THE ROLE OF CONSULTANTS IN AGRICULTURAL DIGITALISATION

FŰRÉSZ EDINA[1], TÓTH KRISZTINA*[1], AGĂNENCEI MARIA ADRIANA[2], VENTER GABRIELA MIHAELA[2], OCNEAN MONICA*[2]

[1]Hungarian University of Agriculture and Life Sciences

[2]University of Life Sciences "King Mihai I" from Timișoara, Faculty of Management and Rural Tourism, Timisoara, Romania

*Corresponding author's e-mail: monicaocnean@gmail.com

Abstract: *One of the critical points for the development of agriculture is the extent to which farmers are willing to exploit the potential of digitalization and precision tools. In our research, we seek to find out what farmers believe are the factors that might hinder their digital switchover and what role extension agents currently play in promoting digitalisation. In the literature review, we have introduced the main Agricultural Knowledge and Innovation System actors. Farmers' views were measured through a semi-structured interview involving 15 young, qualified farmers. Brain Storming was applied to the target group of 48 farmers. Based on the research results, it can be concluded that the current efforts are in the direction of spreading precision farming. Even with active communication and better coordination between actors, there is a need for training programmes at different levels, both for extension agents and farmers. It would be advisable to involve advisers not only in disseminating research results but also in the research itself, in order to increase their credibility in the eyes of farmers.*

Key words*: adviser, agricultural digitalization, demonstration farm, precision technology*

INTRODUCTION

Even today agriculture faces many difficulties. It poses a significant challenge to farmers to remain competitive despite of the extreme weather conditions, climate change, labour shortages, marketing and input supply problems. The extent to which farmers are willing to exploit the potential of digitalisation and precision tools is a critical point in the development of agriculture.

Researches show that the data collected by digital tools and artificial intelligence can greatly improve the efficiency of the sector, enable faster decision-making, help to pinpoint problems and identify cause and effect. In our research we are looking for answer to what factors, according to the farmers, may hinder the digital switchover, what role the advisors currently play in the dissemination of digitalisation, what methods they can use to help their clients in the decision-making process.

MATERIALS AND METHODS

In the first phase of our research, we assessed the situation of agri-digitalisation by studying international and foreign literature. In line with the main objective of the research, the personal opinions and attitudes of farmers and extension agents surveyed towards agri-digitalisation were presented. For this purpose, we chose a research method that allowed us not only to collect data, but also to obtain detailed information focused on individuals. Therefore, we used semi-structured interviews with farmers as a qualitative research method. [4] For the consultants, we used the Brain-Storming method, where they first worked in a small group (4-5 people) and then presented to a larger group (48 people). The research was carried out within the framework of the Precision Agricultural Consultant/Specialist Engineer training programme of Széchenyi István University.

As the agricultural society is extremely diverse, both in terms of farm size and territorial differences, we tried to define a narrow target group in order to get a more accurate picture of the segment. As, based on the preliminary literature review, the main problem with the spread of digitalisation is the lack of knowledge, we wanted to interview farmers

who have a professional qualification, so all interviewees have an agricultural qualification. In terms of age, we focused on young people, so all respondents are under 40 years old, are involved in arable crop production and are in a leading role in farming. The questions were grouped around three issues. The first part included questions about the farmer, the second about the farm and the third about digitalisation. Audio recordings were made during the interviews to facilitate processing. A personal data sheet was prepared for each interviewee, including all the questions, the exact date of the interview, the time of the interview and the time of its start and end. We also marked the comments on the data sheet that could help the processing. The pre-prepared interview outline helped to keep the interview in focus so that all the relevant questions for the research were answered. The contacted farmers were interested in the topic and considered it to be very topical and were happy to discuss it. The interviews with the farmers took place at a pre-arranged time. The interviews varied greatly in length, with the shortest being 40 minutes and the longest 90 minutes.

Based on the feedback from farmers and extension agents, we examined the services of the currently available NAPS, as well as other programmes, subsidies and training help digitisation. Based on these, we present the role of the Hungarian Agricultural Knowledge and Innovation System (AKIS), the Digital Agricultural Strategy (DAS) and the Digital Agricultural Academy (DAA).

RESEARCH RESULTS

Similar research was carried out in several countries and farmers' views on digital data have been surveyed. These researches also revealed that Australian, American and European farmers treat data provision with reservation. They are happy to share data with their partners, but they find open data communication with large companies questionable due to market competition and potential business gain. From the farmers surveyed in EU countries those who own an area of more than 500 ha are already running a fully digitalised business, but there are large gaps in the development of smaller farms. However, among small farms, many producers work only part-time and there is a high proportion of seasonal employment, compounded by an ageing age structure and a lack of highly qualified labour.[5]

According to the 2020 Agricultural survey, nearly 8% of the 241 000 farmers in Hungary have no agricultural education. These may be why family farms prefer traditional production systems to innovative solutions. [5] Because of this the issue of trust and acceptance is particularly appreciated. The work of an adviser has always been based on trust and acceptance of the adviser as a person, alongside expertise. But there are many uncertainties in the digitalisation process. These are briefly summarised below:

- training and availability of the consultants
- the skills of farmers
- connection problems, interoperability
- benefit-cost ratio and resulting payback period
- reluctance to share data [8]

In Hungary, according to the National Chamber of Agriculture (NAK), there are 197 consultants working in the field of precision farming (crop production, animal husbandry, horticulture) and another 2 in the field of digitalisation in forestry [10] An independent adviser is an adviser who is not a member, owner or employee of a company or has no other employment-related legal relationship with a company which carries out sales and agency activities related to the agricultural activities of the recipient of the service and does not carry out administrative or physical control activities related to the granting of public aid for agriculture, food processing, forestry, rural development or public authority tasks.[9]. The

number of consultants is growing dynamically, as all agricultural universities in the country have started precision and digitalisation training courses [11].

The central coordination of the Hungarian AKIS is currently under development, currently the identification and joint thinking of the actors in the system is being implemented through the Agricultural Advisory System. For the future, coherence in cooperation is expected to increase, given the demand and willingness of government, professional and social actors. AKIS actors are: farmers/foresters/food producers, extension agents, researchers, farmers' organisations, as well as governmental and non-governmental organisations, in-school and out-of-school education institutions, networks, media, other services, etc., i.e., all those who produce or transfer knowledge.[13]

The following institutions of higher education play a relevant role in the effective operation of AKIS: Hungarian University of Agricultural and Life Sciences, University of Veterinary Medicine, University of Debrecen, University of Nyíregyháza, University of Sopron, University of Szeged, Széchenyi István University. Other actors in the AKIS system are the agricultural vocational training schools maintained by AM and the institutions involved in adult education, the farmer and farmer professional and inter-professional organisations and associations that link the various agricultural and food supply chains in Hungary. [13]

AKIS is directly and/or indirectly financed by public, private and EU funding. In this respect, actors include EU-funded networks. (Innovation Networks: EIP-AGRI, LEADER, ENRD). [14] Media and other multimedia channels, be it on-line media, social networks, or even paper-based publications, are one of the most important elements of knowledge dissemination, but also national and international events and fairs where AKIS actors can meet face-to-face. [13]

Horizontally, the National Chamber of Agriculture (NAK) represents the interests of all those active in all areas of the agri-food economy, from production and processing to trade, given that membership of the Chamber is compulsory in Hungary.[2] NAK also plays an important role in knowledge transfer by organising training and examinations for expert advisors, carrying out coordination tasks related to the activity of expert advisors, as well as by establishing, maintaining and publishing a register of expert advisors and expert advisory organisations, maintaining contacts with the expert advisory organisations for agriculture and rural development in the Member States of the European Union. [1] In addition to the NAK, two professional chambers also play an important role in the field of knowledge transfer: the Hungarian Chamber of Plant Protection Engineers and Phytomedicines (MNMNK) and the Hungarian Veterinary Chamber (MÁOK). [13] The farmers' information is mainly provided by NGOs. The main task of more than 100 such organisations is to develop the public.[6]

Professionals in many areas of the sector are looking to digitalisation for solutions. In addition to improving resource and energy efficiency, digital solutions are expected to contribute to addressing societal challenges such as environmental protection, biodiversity conservation and the optimisation of logistics, which can lead to traceability processes along the entire value chain. Various sensors, drone technology, among other things, allow rapid detection of plant diseases and efficient distribution of the necessary nutrients and water. Their use leads to a significant increase in productivity, reduces labour costs, improves the quality of agricultural products and saves the farmer time by reducing the effort required for the various work processes, which significantly improves working conditions. [3]

In November 2021, the "Who sows as well as data - Agricultural Workshop" was organised in Hungary to examine the situation of agricultural digitisation. The current status of digitalisation in all sectors of the sector was assessed, and the factors hindering its use were identified. For arable crops, precision farming is already present, to varying degrees,

on both small and large farms. Data sharing is still only used by a mere 5% of large farms along the production pathway. Lack of knowledge was identified as the main barrier to the uptake of digitisation, as well as farming habits based on tradition and custom, which are not changing in the younger generation. Farmers are distrustful in relation to data provision, there is no unified farm management system, so it would have to be developed by the farmers, for which the sector does not have an adequate number of advisors. [7]

Hungary's Digital Agricultural Strategy [12] was adopted in 2019. It aims to promote the use of modern technologies in the sector. Based on the Action Plan, a number of projects have been launched in 2020:

- Digital Academy of Agriculture
- Digital Farmers Market
- The development of the Mezőhegyes National Stud Farm and Tangazdaság Zrt. into a digital agricultural model farm, including a test environment for the development and testing of agricultural machinery and technologies and solutions.
- Preparation of a Digital Food Strategy
- Free access to agricultural meteorological data on open data from 2020 -
- SoilWeb development for georeferenced storage of soil sampling data
- E-Winery Register
- MÁK application to access MePAR data
- VP_2-4.1.8-21 Support for precision improvements related to the digital transformation of farming

The DAA aims to prepare producers in the Carpathian Basin to adopt digital solutions. The DAA's awareness-raising activities of the Digital Academy of Agriculture lay the foundation for the sector's actors to consciously adopt digital technology, increasing income and profit at production and farm level. The DAA's training process ensures that farmers and food business operators without digital skills can learn about the digitalisation solutions available in the agribusiness sector. The focus is on enabling farmers to acquire the basic application skills needed to use it and to put together a basic concept for the development of their own farm. The DAA will ensure that participants can test the tools and applications in real-life situations and experience the application in digital model farms. [15]

The Digital Farming Academy organised demonstration farm training to promote precision technologies. Among the consortium members, the training was coordinated by the Hungarian University of Agricultural and Life Sciences. The DAA network of demonstration farms can be found on the official DAA website. The locations of the training courses and the number of participants is presented in Table 1.

Table 1.

Locations of the training courses and the number of participants

Country	Number of municipalities	Number of programmes	Number of participants
Hungary	45	60	993
Romania	11	12	263
Serbia	4	5	91
Slovakia	4	4	42
Ukraine	1	2	21

Source: Hungarian University of Agricultural and Life Sciences, Centre for Adult Education and Counselling (2022)

The topics of the presentations are summarised below:

- Precision Crop Protection
- Precision Arable Crops
- Precision agriculture
- Precision farming
- Site-specific liquid nitrogen fertilizer application based on remotely sensed data (and the application of fleet tracking systems in practice
- Precision animal husbandry (fish farming, beekeeping)

The Hungarian government has launched a call for proposals to support the digital switchover of farms to precision farming, in line with the objectives of the Partnership Agreement with the European Union. Under the call, projects meeting the criteria were awarded a maximum of HUF 250 million in non-repayable grants.

Within the framework of the call, it was possible to purchase site-specific and precision (GPS/DGPS, RTK-compliant) agricultural machinery for arable crops, horticulture and viticulture, combine harvesters with performance enhancement, yield mapping systems, harvesting equipment for grain harvesting, and ISOBUS machines with serial port connection. They also supported the purchase of info communication equipment, tablets, laptops, desktops, decision support tools, programmes and software closely related to precision farming and systematic data collection, storage and analysis. It was possible to purchase tools and machinery for the technological improvement of existing production equipment. The call for proposals included support for training and education related to the transition to precision farming among the mandatory activities that could not be supported separately. The call for proposals thus enabled applicants to acquire the necessary skills to operate precision equipment during the period covered by the call for proposals [12]

In summary, it can be concluded that the AKIS actors are doing their part to accelerate the digitalisation processes in agriculture, in line with their respective responsibilities.

The aim of our research is to describe the role of extension agents in agricultural digitisation, and to this end we have mapped the attitudes of farmers, extension agents and AKIS actors.

In the first phase of the research, we included farmers with professional qualifications (12 with a BSc degree in agriculture, 2 with an agricultural MSc and 1 with a general qualification) and a skill level in the use of digital tools due to their age (30-38 years old). We have chosen this target group because the strongest limiting factor in the literature is school completion.

We wanted to get the views of farmers who are truly committed to agriculture and want to pursue it at a high professional level in the future. Accordingly, all 15 interviewees said that they were aware of the tools available to support digitisation (events, grants, training opportunities). Their main sources of information: studies, news on the internet, farmer forums, professional colleagues. Farmers have identified factors that influence their success, such as: monitoring innovation processes, introducing innovations adapted to farm size and revenue. They believe that the data collected by digital tools can provide solutions for adapting to extreme weather conditions, selecting input materials and more cost-efficient production. They identified the following difficulties: adaptation to extreme weather conditions, lack of manpower, lack of free time, interpretation of data, high cost of precision tools, lack of practical experience, lack of professional forums.

The young, skilled, innovative farmers surveyed also have many questions and therefore need programmes that explore cause and effect relationships in more depth and interpret data. All of them indicated that they had attended a DAA event and found the programme of events and presentations useful. They are in contact with commercial

consultants who distribute machinery, but have not yet requested a specific consultancy service. This is because they have not yet developed professional trust in them.

The results of a survey of advisers coincide with farmers' opinions. Precision agricultural engineer training started in Hungary in 2017 and since then the number of graduated agricultural engineers has been growing dynamically. The age of the target group of specialist agronomists is between 27-52 years, with the majority of them 72% having their 3rd professional degree. In their opinion, the role of consultants in this field requires new methodological skills, because there is not only knowledge transfer, but also knowledge exchange and co-creation, as even consultants do not have enough practical experience in this field, and there are still uncertainty factors in the technologies. Evaluation and interpretation of the data is not always available.

Low-skilled farmers also face a reluctance to collect data, and in this situation, it is almost impossible for advisors to change attitudes and generate interest in innovation.

Less than 5% of consultants participate mainly as participants in DAA event series, and less than 5% of consultants have taken on a speaker role at professional presentations. They are looking for AKIS actors with whom they could cooperate, especially from research and higher education institutions. In their opinion, training grants are the most needed, as well as technology demonstrations based on model farms. They are open to national and international research by universities and research institutes (EIP-AGRI, EUREKA, ERASMUS+), although only 3% of the consultants involved in research have so far participated in such programmes.

CONCLUSIONS

Based on the results of the research, it can be concluded that current efforts are moving towards the spread of precision farming. Even with active communication and better coordination between actors, there is a need for training programmes at different levels, both for extension agents and farmers. It would be advisable to involve advisers not only in disseminating research results but also in the research itself, in order to increase their credibility in the eyes of farmers. Young farmers are open to precision technologies, but they need more programmes where they can gain tangible knowledge. Demonstration farm programmes can also help farmers who are not yet aware of the benefits of data collection and precision technologies and are afraid of introducing new innovations.

REFERENCES

[1]. ANDRÁS VÉR ATTILA NÉMETH, LÁSZLÓ GULYÁSA, KRISZTINA TÓTH, JÓZSEF KOZÁRI, 2017, The Need of Change in Education of Agricultural Advisors in Hungary, In: Smyrniotopoulou, Alexandra; Koutsouris, Alex (szerk.) 23rd European Seminar on Extension (and) Education ESEE 2017 - Transformative learning: new directions in agricultural extension and education, Chania, Greece, Paper: Agricultural Education 1/3, 6 p.

[2]. BORZ DENISA-ALEXANDRA, BENCZE TIBOR, TOTH KRISZTINA, OCNEAN MONICA, 2018, The Experiences of the Transforming Extension Training in Hungary, Lucrari Stiintifice Management Agricol 20 : 3 pp. 217-223. , 7 p. (2018)

[3]. EVAGELOS D. LIOUTAS, CHRYSANTHI CHARATSARI, MARCELLO DE ROSA, 2021, Digitalization of agriculture: A way to solve the food problem or a trolley dilemma? Technology in Society 67

[4]. HAJDÚ GÁBOR, 2018, A kvantitatív és a kvalitatív társadalomtudományi kutatás módszerei - dióhéjban. Kúria III. évfolyam 2. szám

[5]. SEBASTIAN LINSNER, FRANZ KUNTKE, ENNO STEINBRINK, JONAS FRANKEN, AND CHRISTIAN REUTER, 2021, The Role of Privacy in Digitalization -

Analyzing Perspectives of German Farmers. Proceedings on Privacy Enhancing Technologies, 334–350 p
[6]. TOTH KRISZTINA, OCNEAN MONICA, FŰRÉSZ EDINA, VÖRÖS-LÁCZÓ EDINA, AMARIEI DANIEL, 2020, Role of agriculture extension in the agricultural knowledge system - state-of-the-art, Lucrari Stiintifice Management Agricol 22 : 2 pp. 301-304. , 4 p. (2020)
[7]. VARGA PÉTER, 2021, Az adatalapú agrártermelés hazai helyzetének áttekintése. IVSZ
[8]. * EUROPEAN COMMISSON:** The Digitisation of the European Agricultural Sector. https://digital-strategy.ec.europa.eu/en/policies/digitisation-agriculture. Download date: 2022.11.02.
[9]. * NEMZETI JOGSZABÁLYTÁR**: https://njt.hu/jogszabaly/2022-1-20-7R
[10]. * NEMZETI AGRÁRGAZDASÁGI KAMARA**. https://www.nak.hu/a-nak-altal-nyilvantartott-aktiv-szaktanacsadok#result Download date: 2022.11.02.
[11].*** https://www.felvi.hu/felveteli/szakok_kepzesek/szakleirasok/!Szakleirasok/index.php/szak/20686/szakleiras Download date: 2022.11.04.
[12]. *** Közös Agrár Politika 2023-2027 Nemzeti Stratégiai Tervének kivonata
[13]. *** AKIS Country Report HUNGARY http 4: I2CONNECT AKIS Country Report HUNGARY https://www.nak.hu/images/i2connect_AKIScountryreport_HUNGARY-FINAL-2021_01_12-EN-v2.pdf Download date: 2022.11.05.
[14].*** Magyar agrárium digitalizációjának előmozdításáról és összehangolásáról, Magyarország Digitális Agrár Stratégiájáról https://njt.hu/jogszabaly/2019-1470-30-22 Download date: 2022.11.05.
[15]. *** Digitális Agrárakadémia https://www.digitalisagrarakademia.hu Download date: 2022.11.03.