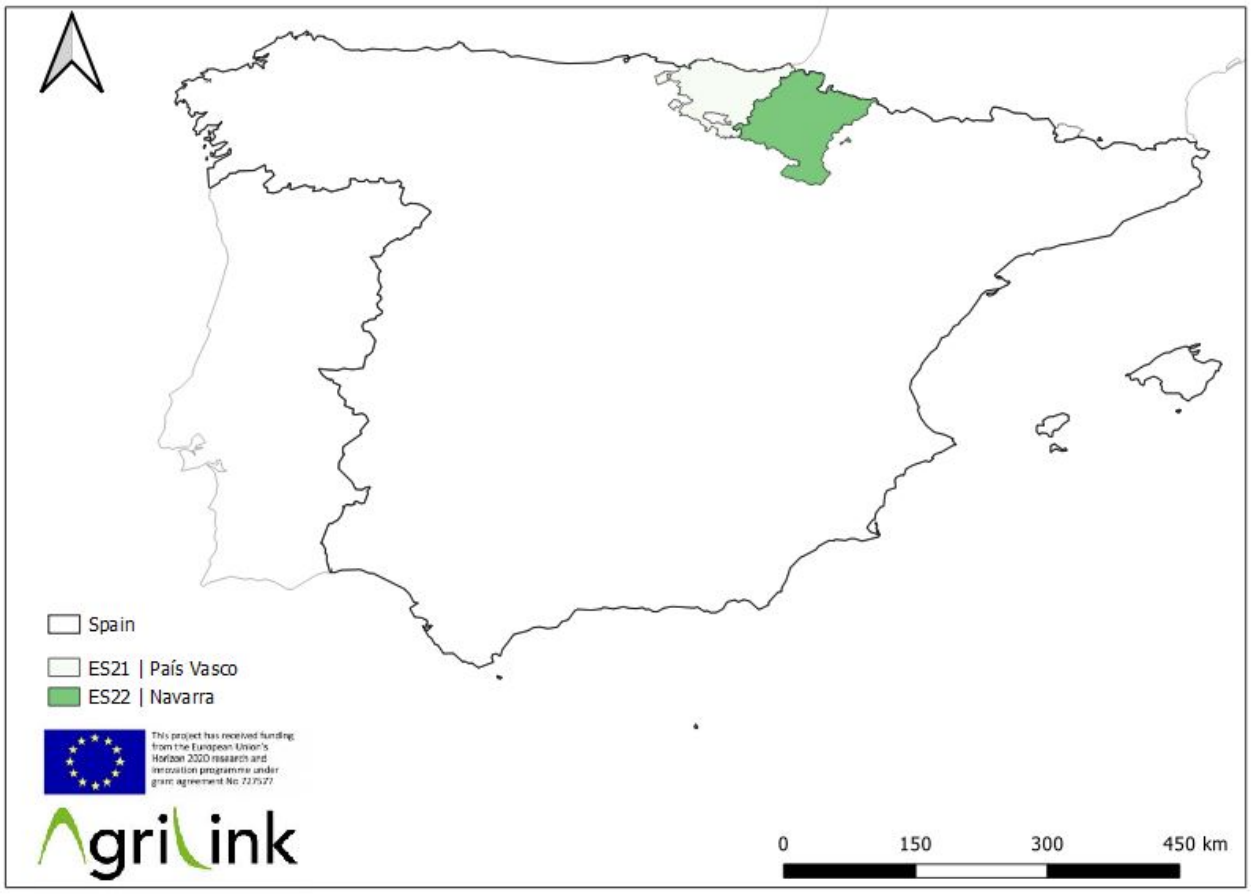


Figure 5: Retro-innovation focus regions (Navarra and País Vasco)

In recent years, there has been a growing interest in diversifying and innovating both in products and in marketing for several reasons:

- Crisis and unfavourable situations
- Consumer demand for different products
- Added value
- In the face of urban planning pressure, look for an alternative to reduce the size of the facility maintaining profitability

Nowadays the diversification of dairy products of these regions is a great challenge. A recent study confirms that in the Basque Country and Navarra, more than the 90% of the cheeses are foreign or without certification. There is now a project to encourage new types of Basque cheeses (and/or the use of old recipes), because of the increase in the demand and opportunity that this new tendency can offer.

These new products will be made with certified milk and will allow creating new families of products that will complement the classic Idiazabal.

4.2. Group of farmers target and sampling strategy

BIOLOGICAL CONTROL

A sample of farmers of horticultural (both outdoor and greenhouse production), fruit trees, and vineyard production has been selected. Those crops have been considered to collect the diversity of crops in the region. Although extensive crops are not the goal of the study because the analysed techniques are not applied in this type of crops, many of the interviewed farmers had large areas of extensive crops.

The selection of farmers was started by the advisors of INTIA since it was the easiest way to access them. Later, seeing that using only that strategy, the results could be biased, it was complemented with the snowball technique (selecting farmers through other farmers).

The sample is based on 17 adopters and 12 non-adopters. In some areas, the techniques were spread for several reasons and it was more difficult to find non-adopters. 3 droppers were also interviewed, two of them were considered non-adopters before the interview but then it was discovered that they had previously implemented and abandoned the technique.

DIRECT MARKETING

A farmers' sample with different productive orientations (dairy products, beef, pork, eggs and horticultural products) was selected for the interviews. There were farmers who had adopted the innovation and others who had decided not to adopt it.

The selection of farmers was carried out through the advisors of INTIA. Given the heterogeneity of products, farmers' pairs who have similar structure and orientation were selected. Different profiles were considered:

- Adopters: Farmers who already use the innovation

-Non-adopters: Farmers who know innovation but have decided not to implement it in their farms

- Droppers: Farmers who once decided to implement the innovation but abandoned them for some reason.

RETRO-INNOVATION

The selection has been made through INTIA in Navarra and Management Centres or Advisory Organisations in the Basque Country. These organizations have been chosen because they are close to farmers and they know the situation very well. In this case, some farmers did not want to take part in the interviews. Some of the interviewees have taken part in a European project "Innolact Poctefa" (https://www.innolact-poctefa.com/es/inicio/) in which the centres and advisory organizations have participated in topics related to sustainability and efficiency.

The sample is based on:

- Sheep sector: 50% of the interviewees. They are developing new products: blue cheese, curd, yogurts and ice creams.

- Dairy cow sector: 40% of the interviewees. They are developing new products: cheese, yogurts, ice creams and pasteurised milk. They are also changing the way in which they sell (vending machines).
- Goat sector: 10% of the interviewees. They are developing different kind of cheeses.

Among non-adopters there is one farmer who is thinking about adopting. Most of them have not changed the marketing way. However, together with the development of new products, some of them have changed commercialization channels: restaurants, supermarkets, distributors, etc.

Table 2: Farmers surveyed per case study

Innovation case study	Adopters	Non-adopters	Droppers	Total
Biological Pest Control	17	12	3	32
Direct Marketing	18	18	2	38
Retro innovation	18	13	0	31

Source: AgriLink – Country

Farmers for the narratives were selected according to their profile (adopter, non-adopter and dropper) and to the case study to which they belong.

Two farmers of the case of biological pest control have been selected (one adopter and one dropper). The adopter has been selected because it is a pioneer farmer in an area in which mating disruption is now very common. The dropper has been selected because, although he is a committed farmer and he had the support of different advisors, he had to abandon because of technical and economic reasons. This is an example of other aspects that condition the implementation of the innovation.

One adopter has been selected for the other two case studies. This farmer decided to diversify the production and create new dairy products (retro-innovation), but besides, he decided to sell them directly to the consumers (direct marketing). It is an example of a pioneer in an area in which reducing the number of heads in the farm and changing the way of production and marketing is unusual.

4.3. AKIS experts and advisory organisations

These interviews were defined after finishing farmers' interviews, so interviewees were selected according to what farmers said.

In the case of **biological control** the advisory suppliers' landscape is based on public and private organisations. In the interviews there are policy makers and an IPM expert of the public advisory service who have been involved in projects aimed to spread the use of alternative techniques in Navarra, some input suppliers that were mentioned during the interviewees, a big group of advisors of the public advisory service that were mentioned and that have different profiles, technicians from wineries, agro-industries, etc.

In the case of **Direct Marketing** there have been no specific advisory services. This year, a new area for the promotion of this innovation has been created in INTIA (a public company attached to the Department

of Agriculture of the Government of Navarra). The consultants interviewed are mostly workers from public companies or officials.

- Official of the Department of Agriculture of the Government of Navarra. Area for the promotion of agri-food products of Navarra. The interviewee is in charge of the management of the register of agri-food handicrafts and the direct sale census that was created after the approval of the Law of direct sale (LF 8/2010). He is the reference person on issues related to 'Direct marketing'.

- Official of the Department of Agriculture of the Government of Navarra. Area of promotion of organic farming. In many cases this promotion is linked to the opening of new marketing channels.

- Worker of Protected designation of origin Idiazabal: Since 1987, this entity helps in the marketing of its partners' cheeses.

- Worker of the Public Advisory service in the section of 'Advice on the management of beef cattle'. He has participated in the launching of several direct sales initiatives of his beef-producing partners.

- Worker of the Public Advisory service. Coordinator of the new section in INTIA for the promotion of direct marketing called 'Short circuits'. She has taken part in a project for the introduction of ecological and local product in the children's schools of Pamplona´s the town hall

In the case of **retro-innovation** advisory services change according to the case. This is the list of entities:

- Research and technological centres that support companies in the development of new products.
- Advisory organizations: they support farmers on financial matters and food safety. They also support new farmers developing the feasibility plan and they help them in the first steps.
- Rural Development Agencies.

Regarding AKIS experts, three advisory organisations have been interviewed: Abelur, Abere and Lurgintza. These Management Centres are non-profit cooperatives specialised in advising the sector, offering services to individual farms, as well as to professional associations of producers and cooperatives.

They are specialized in different work areas (technical, economic, taxes, environmental, CAP, etc.) and they are an important connection with the Government. They have a key role in the transference of knowledge either directly or through the associations and cooperatives.

4.4. Farmers selected for in-depth narrative interviews

Some farmers were selected for the narratives. The idea is to go in-depth in three interviews to better understand the cases, the advisory landscape, relationship of farmers with advisory services through the TCM, etc.

5. Results

5.1. Case 1: the role of farm advice in innovation case study Biological control

5.1.1. Findings related to the Farmers' survey

5.1.1.1. Farmers' profile and farm structure

Regarding farmers' profile, Figure 6 shows how the area of their farms is distributed in relation to the type of crop. Almost the 50% of the total area is used for arable crops (959 ha). Fruit trees and vineyard take up 17% and 19% respectively. Outdoor horticultural crops account for 12% and greenhouse crops for 3%. Arable crops are not considered in this study, but most of the interviewees have these crops in addition to fruit trees, vineyards, etc.

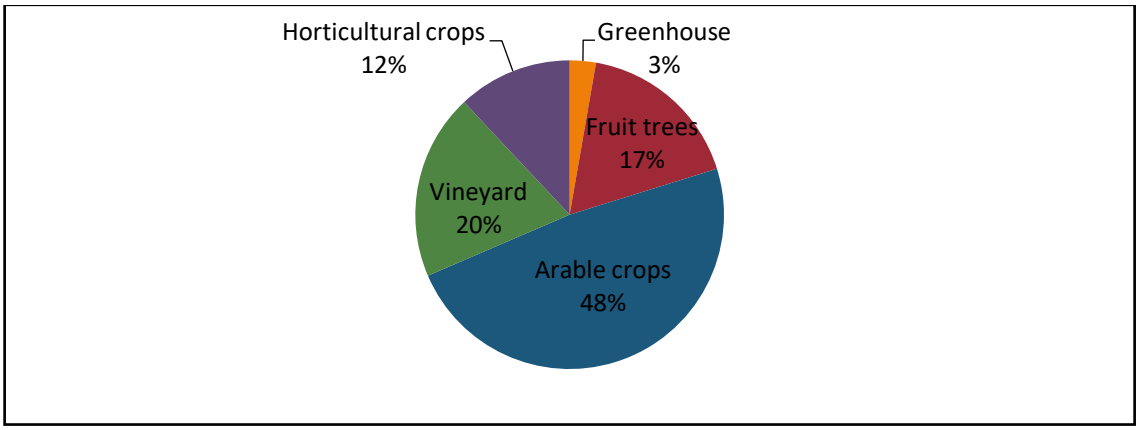


Figure 6: Distribution of the area per type of crop

The following graph shows farmers' profile in relation to the size of their farm.

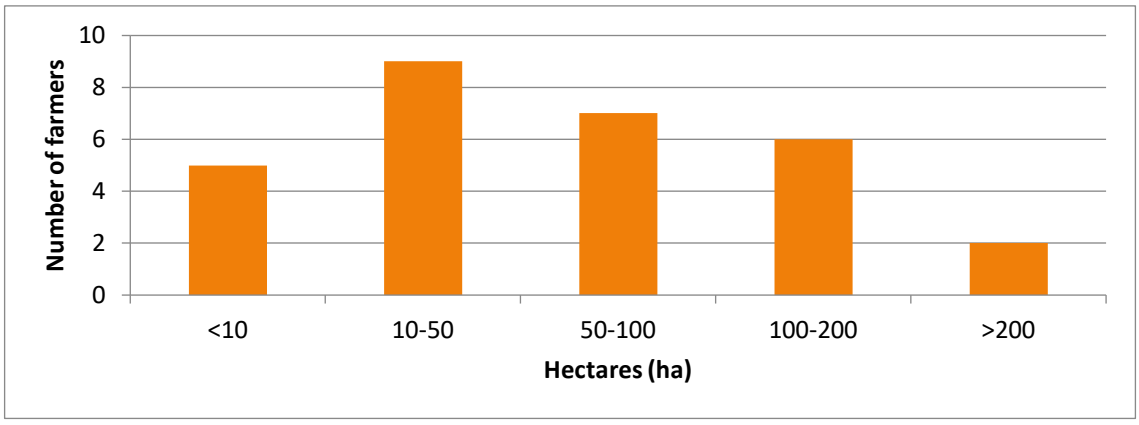


Figure 7: Number of farmers according to the number of hectares

More than 50% of the hectares (1091 ha) have an irrigation system. The following figure shows how different types of irrigation systems are distributed.

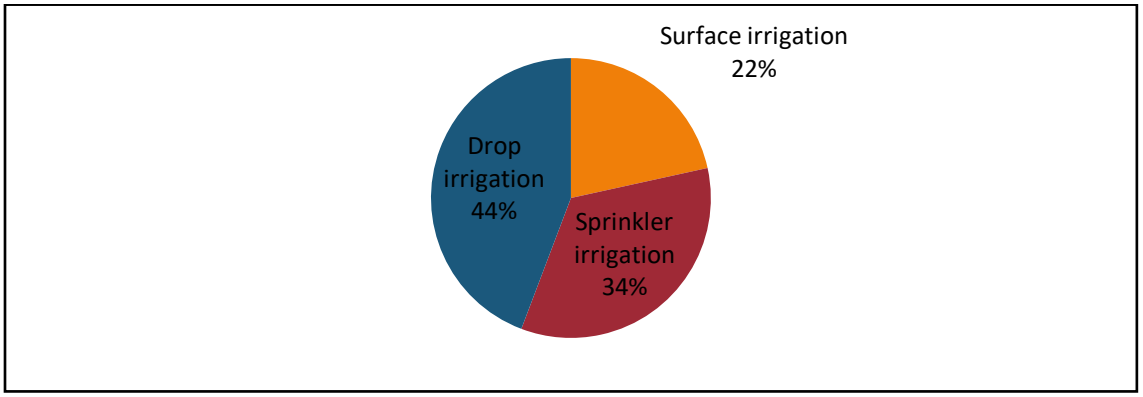


Figure 8: Distribution of different types of irrigation

With regard to the business orientation, all the farmers sell their products through the cooperative, the agroindustry, winery, etc. Only in some special cases (nut production), it is done directly to the final consumers. The farms are not related to other types of activities (agro tourism, visits, etc.). In some cases farmers have received visits from students or other groups, but without being a source of extra income for their farms.

Most of the interviewees have hired labour on the farm. The majority hire part-time (during pruning, harvesting, thinning, etc.). In some cases there are family members who are also partners in the farm, but in a few cases there are family members who work there. It is observed that when there are permanent workers or members of the family, there is a higher influence of their opinions in the decision-making; in some cases as a boost to develop them and in other cases as a brake.

The majority of the interviewees (72%) are between 41 and 60 years old. The 20% is under 40 and there are three farmers who are older than 61 (only one of these farmers has a successor who wants to continue working on the farm).

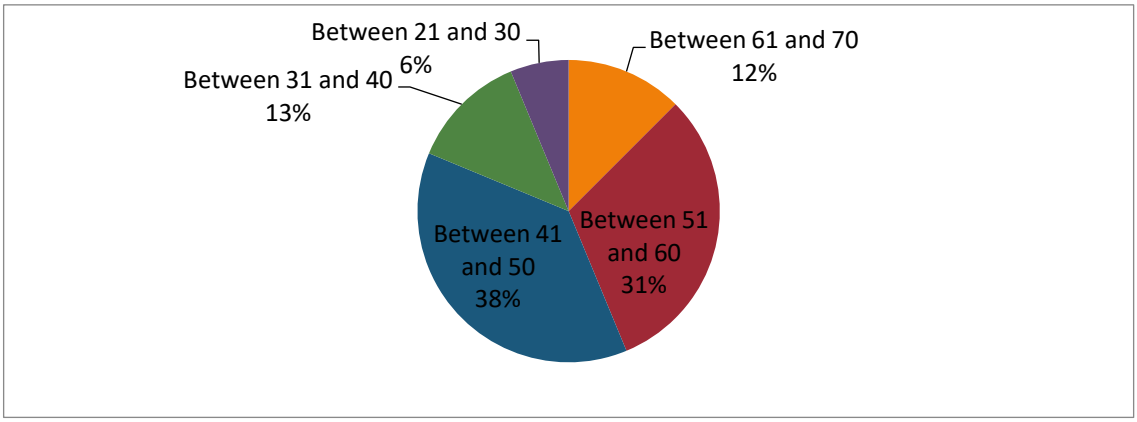


Figure 9: Distribution of the age of farmers

Table 3 collects the data related to the level of studies of the farmers. More than 30% did a vocational degree and almost 20% went to the university.

Table 3: Level of studies of farmers

Level of education	Percentage (%)
None	6.25
Minimum compulsory	25
High school diploma	15.6
Vocational training not in agriculture	15.6
Vocational training in agriculture	18.7
University degree not in agriculture	12.5
University degree in agriculture	6.25

In terms of professional experience, most them of have been working in the sector for more than 15 years. Around 40% have more than 30 years of experience and 17 of them have previous experience outside the sector: 14 before becoming farmers and 3 combining both tasks for some time.

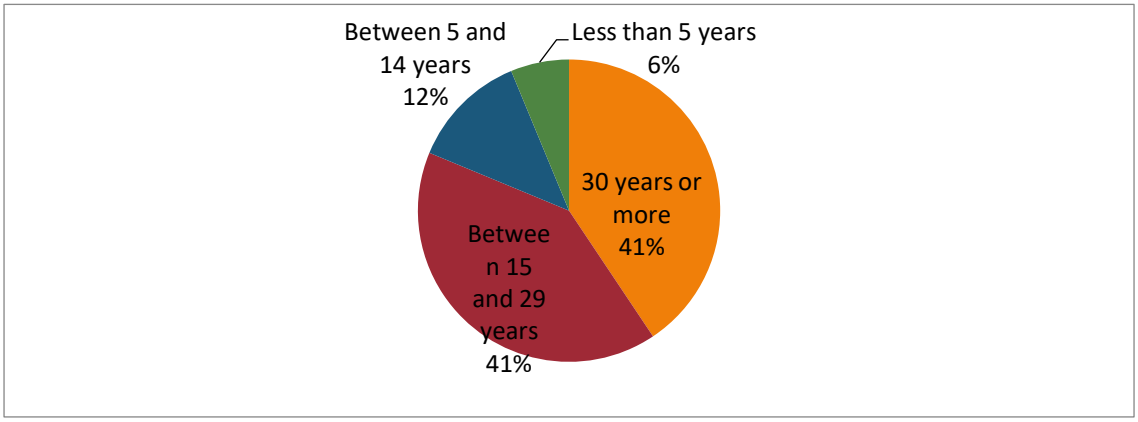


Figure 10: Years working in the farming business

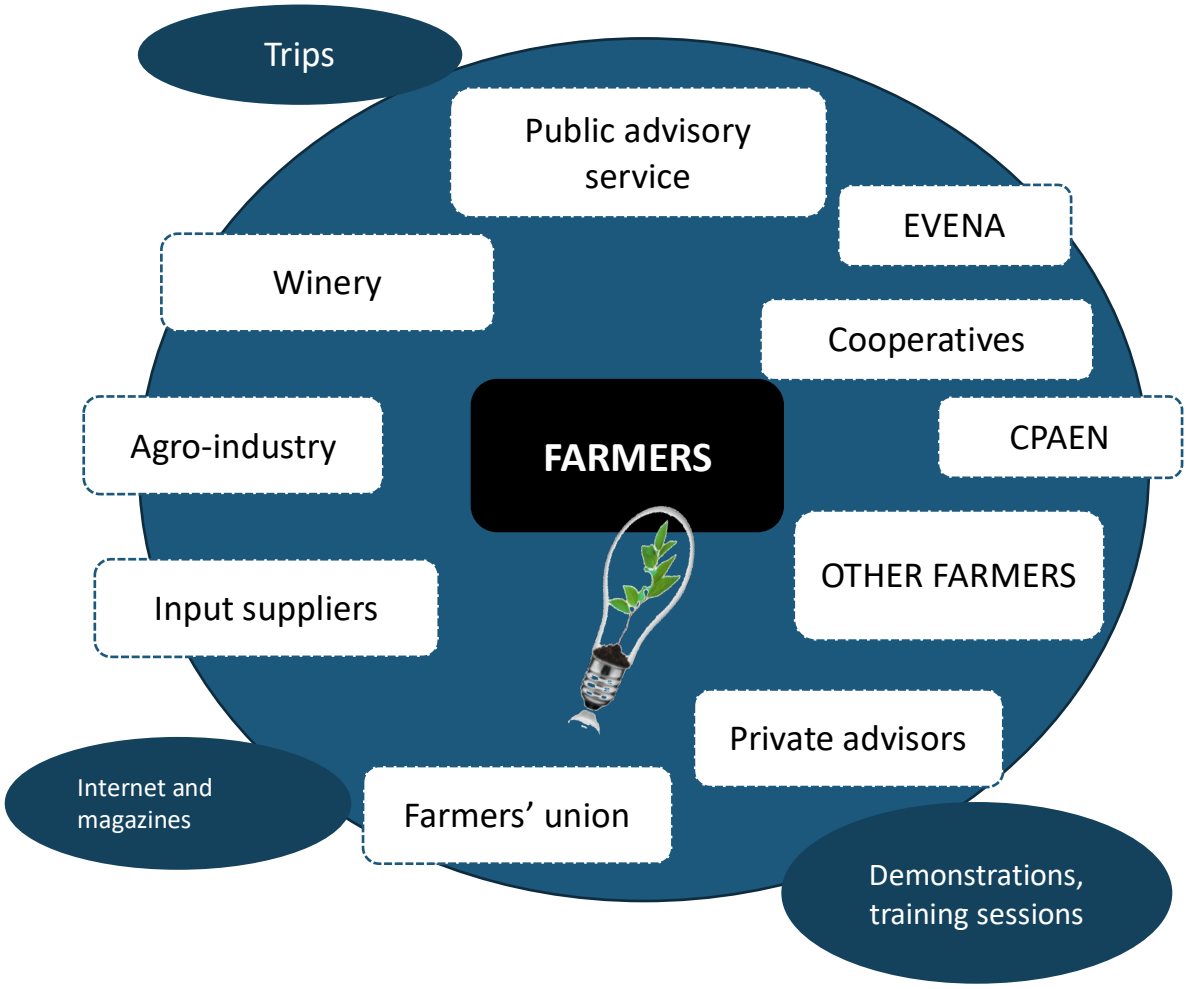
Regarding training, most of them attend at least one training event per year. Most of the meetings are about technical issues (demonstrations, legal changes, organic farming, new techniques, campaign results, etc.), organised by the public advisory service, the cooperative or winery, etc. In some cases there are also courses on financial issues, organised by agricultural unions.

Regarding the use of technologies to manage the farm, most of them use smartphones and some of them the computer for the administrative management of the farm. Two farmers have hired software and three of them have some specific application on their mobile phone for the management of the farm. The rest use whatsapp as a communication tool and also the SMS warnings service of the Pest Monitoring and Warning system of INTIA.

In short, the selected group includes the diversity of farmers of the region, located in different areas, with different types of crops, different ages, etc. However, when establishing comparisons between farmers

who have adopted the innovation or not, it has always been tried to compare similar profiles (in age, geographical area, type of crop, etc.).

5.1.1.2. Farmers' attitude towards innovation and change



The number of actors who are around farmers is broad. In most cases, members of the **Public Advisory Service** are mentioned as relevant. These advisors provide technical advice both personally on the farm and by phone or through talks, training sessions, etc. In the case of the vineyard the role of INTIA is replaced by EVENA (Viticulture and Oenology Research Station of Navarra).

Depending on the crop, other relevant actors also appear, such as **winery technicians** (vineyard), **cooperative** (fruit trees) and **agroindustries** (horticultural crops).

All the farmers said that **other farmers** are influential in the current management of their farms. **Input suppliers** are often cited, although on several occasions it is emphasised that, because of the commercial

interest that may be behind these companies, it is not as highly appreciated as public advice. The use of the Internet and subscriptions to magazines on agricultural issues are also relatively frequent. On some occasions, trips and seminars and demonstrations are mentioned as an important source of knowledge for the management of the farm.

Finally, in terms of advice on financial and administrative issues, agricultural unions and CPAEN (organic farmers) are mentioned.

With regard to the three main activities developed to acquire knowledge, all the interviewees emphasise that the most important thing is to talk to other people (other farmers and advisors). It is also considered important to test and experiment on the farm itself and to observe the innovation on other farms (journeys, trips, demonstrations, etc.). More than 30% of the farmers use the Internet as a source of knowledge. Learning through talks and workshops in cooperatives, wineries, INTIA, etc. is also mentioned.

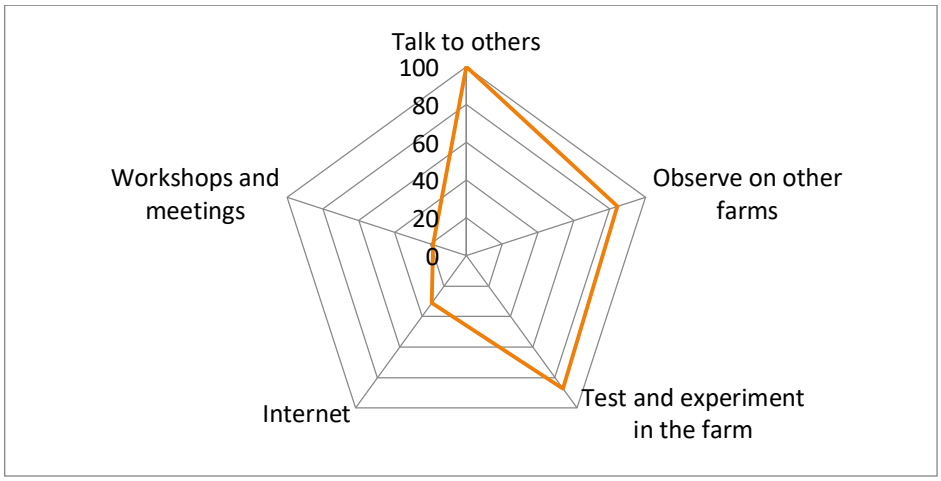


Figure 11: Three most important activities to acquire knowledge

In general, all the interviewees try new ways of doing things at the farm and they try to find solutions when problems occur. When asked about creativity, half of them think that they are creative (changes in machinery, cover crop mixtures, etc.). Most of them are interested in how things are done in other places and they search for information about new ideas. Some of them are influential and they try to persuade other farmers. However, many of them said that although they don't have any problem to talk about their experience, they don't try to convince anybody. When asked about problems and how to solve them, all of them said that they try to reach out people that can help them. The question in which all of them disagree is related to funds for the implementation of new ideas. They think that they don't have much economic support to implement new things and when they want to do it, they have to take the risk.

Table 4: Innovation profile

	I try new ways of doing things at my farm	I prefer to do things that require creativity	When something does not function well at my farm, I try to find a new solution	I try to get new ideas from other farmers or farm managers	I am interested in how things are done elsewhere, in order to use those ideas on my farm	I search for information on new ideas, in order to try to implement the best ones	When I have a new idea, I try to persuade others to implement it as well	When I have a new idea, I try to get support for it from others	I try to show others the positive sides of new ideas	When I have a new idea, I try to involve people who are able to collaborate in it	I develop suitable plans and schedules for the implementation of new ideas	I look for and secure funds that are needed for the implementation of new ideas	For the implementation of new ideas I search for new technologies, processes or practices	I try to involve key decision makers in the implementation of an idea	When problems occur during implementation, I try to reach out to people that can solve them	When I have a new idea, I look for people who are enthusiastic about it	I am able to persistently overcome obstacles when implementing an idea	I do not give up even when others say it cannot be done	I usually do not stop until I accomplish the goal	During idea implementation, I am able to persist even when work is not going well
Strongly agree	1	0	7	4	3	4	0	0	0	0	0	1	1	1	3	1	0	3	1	0
Agree	24	12	21	20	24	22	16	21	20	22	20	3	23	18	26	19	25	15	18	14
Neutral	3	12	0	5	1	3	8	6	7	6	5	11	4	6	0	6	2	5	8	11
Disagree	1	2	0	0	1	0	4	2	2	1	2	12	1	4	0	3	0	3	0	2
Strongly disagree	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

5.1.1.3. Farmers' innovation paths and trigger cycle change model

The alternative techniques analysed are known among farmers, although the context of each of them is different.

In the case of matting disruption, it is already widespread in specific areas of vine production. All the farmers know it and it has been applied for many years in areas with a high incidence of moths. The influential actors in this case are the **public advisory service**, **input suppliers** and **wineries / cooperatives**. In one of the cases, due to the initiative of the cooperative and collaboration with the input supplier (pheromones) at the beginning, it was possible to reach agreement with all the farmers of an area and they all have applied matting disruption for about 10 years, making it a very effective and profitable technique. Even those who do not use it, value this efficiency and profitability, but they claim that they do not have enough surface to implement it or that in some cases, the incidence of the pest is so low that it is not necessary to apply it.

The use of matting disruption in fruit crops is more recent, with the exception of organic farmers who started using it around 20 years ago. These organic farmers learned about the techniques in different ways, both through **suppliers** that brought results from other European countries and through the **public advisory service** (INTIA) and collaborations in projects. The rest of the farmers in the South of the region have started to use them more recently because of the change towards new production models (Directive on the Sustainable Use of Pesticides). Although the routes through which they know about the techniques are varied (INTIA technical staff, cooperative, input providers), it is the demand of the cooperative that increases the use of the technique.

In the case of greenhouses, matting disruption has become a common practice in the last three years, and it is difficult to find farmers who do not use it. The input supplier started to offer this new alternative three years ago and the knowledge about the technique has been extended through the technical staff of INTIA.

The use of biological control is quite common in greenhouse crops. Some farmers started using it more than 10 years ago. The **public advisory team** played a fundamental role in raising awareness of this innovation, but also the **input suppliers** play a fundamental role in supporting the implementation of innovation.

In the case of fruit trees, the use of biological control is less common. Farmers agree that the management is complex and that is why those who have implemented it, tend to abandon it or have many doubts about it. The technique is known through the public advisory service and the input supplier.

Finally, regarding alternative products in horticultural crops, their use has increased and is quite widespread among some farmers, also related to the initiative of the freezers with their tendency towards zero residue products.

Farmers' perception of the implementation of the innovation in the region varies according to the technique. In general, when the techniques work well, those who have tried them believe that if it is not applied, it may be due to a lack of information, a lack of surface to apply it or a lack of conviction or motivation in the use of alternative techniques. In this sense, in some cases the importance of the motivation of the advisor is highlighted when the farmer decides to evaluate / implement the innovation in his farm.

The non-adopters justify that they do not do it because of economic reasons, because they believe that their conditions (plot size, crop diversity, etc.) are not suitable for the technique, because they believe that

they are less effective and at the moment they have other tools to use or because they do not have a demand from the cooperative / winery/ freezer. In conclusion, they think that they are well informed and they have contact with people who can help them but there are other reasons that lead them not to adopt. Asked by adopters, non-adopters believe that they do it because they have better conditions and because they are convinced and they have a greater environmental commitment. There is a group of non-adopters who believe that these techniques have some advantages and are effective and they intend to apply them in a near future.

In the case of matting disruption, experience shows that it is an effective tool and most of them highlight the reduction in the number of treatments and the calm during the campaign as the main advantages. The non-adopters also value this technique for the security and calm it can provide during the campaign.

In the case of biological control, they believe that there is a lack of knowledge in general; the management is more complex because it requires a greater monitoring and they must use products that are respectful with the auxiliary fauna. They believe that this is why many farmers do not even consider it or decide to leave.

Table 5 shows the evaluation carried out by the interviewees in relation to different aspects (productivity, product quality, environment, etc.). Regardless of whether they are adopters or non-adopters, most of them believe that the techniques are beneficial in terms of productivity and product quality and very beneficial for the environment and their health. However, it is evaluated as neutral in the face of business competitiveness, since in most cases it does not mean higher revenues than conventional management.

Table 5: Evaluation of the techniques regarding different aspects

	Productivity	Quality	Environment	Farm workers' wellbeing	Business competitiveness	Local community	Social aspects
Very beneficial	6.3	18,8	65.6	59.4	9,4	18.8	18.8
Beneficial	59.4	56.3	34.4	37.5	15.6	50.0	50.0
Neutral	31.3	18.8	0.0	3.1	56.3	31.3	31.3
Detrimental	3.1	6.3	0.0	0.0	18.8	0.0	0.0
Very detrimental	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1st phase: Awareness

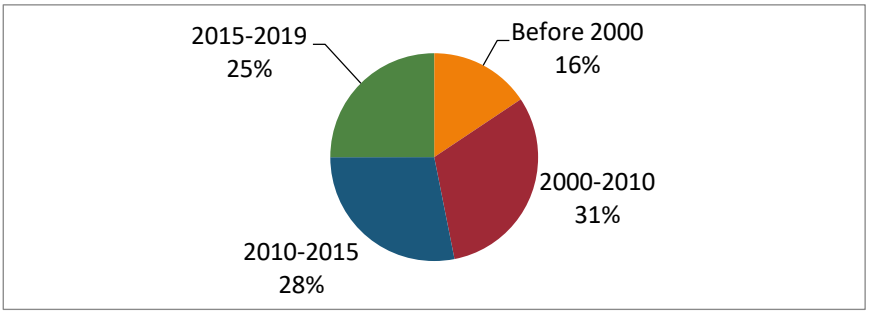


Figure 12: Awareness

All the farmers know the techniques (matting disruption, biological control and alternative products). The majority places the awareness date as of the year 2000. Those who do it in previous dates (during the 90s) are generally organic farmers who began to use these techniques as a tool in the management of their crops.

The awareness date also depends on the type of technique and the crop. In greenhouse crops biological control has been known for many years, while matting disruption is relatively recent. In the vineyard and fruit trees, matting disruption has also been known for some time, while biological control is also relatively recent. The actors involved in raising awareness are diverse and in many cases, more than one actor is mentioned. Figure 13 shows the list of actors and the percentage of interviewees who mentioned them. More than half of the interviewees learned about the technique through INTIA, either through visits to the farm itself or through demonstrations, training courses, conferences, meetings, etc. 34.37% of the interviewees said that they know the technique because they talked to other farmers who were already applying it or who were evaluating it. Suppliers also play an important role in raising awareness and were mentioned by 21.87% of the farmers. Finally, cooperatives and wineries and freezer agroindustries and EVENA appear. In one case the technique had been known through books produced by French research centres.

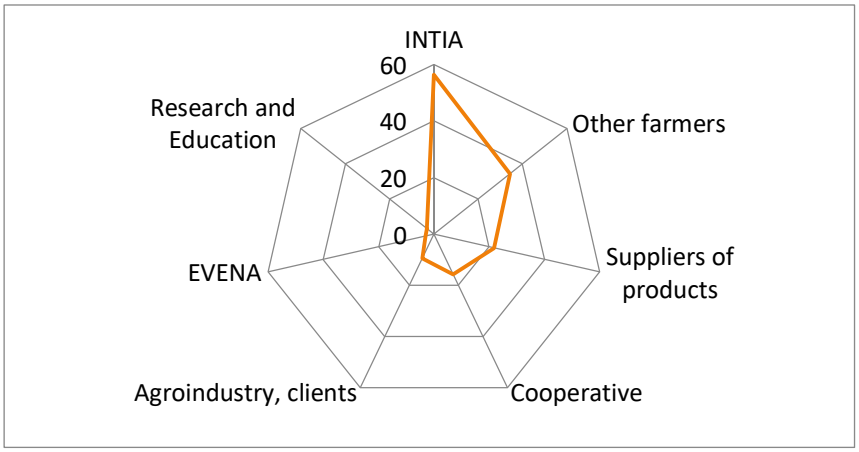


Figure 13: Actors identified in the awareness phase and frequency

2nd phase: evaluation

Although all the interviewees knew the techniques, not all of them decided to carry out an evaluation process to evaluate the implementation of the technique. Thus, 21.9% said that they had not evaluated the technique. However, in some cases the reasons that they alleged not to evaluate it, already indicated that perhaps indirectly there had been an evaluation. In fact, on many occasions, it was difficult for the interviewee to differentiate between the awareness and the evaluation phases. Knowing a technique during a meeting, a day or a visit already implied an evaluation and that is why it was difficult to make this differentiation. In some cases, when the technique had been known through another farmer or through books or the Internet, there was a clearer phase of evaluation in which they had to ask to an advisor (INTIA, supplier, etc.)

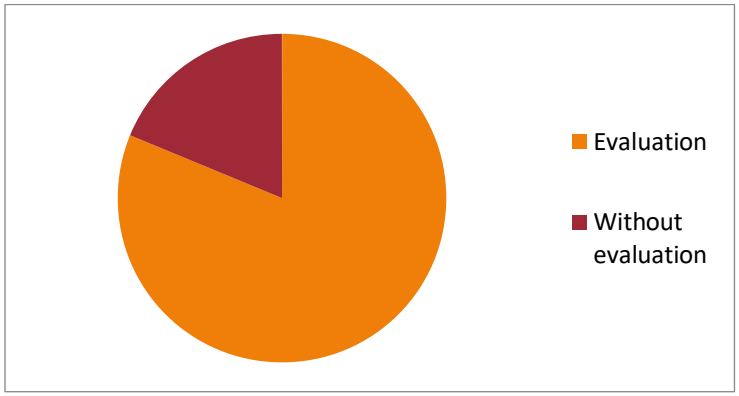


Figure 14: Evaluation (%)

All the interviewees who made the evaluation phase claimed having received support from different actors (technical staff of cooperatives, agroindustries, INTIA, EVENA, providers, etc.). Sometimes throughout the process new actors that were not at the beginning appear. For instance, if the technique is known through INTIA, EVENA or the cooperative, it may be that in later phases, providers of alternative techniques (pheromones, auxiliary fauna, etc.) appear. The way of interaction with influential actors is always personal, directly or by phone.

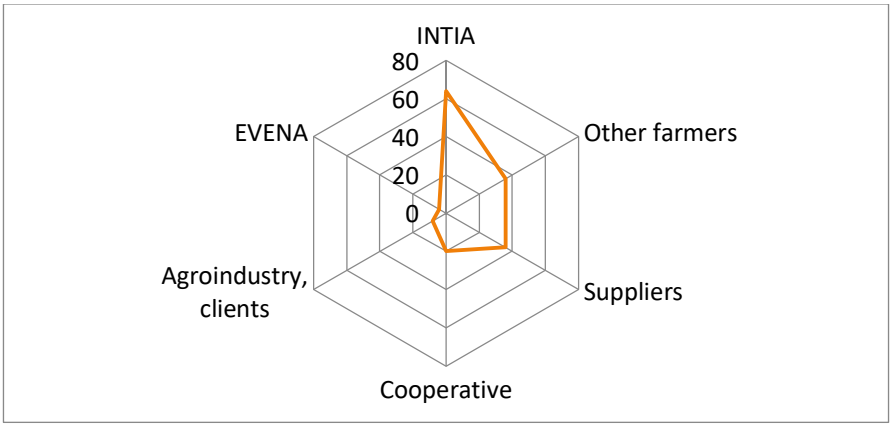


Figure 15: Support during evaluation

In general there is satisfaction with the advice received throughout the innovative process. In the case of organic farmers who started applying the techniques many years ago, they recognised that, although specific people helped them in the process, there was a lack of advice and the advisory service regarding the use of these techniques in those years was not developed. They had to travel to other places, talk to commercial houses, etc. in order to have the information they needed.

The reasons that led farmers to actively evaluate innovation were also varied. On one hand, in most cases it is considered that in situations where there are not many alternatives to control pests, it is one more option to solve the problems. This means that they decide to adopt alternative techniques because they expect these techniques to help them achieve their farming objectives.

The advantages that these techniques may have compared to conventional models of crop protection are also mentioned, such as the reduction in the number of insecticide treatments. This is important from different points of view: economic, reduction of workload and environment. In many cases it is also mentioned that it is the cooperative, winery or freezer that "force" them to make this evaluation by requiring the use of these alternative techniques. Finally, in many cases, there is an allusion to the environmental commitment, trying to produce in a more sustainable way, also for their own health.

In general, the evaluation process is short (no more than a few months). This process consists of collecting more information about the technique (technical information, environmental benefits, etc.), consulting other people who have tried it, travelling to see other farms, seeing feasibility under their own conditions, assessing it economically, etc. In cases in which there was a need of new solutions, the process was straightforward, with virtually no evaluation period. Regarding the needs to carry out this evaluation (figure 16), it is important to talk about it with other farmers and technicians, see it in other farms and learn through meetings, conferences, etc.

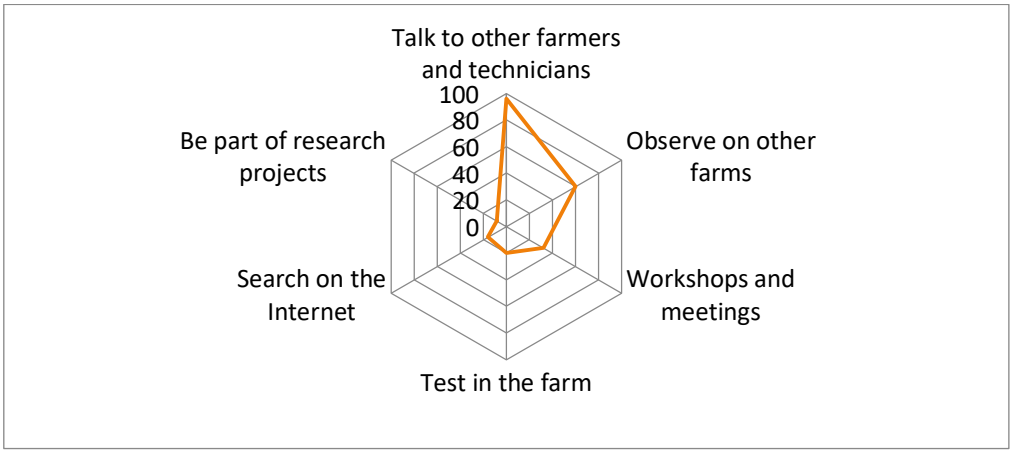


Figure 16: Activities to evaluate

Regarding the factors analysed for the evaluation (figure 17), the majority claimed that they evaluated the costs. In general, it is said that these techniques are more expensive, although it would also allow them to reduce treatments and they admitted that over time, this cost would be reduced. Sometimes the costs were decisive for decision-making. Thus, there was a case in which two neighbour farmers,

with the same advisory service and who knew the matting disruption at the same time, started to evaluate it and one of them decided not to implement it because of the additional cost that the additional cost of the technique.

On the other hand, most of the interviewees appreciated the benefits, although the criteria were different (benefits for the environment and for their own health, improvement in the quality of the product offered to the consumers, reduce the number of treatments, calm during the campaign...).

It is important to mention that costs have are key as they are an immediate factor and these techniques usually require an initial inversion. However, benefits are not immediate and they are frequently diluted among others and the society.

Finally, farmers also considered the risks, but mainly the uncertainties, especially when they were pioneers in the use of the technique and they were very new techniques and there was little information about them.

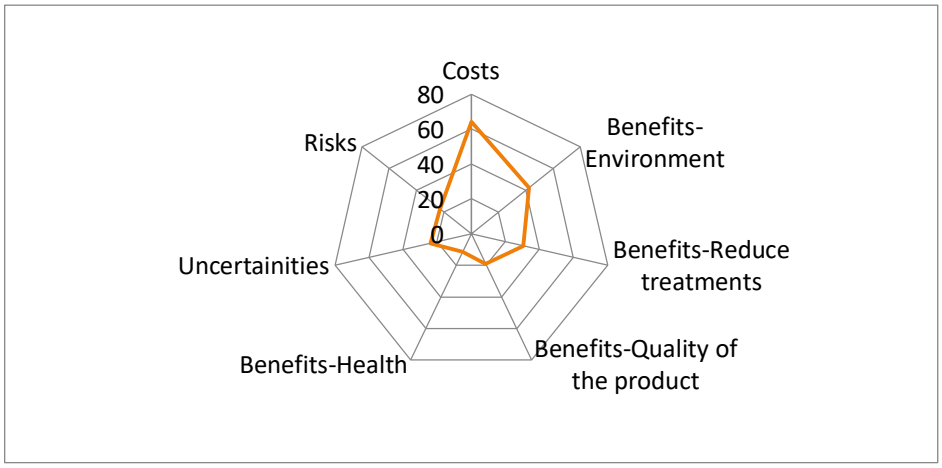


Figure 17: Factors considered during evaluation

3rd phase: Implementation

80% of the farmers who evaluated the innovation decided to implement it.

The implementation date extends from 2000 (organic farmers) up to now. In general, an increase has been observed in the last 4 years, following the Directive on the Sustainable Use of Pesticides, the change towards new production models and the increase in the variety of alternative techniques available in the market.

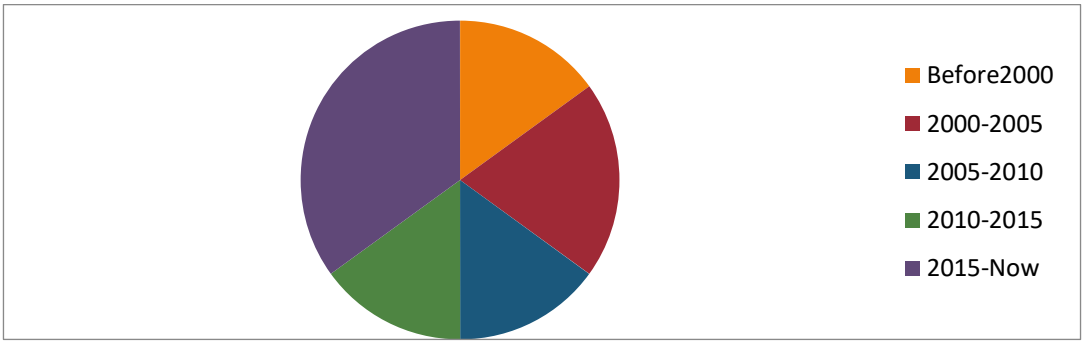


Figure 18: Implementation

Defining the implementation period was complicated, since it was difficult to differentiate when the technique was implemented and when it was consolidated. In general, the period lasts about one campaign. In some cases it takes longer because it is done in the framework of a project and in other cases they considered that they were still implementing it.

The motivations were also diverse, although the environmental and health reasons, the reduction of the workload and calm during the campaign repeat a lot. The satisfaction of offering consumers a better quality product is also mentioned.

Regarding the implementation of the technique, the actors remain the same. In this phase and in relation to the use of alternative techniques, the role of the technician of the supplier company is very important and farmers highlighted some of them for their special interest and support in the follow-up work on the plot itself, etc. Other important actors in this phase are INTIA technicians with their constant visits to the farms, other farmers, technicians of the agroindustry or cooperatives, EVENA, etc.

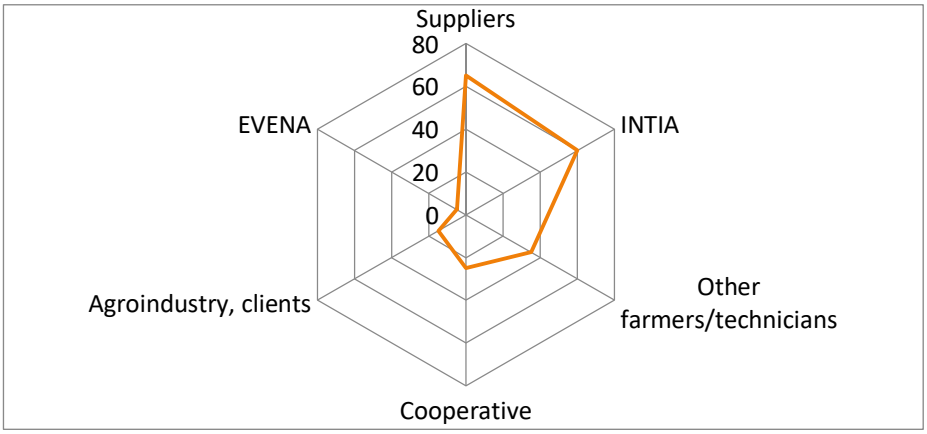


Figure 19: Support needed to implement

Regarding the activities that are necessary to implement the innovation, 100% of the interviewees believe that it was essential to talk about it with other people and test it on the farm. 70% of them thought that it was important to evaluate the results.

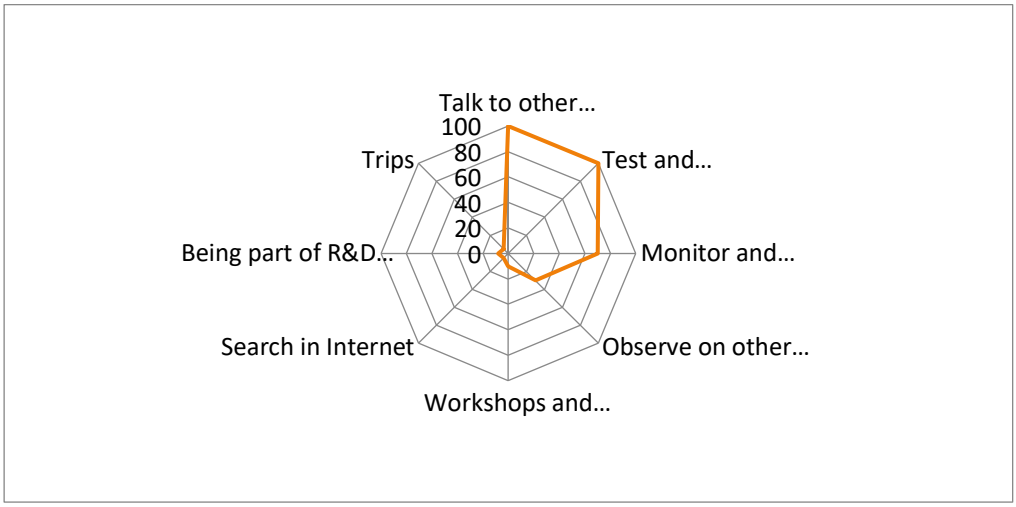


Figure 20: Activities needed to implement

NON-ADOPTERS

As for non-adopters, Table 6 lists the reasons why it was decided not to apply the techniques.

Table 6: Reasons not to adopt

Barriers	
Economic	In general, they are valued as more expensive techniques and, moreover, they do not provide a greater economic benefit since the product is sold at the same price.
Surface	In the case of the matting disruption, an important barrier is the area that is needed and the disposition of the plots of the farmers that prevent the technique from being applied effectively.
Lack of time	Sometimes the lack of time is mentioned. In the case of biological control, those who know it admit that it requires a lot of time to follow up and they see it as a complicated technique.
Lack of support	In one case it was believed that, although the situation has already changed, during many years there has been a lack of information regarding these techniques and their use has been little incentivised.
Subjective beliefs	
Lack of efficacy and demand	In some cases it was believed that the efficacy of these techniques was lower and therefore, having other techniques available, they did not even consider using them because there was no demand for their use by the cooperative, agroindustry, etc.

More knowledge is needed	Techniques such as biological control are considered complex to use since they require more knowledge, more monitoring tasks, etc.

Asked about the idea of implementing the techniques in the future, practically all non-adopters were willing to apply them (some of them in the short term and others considered it more long-term). Only those who claimed to have surface problems (small plots) to apply the techniques maintained that they would not apply them in the future. The rest did not discard it because they believe that the future of agriculture will be based on these techniques; they will improve and there will be conventional products used now that won't be allowed and that increasingly, cooperatives, agroindustries, etc. will demand this kind of production.

DROPPERS

Regarding droppers, three cases have been analysed. In two of them the technique used was biological control and the farmer gave up the technique recently (2015 and 2016). In the other case, the technique used was matting disruption and the abandonment occurred in 2006.

In relation to biological control, the factors considered were two: costs and lack of time.

In one case the farmer decided to use the technique to solve a problem he had with the pest, thinking that the technique would avoid having to be aware of the crop. However, the results were not what he expected and, contrary to what he thought, it required a lot of follow-up work to guarantee effectiveness. In the other case, the technique involved a high additional cost and the results were not too good to be able to compensate for this cost. The two farmers considered the possibility of using the technique again. In the second case, it was considered very in a short-term because now it had higher production and greater margin.

In relation to mating disruption, the problem was that it was a product that was sold as organic. This entailed an additional cost that was not compensated every year, because if there were high productions it was sold as a conventional product. This led to the abandonment of innovation although again, the farmer knew many farmers satisfied with the technique and was willing to re-implement it.

5.1.1.4. Farmers' innovation micro-AKIS

In this innovation case the actors who are involved in the innovation micro-AKIS are more or less the same to those who are involved in the general micro-AKIS. In the case of suppliers, there are some differences since people who sell conventional pesticides do not appear in the innovation micro-AKIS (pheromones and auxiliary fauna). There are multiple triggering events: health and environmental issues, demand from coops and industries, need of alternatives, etc. The actors who are involved in the cycle are more or less the same in all the phases, although sometimes there are some differences between the actor who helps triggering and the actor who help evaluating or implementing (i.e. triggered by the public advisory service and helped later by a pesticides' supplier).

When the actors who influence the decision-making are part of the farmers' general micro-AKIS, the interaction is always constant or frequent. However, when there is another trigger event (trip, visit, etc.), the interaction is more sporadic. The nature of this interaction is always one to one (only in some cases training sessions). Regarding the reciprocity, there is always reciprocity in later stages. In general, there is no reciprocity in the awareness stage.

Family labour is not relevant in this case. There are some family members (spouse, brothers, son...), but hired labour is more frequent in this case. In general, there is no influence of the opinion of hired workers in the decision to implement. However, it is observed that the opinion of the family member is important and sometimes it can be negative because it requires more labour, less tome at home, etc.

5.1.2. Findings from the AKIS experts interviews and advisory organisations survey

5.1.2.1. Advisory landscape in the focus region

The advisory landscape of interviewed farmers is formed by public and private organisations that are working at a regional level.

Organisation	Type of organisation
INTIA	Public applied research and advisory service
EVENA	Public experimentation and advisory service (vineyard)
COOPERATIVES	Farm based organisations
AGRO-INDUSTRY	Private sector
INPUT SUPPLIERS	Private sector
Independent advisors.	Private sector
CPAEN	Public sector
Farmers' unions	

5.1.2.2. Key players of advice for the innovation area in the focus region

The actors who took part in the interview (AKIS experts and advisory organisations) listed the following advisory organisations as key players of advice in Navarra: INTIA, technicians from cooperatives, technicians from agri-food industries, input supply companies (alternative products) and independent technicians.

5.1.2.3. Transformation of advisory landscape

The interviewees from advisory organisations are exclusively dedicated to the agricultural field and offer advice in relation to plant production (advice on farms, farmers and groups of farmers, etc.). The cooperation of these organisations is intense with universities, research centres, public authorities and private companies. All of them make continuous training through universities, private companies, suppliers of agricultural inputs, processors of agricultural products, etc.

The date on which the interviewees first learned about innovation is located more than twenty years ago. In some cases, it was known abroad and in other cases here, through administration staff of this and other regions, publications, research projects at INTIA, congresses, etc.

In relation to the introduction of alternative techniques, the first step was the monitoring carried out through the Pest Monitoring and Warning system and later with mating disruption, biological control and massive trapping. In general, organic farmers were the first to adopt them, although there have also been occasional cases in which the use of the technique was promoted by INTIA as a measure to solve problems of pest control.

Regarding the reasons why the interviewees believe that it is decided to adopt the innovation, all agree that it is due to the lost of many pesticides from the market and the increase in the demand of products with less pesticide residues from consumers (market driven innovation).

The interviewees believe that there are not many people who have abandoned the innovation once it has been implemented, either because the decision to adopt them is linked to environmental and health reasons or because they are considered to be effective methods that complement or can replace conventional products used so far. If they have abandoned it, they believe that it may be because it is not technically viable (size of plots, crop diversity, etc.) or because it is very expensive.

In relation to whether the farmers analyse the positive and negative effects of the innovation, it is believed that it is something basic and that they analyse as a priority the effectiveness and its cost. In relation to this, it is believed that sometimes the negative effects are appreciated more than the positive ones. On the other hand, there are those who think that, regardless of the positive or negative effects, they end up adopting it because there is a demand on the part of the cooperative or the agroindustry.

The advisory organisations interviewed believe that the advice is a basic support until the farmers accept the alternative technique as a useful tool for their production purposes. If the advisors do not believe in the techniques and do not disseminate them, there may be many people who are excluded from the process. The advisors must know the techniques, both from the point of view of effectiveness, as well as their economic cost. They should accompany the farmers who adopt them from the beginning, and if possible use them as a showcase for the rest. In one case it is emphasized that advisory is not the only role and that although their support is essential, in the end the decision is made by farmers.

The organisations identified by interviewees as providers of advice, informing about the techniques and helping in the evaluation and implementation are: INTIA, cooperatives and agroindustries (if they know the techniques) and companies of pesticides and alternative products. In this sense, it is believed that the support of advisory organizations is vital in all phases of decision-making (awareness raising, evaluation and implementation), although implementation is considered as the phase in which support is most essential.

The advisory organisations that are considered most active were the companies that provide alternative products, because they sell the techniques. At the same time, providers highlight their role and that of the administration and INTIA in the dissemination of knowledge about the techniques.

To the question of whether they believe that there have been phases in which advice could be given and the advice was not provided, all agree that there have been times when advice has been lacking in this sense, due to cost issues (expensive techniques), lack of demand from the market, fear of worse efficiencies, reduction of productivity, etc. They believe that in some cases this happens.

Asked about the role of the administration, it is thought that it has had an important role supporting through funds, projects, training, etc. There are also those who, putting other countries as a model, believe that more could have been done. The policy maker itself believes that it can play a very important double role: directing INTIA's advisory policy, forcing the inclusion of these techniques in technical advice, providing and supporting INTIA with better tools for advice, identifying priorities in experimentation, research and projects that include the improvement of the knowledge of these techniques and their transfer to the sector and to INTIA's own technicians; and on the other hand, giving funds to farmers or increasing money to encourage the use of techniques that respect the environment, through the PDR to the use of specific alternatives, promoting the use of local varieties adapted to the environment.

Asked about the challenges that the advisory services have had to face in order to promote the use of the techniques, it is believed that it has been necessary to acquire the knowledge and demonstrate the viability of the techniques (continuous training, exchange of experiences and good practices, confidence in the results...). Finally, in relation to the skills and strategies that are needed it is mentioned that it is necessary to believe in the techniques and learn to use them in each situation to advice on them.

5.2. Case 2: the role of farm advice in innovation case study DIRECT MARKETING

5.2.1. Findings related to the farmers' survey

5.2.1.1. Farmers' profile and farm structure

Regarding the profile of the farmers analysed in the interviews, the graph shows the different sectors to which farmers belong. Three farmers have dairy cattle and sheep.

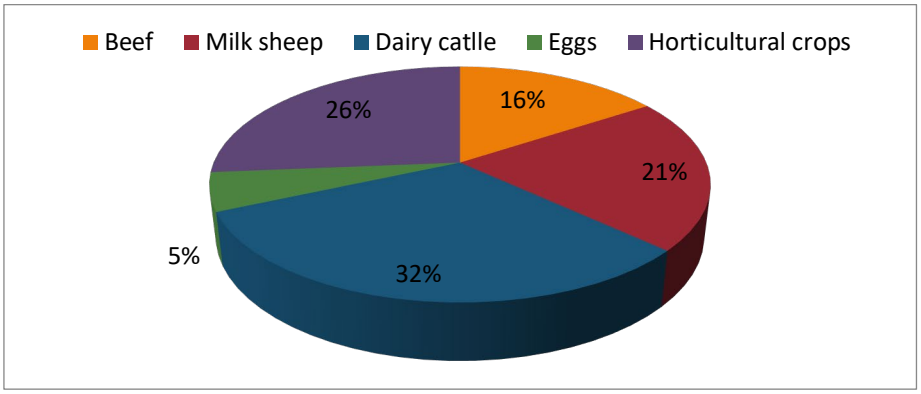


Figure 21: Distribution of farmers

The following graph shows the profile of the farmers in relation to the size of their farm.

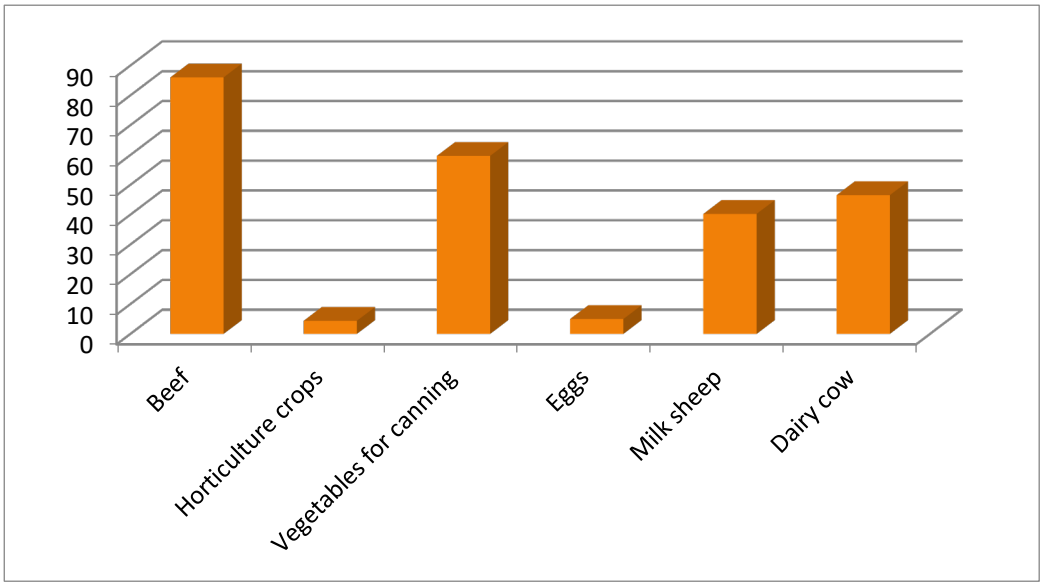


Figure 22: Number of farmers and land

Regarding the structure of the farm: The production of beef cattle that use communal pastures are those that account for the largest number of hectares, followed by farmers of horticultural crops such as pepper, asparagus, etc. Dairy cattle farms are very similar. Those who produce vegetables and poultry need less land.

With regard to the number of heads, it is different among the type of livestock.

- Dairy cow: Between 20 and 220 dairy cows
- Beef cow: Between 10 and 80 nurse cows
- Sheep: Between 50 and 500 milking sheep
- Poultry: Between 500 and 1200 laying hens

As the heterogeneity is very high, it has been tried to make similar pairs of farmers (structure of the farm, product and age) to make a comparison between similar profiles of adopters and non-adopters.

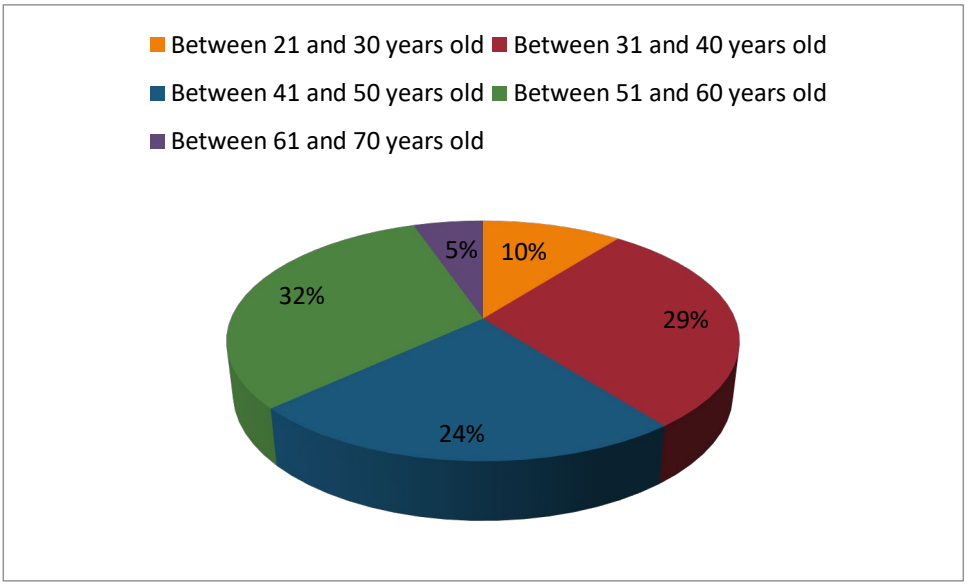


Figure 23: Distribution of interviewees by age

All the farms are family farms and most of them are not related to other types of activities such as agro tourism (only two of them). Most of the respondents live in the farm (92%).
In most of the cases, family members who are also partners of the farm, carry out the work. However, in the 37% of the cases they have permanent staff hired (especially dairy and beef). Regarding work regime, temporary labour occurs in the 29% of the cases and mostly in horticultural crops at harvest time.

Regarding the age, most of the respondents (85%) are between 31-60 years old. Those under 31 years old represent only the 10% and those over 61 years old, the 5%. None of them has a successor.

Figure 24 shows the data referring to the level of studies of the farmers. The 27% have studied vocational training in agriculture and the 11% have university studies in agriculture.

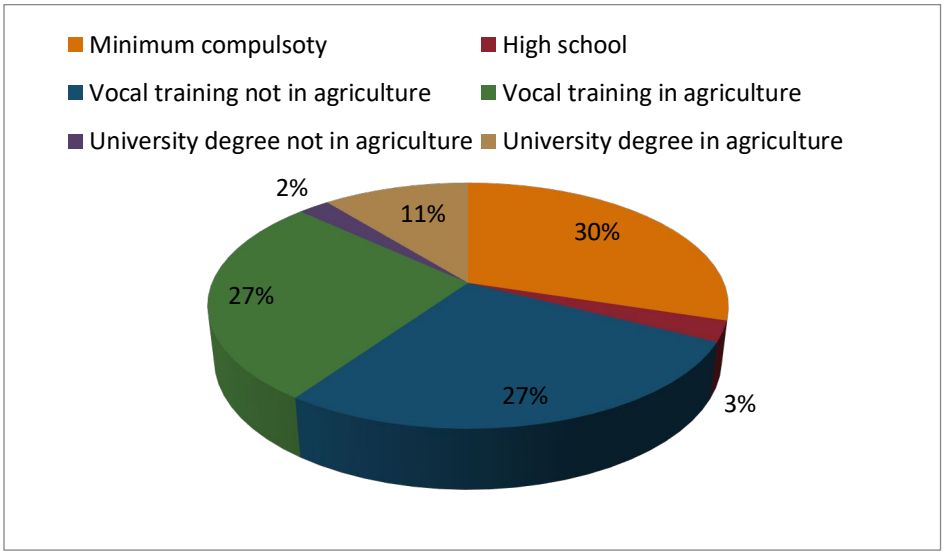


Figure 24: Distribution of interviewees by level education

In terms of professional experience, most of them have been in the sector for more than 12 years. Around 45% have been engaged in agriculture for more than 30 years and 29 of them (76%) have experience in other sectors: 21 before becoming farmers and 8 combining both tasks for some time.

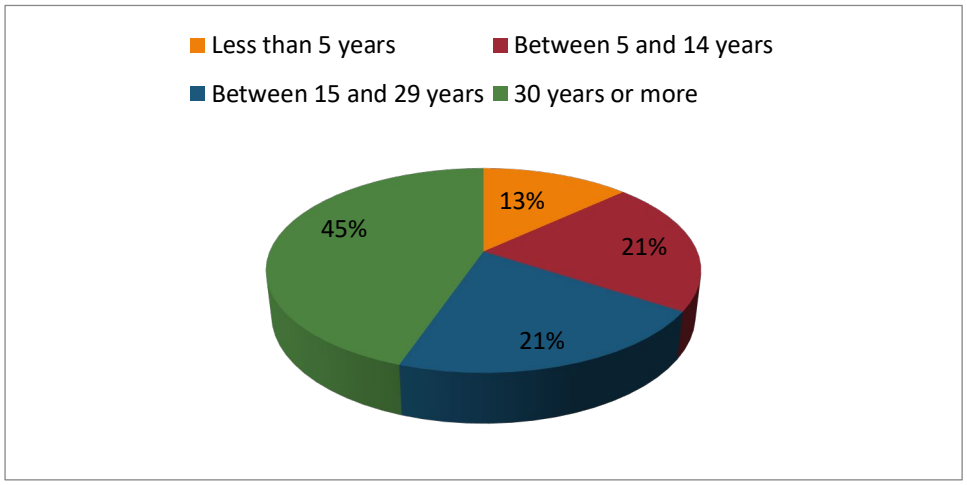


Figure 25: Professional experience of the interviewee in agricultural sector

Regarding training aspects, 60% attend at least one training day per year. Most of the trainings are about technical issues (dairy products development, ecological management, use of mountain pastures…)

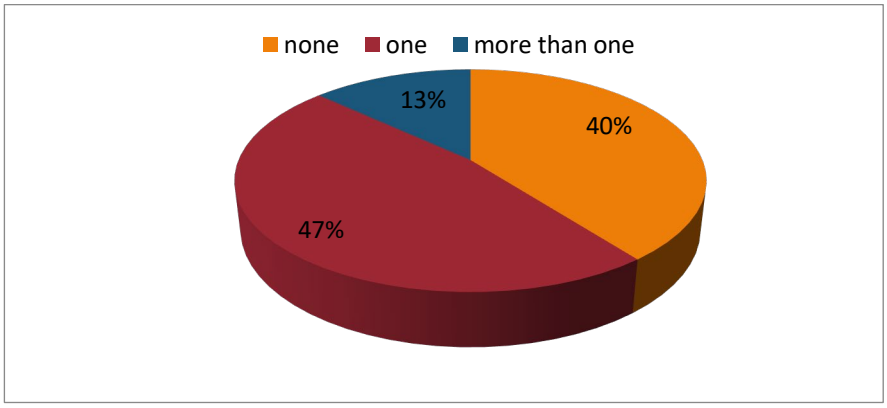
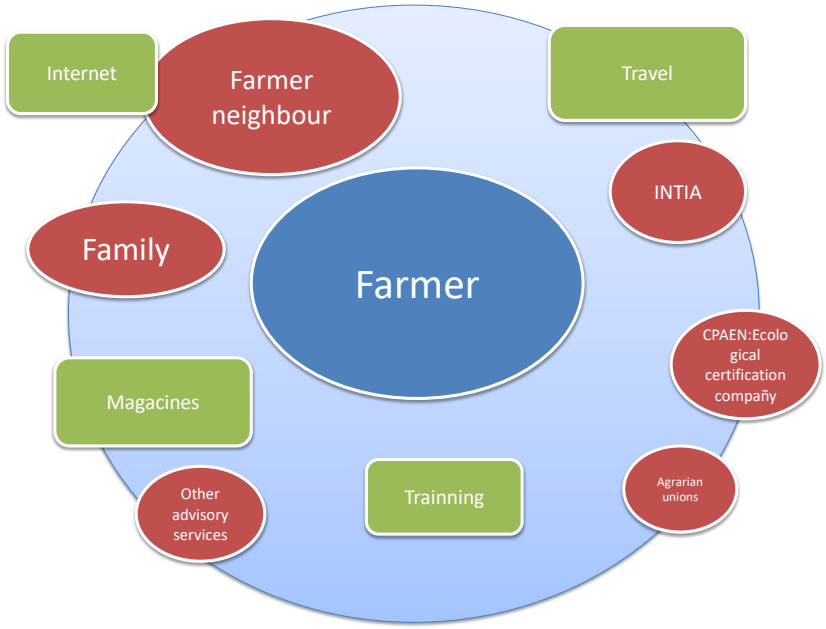


Figure 26: Training of farmers

Regarding the use of technologies for the management of the farm, most of them use the smartphone and the computer. Almost all dairy cattle farmers have contracted software for herd management.

In short, the selected group includes the diversity of farmers of the region, located in different areas, with different types of products, different ages, etc. However, when establishing comparisons among farmers who have adopted the innovation or not, it has always been tried to verify similar profiles (in age, geographical area, type of production, etc.).

5.2.1.2. Farmers' attitude towards innovation and change



There are many actors around the farmers, but there is no specific advice for direct marketing. Therefore, farmers talk to people they trust, family and other neighbour farmers. In many cases, members of the

INTIA advisory team are mentioned as relevant actors. These provide technical advice both personally and by phone or through talks, training sessions, etc.

Depending on the product, other actors also appear, such as advisors related to dairy products and organic farming and in the case of sheep cheese, the Designation of Origin 'Idiazabal' and the association 'Artzai gazta', etc.

The use of the Internet to consult and subscriptions to magazines on agricultural issues are also relatively frequent. On some occasions, trips, conferences and fairs are mentioned as an important source of knowledge for the management of the farm.

Regarding the three main activities to acquire knowledge, all the farmers stress that the most important thing is to talk to other people and observe other farmers, experiment and record the results. The Internet is considered important as a source of knowledge.

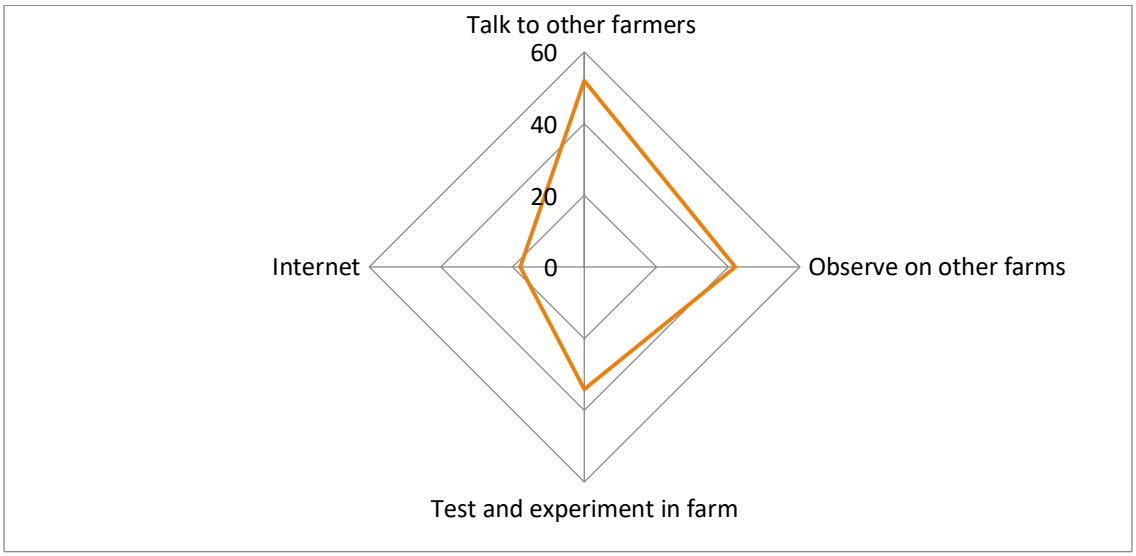


Figure 27: Activities to acquire knowledge

The interviewees have many concerns: They like to know how other farmers work and to be informed about new ideas to implement the ones that best fit them.

They are also persistent even if other people do not support them and are able to overcome obstacles and not stop even if the work does not work.

Some of them are also very independent and do not need to convince others when they think they have a good idea, nor need enthusiastic people for that idea to support them.

Table 7: Innovation profile

	I try new ways of doing things at my farm	I prefer to do things that require creativity	When something does not function well at my farm, I try to find a new solution	I try to get new ideas from other farmers or farm managers	I am interested in how things are done elsewhere, in order to use those ideas on my farm	I search for information on new ideas, in order to try to implement the best ones	When I have a new idea, I try to persuade others to implement it as well	When I have a new idea, I try to get support for it from others	I try to show others the positive sides of new ideas	When I have a new idea, I try to involve people who are able to collaborate in it	I develop suitable plans and schedules for the implementation of new ideas	I look for and secure funds that are needed for the implementation of new ideas	For the implementation of new ideas I search for new technologies, processes or practices	I try to involve key decision makers in the implementation of an idea	When problems occur during implementation, I try to reach out to people that can solve them	When I have a new idea, I look for people who are enthusiastic about it	I am able to persistently overcome obstacles when implementing an idea	I do not give up even when others say it cannot be done	I usually do not stop until I accomplish the goal	During idea implementation, I am able to persist even when work is not going well
Strongly agree	6	5	12	11	12	6	1	1	2	3	1	4	2	2	10	2	5	8	8	5
Agree	22	13	25	23	21	25	12	25	24	28	16	20	17	15	27	18	30	24	20	19
Neutral	6	14	1	2	3	3	15	8	5	4	12	6	12	12	1	15	2	3	8	11
Disagree	4	4	0	2	2	4	10	4	7	3	9	7	6	8	0	3	1	2	2	3
Strongly disagree	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0

5.2.1.3. Farmers' innovation paths and trigger cycle change model

All the farmers know about short marketing channels. In many cases their parents, mothers, grandmothers and / or grandparents did it. Years later, with the industrialisation of agriculture, that way of selling were lost (most of them chose to sale the product to the agroindustry).

Nevertheless, in Navarra there has been a sector that has maintained this way of selling: sheep cheese. This process has been helped by the Designation of Origin (D.O) Idiazabal that together with the association 'Artzai gazta' carry out various fairs and contests to publicise this product.

In the production of this cheese the physical dimension of the farm has not increased, due to the limitations of the breed and natural resources and this has provided stability to the sector, with no surpluses, maintaining a balanced supply and demand, direct relationship with those who consume and a good selling price.

Currently, international organisations such as FAO and WHO see direct sales as a reflection of global changes in production, consumption and health patterns and in Navarra some initiatives in this sense are being timidly developed. This type of adoption is a retro-innovation because the way of selling is different and the production is focused on high quality label products, to be able to make them different from conventional.

With the aim of promoting and developing this commercialisation channel, INTIA has created recently a support team to help farmers who want to adopt this innovation.

The adoption or not of this type of commercialization is closely related to the subsector to which they belong:

Dairy cattle: Very few dairy cattle breeders have adopted the innovation. During the last two decades they have intensified production and milk industries collect their product. This intensification has led to obtain a product without quality label, a 'commodity'. Therefore, direct marketing does not fit in this scheme. Note also, that the sanitary hygienic regulation is not developed in this sense and is the major obstacle to the development of this commercialisation path.

Vegetables: In horticultural crops (lettuce, chard...) there are two types of profiles that are related to personality and farming objectives. There are some farmers who prefer to focus only on production or those who choose to reach the consumer, developing the entire cycle.

Farmers of asparagus, peppers and artichoke, on the other hand, are closely related to the canning industry and few of them choose to adopt the innovation.

Beef cow: The difference in price (the added value) has been in this case the trigger for most of those who have adopted innovation.

Sheep of milk and eggs: There are also two profiles; those who transform their product (minor productions, start-up of a cheese factory, more family labour...) or those who choose to focus on production.

Table 8 shows the evaluation carried out by the interviewees in relation to different aspects (productivity, product quality, environment, etc.). Regardless of whether they are adopters or non-adopters, most of them believe that the innovation is beneficial or very beneficial in terms of product quality, competitiveness, local community and social aspects. Regarding productivity, it is considered detrimental. Farmers who adopt innovation generally produce less because in many cases there is a quality label that limits their production levels or because there is an increase in the added value that makes unnecessary to produce more. Regarding the health and well-being of the farmer, there are some who see it as beneficial because it gives them satisfaction (some adopters). The majority of those who do not adopt it, link the innovation to workload and stress. Finally, although more than 40% consider it as beneficial to the environment, almost another 40% defines it as neutral, since they considered client's energy expenditure in going to the farm.

Table 8: Evaluation of the techniques in relation to different aspects

	Productivity	Quality	Environmental health	Workers welfare	Business competitiveness	Local community	Social issues
Very beneficial	2.6	18.4	15.8	7.9	21.1	21.1	18.4
Beneficial	5.3	47.4	42.1	28.9	57.9	53.2	63.2
Neutral	39.5	34.2	39.5	39.5	18.4	26.3	18.4
Detrimental	47.4	0	2.6	21.1	2.6	0,0	0,0
Very detrimental	5.3	0	0,0	2.6	0,0	0,0	0,0

1st stage: Awareness

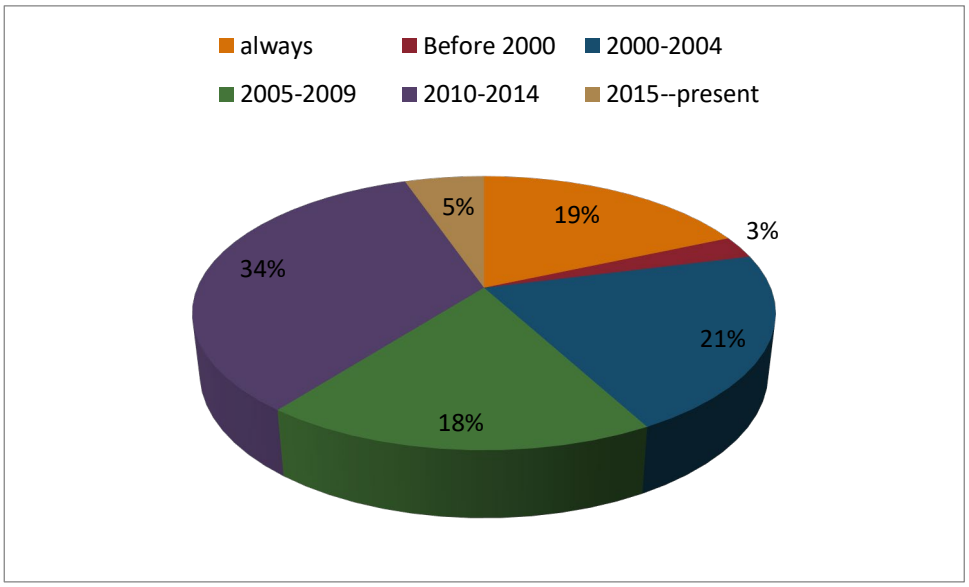


Figure 28: Date of awareness

All the interviewees know direct marketing. Although 19% of the respondents claim that they have always been aware of this opportunity, most of them have considered it as an option in their farm on a specific date and in a specific context: 73% have developed this phase between 2000-2014.
The time required for awareness has been less than one year, in the 37% of the cases it has lasted less than two months.
The most influential actors are trusted people, such as family (74%), neighbour farmers who have adopted innovation (45%) and INTIA staff (21%).

In most cases there is reciprocity and the nature of the interaction is face to face or by telephone in some cases. The other types of interaction do not matter.

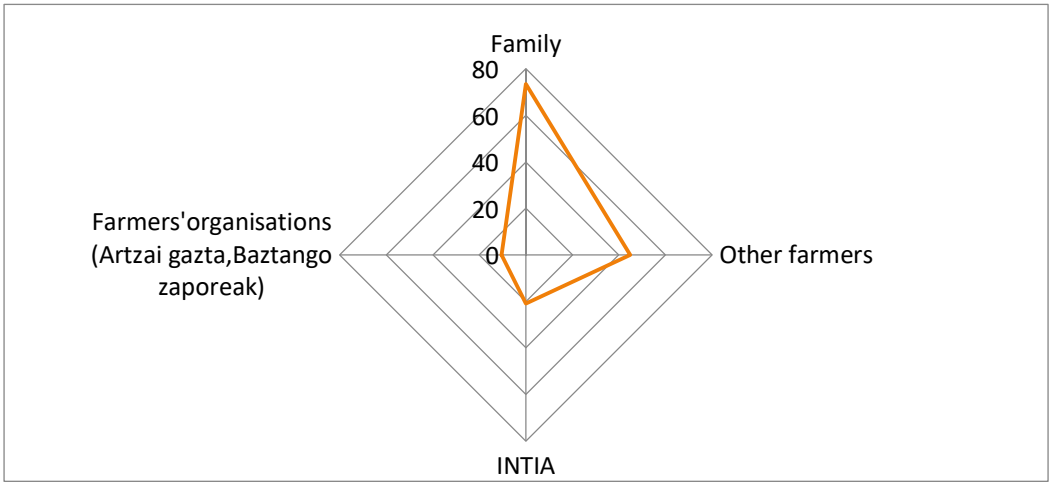


Figure 29: AKIS of awareness

2ª stage: Assessment

Although all farmers knew the innovation, not all of them decided to carry out an evaluation process to evaluate its implementation. Thus, 33,3% said that they had not evaluated the technique. One of them does not rule out evaluating it in the future, relating it to an own brand. The others are not interested.

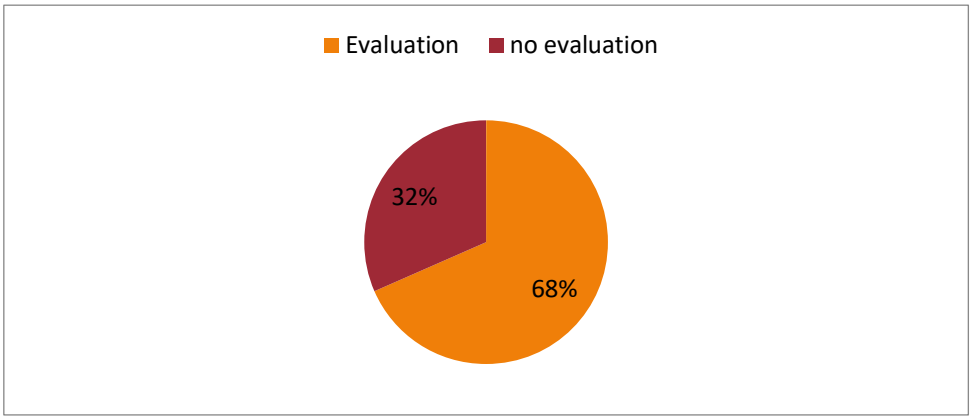


Figure 30: Percentage of interviewees who evaluated the innovation

In this phase, where technical advice (feasibility studies...) becomes important, family and other farmers are less frequent and INTIA, associations and timidly, other private advisers become more frequent. The way of interacting with the influential actors is always personal, directly or by phone.

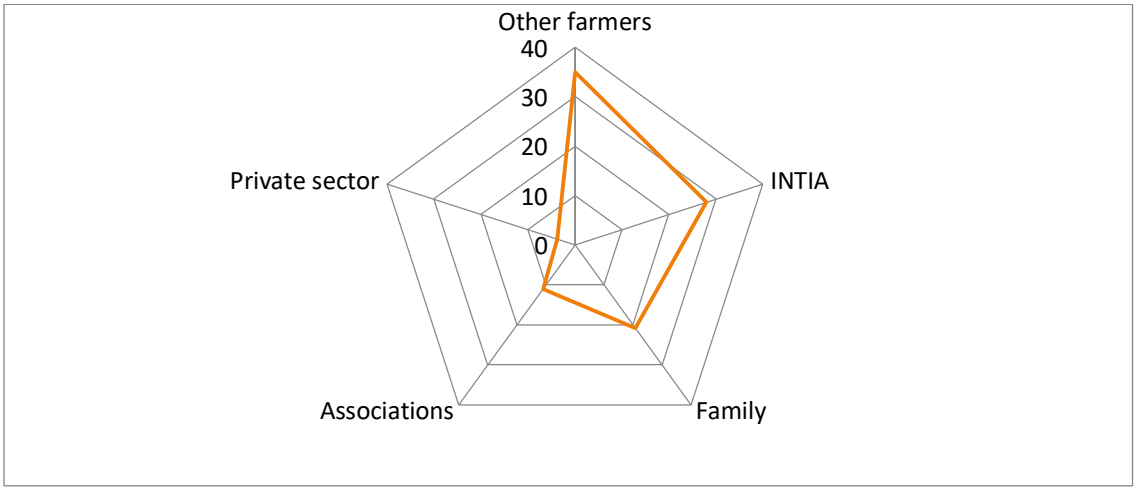


Figure 31: Support received during the evaluation stage.

The reasons that led them to actively evaluate the innovation were also varied. There are three reasons that repeat a lot:

-Economic motivation: Implementing this type of marketing increases the added value and benefits of the business.

-To be able to work and live in their town: In some cases, this innovation entails more labour and it is possible to establish positions for more people

-Philosophy of life: Focus on the quality of the product to satisfy the final customer and interact with him.

The evaluation process took place mainly during the years 2000-2014. In 96% of the cases the evaluation process lasts less than 1 year, from 3 to 6 months in 50%.

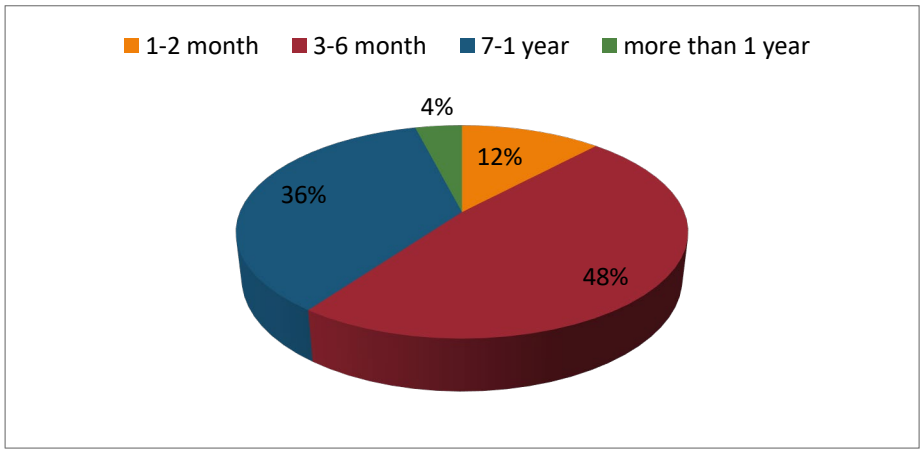


Figure 32: Assessment duration

Regarding the needs to carry out this evaluation (figure 33), it is important to talk about it with other farmers, see it on other farms and carry out tests on the farm.

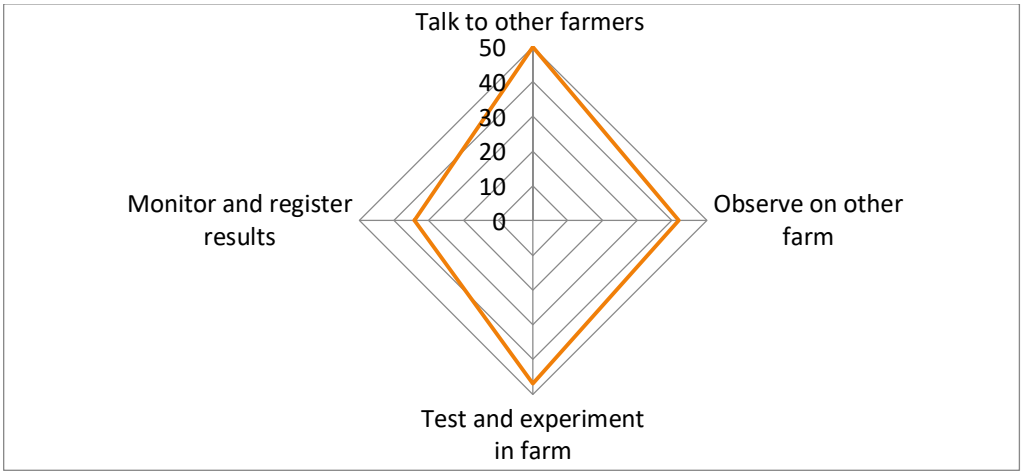


Figure 33: Activities needed to assess innovation

The answer to the doubts in this phase is solved by a short channel: Observing and talking to other farmers who have adopted it and carrying out tests on their farms (making cheeses or other dairy products in its majority).

Regarding the factors analysed for the evaluation (figure 34), some of them have not considered any factor. This innovation along with the development of their product has been their dream and they were decided to go ahead. The rest claimed to have evaluated the costs (50%). In fact, for cattle and sheep farmers in

which the adoption of this way of marketing goes together with the elaboration of dairy products (cheese, yogurt...) the costs are very important. All of them mentioned that sanitary hygienic requirements in comparison with other European countries are more demanding, increasing the costs of the building and the equipment.

With regard to the benefits, since it is very difficult to put an approximate number to this factor, in many cases it has not been taken into account (only the 30% has evaluated economical benefits). Finally, the side effects were also considered, such as the extra time that is needed to sell and distribute and that could influence the time they spend with their family. The risks and uncertainties are not relevant factors in the evaluation; they are used to face the problems.

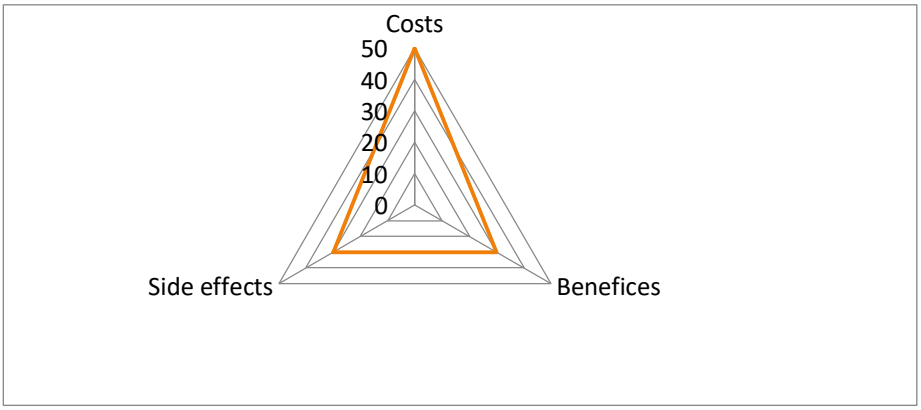


Figure 34: Considered factors for assessment

3ª stage: Implementation

With regard to implementation, the 77% of the farmers who evaluated the innovation decided to implement it. Regarding the implementation date, 63% did so in the period 2005-2014.

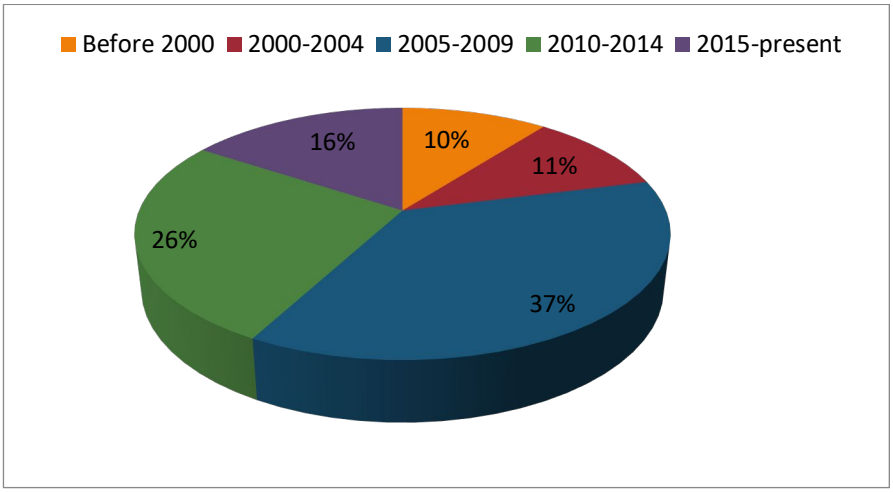


Figure 35: Implementation date

The implementation phase lasts from 3 months to around a year in 75% of the cases. It is the longest phase, in many cases related to the time that is needed to build the infrastructure.

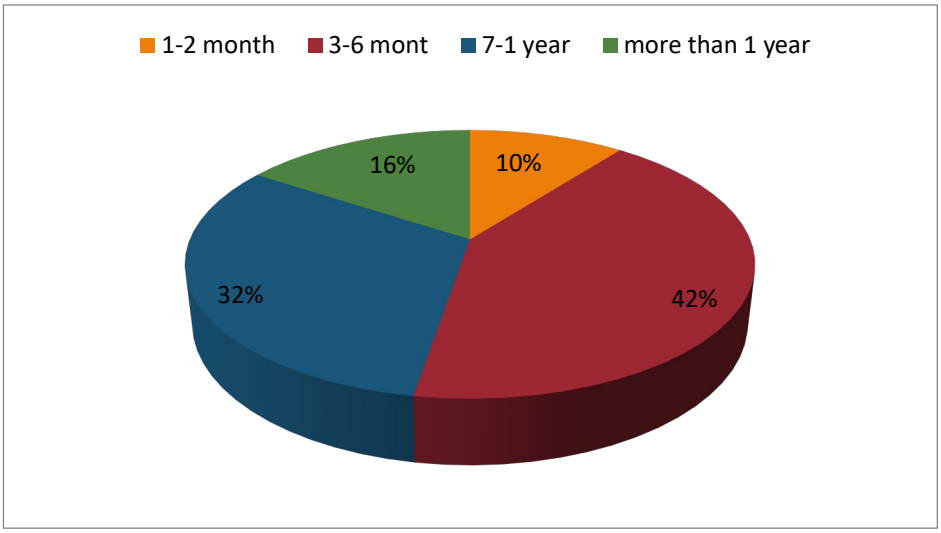


Figure 36: Implementation period

The motivations are related to those that led them to evaluate: The maintenance of the family business (which is linked to live in the village and to be a farmer) and to have a job (economic).

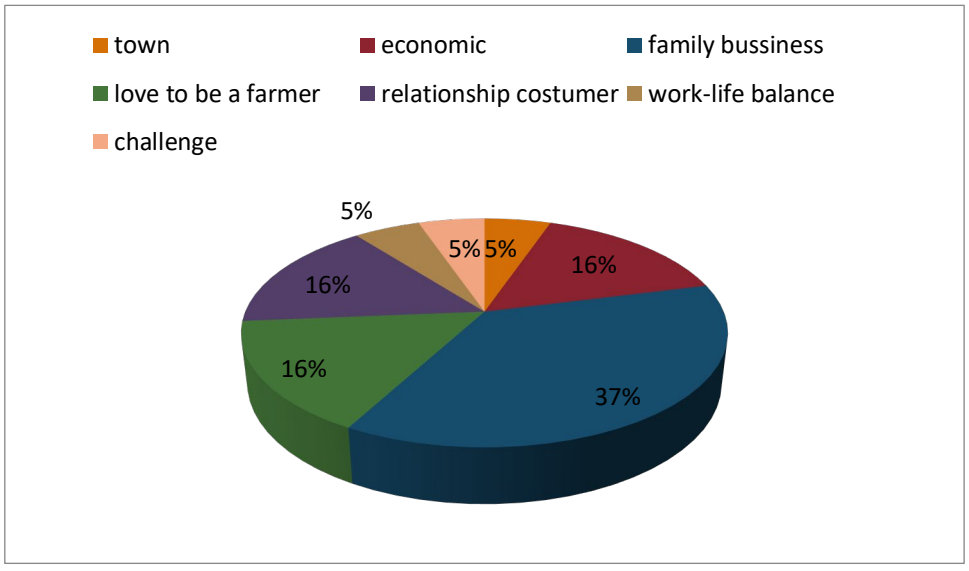


Figure 37: Reasons to implement

Regarding actors, they remain the same, but their frequency changes. Given that implementation is a more technical issue, technical advisors (INTIA) are more important compared to the previous phases (this advice in many cases is related to the infrastructure). Nevertheless, the advice of other farmers are still relevant, this gives us an idea of the need for specific technical advice for this innovation.

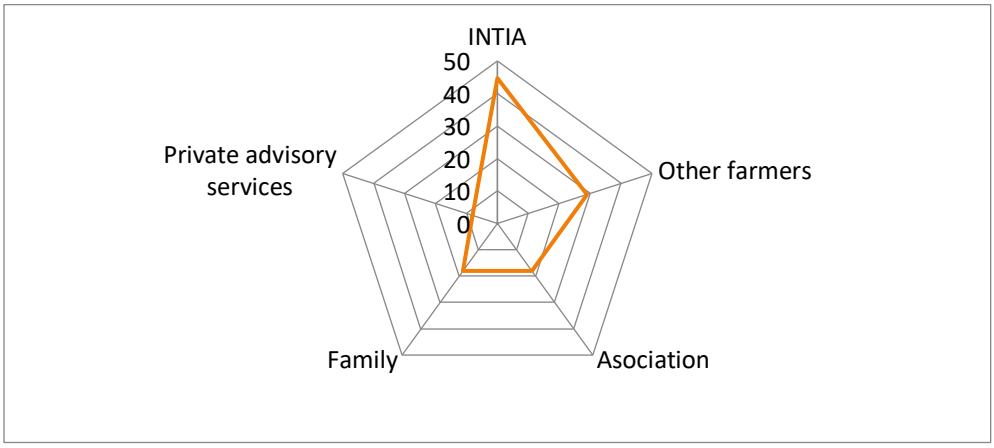


Figure 38: Support to implement

Regarding the activities that are necessary to implement the innovation, talking to other farmers and observing what they do is still very important, together with experimenting and evaluating the results.

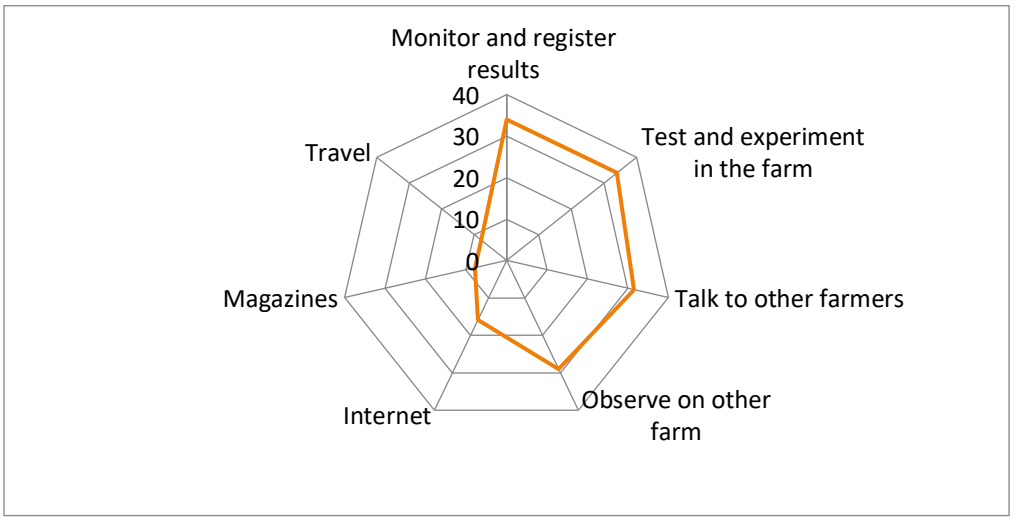


Figure 39: Activities to implementing the innovation

NON-ADOPTERS

As for non-adopters, Table 9 lists the reasons why it was decided not to apply the techniques.

Table 9: Reasons not to adopt

Barriers	
Economic	They needed to invest more than they thought
Work load	A lot of hours to sell and distribute

Lack of support	Direct marketing is not structured (only sheep cheese). It is hard to sell all the production individually
Personal issues	The person who was going to dedicate to direct sales found work outside the exploitation

Asked about the idea of implementing the technique in the future, more than half do not consider it. Only one of them has the idea of implementing it in the future and another sees it as a second option if the way of marketing she uses now (through a company) fails. The others see it unlikely.

DROPPERS

Regarding the droppers, two cases have been analysed. In the first one, the producer is a pioneer in organic production and a teacher for many others. His sisters helped him sell, but he always had to ask for help and he did not have the infrastructure to store the product. Since 2005 he has sold all his production to a canning company with the same philosophy of understanding the business: It is a family business that sells organic canned food.

Regarding the second case, although the farmer produces in an ecological way, he entered into this way of production because it was a challenge for him, rather than a philosophy. But the production was increasing and it was very difficult to sell everything directly. Today his entire product is bought by a canner.

5.2.1.4. Farmers' innovation micro-AKIS

As it has been previously mentioned, in Navarra there was no a structure to support farmers who wanted to do direct marketing. When they decided to think about this innovation they were helped mainly by people who were usually around them (family and neighbours but also technical advisors that were around them helping on other issues). As there was no specific advice, during the awareness phase they were helped by these people. Then, in the following phases, they needed more technical advice and they had to talk to other advisors (public advisory service, associations, independent advisors, etc.).

Thus, the general micro-AKIS is the same as the innovation micro-AKIS. This may change in the future, as now there is a specific area in the Public Advisory Service to support farmers who want to adopt this innovation.

Family has a key importance in this innovation. All the farms are considered family farms and they have family labour.

5.2.2. Findings from the AKIS experts interviews and advisory suppliers survey

5.2.2.1. Advisory landscape in the focus region

Although direct marketing has always existed, since the "Direct marketing law in Navarra" was published in 2010, it is more structured and it has been strengthened with the creation of a new service in INTIA.

Nowadays, farmers consider this innovation because there is a growing demand, because they want to diversify or because of they can get agricultural subsidies to improve the farm (incentives). In short, to improve their benefits.

Few of those who adopt this innovation abandon it because it is a profitable alternative to the way in which it has been produced during the last 20 years (high level of production and with cheap selling prices).

Farmers seek information because there is an interest mainly in terms of hygienic and sanitary regulations.

5.2.2.2. Key players of advice for the innovation area in the focus region

The entities that advise are: INTIA, trade unions, farmer associations (Artzai gazta, D.O., APIDENA) and the government itself. One of the most common queries is related to hygienic and sanitary regulations. Evaluation and implementation are the two most important phases when starting a project.

Regarding the Government, the area that is focus on the promotion of organic farming encourages direct sales, because in many cases it is linked to organic products. The government also manages direct sales census that informs and controls compliance with regulations.

5.2.2.3. Transformation of advisory landscape

It should also be pointed out that to be the innovation sustainable, it is necessary to adapt the hygienic-sanitary measures to farms that have lower productions. It is also necessary to train advisors about this issue. This is the key in the development of the innovation.

The positive effects of the innovation are the following:

- Development of rural areas
- It is an alternative to the traditional way of selling
- Environmentally sustainable (carbon footprint)
- Increase the added value of the product.

As a negative effect, it is stressed that consumers get confused between local and ecological products.

The Government supports the innovation economically, with subsidies to the RDP and also highlights the importance of the EAFRD projects. One of these projects has been the creation of EKOALDE, an ecological product distribution platform that is being managed by the producers themselves for the development of short marketing channels. Its aim is the creation of a more efficient and well structured distribution.

The main challenge to advance in this innovation is, the flexibility of hygienic and sanitary regulations for small producers and on the other hand, the definition of product 'linked to exploitation', creating a name and a brand.

5.3. Case 3: the role of farm advice in innovation case study RETRO INNOVATION

5.3.1. Findings related to the Farmers' survey

5.3.1.1. Farmers' profile and farm structure

The 35,5% of the interviewees are female. Generally, women are involved in the development of dairy products. Regarding the distribution of hectares, the 1047 ha of the interviewees are distributed on: own land (354 ha), rented (674 ha) and jointly used land (221 ha).

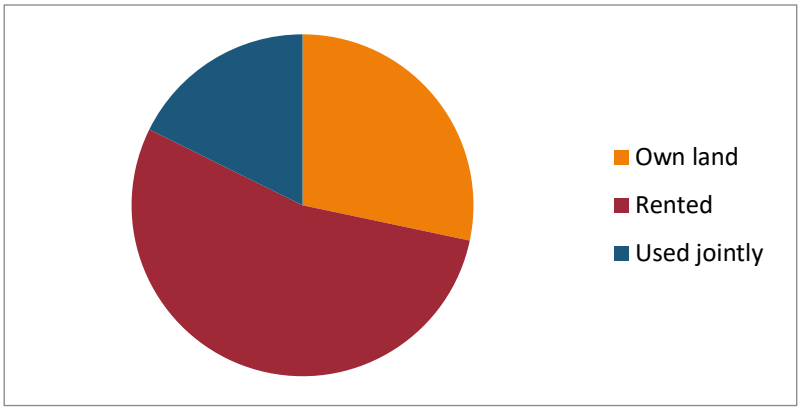


Figure 40: Distribution of hectares

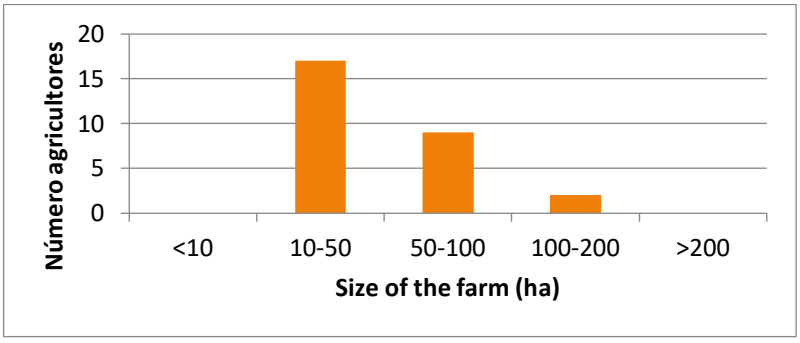


Figure 41: Farm size and number of farmers

The average size of the farm is 45,37ha although this depends on the region and its orography. In Gipuzkoa for example, due to the steep orography, the farm size is around 35 ha while in Álava there are more plains, the land availability is higher and farm size is between 50 and 100 ha.

As it is the aim of the case study, all the interviewees are focused on sheep (7 farmers) and dairy cattle sector (21 farmers). Three of them have either sheep or dairy cows and some of them have horses and beehives.

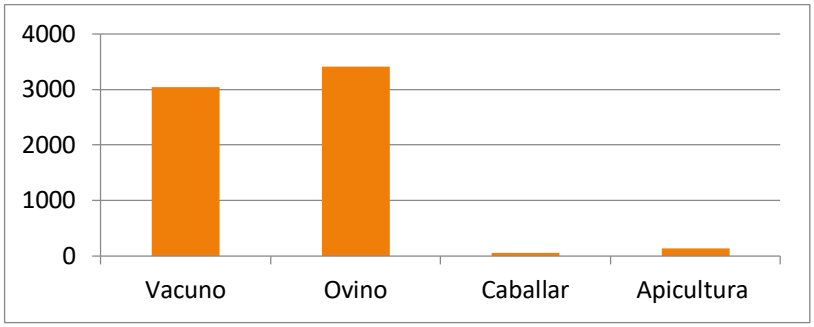


Figure 42: Number of heads

Only 1,8% of the farmers are organic. Organic farming in the sector is increasing but quite slowly.

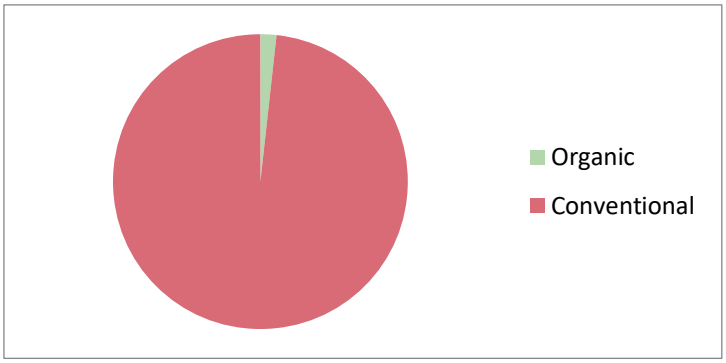


Figure 43: Conventional/organic

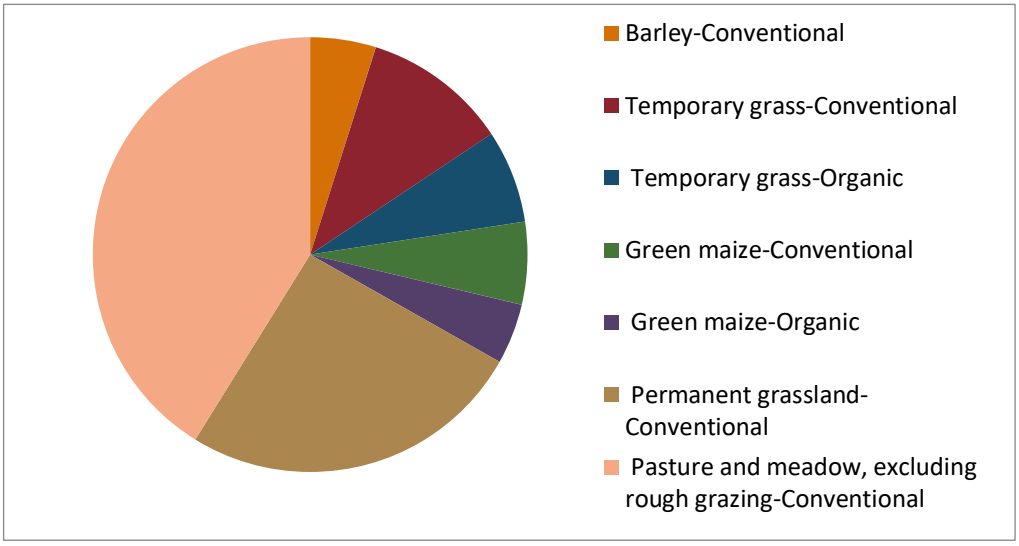


Figure 44: Distribution of crops

Regarding product destination, in most of the cases the 100% of the production is sold. Direct marketing is relevant in this case.

Table 10: Direct marketing and number of farmers

% direct sales	Number of farmers
More than 75%	13
Between 50 and 75%	2
Between 35-50	1
Less than 35	6
0	8

8 agricultural holdings are engaged in other gainful activities related to the farm (agro-tourism, forestry, renewal energy production, etc.). The 100% of the interviewees benefit from agricultural subsidies (CAP). In most of the cases it entails less than 25% and in some cases it entails between 25 and 50% of the income. 9 farmers benefit from financial support for innovation (local action group measures and European policies).

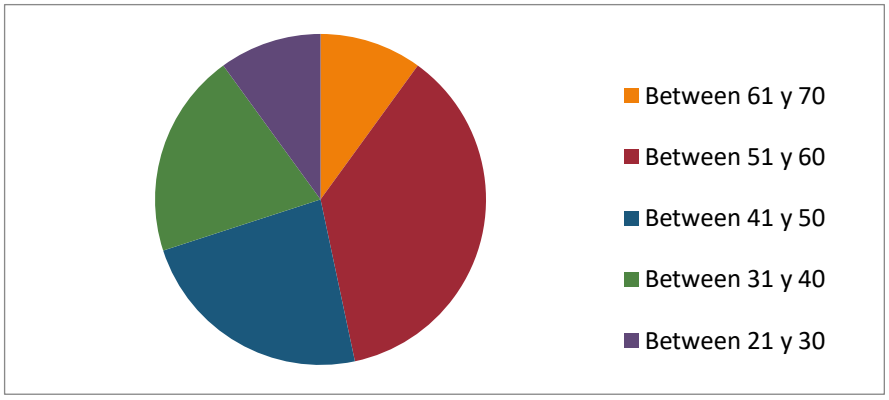


Figure 45: Farmers profile

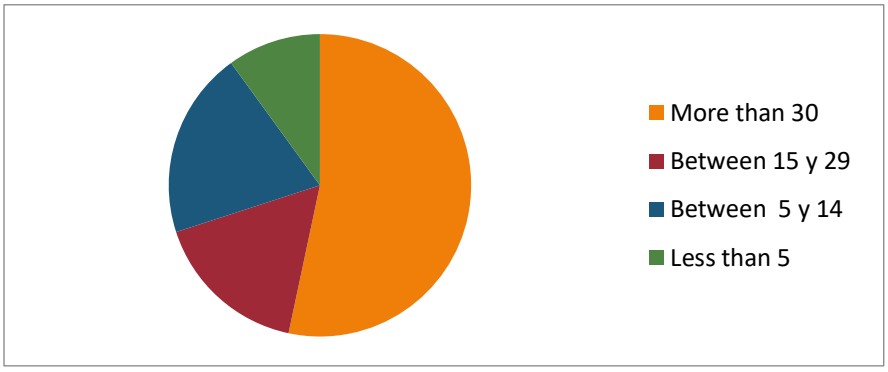


Figure 46: Farmers' experience

Family work is relevant in this case study. The 64% of the farms have family members working on the farm part time or full time. When they are asked about the influence of workers in the decision-making, it is

observed that family members influence the decision making positively, while when they are not family members there is not this kind of influence.

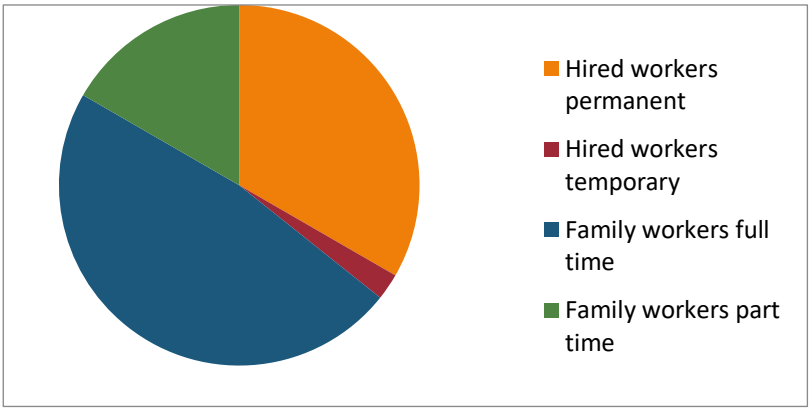


Figure 47: Farm labour

Table 11: Level of studies

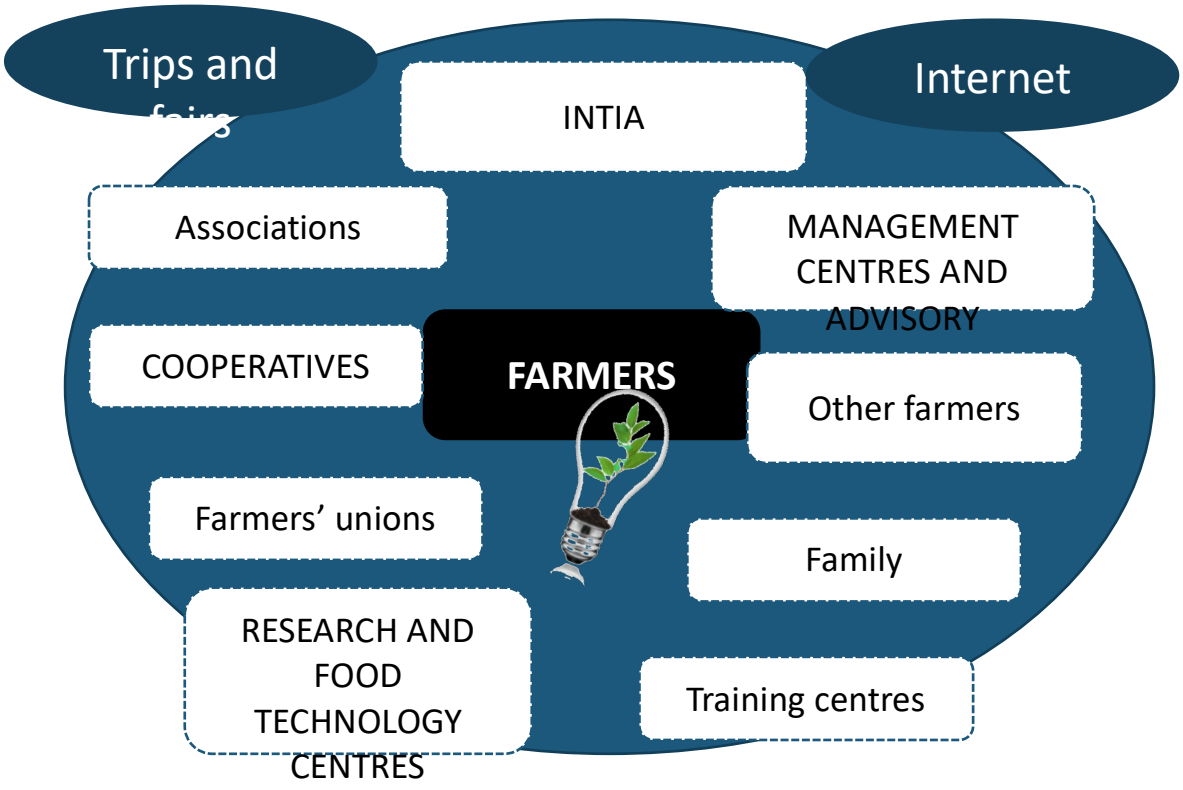
Level of education	Percentage (%)
None	0
Minimum Compulsory	9
High school diploma	1
Vocational training not in agriculture	10
Vocational training in agriculture	5
University degree not in agriculture	4
University degree in agriculture	1

With respect to training, the 61% attended at least one course during the last year. The topics were mainly related to cheese making, organic farming, management and production of quality milk, commercialization and new products.

Regarding the use of technologies, most of them use the mobile phone and some of them the computer in order to do the administrative management of the farm.

5.3.1.2. Farmers' attitude towards innovation and change

Farmer based organizations, hi-tech companies and private non-profit-farmers' owned advice companies are the most frequent actors mentioned by farmers.



The figure 48 shows the most important sources of knowledge for farmers in this case study. Testing in the farm and monitoring the results are the most important activities to acquire knowledge. Also, observing on other farms and talking to others is essential. As far as the communication method is concerned, most of them prefer individual (one by one), either face to face or by phone.

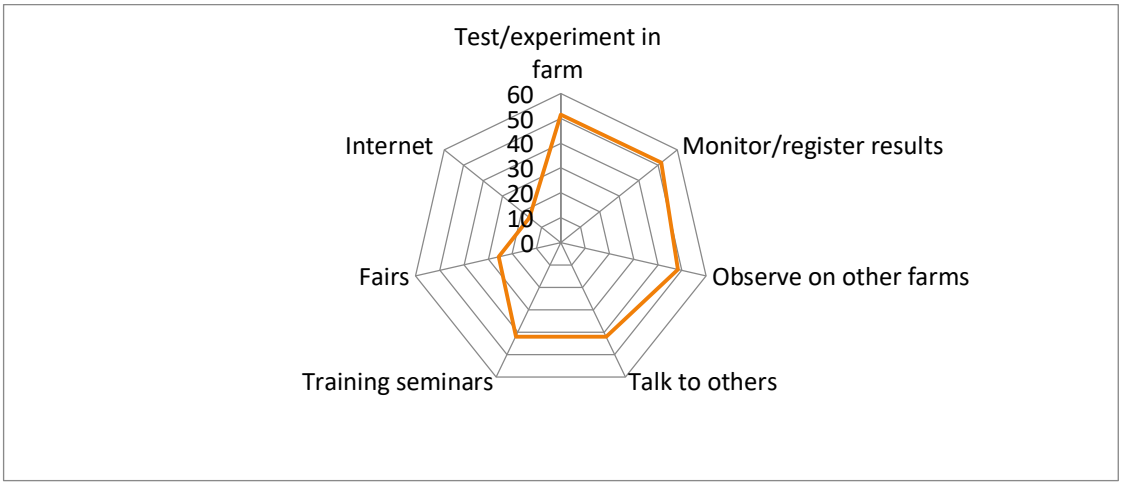


Figure 48: Activities to acquire knowledge

Regarding innovation profile, all of them say that they like to try new ways of doing things at their farm. They try to get support and involve people who can help them, but in general, they don't try to persuade others to implement the techniques. When there are problems, they persist and overcome obstacles to accomplish the goal.

Table 12: Innovation profile Retro-innovation

	I try new ways of doing things at my farm	I prefer to do things that require creativity	When something does not function well at my farm, I try to find a new solution	I try to get new ideas from other farmers or farm managers	I am interested in how things are done elsewhere, in order to use those ideas on my farm	I search for information on new ideas, in order to try to implement the best ones	When I have a new idea, I try to persuade others to implement it as well	When I have a new idea, I try to get support for it from others	I try to show others the positive sides of new ideas	When I have a new idea, I try to involve people who are able to collaborate in it	I develop suitable plans and schedules for the implementation of new ideas	I look for and secure funds that are needed for the implementation of new ideas	For the implementation of new ideas I search for new technologies, processes or practices	I try to involve key decision makers in the implementation of an idea	When problems occur during implementation, I try to reach out to people that can solve them	When I have a new idea, I look for people who are enthusiastic about it	I am able to persistently overcome obstacles when implementing an idea	I do not give up even when others say it cannot be done	I usually do not stop until I accomplish the goal	During idea implementation, I am able to persist even when work is not going well
Strongly agree	8	3	8	7	9	7	3	2	6	4	3	4	5	4	6	1	3	4	5	3
Agree	14	9	18	17	13	11	8	19	16	15	8	12	15	14	19	13	17	13	9	12
Neutral	2	7	0	1	4	5	7	3	2	4	9	7	4	6	1	11	6	6	9	4
Disagree	2	6	1	2	1	2	8	3	1	1	5	2	1	1	0	1	0	2	3	5
Strongly disagree	1	2	0	0	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	1

5.3.1.3. Farmers' innovation paths and trigger cycle change model

Table 13 shows the evaluation made by farmers in relation to different issues (productivity, product quality, environment, etc.). Independent of they are adopters or non-adopters, most of them think that the innovation is beneficial for business competitiveness, local community and social issues. Also, it is good for the quality of the product. With regard to the productivity and the environment it is considered neutral although talking about the environment, if the development of new products entails a higher added value, it is not necessary to increase the size of the farm and the production and that would be good for the environment.

As far as farm workers' wellbeing, some farmers considered it detrimental because the workload increases and they need more time to make the new product and sell it.

Table 13: Evaluation of the innovation

	Productivity	Quality	Environment	Farm workers' wellbeing	Business competitiveness	Local community	Social issues
Very beneficial	23,1	39,3	24,1	13,8	27,6	30,0	27,6
Beneficial	26,9	28,6	34,5	24,1	58,6	56,7	48,3
Neutral	42,3	28,6	41,4	34,5	13,8	13,3	24,1
Detrimental	7,7	3,6	0,0	27,6	0,0	0,0	0,0
Very detrimental	0,0	0,0	0,0	0,0	0,0	0,0	0,0

- **1st phase: awareness**

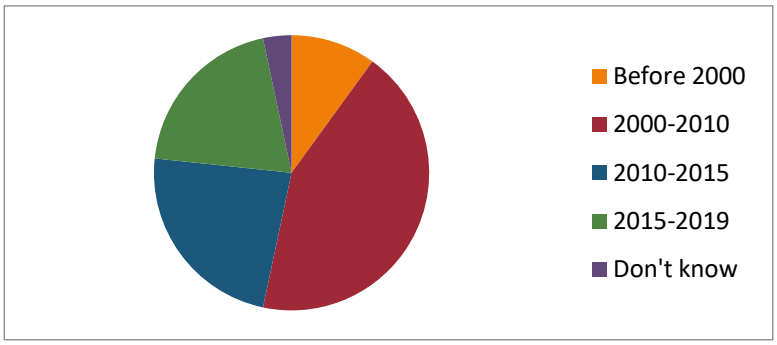


Figure 49: Initiation of awareness

Other farmers are the most important actors in the awareness phase. When they have doubts about the innovation, it is essential to see that others are having good results to think about implementing it (figure 50).

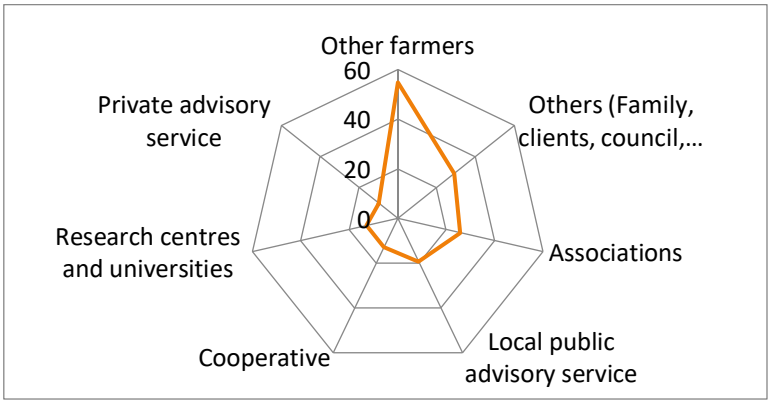


Figure 50: Influential actors

With respect to the communication method, again the most frequent method is to do it directly (face to face or by phone). When the actor is other farmer or the family, it is always face-to-face.

2nd phase: evaluation

Some of the interviewees had decided not to evaluate the innovation, the 32,2%.

The evaluation period changes depending on the situation of the farmer, but in general it is quite short (only some months). Sometimes it is not necessary to invest a lot of money and it doesn't imply a big risk so they don't spend much time on the evaluation. However, sometimes they used to sell milk and they have to change the infrastructures to diversify and make different products. In this case the technical and economic evaluation is much more important. The evaluation process consists of gathering more information about the technique (technical, economic, benefits, etc.), ask to other people who have tried it, travel to observe it on other farms, etc. The reasons that led them to evaluate the innovation were varied. In many cases, it is mentioned the need to find new solutions and opportunities in the face of different situations and problems. In some cases, clients were the actors that led to the evaluation. In other cases, the innovation was linked to the generational replacement in the farm. In two cases the advisory service and the participation in a project led them to evaluate.

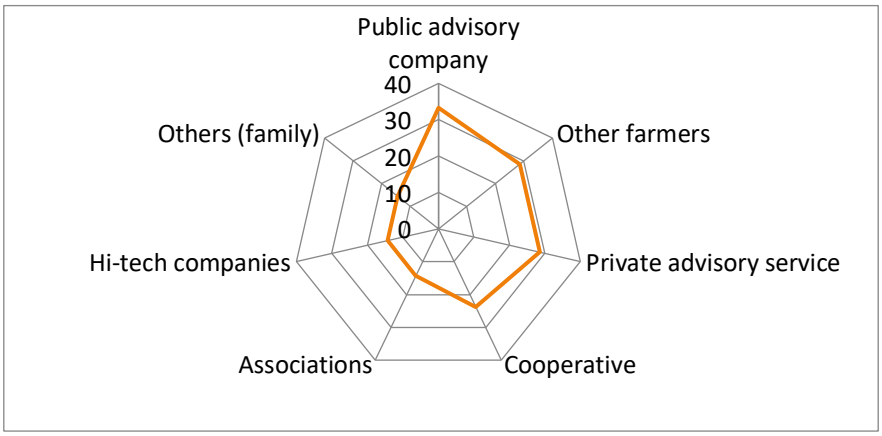


Figure 51: Actors involved in the evaluation

With regard to the activities that are needed to evaluate, they think that is necessary to test it, observe it on other farms, talk to other farmers, etc. (figure 52).

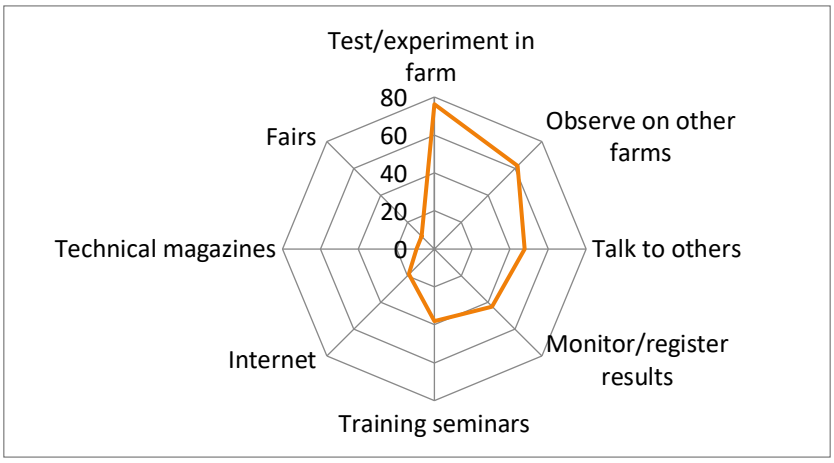


Figure 52: Activities to evaluate

With respect to the factors they considered during the evaluation most of them mentioned the costs, but also the benefits of the innovation (figure 53).

- Costs: Infrastructure, need to invest in machinery, feasibility studies, administrative barriers, more labour… Administrative barriers are very important. They mentioned that hygienic-sanitary requirements are the same as if they were a big enterprise and sometimes they cannot cover this issue.
- Benefits: Better perception in the society, improvement of the quality of life, more added value, more economic benefit and own satisfaction.
- Risks: Investments, more workload, maintain milk quality, maintain clients.
- Uncertainties: Market response, how to face exceptional problems.
- Negative side effects: more workload, more time in the farm, need of more organization.

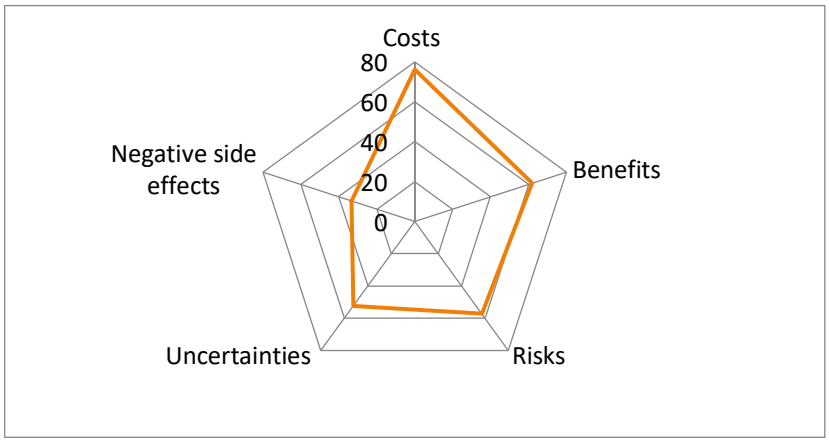


Figure 53: Factors considered for the evaluation

3rd phase: implementation

The 61,9% of the interviewees who evaluated the innovation, decided to implement it. The implementation date moves between 2000 and 2019, although most of the cases the implementation was made between 2000 and 2010. The time needed to implement is less than one year.

Interviewees mentioned a lot of reasons to implement: support of Leartiker (the research and food technology centre), clients' demand, offer a different product, business opportunity, close the cycle in the farm, generational replacement, more added value reducing the size of the farm, work at home, be able to live in the village, be independent, more sustainable production and personal and professional challenge. The figures 54 and 55 show the frequency of different actors who take part in the implementation phase and the activities that are more important to acquire knowledge for this implementation.

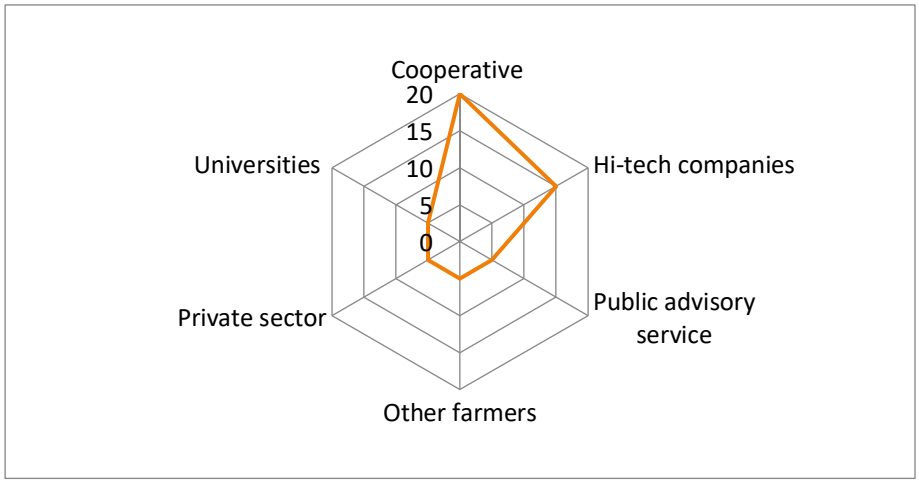


Figure 54: Actors involved in the implementation

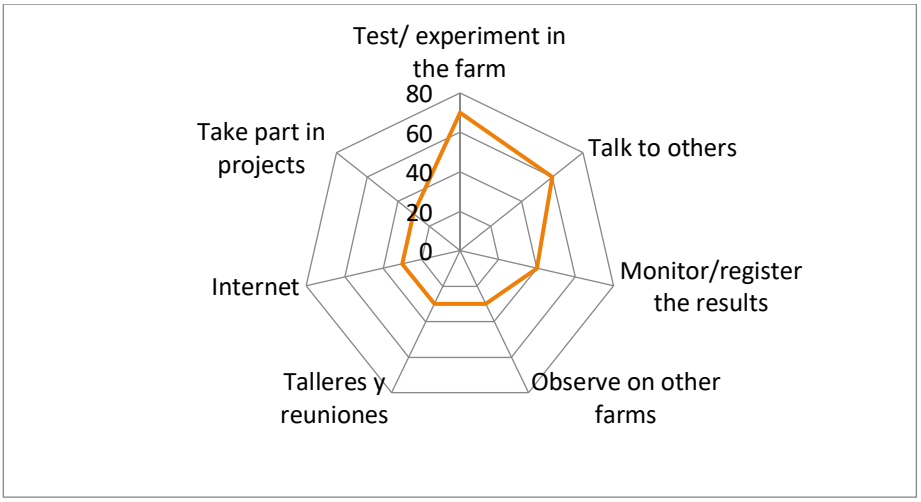


Figure 55: Activities for the implementation

NON-ADOPTERS

As far as **non-adopters** are concerned, the reasons they mentioned not to adopt are the following:

Table 14: Reasons not to adopt

Barriers (78,6%)	
Lack of time	In most of the cases it is mentioned that the innovation implies more workload and they don't have time to assume it. Besides, if they have to hire somebody the costs increase.
Technical and administrative issues	Technical barriers and administrative requirements are obstacles to implement the innovation. As previously mentioned, the hygienic-sanitary requirements are an important obstacle.
Age	The age is also a barrier. Those who have a decent salary and who are more than 50, do not think about implementing and they wait for the retirement. Only when there is a generational replacement, they think about the innovation.
Lack of resources (35,7%)	In most of the cases, it is mentioned that they would need more economic and human resources.
Lack of support (14,28%)	Lack of support of other farmers, because they have their own interest. If the offer increases, prices may fall down and sometimes this is problematic.

5.3.1.4. Farmers' innovation micro-AKIS

The innovation micro-AKIS in this case is partially similar to the general micro-AKIS of the farmer. People who are around farmers (their advisors) are not necessarily linked to the innovation. They have direct contact with farmers and they always help them in the management of the farm. If the farmer has a problem they help them find solutions and they try to evaluate together different possibilities and innovations to face problems and difficult situations.

Nevertheless there are some actors who are not in the general micro-AKIS because they are linked to the innovation (researchers, universities…). Once farmers know about the innovation and they want to evaluate or implement it, they usually need to be helped by these entities.

There are different trigger events. In some cases there are some farmers who change or improve because they want to do it or the demand changes and they want to answer to this demand. However in other cases, there are problems and the innovation can be an opportunity to confront this situation.

Actors are more or less the same in all the phases. Advisors are key in all of them and researchers usually appear in later phases. Family labour is relevant in this case and it affects the decision making process.

5.3.2. Findings form the AKIS experts interviews and advisory suppliers survey

5.3.2.1. Advisory landscape in the focus region

The advisory landscape is formed by public, private and farmer based organisations that operate at a local and regional level.

Organisation	**Type of organisation**
INTIA	Public applied research and advisory service
Artzai gazta	Association- Private
RURAL DEVELOPMENT AGENCIES	Public sector
COOPERATIVES	Farm based organisations
LEARTIKER	Private sector- Researchers
MANAGEMENT CENTRES (ABELUR, AGA, LORRA, LURGINTZA and ABERE)	Private sector
Independent advisors	Private sector

5.3.2.2. Key players of advice for the innovation area in the focus region

The actors who took part in the interview (AKIS experts and advisory organizations) listed the following advisory organizations as key players of advice in Navarra and the Basque Country: Research and technological centres, Rural Development Agencies, Advisory organisations (Public advisory organisations and Management Centres), Associations and private organisations that offer training regarding the innovation.

Research centres, management centres and public advisory organisations are key as advice providers in this area. Research centres support farmers when they want to make new products. In the case of management centres and public advisory organisations farmers are their clients and they offer support on technical and economic issues, food security, etc. They also help farmers when they want to move into the sector. They have direct relationship with farmers and they know the situation, needs and perspectives very well.

They take part in regional, national and European projects, they are key in the transference of knowledge, regulations and technologies, they are key providers of training, etc.

5.3.2.3. Transformation of advisory landscape

In the past in Navarre and the Basque Country it was common to develop different kind of dairy products based on sheep milk. Some years ago, these products and the knowledge and recipes disappear and all the farmers focused their production on Idiazabal cheese, a prestigious cheese with a Designation of Origin that uses local breeds. Regarding cow's milk, almost all the farmers are part of a cooperative that sells the milk. It is not common to develop dairy products.

Nevertheless, it is very common to buy other types of cheeses from nearby countries (France), where is traditional to make different kind of cheeses. Thus, in recent years some projects are trying to drive initiatives to innovate either with the product or the commercialisation because of several reasons: crisis and unfavourable situations demand of different products, added value...

When farmers decided to introduce new products it was because they were already making a product and they wanted to diversify the production (they have their own clients and it is easier to introduce new things). This was influenced by the clients (demand of new products). When they decided to change the commercialisation channel, it was because they were part of the cooperative that sold the milk and they wanted to sell part of the milk using vending machines. They were helped by advisory entities and Rural Development Agencies.

After introducing the innovation, some of them decided to abandon because they didn't get enough added value with the product, they needed to find new clients, the work-load increased, the demand of the product decreased, etc. Those who consolidated the innovation, overcome these obstacles.

If they decide not to adopt it is because they are happy and they are not interested in changing. In other cases farmers prefer to focus on production and they don't want to care about transformation and commercialisation. In other cases there are some limitations (space, age, economic resources, labour, etc.). Farmers look for information about the innovation, but sometimes it would be necessary to know more to make a better evaluation (market surveys, economical aspects, training, social aspects, etc.)

As far as advisory entities is concerned, they join farmers along the process and they analyse economic results to see if it is viable and try to face problems and difficult situations. The role of advisory organisations is different depending on what they need. If they need help regarding the feasibility of the project and help to go ahead with the project they will be helped by some entities. However, if they need help regarding the new product and how to make it, they will be helped by other actors (research and innovation centres).

Advisors are essential in all the phases but especially during the evaluation process. They join farmers and they try to promote the innovation but depending on farmers' profile (age, interests, possibilities,..). The role of advisory entities is to transfer knowledge and help farmers according to their needs. The aim is to improve the sustainability of the farm and sometimes what is good for one farmer is not good for the other one. Although all the aspects of sustainability are essential, the economic results are crucial, because if is not economically sustainable, it won't be socially sustainable (quality of life, generational replacement, etc.).

Public policy supports the role of advisory suppliers (training, economic support, projects...), but they didn't play a key role in this process.

6. Discussion: Answering research questions

6.1. Role of advisory suppliers in the farmers' TCM and innovation paths

The way in which advisors influence awareness depends on the triggering event and this triggering event can be diverse: more restrictive legislation, new motivations, demand from clients, appearance of a new problem or situation, generational replacement, etc. In many cases, farmers become aware and consider adopting innovation, after knowing the innovation through other farmers, through the family, neighbours, etc. In these cases, the advisor does not appear in that first phase, but it has a very important role in the evaluation or implementation phases.

However, it is considered that advisors are important in the awareness phase of those farmers who wouldn't think about making a change. If advisors don't believe in the innovation and they don't disseminate it, there are many people who are excluded from the process.

Some differences in the advisory service are also observed depending on the innovation. In the three cases studied, there is a difference in the advisory structure around the farmers. In the cases of biological control and retro-innovation, there is a group of advisors who can inform producers about innovation and in the case of direct marketing there was no structure specifically indicated for it. When there is a structure, it is easier to encourage the use of an innovation.

The role of advisors is key in assessment phase. Whatever the trigger event is, farmers will need help to assess the feasibility, positive and negative effects of the innovation, benefits, risks, economic issues, etc. The advisors must know the techniques, both from the point of view of effectiveness, as well as their economic cost. If there is no advice, farmers will try to find it elsewhere. All the advisory organisations that have been interviewed feel that they are more important in the assessment phase.

All the cases are becoming more and more important and companies are investing or taking part in projects to try to improve the advisory service and support farmers who want to adopt the innovation. In the case of biological control, companies are investing a lot in this topic (making trials, developing Decision Support Tools, etc.) and advisors say that receive information and training about it. In the case of direct marketing, there is a new structure in the region (Navarra). Before it was not organised and advisors did not receive training about this. Nowadays awareness is raising and advisors are receiving training, collaborating with other organisations, exchanging knowledge and experiences, taking part in projects, etc. In the case of retro-innovation, in the Basque country there are organisations called Management Centres that offer different kind of support to farmers (technical, economical, related to taxes, CAP, etc.). They support farmers throughout the different phases of the TCM and also research centres have an important role in the implementation of the innovation. In recent years they are taking part in projects to try to encourage the implementation of the innovation in the area.

The number of advisors for the evaluation phase is different depending on the innovation. In the case of biological control the advisory landscape is much more fragmented (INTIA, cooperatives, agri-food industries, suppliers, etc.). Some of the farmers highlighted the importance of having a public advisory service for the evaluation stage because there is no economic interest behind their advice. In the cases of direct marketing and retro-innovation the advisory landscape is more reduced, although sometimes in retro-innovation they need to be helped by researchers.

The evaluation process is different depending on the innovation. It is not the same to evaluate if they want to use one alternative technique instead of a pesticide or to change their way of production and the infrastructure because they want to develop new products or change the way of selling. The evaluation that requires is different.

In some cases, especially when there is a strong conviction, there is no evaluation or the results of this evaluation do not matter at all because they really want to change. It can be because of an environmental motivation, philosophy, added value, because they want to live in rural areas, they want a better quality product, etc. This is observed with organic farmers who started applying the techniques when they were unusual and also in most of the farmers who adopt direct marketing in their farms.

The implementation stage is another key phase in which farmers decide if they want to consolidate the innovation or to assess new options. In the case of biological control farmers are helped by advisors, directly in their farms or by phone, although other types of interaction are also important in this case (farmers' groups, demo activities, etc.). In the case of direct marketing and retro-innovation, the relationship is always face to face or by phone.

Apart from the public advice that is always there, in the case of biological control, suppliers have a key role in the implementation stage as they sell the technique and in some cases they help to monitor and assess the efficacy of the technique in the field. Farmers appreciated this. In the case of direct marketing associations and rural development agencies are also important and in retro-innovation research centres that work on new products are key.

6.2. Farmers diversity and role of advisory in innovation uptake processes

The role of the advisor is key, but in the end the decision is going to be made by farmers and this depends on their profile and characteristics. In this sense, personal beliefs, motivation and financial situation are the most determining factors. This is observed in direct marketing when there is a philosophy and they think that what they are doing is what they really want to do, whatever the numbers are and also in organic farmers that use alternative techniques because they believe that is much better for the environment, for their health or for the society. They wouldn't change the way in which they do things. In these cases agroecological values are considered along with the productive and economic interests.

In the case of direct marketing the innovation is more linked to smaller farms with more limited productions and it is also related to organic farming. In the case of retro innovation it is also linked to smaller farms, since the added value that they obtain with the diversification allow them reduce the size of the far

It is also observed that there are farmers who are more innovative, they tend to innovate because of their way of being. These people are more curious, they ask about new things, they tend to look for information, ask to the advisors, visit other countries, other experiences, etc. In general there is a relationship between this and the age of the farmer. Young farmers tend to be more innovative and they tend to think more about environmental issues because nowadays there is more concern about these topics and also because they see that these innovations are key for the future of their farms. Farmers who are closer to the retirement and who have a decent salary don't think about changing the way in which they do things or about investing money (only if there is someone who is going to replace them).

The economic aspects are also a key. The price that they receive for the product quality, the way in which they can innovate and their economic status also conditions the uptake of an innovation. Some farmers

have more limitations to change the infrastructure of their farms or they cannot afford alternative techniques. In many cases, this issue makes the difference between an adopter and a non-adopter.

Technological innovation requires a more innovative farmer profile and training or at least a greater interest in technology. In general, these are large farms and farmers who are much specialised in their area of activity. In this case the role of the companies as advisors is the most relevant. For public advisors it is very difficult to keep up to date with the evolution of technologies. It is necessary a certain level of specialization that INTIA is achieving with some technicians. It is a challenge to find the way to provide this type of technological services from the impartiality of the public company.

However, social innovation is more linked to the profile of a small, organic farmer. In this case, the role of the advisors is more secondary, since the support of the innovators is produced above all in other small farmers who have already initiated the change before.

The regional context is important. In the case of direct marketing and some specific products (cheese), it has always existed and it has been related to rural areas. Nowadays, there is a change in the way that we consume, we consider environmental aspects and also the need to maintain the development of rural areas. Thus, there is an increasing interest in local products that boost the interaction between rural and urban areas, consumers and farmers, help bring together social, economic and territorial development.

6.3. Transformation of advisory suppliers and farmers' innovation uptake processes

In the past the regional advisory service was more focused on intensification and production. However, the advisory service changes and progresses along with changes in legislation, society, etc. It is necessary to have a regional advisory service that dynamises new ways of production and commercialisation. Urban society is creating a type of social and environmental demands that condition the production system of farmers. The market is setting trends, for instance; recently, consumers prefer more seasonal products, proximity, more natural and organic products, etc. These demands are increasingly influencing public policies and administrations are trying, with the means at their disposal, to favour this type of demand and open up this type of local markets. This is the very clear case of the Government of Navarre.

The digitalisation of agriculture is leading to changes in advisory systems. Social networks are one of the most widely used tools for the flow of information between technicians and farmers. Farmers are increasingly using the Internet to access the information they need. Advisory services strive to provide the necessary information also through digital tools, such as websites, blogs, and electronic newsletters. The mobile phone has proved to be the most widely used tool.

7. Case study narratives

This section was removed due to the GDPR regulations.

8. Conclusions: Insights & Highlights

The landscape of the advisory services in the focus regions varies according to the cases. All of the cases are increasingly important in the regions and advisory services are investing in order to boost these innovations.

Some missing elements within R-FAS have been found. Pioneers and people who started assessing the innovation many years ago, implemented it because they looked for information about it or they contacted people who could help them. They were helped by specific people who were around them and tried to help them, but there was a lack of advisory structure regarding the innovation. In the case of biological control the advice was mainly based on the use of pesticides, the number of organic farmers or farmers who were thinking about using these techniques was very small and in general, advisors were not key during the awareness phase. However, after knowing about the innovation, they claimed that there were specific people who could help them assessing and implementing the innovation. Nowadays the knowledge about alternative techniques is widespread among advisors and they are also part of the awareness phase of the innovation cycle. The same situation is observed in the case of direct marketing, in which there was no specific advice for the adopters' needs.

It is observed that when there are synergies among different advisory organisations, the adoption is much more effective. Farmers are supported by different actors and they need a unified message. There is a case in which due to a strong collaboration between a cooperative and an input supplier all the farmers in an area decided to apply mating disruption in their vineyards.

Although the advisory service is crucial, many times farmers' profile has great influence in the adoption of the innovation. It is observed that farmers who are advised by the same people decide to adopt or not to adopt according to their convictions, economic situation, age, etc.

Even though the advisory service is more and more fragmented, it is considered that the public advice is the most neutral source of information.

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