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

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<td>AgriLink</td>
<td>Agricultural Knowledge: Linking farmers, advisors and researchers to boost innovation</td>
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<tr>
<td>AOS</td>
<td>Advisory Organisation Supplier</td>
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<tr>
<td>AKIS</td>
<td>Agricultural Knowledge and Innovation System</td>
</tr>
<tr>
<td>CAP</td>
<td>Common Agricultural Policy</td>
</tr>
<tr>
<td>CDR</td>
<td>Agricultural Advisory Centre</td>
</tr>
<tr>
<td>DoA</td>
<td>Description of the Action</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>MARD</td>
<td>Ministry of Agriculture and Rural Development</td>
</tr>
<tr>
<td>Micro-AKIS</td>
<td>Micro-level Agricultural Knowledge and Innovation System</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisations</td>
</tr>
<tr>
<td>NUTS</td>
<td>Nomenclature of Territorial Units for Statistics</td>
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<tr>
<td>ODR</td>
<td>Regional Agricultural Advisory Centres</td>
</tr>
<tr>
<td>R-FAS</td>
<td>Regional Farming Advisory System</td>
</tr>
<tr>
<td>TCM</td>
<td>Trigger-Cycle Model</td>
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<td>WP</td>
<td>Work package</td>
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Executive Summary

This study is intended to assess the diversity of farmers’ use of knowledge and services from both formal and informal sources (micro-AKIS), and how they translate this into changes on their own farms. The main aim of this report is to provide a comprehensive description of the decision-making process of the farmers towards innovation and role of advice suppliers in this process (including advisory services as well as commercial suppliers).

The provided description is based on the outcomes from Case studies, consultations with Regional advisory board, and other relevant actors. It aims to assess the role of knowledge in farmer decision-making and identify the range of organisations involved in providing advice to farmers regarding the following innovations areas:

- Development of renewable energy in rural areas as an alternative to traditional forms of energy,
- Nature resources and common management,
- Application of precision farming system.

Structure of the document follows the aims of the report. Chapter 2 describes the key concepts and research questions. Chapter 3 explains WP2 case studies overview and methodological approaches, like case studies selection and sampling strategy. The outcomes from country case studies, farmers groups and advisory suppliers are described in chapters 4 and 5, separately for each innovation area. The report discusses the three research issues, namely:

- Role of advisory suppliers in the farmer’s Trigger Change Model (TCM) and innovation paths
- Farmer’s diversity and the role of advisory in innovation uptake processes
- Transformation of advisory suppliers and farmer’s innovation uptake processes

Additionally, the case study narratives were prepared to show the context and the distinctness in the innovation processes. Each of them shows the situation and innovation development in four stages of the decision-making process of the farmer according to TCM concept: Path dependency, Trigger event, Active assessment, Implementation and Consolidation. The last chapter point-outs the conclusions, the good and failure stories, the gaps and surprises.

Analysis intend to examine how farmers make their decisions; who influences them most; key factors in the creation of trust between farmer and advisors; new forms of interactions amongst advisors, farmers and scientists; and advisors’ potential to boost innovation.
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 farmer’s 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 farmer’s 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 farmer’s micro-AKIS and the role played by advisors in the selected case studies. These were delimited 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.

In Poland the option was to select three case studies covering different type of innovations in different regions of Poland. The three case studies are the following:

- **Case study 1: Development of renewable energy in rural areas as an alternative to traditional forms of energy**

  This case study is part of the innovation cluster “Developing new activities” (NACT). The selected focus region for the case study implementation is Radomski (NUTS 3 – PL128).

  The functionality of a modern farm is closely related to the need to cover the growing demand for electricity and heat. Farmers have to run a rational energy economy and seek alternative sources of supply in the face of rising fuel and electricity prices.

  Farms operate in the specific conditions of rural areas that constitute over 90% of Poland’s territory. The use of renewable energy sources in these areas may be an opportunity to compensate for the development of these areas. Diversification of resources in rural areas creates opportunities for innovation and the development of renewable energy sources.
Increasing climatic anomalies, hurricanes, floods, which are increasingly occurring in Poland, are also the cause of power outages. This encourages the promotion of distributed energy and the pursuit of energy self-sufficiency of the farm through the development of renewable energy.

Sustainable development targets include the use of distributed, low-power energy sources that produce local energy and supply it directly to households. These criteria are best met by renewable energy sources such as biomass boilers, microbiogas plants, small wind turbines, small hydropower plants, solar collectors and photovoltaic cells. The use of these technologies in agriculture enables the independent production of energy and reduces its purchase from the outside, which brings measurable financial and ecological benefits.

The development of renewable energy can become one of the most important factors for rural development. Renewable energy will increase the quality of energy in rural areas, improve supply reliability and thus stabilize the conditions for farming.

The AKIS actors relevant in this focus regions are the Agricultural Advisory Centre, the regional advisory services, private advisories, and consultants.

The target group of farmers to define the case study are the commercial farmers, with all sizes of farms: small, medium to large sized farms.

This case study address specific research questions, which comprise:

Which is the role of advisers and the (new) tools used by them in helping farmers to develop and/or adopt market and/or value chain innovation which might involve a complex network of diverse actors and interactions along the respective value chains or its huge simplification due a direct relationship between farmers and consumers? What role does the adviser play in the transition to renewable energy by farmers?

• **Case study 2: Nature resources and common management**

This case study is part of the AgriLink innovation cluster Common management of natural resources (COMM). It was implemented in focus region of Siedlecki (NUTS3 PL12E)

Agriculture has important production functions, mainly related to the production of agricultural products. The subordination of agricultural ecosystems to food production cannot, however, affect the balance of the environment. Production should be in full harmony with the privilege of nature. Biodiversity is fundamental to the functionality, stability and productivity of each of the ecosystems that underlie life and all human activity. The products and functions it provides are essential to maintaining human well-being and for future economic and social development.

Protecting ecosystems is an important and challenging task, especially in rural areas. Negative environmental changes, caused by human activity, threaten the stability of ecosystems and the disappearance of species and precious natural habitats. Reducing threats is the biggest challenge of ecological policy both in Poland and in the European and global scale.

Preventing degradation of the landscape and maintaining its proper functioning, while optimizing the use of the production function, requires multidirectional measures, with the most appropriate of which is shaping the spatial structure of the landscape and using the appropriate set of agricultural practices. A properly structured rural landscape should include, in addition to agricultural land, elements of ecological infrastructure such as: midfield afforestation, small and medium surface ecosystems of natural and semi-natural habitats, ecological corridors, buffer zones, ditches, ponds, etc. The number and distribution of these landscape elements should ensure the ecological order within the landscape structure. Such a
landscape, with a properly shaped network of semi-natural ecosystems, is the basis for optimizing the agricultural economy.

The relevant advisor actors in this region comprise the Agricultural Advisory Centre, the regional advisory services, the private advisory sector and free-lancer consultants.

The target group of farmers to define the case study are the commercial farmers, with small, medium to large sized farms.

This case study address specific research questions, which comprise:

What is the role of the adviser in raising awareness and activating rural residents in context of biodiversity enhancement? Collaborative and participatory innovation poses the challenges of advisers to interact with a different type of “client” (not the individual farmer) focus on collective management arrangements, which ask for advisers’ new competencies and functions and therefore we need to know which are these new functions and how they can cope with them (e.g. training, different background of advisors…).

- **Case study 3: Application of precision farming system**

The third selected case is part of the AgriLink Technological innovation cluster (TECH). The focus region selected for its implementation comprise two NUTS 3 in Poland South-east, Wielkopolskie and Wroclawski (PL518).

In this region, agriculture is one of the most important sectors of the region’s economy. Farmers manage about 1,800 thousand hectares of agricultural land. Farmers of the region have the largest agricultural production in the whole country, both globally and by commodity. The region is ranked second in national and commodity crop production, and has the first place in global livestock production. Innovative well-organized agriculture – in the region the agriculture has benefited from high support of European funds and is quickly modernizing. Modernization of production assets in Wielkopolska / Wroclawski region in agriculture is proceeding much faster than on average in the country.

Farms applying or interested in the introduction of the precision farming system are mainly large-scale facilities conducting intensive crop production based largely on technological simplifications – based on the analysis of environmental conditions (soil richness analyses, information on the occurrence of pathogens).

In the region, there are large-scale farms established on the former state-owned farms, which, due to the intensification of production and the need to reduce costs, introduce simplified technologies in the cultivation of plants. In these facilities, there are favourable conditions for introducing elements of precision agriculture into the plant production process and the efficient use of resources in the form of efficient mechanization measures on their equipment.

Legal requirements demanded to agriculture, which are conditions that protect the natural environment, human and animal health, concern the use of sustainable fertilization and integrated pest management, which in turn is associated with precise fertilization and chemical protection measures.

The predominant AKIS actors in this region are the Agricultural Advisory Centre, the regional advisory services, the private advisory sector and free-lancer consultants.

For the case study the target group of farmers were the commercial farmers of all farm sizes (small, medium, large).
This case study allows to address specific research questions, such as:

Which is the role of advisers and the (new) tools used by them in helping farmers to develop and/or adopt market and/or value chain innovation which might involve a complex network of diverse actors and interactions along the respective value chains or its huge simplification due a direct relationship between farmers and consumers? What is the role of an adviser in imparting new knowledge in the field of application of precision fertilization and starter fertilization?
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 a 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 whom 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 farmer’s 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) farmer’s 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.
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) Farmer’s 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 farmer’s 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

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

Source: AgriLink

The farmer’s 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.
Farmer’s 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 farmer’s 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.

Farmer’s 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 farmer’s 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 farmer’s 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 farmer’s 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 where 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

Three innovation case studies were conducted in Poland:

- **Case study 1: Development of renewable energy in rural areas as an alternative to traditional forms of energy**

  This case study is part of innovation cluster “Developing new activities” (NACT) and was located at the focus region of Radomski (NUTS3-PL128).

- **Case study 2: Nature resources and common management**

  This case study is part of innovation cluster “Common management of natural resources” (COMM) and was developed at the focus region of Siedlecki (NUTS3-PL12E).

- **Case study 3: Application of precision farming system**

  This case study is part of innovation cluster “technological innovation” (TECH) in the group of Precision farming”. In this case the selected focus region were two NUTS3 Wielkopolskie (NUTS3-PL41) and Wroclawski (PL518).

Figure 3 shows the location of these focus regions across Poland.

![Figure 3: Territorial distribution of case studies in Poland](image)
4.1.1 Case study 1 - Development of renewable energy in rural areas as an alternative to traditional forms of energy

The functionality of a modern farm is closely related to the need to cover the growing demand for electricity and heat. Farmers are forced to run a rational energy economy and seek alternative sources of supply in the face of rising fuel and electricity prices.

Farms operate in the specific conditions of rural areas that constitute over 90% of Poland’s territory. The use of renewable energy sources in these areas may be an opportunity to compensate for the development of these areas. Diversification of resources in rural areas creates opportunities for innovation and the development of renewable energy sources.

Sustainable development targets include the use of distributed, low-power energy sources that produce local energy and supply it directly to households. These criteria are best met by renewable energy sources such as biomass boilers, microbiogas plants, small wind turbines, small hydropower plants, solar collectors and photovoltaic cells. The use of these technologies in agriculture enables the independent production of energy and reduces its purchase from the outside, which brings measurable financial and ecological benefits.

The development of renewable energy can become one of the most important factors for rural development. Renewable energy will increase the quality of energy in rural areas, improve supply reliability and thus stabilize the conditions for farming.

The selected focus region, Radomski, is characterized by a gradual increase in the area of cultivation of oilseeds and plants used for biofuels and for energy purposes. It is a proper place to explore what guides farmers in the selection of such crops and the development of alternative renewable energy sources.

The region is characterized by agricultural production in which the importance of commercial farms is increasing. The main branches of production are: milk production, cereal cultivation, forage plants and pig breeding. The specialization in the region is the cultivation of peppers, which accounts for 80% of the national production of this vegetable. The area of cultivation of oilseeds and plants used for biofuels and for energy purposes is gradually increasing. Due to significant changes in agriculture, the agri-food processing sector is also developing in the region. There are over 80 processing plants in the region.

Appropriate areas for agricultural production with organic methods have caused not only interest in agriculture among farmers - 48 organic farms operate in the region - but they also contribute to the development of agrotourism farms located in an area with interesting history, specific folklore and attractive tourist location.

The Polish farm advisory system is based on the regulations of the Act on Agricultural Advisory Units. Subsequent amendments to the act sanctioned the creation of consultancy in the FAS system, consisting of public and private entities. However, that public advisory plays a dominant role.

In accordance with the law in force, agricultural advisory units in Poland are:

- Agricultural Advisory Centre,
- 16 regional agricultural advisory centres with 27 regional branches and 312 local offices,
- Non-public institutions and entities.
4.1.2 Case study 2 - Natural resources common management

Agriculture has important production functions, mainly related to the production of agricultural produce. Biodiversity is fundamental to the functionality, stability and productivity of each of the ecosystems that underlie life and all human activity. The products and functions it provides are essential to maintaining human well-being and for future economic and social development.

Protecting ecosystems is an important and challenging task, especially in rural areas. Negative environmental changes, caused by human activity, threaten the stability of ecosystems and the disappearance of species and precious natural habitats. Reducing threats is the biggest challenge of ecological policy both in Poland and in the European and global scale.

Preventing degradation of the landscape and maintaining its proper functioning, while optimizing the use of the production function, requires multidirectional measures, with the most appropriate of which is shaping the spatial structure of the landscape and using the appropriate set of agricultural practices. A properly structured rural landscape should include, in addition to agricultural land, elements of ecological infrastructure such as: midfield afforestation, small and medium surface ecosystems of natural and semi-natural habitats, ecological corridors, buffer zones, ditches, ponds, etc. The number and distribution of these landscape elements should ensure the ecological order within the landscape structure. Such a landscape, with a properly shaped network of semi-natural ecosystems, is the basis for optimizing the agricultural economy.

Siedleckie is a region characterized by high natural potential on the national scale and a high concentration of Natura 2000 areas, where activities are carried out in the field of preservation of certain types of valuable natural habitats and species. Simultaneously, Siedleckie is part of the regions in Poland characterized by a significant role of the agricultural sector. The favourable conditions for conducting agricultural activity (mainly crop production) are primarily determined by favourable soil and climate factors, a large share of arable land and the highest share of farmland in Poland in the total area (70.0%).

The natural potential of the region is much better compared to the average values in Poland. There is a high index of the quality of agricultural production space, which includes: soil quality, water conditions, climate, and land relief. For these reasons, Siedleckie is the leader region in the production of many agricultural and fruit crops, like berries (raspberries, currants, strawberries), fruit orchards (mainly apples), legumes (peas, beans, broad beans), and cereals, ground vegetables and potatoes.

In Poland, the organization of the farm advisory system is based on the regulations of the Act on Agricultural Advisory Units. Subsequent amendments to the act sanctioned the creation of consultancy in the FAS system, consisting of public and private entities. However, that public advisory plays a dominant role.

In accordance with the law in force, agricultural advisory units in Poland are:

- Agricultural Advisory Centre,
- 16 regional agricultural advisory centres with 27 regional branches and 312 local offices,
- Non-public institutions and entities.

4.1.3 Case study 3 - Application of precision farming system

The requirements introduced in agriculture, which are conditions that protect the natural environment, human and animal health, concern the use of sustainable fertilization and integrated pest management, can
be responded by adopting precise fertilization and chemical protection practices, what is generally known by precision farming.

In the selected focus region the farms applying or interested in the introduction of the precision farming system are mainly large-scale facilities conducting intensive crop production based largely on technological simplifications – based on the analysis of environmental conditions (soil richness analyses, information on the occurrence of pathogens).

The region comprising the NUTS3 of Wielkopolska and Wrocławski is characterised by large-scale farms established on the former state-owned farms, which, due to the intensification of production and the need to reduce costs, introduce simplified technologies in the cultivation of plants. In these facilities, there are favourable conditions for introducing elements of precision agriculture into the plant production process and the efficient use of resources in the form of efficient mechanization measures on their equipment.

In this region the agriculture is one of the most important sectors of the region's economy. Farmers manage about 1,800 thousand hectares of agricultural land. Farmers of the region have the largest agricultural production in the whole country, both global and by commodity. At the national level the region is ranked second in global and commodity crop production and in first place respecting the national livestock production. The region is defined by an innovative well-organized agriculture – in the region the agriculture with the high support of European funds is quickly modernizing. Modernization of agriculture production assets in Wielkopolska and Wrocławski region is proceeding much faster than on average in the country.

In Poland, the organization of the farm advisory system is based on the regulations of the Act on Agricultural Advisory Units. Subsequent amendments to the act sanctioned the creation of consultancy in the FAS system, consisting of public and private entities. However, that public advisory plays a dominant role.

In accordance with the law in force, agricultural advisory units in Poland are:

- Agricultural Advisory Centre,
- 16 regional agricultural advisory centres with 27 regional branches and 312 local offices,
- Non-public institutions and entities.

4.2 Group of farmers target and sampling strategy

4.2.1 Case study 1 - Development of renewable energy in rural areas as an alternative to traditional forms of energy

In this case study the target farmer group are the commercial farmers of all farm sizes (small, medium, large).

The farmers were selected for the study by local agricultural advisors who run their professional activities in the area of the focus region. Some of these advisors cooperate with farmers in the field of innovation covering case study, but a greater part of them are independent advisors, unrelated to selected farmers and subject of interest of case studies.
4.2.2 Case study 2 - Natural resources common management
In this case study the target farmer group were also the commercial farmers of all farm sizes (small, medium, large), which owned land includes areas included in NATURA 2000 sites. These farmers can benefit from agro-environmental-climatic programs which aim is to promoting practices contributing to sustainable land management (to protect soils, water, and the climate). These programs include:

- Protection of valuable natural habitats and endangered bird species,
- Protection of endangered genetic resources of crop plants and livestock, protection of landscape diversity,
- Organic farming.

The farmers were selected for the study by local agricultural advisors who run their professional activities in the area of the focus region. Some of these advisors cooperate with farmers in the field of innovation covering case study, but a greater part of them are independent advisors, unrelated to selected farmers and subject of interest of case studies.

4.2.3 Case study 3 - Application of precision farming system
This case study target was also the commercial farmers of all farm sizes (small, medium, large) of the selected focus region.

The farmers were selected for the study by local agricultural advisors who run their professional activities in the area of the focus region. Some of these advisors cooperate with farmers in the field of innovation covering case study, but a greater part of them are independent advisors, unrelated to selected farmers and subject of interest of case studies.

Table 2 depicts the total farmers surveyed in each case study and their distribution according to the categories established: adopter, non-adopter and dropper.

<table>
<thead>
<tr>
<th>Innovation case study</th>
<th>Adopters</th>
<th>Non-adopters</th>
<th>Drovers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable energy</td>
<td>36</td>
<td>1</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Nature resources</td>
<td>35</td>
<td>4</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Precision farming</td>
<td>25</td>
<td>7</td>
<td>8</td>
<td>40</td>
</tr>
</tbody>
</table>

Source: AgriLink – Poland

4.3 AKIS experts and advisory organisations
The advisors from the region are mainly representatives of public agricultural advisory services providing their services in the region. For the interviewers the advisors who carry out their daily work related to the subject of innovation were selected. Those advisors, on a daily basis, advise on the possibilities and principles of including this type of activity to farms in the region.

Among the AKIS actors, other than advisors, the representatives of research and education entities, operating in the field of innovation were selected. These entities conduct their activities in topics related
to the innovation, often cooperating with agricultural advisory structures, in order to disseminate knowledge and technological solutions ready for use in an agricultural holdings.

4.4 Farmers selected for in-depth narrative interviews

The farmers selected for in-depth narrative interviews represent a representative group of farmers in the region, in terms of the range of agricultural production, size and techniques used on the farm. Selected farmers represent both adopters, non-adopters and to some extent droppers.

The selection of the most representative farmers for the topics and the specification of the region were made by local agricultural advisors who operate in the area of case studies. The selection was based on the experience of advisors in cooperation with farmers from a given topic and region. Carefully selected farmers are a representative group for the region.
5 Results

The case studies in Poland covered three thematic areas, i.e. renewable energy sources in rural areas, natural resources common management and implementation of precision agriculture at farm level.

As part of the case studies, 40 questionnaires with farmers from each of the thematic areas (120 in total) were conducted, describing a representative approach to the implementation of innovative solutions in the field of the above thematic areas. The results of the survey are presented below.

5.1 Case 1: the role of farm advice in innovation case study Development of renewable energy in rural areas as an alternative to traditional forms of energy

5.1.1 Findings related to the Farmer’s survey

5.1.1.1 Farmer’s profile and farm structure

From the selected sample, all farms were characterized by having one owner. In the vast majority of cases, the respondent’s position on the farm is the farm owner, only 1 in 40 respondents is a farm manager.

The age of farmers - respondents is as follows:

![Figure 4: Age of the farmers](image)

The gender structure among farmers is as follows:

![Figure 5: Gender structure of farmers](image)

The structure of farmers' education is as follows:
The structure of work experience in agriculture is as follows:

Most of the respondents (75%) did participate in the last 12 months in courses, trainings or workshops in the field of agriculture (at least one, mostly two). The thematic scope of the training included mainly issues related to innovation and also direct payments and farm development. Only a small percentage (around 10%) did not participate in any training.

The average area of the farm, among the surveyed, is 19.5 ha. However, there is a large diversity in the size of farms, the smallest surveyed holding had 1.2 ha and the largest 120 ha.

The main crops in the researched farms are the cereals comprising, common wheat and spelt, barley, oats, durum wheat, grain maize, and rye.

All these crops are grown in an open field. A significant part is conventional crops; only 1 in 40 are grown in the organic farming system. A significant part of these farms has pastures (permanent grassland). Irrigation of crops does not occur in most cases, only in one case the use of surface irrigation was noted.
The production of cattle is dominated by the bovine breeding (mainly dairy cows) and pigs. A small percentage is sheep breeding.

The 3/4 of the surveyed farms sell their final products, of which more than half sells less than 50% of the total final production, to a lesser extent sales are in the range more than 50% but less than 100% and those that represent 100% of the total final production. Only a small percentage of these farms sell their products directly to final consumers. About 1/3 of farmers said that sales are none or residual.

All of the farms benefit from subsidies for running a farm. Half of them show less than 25% and the other half between 25-50% of the income generated by the agricultural holding from the subsidies.

5.1.1.2 Farmer’s attitude towards innovation and change

All respondent farmers stated that advisors from the public sector cooperating with farmers at the regional level play a significant role in advising on innovation. The vast majority of the farmer - advisor interaction takes place in the form of 'one to one' (individual advice in person). In addition, many farmers benefit from advisory services in the form of training sessions, workshops, and seminars, organized by local public advisors. The type of support for advisory services is as follows:

![Figure 8: The type of support for advisory services](image)

The structure of farmers' demand for skills and knowledge and its source is as follows:
5.1.1.3 Farmer’s innovation paths and trigger cycle change model

Regarding the reference of the farmer to innovation, a significant part are adopters (developed and / or introduced an innovation), 9 of which will be referred to as pioneer (responsible for development and / or introducing the innovation in the region). From the sample of tested farmers, there were 2 droppers (introduced innovation but discontinued its use) and 1 non-adopter (did not introduce innovation).

The structure of farmers’ perception on the effects of the innovation in the focus region and in what he/she bases this evaluation is as follows:
The awareness stage

In the case of raising awareness in terms of the innovation, there were two main actors involved: a) the Public sector represented by the local advisory services; b) the Private sector, mainly the input and machinery companies and agro-industries (to a much lesser extent).

The interaction between these entities and farmers in the awareness stage rising was varied, with the predominance of frequent and constant contacts. The form of this interaction was mainly 'one to one' (individual advice in person) and, to a lesser extent, group consulting (training session, workshop or seminar).

The assessment stage

The event that made farmer thing seriously about assessing the innovation on the farm was usually associated with an entity that was involved in raising awareness in the field of innovation. In the case of local public advisory services, these events were primarily a 'one to one' meeting with a local advisor or training / workshop at the local agricultural advisory office. In the case of private sector - input and machinery companies and industries - this event was usually a technical fair, where these entities were present and presented their technological solutions.

In the opinion of farmers they received support in assessing the option to implement the innovation in all cases. The entities that provided this support were those involved in raising awareness in the field of innovation. This support was usually provided in the form of a 'one to one' meeting or training session, workshop or seminar.

Among the factors that the farmer considered in the assessment of the innovation on the farm, the most frequent were:

- Cost reduction resulting from the application of innovations,
- Farm savings resulting from the application of innovations,
- Independence from an external energy supplier,
• Environmental issues.

The implementation stage

In the case of the renewable production innovation, 97% of farmers who evaluated the innovation decided to implement it.

Defining the implementation period of innovation is difficult to determine, mainly due to a number of accompanying processes. Generally, this period took one production season, depending on the level of farmer’s preparation and the availability of technological solutions.

The motivation to introduce innovations was also varied, however, it was corresponding to a large extent with the factors determined in the assessment phase, i.e.:

• Economic issues (savings, cost reduction),
• Energy independence,
• Environmental issues.

In terms of support during the implementation of innovation, all farmers received adequate support, mainly from the entities involved in the awareness and assessment process. This support was provided mainly in the form of 'one to one' interaction, occurring frequently or sporadically.

Non-adopters

Only one farmer didn’t introduced the innovation. The main reasons for not introducing innovation into the farm were economic issues - lack of economic justification as to the benefits arising from the introduction of innovation and lack of adequate support throughout the entire innovation development stage. Despite the fact that the farmer did not introduce innovations, he stated that was considering the possibility of a future implementation, but not in a near future.

Droppers

In this case, there were 2 farmers who introduced innovation but discontinued its use. One of them was implementing the innovation on the farm for 1 year and the other for 2 years. The main reason for discontinuing innovation, in both cases, were lower inflows and benefits than expected. As it is stated in the interviews, the decision to stop implementing innovation was not related to the presence / quality of support from advisory. It was a decision made mainly on economic issues / cost-effectiveness of further innovation implementation. Often, farmers consulted external entities, including advisory representatives, before making this decision. However, each time it was an independent decision.

Both of the farmers consider the possibility of reintroducing the innovation to their farms, but not in the next 3 years.

5.1.2 Findings from the AKIS experts interviews and advisory organisations survey

5.1.2.1 Advisory landscape in the focus region

In the focus region the local branch of state agricultural advisory services operates. Its coverage includes all farmers engaged in agricultural activities in this area. The scope of advisors' activities in this region
includes the entire agricultural production, however, it focuses on those areas of agricultural production that are dominant in the region.

Private advisors are also present in the region, but within a limited range. Their subject of activity is wide, not limited only to the subject of innovation.

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

The interviewed AKIS actors were selected according to the farmers’ micro AKIS identified in the interviews. It includes both AKIS actor from the innovation area and main actor of the daily base decision-making.

The main advice actors for the innovation area in the focus region are as follows:

- **Public sector – local advisory services**
  These services are relevant and providing support in the innovation area for most of the interviewed farmers. Public advisors are main advice providers for most of the farmers in the region, which is due to the long history of public consultancy in the region, trust in farmer-advisor relations, and the high competences demonstrated by advisors in the subject of innovation.

- **Private sector – input and machinery companies and industries**
  These entities play a complementary advisory role in relation to public advisory units. Due to the technically advanced specification of innovation, they are, however, an indispensable element for its full implementation on farms.

The main advisory channels for farmers at the adoption/implementation phase of innovation are outlined below:

![Figure 12: Key players of advice for the innovation area](image)

The region also has scientific / industrial entities thematically related to the subject of innovation, such as: the Institute of Soil Science and Plant Cultivation, local Chambers of Agriculture. However, as shown by the AKIS survey, they do not play a significant role in the farmer’s decision to implement innovation.
5.1.2.3 Transformation of advisory landscape

Most farmers are adopters, among whom there are also a significant percentage of pioneers. Due to the gradual increase of farmers implementing innovation, the percentage of droppers is also increasing. This is reflected in growing demand for advice from farmers.

The share of specialists dealing with innovation is increasing. This is mainly due to the market situation and growing demand for consultancy in this area. As it results from the interview, in the case of public agricultural advisory units, there are enough advisors in the region in relation to the demand from farmers - specialists dealing with renewable energy sources. In the case of private entities, consulting is most often combined with the sale of products / technology.

5.2 Case 2: the role of farm advice in innovation case study ‘Natural resources common management’

5.2.1 Findings related to the Farmer’s survey

5.2.1.1 Farmer’s profile and farm structure

The farmers included in the selected sample, were characterized by having one owner. In all of the cases, the respondent’s position on the farm is the farm owner.

The age of farmers - respondents is as follows:

![Figure 13: The age of farmers]

The gender structure among farmers is as follows:
The structure of farmers' education is as follows:

- High school diploma in agriculture: 32%
- High school diploma not in agriculture: 10%
- Vocational training in agriculture: 18%
- Vocational training not in agriculture: 10%
- Minimum compulsory: 12%
- University degree in agriculture: 3%
- University degree not in agriculture: 0%
Most of the respondents (75%) did participate in the last 12 months in courses, trainings or workshops in the field of agriculture (at least one, mostly two). The thematic scope of the training included mainly issues related to innovation and also direct payments and farm development. Only a small percentage (around 10%) did not participated in any training.

The average area of the farm, among the surveyed, is 17 ha. However, there is a large diversity in the size of farms, the smallest surveyed holding had 6 ha and the largest 35 ha.

The main crops in the surveyed farms are: common wheat and spelt, barley, oats, vegetables and grain maize.

All these crops are grown in an open field. A significant part is conventional crops, only 6 in 40 are grown in the organic farming system. A significant part of these farms has pastures (permanent grassland). Irrigation of crops does not occur in examined cases.

The production of cattle is dominated by the bovine breeding (mainly dairy cows) and pigs. A small percentage is poultry breeding (mainly laying hens).

The 3/4 of the surveyed farms sell their final products, of which more than half sells less than 50% of the total final production, to a lesser extent sales are in the range more than 50% but less than 100% and those that represent 100% of the total final production. Only a small percentage of these farms sell their products directly to final consumers. 1/3 of farms show that sales are none or residual.

All of the farms benefit from subsidies for running a farm. Half of them show less than 25% and the other half between 25-50% of the income generated by the agricultural holding from the subsidies.

### 5.2.1.2 Farmer’s attitude towards innovation and change

All the respondent farmers stated that advisors from the public sector cooperating with farmers at the regional level play a significant role in advising on innovation. The vast majority of the farmer - advisor interaction takes place in the form of 'one to one' (individual advice in person). In addition, many farmers benefit from an advisory services in the form of training sessions, workshops, and seminars, organized by local public advisors.
In this case study another important advice provider is neighbour farmer or peer, with whom farmers come into close interaction (one-to-one, single advice in person) with high frequency.

The type of support for advisory services is as follows:

**Figure 17:** The type of support for advisory services

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>32%</td>
</tr>
<tr>
<td>Subsidies</td>
<td>36%</td>
</tr>
<tr>
<td>Farm development</td>
<td>22%</td>
</tr>
<tr>
<td>Marketing</td>
<td>10%</td>
</tr>
</tbody>
</table>

The structure of farmers' demand for skills and knowledge and its source is as follows:

**Figure 18:** The structure of farmers' demand for skills and knowledge

<table>
<thead>
<tr>
<th>Learning Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor and register the results</td>
<td>26%</td>
</tr>
<tr>
<td>Test and experiment in the farm</td>
<td>25%</td>
</tr>
<tr>
<td>Observe on other farm</td>
<td>21%</td>
</tr>
<tr>
<td>Search in the internet</td>
<td>2%</td>
</tr>
<tr>
<td>Learning in training/technical workshops</td>
<td>6%</td>
</tr>
<tr>
<td>Talk to others</td>
<td>20%</td>
</tr>
</tbody>
</table>
5.2.1.3 Farmer’s innovation paths and trigger cycle change model

Regarding the reference of the farmer to innovation, a significant part are adopters (developed and / or introduced an innovation), none of which will be referred to as pioneer (responsible for development and / or introducing the innovation in the region). From the sample of interviewed farmers, there were 1 dropper (introduced innovation but discontinued its use) and 4 non-adopters (did not introduce innovation).

![Figure 19: Farmers relation to innovation](image)

The structure of farmers’ perception on the effects of the innovation in the focus region and in what he/she bases this evaluation is as follows:

![Figure 20: The structure of farmers' perception on the effects of the innovation](image)
The awareness stage

In the case of raising awareness in terms of the innovation, there were two main actors involved, which were the local public advisory services and the neighbour farmer or peer.

The interaction between these entities and farmers in the awareness stage was varied, with the predominance of frequent and constant contacts. The form of this interaction is mainly 'one to one' (individual advice in person) and, to a lesser extent, group consulting (training session, workshop or seminar).

The assessment stage

The event that made farmer thing seriously about assessing the innovation on the farm was usually associated with an entity that was involved in raising awareness in the field of innovation. In the case of public sector - local advisory services, these events were primarily a 'one to one' meeting with a local advisor or training / workshop at the local agricultural advisory office. In the case of neighbour farmer or peer, this event was usually 'one to one' meeting with strong cooperation.

In the opinion of interviewed farmers they received support in assessing the option to implement the innovation in all cases. The entities that provided this support were those involved in raising awareness in the field of innovation. This support was usually provided in the form of a 'one to one' meeting or training session, workshop or seminar.

Among the factors that the farmer considered in the assessment of the innovation on the farm, the most frequent were:

- Environmental issues (maintenance and protection of biodiversity),
- The possibility of obtaining additional payments.

The implementation stage

90% of farmers who evaluated the innovation decided to implement it.
Defining the implementation period of innovation is difficult to determine, mainly due to a number of accompanying processes. Generally, this period takes one production season, depending on the level of farmer’s preparation and the availability of technological solutions.

The most common forms of biodiversity conservation are, as follows:

- Maintaining valuable natural meadows in the Natura 2000 area,
- Introduction of old varieties of arable crops,
- Delaying the time of mowing meadows to protect wild animals and rare bird species,
- Midfield afforestation, ecological corridors, buffer zones, ditches, ponds.

The motivation to introduce innovations was also varied, however, it was corresponding to a large extent with the factors determined in the assessment phase, i.e.:

- Environmental issues (maintenance and protection of biodiversity),
- The possibility of obtaining additional payments.

In terms of support during the implementation of innovation, all farmers received adequate support, mainly from the entities involved in the awareness and assessment process. This support was provided mainly in the form of ‘one to one’ interaction, occurring frequently or sporadically.

**Non-adopters**

In this case, there were 4 farmers who did not introduce innovation. The main reasons for not introducing innovation into the farm were:

- No interest for the farm,
- No visible benefits for the farm,
- No favourable weather conditions (drought).

Despite the fact that the farmer did not introduce innovations, the farmer is considering the possibility of a future implementation, but not in a near future.

**Droppers**

In this case, there was one farmer who introduced innovation but discontinued its use. The farmer was implementing the innovation for 2 years before abandoning. The main reason for discontinuing innovation was no visible effects and benefits of introducing innovations. This farmer does not consider the possibility of reintroducing the innovation to the farms.

5.2.2 Findings from the AKIS experts interviews and advisory organisations survey

5.2.2.1 Advisory landscape in the focus region

In the focus region the local branch of state agricultural advisory services operates. Its coverage includes all farmers engaged in agricultural activities in this area. The scope of advisors' activities in this region includes the entire agricultural production, however, it focuses on those areas of agricultural production that are dominant in the region.
Private advisors are also present in the region, but within a limited range. Their subject of activity is wide, not limited only to the subject of innovation.

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

The interviewed AKIS actors were selected according to the farmers’ micro AKIS identified in the interviews. It includes both AKIS actor from the innovation area and main actor of the daily base decision-making.

The main advice actors for the innovation area in the focus region are as follows:

- Public sector – local advisory services
  Relevant and providing support in the innovation area for most of the interviewed farmers. Public advisors are main advice providers for most of the farmers in the region, which is due to the long history of public consultancy in the region, trust in farmer-advisor relations, and the high competences demonstrated by advisors in the subject of innovation.

- Neighbour farmer or peer
  These entities play a complementary advisory role in relation to public advisory units. Due to the specification of innovation based on farmers’ cooperation, they are natural and important player.

The main advisory channels for farmers at the adoption/implementation phase of innovation are outlined below:

Figure 21: Key players of advice for the innovation area

The region also has scientific / industrial entities thematically related to the subject of innovation, such as: the Institute of Technology and Life Sciences, the Institute of Soil Science and Plant Cultivation, local Chambers of Agriculture. However, as shown by the AKIS survey, they do not play a significant role in the farmer’s decision to implement innovation.
5.1.2.3 Transformation of advisory landscape

Most farmers are adopters. The specification of the topic translates rather into the constant involvement of farmers in activities (quite low financial outlays, relatively low labour outlays).

The share of specialists dealing with innovation is rather stable. As it results from the interview, in the case of public agricultural advisory units, there are enough advisors in the region in relation to the demand from farmers – specialists dealing with Natural resources common management. The share of private advisory entities is negligible due to the low market potential of their activity.

5.3 Case 3: the role of farm advice in innovation case study ‘Application of precision farming system’

5.3.1 Findings related to the Farmer’s survey

5.3.1.1 Farmer’s profile and farm structure

From the selected sample, the majority of farms were characterized by having one owner, only one of them belongs to the group holdings (owned by a group of natural persons). Respectively, in the vast majority of cases, the respondent’s position on the farm is the farm owner, only 1 in 40 respondents is a farm manager.

The age of interviewed farmers is as follows:

The gender structure among farmers is as follows:
Figure 23: The gender structure among farmers

The structure of farmers' education is as follows:

Figure 24: The structure of farmers’ education

The structure of work experience in agriculture is as follows:

Figure 25: The structure of work experience in agriculture
Most of the respondents (75%) did participate in the last 12 months in courses, trainings or workshops in the field of agriculture (at least one, mostly two). The thematic scope of the training included mainly issues related to innovation and also direct payments and farm development. Only a small percentage (around 10%) did not participate in any training.

The average area of the farm, among the surveyed, is 101 ha. However, there is a large diversity in the size of farms, the smallest surveyed holding had 12.5 ha and the largest 460 ha.

The agricultural production on the farm comprises crop production and livestock. The main crops are common wheat and spelt, rape, protein crops and grain maize. All these crops are grown in an open field. All these farms cultivate in the conventional system. A significant part of these farms has pastures (permanent grassland). Irrigation of crops does not occur in any of the cases. The livestock production is dominated by the bovine breeding and pigs dominate the production of cattle.

The 3/4 of the surveyed farms sell their final products, of which more than half sells less than 50% of the total final production, to a lesser extent sales are in the range more than 50% but less than 100% and those that represent 100% of the total final production. Only a small percentage of these farms sell their products directly to final consumers. 1/3 of farms show that sales are none or residual.

All of the farms benefit from subsidies for running a farm. Half of them show less than 25% and the other half between 25-50% of the income generated by the agricultural holding from the subsidies.

5.3.1.2 Farmer’s attitude towards innovation and change

All the interviewed farmers stated that advisors from the public sector cooperating with farmers at the regional level play a significant role in advising on innovation. The vast majority of the farmer-advisor interaction takes place in the form of 'one to one' (individual advice in person). In addition, many farmers benefit from an advisory services in the form of training sessions, workshops, and seminars, organized by local public advisors.

Another significant key advice provider in the case of this innovation (precision farming) are the input and machinery private suppliers, also the downstream industry. The neighbour farmer or peer-to-peer interaction emerge as well as relevant source of advice in this case study.

In the case of the private sector, the input and machinery companies and industries, the method for advice supply is by direct consulting or during events presenting the equipment, while in the case of neighbour farmer or peer it’s mainly 'one to one' cooperation.

The type of support for advisory services is as follows:
5.3.1.3 Farmer’s innovation paths and trigger cycle change model

Regarding the reference of the farmer to innovation, a significant part are adopters (developed and / or introduced an innovation), one of them of which will be referred to be a pioneer (responsible for development and / or introducing the innovation in the region). The selected farmers include eight droppers (introduced innovation but discontinued its use) and eight non-adopter (did not introduce innovation).
The structure of farmers’ perception on the effects of the innovation in the focus region and in what he/she bases this evaluation is as follows:

Figure 29: The structure of farmers’ perception on the effects of the innovation

The awareness stage

In the case of raising awareness in terms of the innovation, there were three main group of actors involved, i.e.,

- Public sector - local advisory services,
- Private sector - input and machinery companies and industries,
• Neighbour farmer or peer.

The interaction between these entities and farmers in the face of awareness rising was varied, with the predominance of frequent and constant contacts. The form of this interaction is mainly 'one to one' (individual advice in person) and, to a lesser extent, group consulting (training session, workshop or seminar).

**The assessment stage**

The event that made farmers thing seriously about assessing the innovation on the farm was, in most of the cases, associated with an entity that was involved in raising awareness in the field of innovation. In the case of local public advisory services, these events were primarily a 'one to one' meetings with a local advisor or a training / workshop at the local agricultural advisory office. In the case of private suppliers of input and machinery and industries, this event was mainly a technical fair, where these entities were present and presented their technological solutions.

In the opinion of the interviewed farmers they received support in assessing the option to implement the innovation in all cases. The entities that provided this support were those involved in raising awareness in the field of innovation. This support was usually provided in the form of a 'one to one' meeting or training session, such as a workshop or seminar.

Among the factors that the farmer considered in the assessment of the innovation on the farm, the most frequent were:

• Cost savings related to the implementation of innovation,
• High costs of machinery,
• The effectiveness of technology.

**The implementation stage**

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

Defining the implementation period of innovation is difficult to determine, mainly due to a number of accompanying processes. Generally, this period takes one production season, depending on the level of farmer's preparation and the availability of technological solutions.

The motivation to introduce innovations was also varied, however, it was corresponding to a large extent with the factors determined in the assessment phase, i.e.:

• Introducing new technologies to the farm,
• More sustainable way of farming,
• Cost and time savings,
• Environmental issues (reducing the consumption of production resources)

In terms of support during the implementation of innovation, all farmers received adequate support, mainly from the entities involved in the awareness and assessment process. This support was provided mainly in the form of 'one to one' interaction, occurring frequently or sporadically.

**Non-adopters**

In this case, there were 8 farmers who did not introduce innovation. The main reasons for not introducing innovation into the farm were:
• Economic issues – high cost of machinery, lack of economic justification as to the benefits arising from the introduction of innovation),
• Limited area of arable land - no suitable machines for small farms.

Despite the fact that the farmer did not introduce innovations, the farmer is considering the possibility of a future implementation, but not in a near future.

Droppers

In this case, there were 8 farmers who introduced innovation but discontinued its use. The average period of innovation implementation is from 1 to 3 years. The main reason for discontinuing innovation is:
• Too small farm area,
• High costs compared to small profits,
• Limited benefits of introducing innovations,
• Lack of technological solutions allowing for proper cultivation (e.g. increase in the occurrence of weeds in cereals).

Most of the farmers consider the possibility of reintroducing the innovation to their farms, but not in the next 3 years.

5.3.2 Findings from the AKIS experts interviews and advisory organisations survey

5.3.2.1 Advisory landscape in the focus region

In the focus region the local branch of state agricultural advisory services operates. Its coverage includes all farmers engaged in agricultural activities in this area. The scope of advisors’ activities in this region includes the entire agricultural production, however, it focuses on those areas of agricultural production that are dominant in the region.

Private advisors are also present in the region, but within a limited range. Their subject of activity is wide, not limited only to the subject of innovation.

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

The interviewed AKIS actors were selected according to the farmers’ micro AKIS identified in the interviews. It includes both AKIS actor from the innovation area and main actor of the daily base decision-making.

The main advice actors for the innovation (precision farming) in the focus region are as follows:
• Public sector – local advisory services
  These services are relevant and provide support in the innovation area for most of the interviewed farmers. Public advisors are main advice providers for most of the farmers in the region, which is due to the long history of public consultancy in the region, trust in farmer-advisor relations, and the high competences demonstrated by advisors in the subject of innovation.
• Private sector – input and machinery companies and industries
These entities play a complementary advisory role in relation to public advisory units. Due to the technically advanced specification of innovation, they are, however, an indispensable element for its full implementation on farms.

- Neighbour farmer or peer
  These entities play a complementary advisory role in relation to public advisory units. Due to the innovation specificity and the need to create local-based knowledge farmers’ cooperation regarding the information and knowledge sharing appears an important contribution to help farmers with the innovation implementation.

The main advisory channels for farmers at the adoption/implementation phase of innovation are outlined below:

**Figure 30: Key players of advice for the innovation area**

The region also has scientific / industrial entities thematically related to the subject of innovation, such as, the Institute of Plant Protection and the local Chambers of Agriculture. However, as shown by the micro AKIS survey, they do not play a significant role in the farmer’s decision to implement innovation.

### 5.1.2.3 Transformation of advisory landscape

Most farmers are adopters, among whom there are also a significant percentage of pioneers. Due to the gradual increase of farmers implementing innovation, the percentage of droppers is also increasing. This is reflected in growing demand for advice from farmers.

The share of specialists dealing with innovation is increasing. This is mainly due to the market situation and growing demand for consultancy in this area. As it results from the interview, in the case of public agricultural advisory units, there are enough advisors in the region in relation to the demand from farmers - specialists dealing with precision farming. In the case of private entities, consulting is most often combined with the sale of products / technology.
6 Discussion: Answering research questions

6.1 Role of advisory suppliers in the farmer’s TCM and innovation paths

Agricultural advisory services, implemented by State owned agricultural advisory units, have an undisputed leadership position in the rural environment in the provision of consultancy services for rural residents. It is the legacy of the work of many generations of employees of advisory services, who for more than a hundred years have been constantly supporting rural society in economic, political and social transformations, they deserve a great loan of trust. It is necessary to emphasize the special importance of agricultural advisory in periods of rapid political and economic changes or intensive social development.

![Agricultural advisory system in Poland](image)

Agricultural advisory offices having great organizational potential and equally valuable human capital play an important role in initiating or supporting all activities undertaken for the development of rural areas. Through their activities, advisory institutions shape the image of an institution that identifies with the interest of farmers. It is possible through a continuous modification of tasks aimed at adapting the implemented advisory activities to the changing management conditions and innovation uptake.
In Poland an agricultural advisory system is operating for years in the form of regional agricultural advisory centres (ODRs) providing advisory services in accordance with general EU requirements. This is due to the fact that the farm advisory system in Poland has already carried out many activities, including those formulated in the EU-FAS objectives and tasks.

The EU-FAS is implementing on regional level. The system is coordinated at national level by the MARD. The second phase of the FAS implementation includes agricultural advisory services resulting from EU legislation. These horizontal services are implemented at the level of all regions. They are available for all farmers in all over the country eligible for support from the CAP.

In Poland, EU-FAS consists of several entities providing agricultural advisory services, including Agricultural Advisory Centre in Brwinów (CDR), 16 regional agricultural advisory centres (ODRs), 16 regional agricultural chambers, private advisory companies, advisory firms and independent advisors. The main part of the system consists of 16 regional ODRs. The vast majority (over 90%) of advisory services for farmers are delivered by the ODRs.

Generally agricultural advisory services in Poland are defined as help in solving farmers' problems and in making decisions process.

The basic task of agricultural advisory is providing comprehensive assistance to farmers and rural residents in order to increase income from the farm and implementing activities aimed at improving the living conditions of rural families.

Private consultancy entities operate on the basis of the Act of 2.07.2004 on the freedom of economic activity (i.e. Journal of Laws of 2013, item 672). To benefit from support under the 'Use of advisory services by farmers and forest owners' measure of the Rural Development Program for 2007–2013, private companies must be accredited by the Minister of Agriculture and Rural Development. Currently (as of 2015) there are 182 accredited agricultural advisory entities that employ 366 authorized advisors. Most of them (110) are sole proprietorships, and 92 are companies in which the owners themselves have the right of advising.

6.2 Farmers diversity and role of advisory in innovation uptake processes

What is the relationship between different types of farmer and advisory providers in the decision-making process?

The most important group of customers for Polish advisors are small and medium farms. This is related to specific characteristics of Polish agriculture (fragmentation of farms, agrarian overpopulation, weak soil, poor use of production means). Nonetheless, advisors still ranked “helping large market oriented farms” fourth, before assistance to the so-called young farmers, i.e., persons below the age of 40, and rural women.

Looking at the main topics of advisory services, we can notice that there is no big difference between the groups of clients. The main topics of advisory for medium commercial farms are: plant production, animal production, accounting, taxes, cross-compliance and environment protection. Similar topics for small commercial farms, excluding environment protection, but including rural development, are covered. The four first topics and renewable energy hold true for young farmers (Kania, 2017).
6.3 Transformation of advisory suppliers and farmer’s innovation uptake processes

How does the transformation of advisory providers landscape influence farmers’ decision-making and uptake of innovation?

The most important factor for the advisory system to be efficient is the advisory staff – competent professionals, with extensive and in-depth professional knowledge and good communication skills, familiar with farmers’ needs, being market-orientated and capable of working with all stakeholders. In the period from 2006–2015 the number of advisory staff at local advisory offices was successively decreased.

<table>
<thead>
<tr>
<th>Employees in local advisory offices</th>
<th>Total of advisors and distribution by speciality</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total of advisors</td>
<td>Management staff</td>
<td>Subject matter specialists</td>
</tr>
<tr>
<td>2006</td>
<td>4212</td>
<td>500</td>
<td>1045</td>
</tr>
<tr>
<td>2015</td>
<td>3549</td>
<td>565</td>
<td>753</td>
</tr>
<tr>
<td>Variation (%)</td>
<td>-15.8</td>
<td>-13.0</td>
<td>-28.0</td>
</tr>
</tbody>
</table>


At present, the number of advisors employed in the ODRs is 3,549, of which 31.9% are women. Since 2006, the number of full-time positions in provincial ODRs has declined (reduction by 15.8%). The reason for the declining number of advisors can be due to a very tight budget, year by year limited by the government, but also due to the fact that many advisors decided to open their own advisory practices (Kania, 2017).

In fact, in Poland, we can’t observe formal systemic network connections between advisory service providers. These are rather informal networks of cooperation, including scientists. This results from the science assessment system only to a low extent taking into account the effects of work for business practice. In this situation, the advisory services do not always respond to new challenges and expectations of farmers.
7 Case study narratives

This section was removed due the GDPR regulations.
8 Conclusions: Insights & Highlights

INSIGHTS

This report presents the scope of cooperation between farmers – potential recipients of innovative solutions – and information providers in the field of these solutions. The interactions between these groups of entities are diverse, depending on the subject of innovation, scope, level of involvement of technological solutions and the region in which the research was conducted.

Good stories

In most cases, farmers who are interested in introducing innovative solutions do not operate on their own, seeking experienced entities to cooperate with, allowing them to understand well the scope of a given innovation, the potential benefits resulting from its implementation, and some risks that may be associated with it.

In the studied case studies, three main information providers can be distinguished (in various proportions depending on the subject of innovation), i.e.:

- Public sector – local advisory services,
- Private sector – input and machinery companies and industries,
- Neighbour farmer or peer.

In most cases, these entities remain present, to a greater or lesser extent, throughout the whole process of the innovation (from awareness, through assessment to the implementation stage). Therefore, the farmer is assured of the comprehensive assistance and support throughout the innovation process. The role of these entities is active and aims at supporting the farmer in making decisions aimed at improving the functioning of his agricultural economy.

Failure stories

As part of the conducted research, it was shown that in a few of the cases the direct reason for making a decision not to introduce or cease the innovation already introduced was the lack of adequate support from external entities. This advice did not occur at all or was so limited that it had a negative impact on the farmer’s decision to implement the innovation.

Gaps

The main gap resulting from the conducted research is the limited number of entities involved in advice in the field of introducing innovations in agricultural holdings. This limited number of information providers results mainly from the specificity of the overall agricultural advisory system in Poland as well as from the specifics of the thematic scope of the studied case studies. Improvement - increasing the involvement of other entities in innovative advisory would certainly have a beneficial added value for the entire process.
References
