D.T1.1.2 PRECISION FARMING POLICY ECONOMIC REVIEW ANALYSIS

D.T1.1.2 Precision farming policy economic review analysis-

Hungary

Version 1

Contents

Hungary

1. Role of PF industrial sector - Overview about industry/companies

The use of precision agricultural technology is not yet widespread in Hungary. Yet, the growth in the number of producers using site-specific crop production has accelerated in the last two to three years. Location-specific farming is growing in crop production, because of the income position of the sector. This provides the resources needed to introduce technology that would otherwise have significant investment costs. Precision farming is linked to soil-friendly and less environmentally harmful cultivation practices.

Although precision farming has appeared in Hungary for more than a decade and a half, it is still an unknown concept for many. According to a 2015 survey by Agroinform.hu and Market Insight, only half of the field growers have heard of it. However, this proportion also depends on the size of the farm. 88% of decision-makers on large farms over 500 hectares, 67% on medium-sized farms between 100 and 500 hectares, and only a third of small farms under 100 hectares have heard of precision farming.

In Hungary, those who use precision farming are mainly farmers under 40 years of age. They have also finished higher education and have over hectares of land, which is in line with international experience.

According to an online survey by AgroStratéga, the proportion of farmers using GPS was already 44% in 2015, but it reached 48% in the under-40s. Yet, many of those who use GPS vehicle navigation or soil sampling are not considered to be precision farmers. This is due to the lack of use of technologies that lead to site-specific, differentiated treatments.

2. Impact of PF - Status in the region

Digitization has brought significant changes in data management, data production, and processing. The operation of digital devices is combined with organizational data. This makes it possible to get to know the operation of each area in detail and to identify new aspects. It has become possible and inexpensive to communicate with a tool that is among the actors in agriculture that favors technological and economic processes (e.g., e-commerce). Due to the performance of certain technical elements of automation, complete conditions were fixed (for example automatic

steering, individual feeding). The use of robotics as an autonomous tool capable of solving the problem (for example grape pruning robot, milking robot) is an essential step.

Technological advances and digitization have enabled activities in the areas of process automation, the spread of robotics, the collection, processing, storage of large amounts of data, management decision support, business support, and the spread of electronic administration processes in network connections (e-commerce) and public administration (e-government).

The digital transformation is a major enabler of the technological and economic processes in the agricultural sector, employment, and social relations. Significant changes can affect unprepared actors and all such can speed up both lagging and catching up on trends.

Increased efficiency

Digital tools and applications can provide efficiency gains made up of several elements. At the level of production, digital tools increase the efficiency of input materials and the use of natural resources. Moreover, they increase yields, improve quality, by-products, waste, and reduce production risks. Improve the efficiency of technology and management decisions at the plant level. At the level of product lines, sales risks are reduced.

The efficiency of the digital agricultural economy depends on farm-level management decisions. Hungary's Digital Agricultural Strategy ensures that the farm service is provided with the necessary data, information, technological and human competencies, and knowledge.

Digital technology is also transforming the human resource needs of the agricultural economy. Precision technologies, automation, robotics, and decision support systems reduce the need for trained physical labor. On the other hand, the operation, maintenance, and development of new technologies need new knowledge from existing users, managers, and owners.

Significant amounts of data are produced in all areas of digital technology. Precision production, automation, robotics, and data collected by sensors, represent a value from the control of immediate interventions.

Environmental factors

Pesticides and fertilizers used in plant protection are a huge burden on public health, production costs,, and the environment.

The high rate of pesticide and fertilizer use and crop risk is still significant in Hungary. One important issue in agricultural crop protection is the global reduction of crop loss. Excessive amounts of chemicals, in turn, lead to increased resistance to pathogens and pests. Similar problems arise with antibiotics used in animal husbandry. Antibiotic resistance can also have a negative impact on human health.

Precision production can help producers by providing precise information on the current state of plants, the microclimatic conditions (microzones), the development of plant diseases, and the effect of current pathogens and pests on plant physiology.

The use of large-scale precision technology in agriculture means:

-Precise plant protection.

-Nutrient application.

-Machine operation.

-Reduction of livestock emissions, and ecological footprint.

Digital technology generally reduces the number of fossil fuels used for cultivation, thus the emission of greenhouse gases (GHGs) and air pollutants (NOx, PM2.5, NMVOC).

By using digital technology, the precision data available reduces the application of input materials, rationalizes the use of operational technologies, and can reduce the environmental impact.

Moreover, by increasing the quantity and improving the quality of the products produced, experience has shown that the effect of precision production has a positive effect on environmental factors.

3. Support PF at Policy level in Hungary

The Hungarian Government adopted Decree 1456/2017. (VII. 19.) on the expansion of the Digital Welfare Program and the adoption of the Digital Welfare Program 2.0.

According to the resolution, the Government considers it important for Hungary to be able to make use of its unique agricultural economic opportunities through digitization. Therefore, the development and submission of Hungary's Digital Agricultural Strategy were ordered. To carry out this task the Prime Ministerial Commissioner for the Digital Welfare Program was nominated.

Additionally, the Artificial Intelligence Strategy of Hungary also promotes the use of state-of-the-art AI solutions in the field of agriculture. As agriculture is considered to be a key area for competitiveness, the AI Strategy ensures that forwards-looking initiatives in the field of AI all contribute to the successful exploitation of innovative technologies.

Main aspects of the Digital Agricultural Strategy

The aim of Hungary's Digital Agricultural Strategy (DAS) is to support the use of digital technologies in the areas of agriculture. Moreover, to help identify and manage the potential risks. The vertical and horizontal territorial approaches provided by the DAS can be applied to cover:

-Agricultural production.

-Production lines.

-Human resource development.

-Research and development-innovation.

-Administration.

-Public services, policy development, and support system.

Resources:

Digital Agricultural Strategy of Hungary: https://digitalisjoletprogram.hu/hu/tartalom/das-magyarorszag-digitalis-agrar-strategiaja

Artificial Intelligence Strategy of Hungary: https://ai-hungary.com/files/c0/2d/c02dec104186938b84d95132eecc31ce.pdf

4. Subsidies, schemes supporting PF in Hungary

The growing food demand of the growing population, the decline of agricultural land and water scarcity requires more and more efficient cultivation methods, and this can facilitate the rapid spread of precision farming.

The overarching goal (Á1) of the digitalisation of the agricultural economy is the automatisation and robotisation of technological operations available to increase the profitability of agricultural production and more efficient use of environmental resources.

Goals can be divided into two groups: strategic (S1,S2,S3) and horizontal goals (H1.1, H1.2, H2.1, H2.2, H3.1, H3.2, H3.3, H4.1). The strategic goals are agricultural production (S1), agricultural holding (S2) and product line (S3).The horizontal goals are human resources (H1.1, H1.2), research, development and innovation (H2.1, H2.2), public administration and services(H3.1, H3.2, H3.3) , development policy and grants (H4.1).

.

A more detailed description about the DAS (Digital Agricultural Strategy) goals can be found in the table below:

[1]

Code	Goals
Á1	Contribute to increasing the profitability of agricultural production by collecting and processing information, automating and robotizing technological operations in addition to the efficient use of available environmental resources
S1	Wider application of precision farming
S2	Using plant management applications in farm management and in decision preparation
S3	Development of product tracking systems and online business management
H1.1	Development the digital competence of agricultural economic actors
H1.2	Making digital agricultural expert advice available to producers
H2.1	Development of the digital agricultural innovation environment
H2.2	Development of the digital agricultural startup "ecosystem"
H3.1	Reduce the cost of the access to public data and digital services
H3.2	Legal deregulation to exploit the potential of digital technology
H3.3	Improve the processing of sector data collection
H4.1	Support the spread of precision farming

The market demand for agricultural knowledge and innovation in Hungary is currently low. In the field of innovation-based research and development the Hungarian agricultural economy is lagging behind the western EU member states, so development policy measures are much needed. For further development it is necessary to link the provisions to the strategic goals of the digital agricultural economy and also to set a priority order. In the table below the links between the objectives of the DAS and the provisions are presented:

[1] Source: https://digitalisjoletprogram.hu/files/47/ce/47ce5027f5cdb585095631589cc9e5b5.pdf; page: 49-50

Provisions	Priority level	DAS (Digital Agricultural Strategy) goals											
		Á1	S1	S2	S3	H1.1	H1.2	H2.1	H2.2	H3.1	H3.2	H3.3	H4.1
Development of digital competencies													
Digital Academy of Agriculture	+++	+	+	+	+	+	+	+	+				
"Smart Farmer Program": development of agricultural vocational training	+++	+	+	+	+	+							
Development of higher education in agriculture	+++	+	+	+	+	+	+	+	+				
Development of expert consultancy	+++	+	+	+	+		+						
Digital agricultural overhead reduction													
Digital base map (MEPAR)	+++	+	+	+						+			
GNSS (Global Navigation Satellite System) service	+++	+	+	+						+			
Agrometeorology	+++	+	+	+						+			
Further development of the plant protection forecasting service	++	+	+	+						+			
Grape protection system	++	+	+	+						+			
Soil protection advisory system	++	+	+	+						+			
Drone service	+	+	+	+						+			
"Smart testing system" collection and analysis of industry data	+++	+		+								+	
Surface covering data system	++	+	+	+	+					+		+	
Fruit cadastre	++	+	+	+	+					+		+	
Yield estimation based on remote sensing	++	+		+						+			
Digital agricultural innovation center	+++	+	+	+	+	+	+	+	+				+
Digital food chain research, development and innovation center	+++	+	+	+	+	+	+	+				+	+
National food chain data provider center	+++	+			+					+		+	
Water supply usage	++	+		+						+		+	
Forestry information framework (ERDEINK)	++	+		+	+					+		+	
Upgrade of the fisheries information system	++	+		+	+					+		+	
E-cellar book	++	+		+	+							+	
Development of the innovation environmen	++	+						+					
Development of digital commerce	+++	+			+					+			
Adapting regulation to the possibilities of digital technology	+	+	+	+	+						+		

[2]

+++: High priority; **++:** Medium priority; **+:** Low priority

Low and medium priority provisions can be linked to the development of the sector concerned, without immediate intervention. High priority provisions requires immediate intervention. In the table below provisions with highest priority level are presented[3]:

[2] Source: https://digitalisjoletprogram.hu/files/47/ce/47ce5027f5cdb585095631589cc9e5b5.pdf; page: 53-54

[3] Source: https://digitalisjoletprogram.hu/files/47/ce/47ce5027f5cdb585095631589cc9e5b5.pdf; page: 55-91

Provisions	Purpose of the measure	Priority level
Digital Academy of Agriculture	Providing the knowledge, testing and acquisition of the necessary basic skills in digital technology to the agricultural producers and other actors in the agricultural economy. The dissemination activities of the Digital Academy of Agriculture provide the basis for the conscious use of digital technology by the actors of the sector and thus for the increase of income and profit at the level of production and operation.	+++
"Smart Farmer Program": development of agricultural vocational training	The aim of the "Smart Farmer Program" is to integrate the knowledge related to the digital agricultural economy into the curriculum of all agricultural vocational training and to provide the training of instructors, material conditions, demonstration farms and partners necessary for the acquisition of students' practical knowledge.	+++
Development of higher education in agriculture	Integration of digital agricultural technology and related user and developer knowledge materials into Hungarian higher education courses.	+++
Development of expert consultancy	Extending the agricultural advisory system to digital areas so that producers can receive specific, personalized advice on planning and operating the digitization of their own farm.	+++
Digital base map (MEPAR)	Providing a digital base map for the operation of producer and plant-level applications and for the geospatial storage of plant-level data. Making the Agricultural Parcel Identification System (MEPAR) available would ensure that production technology data and support and administrative data are recorded and stored in one map (link: https://www.mepar.hu/mepar/).	+++
GNSS (Global Navigation Satellite System) service	Development and free accessibility of GNSS service. GNSSnet.hu (link: https://www.gnssnet.hu/) consists 35 domestic and 19 border reference stations operated by the National Agricultural Center, this is the first Hungarian reference station network suitable for the production of RTK (Real Time Kinematic) corrections, which enables centimeter-accurate satellite positioning.	+++
Agrometeorology	Provision of agrometeorological data and forecasts by the National Meteorological Service.	+++
"Smart testing system" collection and analysis of industry data	This is a pilot project to Agricultural data integration. Extension of the test plant system, collection, processing, analysis and publication of anonymised data (production, economic, environmental, market) in order to improve the efficiency of the sector.	+++
Digital agricultural innovation center	The key to the development of Hungarian agricultural production is partly in the hands of higher education institutions, whose main task is to integrate modern precision technologies and digital solutions into the training system. It is essential to develop a sustainable university-company cooperation model that follows the dynamics of the market. Szent István University proposes the establishment of a Digital Agricultural Innovation Center. The task of the Center is to create a Digital Economy and a Digital Agricultural Test Track with the involvement of precision technologies and digital solutions, to use the infrastructure to generate R & D & I projects, test new technologies, introduce them to the market and create a real-time curriculum development program.	+++
Digital food chain research, development and innovation center	Implement the world's first veterinary training center where consumer health and epidemiological safety are created with the support of digital tools in a complex food chain approach. Developing digital technologies that will increase the competitiveness of animal keepers and food chain operators in a globalized world. Creation of a marketable know-how (IT, veterinary, animal husbandry, feed, etc.) in parallel with the development of other related industries. Provide a relevant background from the collected and analyzed data for the businesses and serve the authority's data needs for consumer and epidemiological security.	+++
National food chain data provider center	Ensuring the digital traceability of products by collecting and processing the necessary data and providing a knowledge base.	+++
Development of digital commerce	Creating digital marketplaces between producers and buyers in several areas (fruit, vegetables and biomass).	+++

5. The goals and outlook of the Hungarian Digital Agricultural Strategy (DAS)

The Hungarian economy is far from its currently available food production potential. According to Hungary's Food Economics Concept (2017-2050), accepted by the Hungarian Government the domestic food economy has the potential to reach a 60% higher output compared to the current rates. This could be achieved through organizing processes more efficiently, increasing processing, and targeted response to demand in the Hungarian food economy.

In other EU countries, digital technologies already make a significant contribution to the efficiency and profitability of the agricultural economy. Today, digital agricultural solutions have become more than just convenience features, they are the main drivers for competitiveness.

Many enterprises operating in the Hungarian agricultural economy are exploiting the opportunities and benefits that digitization and innovative technologies can offer. Yet, this process can be observed in significantly larger, more capital-intensive, and innovative companies. The digitization of smaller companies is a slower and more demanding process currently in Hungarian agriculture.

With the help of the Digital Welfare Program (DJP), the Digital Agrarian Strategy (DAS) is designed to collect and process information, automate technological operations, and increase the profitability of agricultural production through robotics while making efficient use of existing environmental resources.

5.1 Government decisions supporting the implementation of the Digital Agricultural Strategy

To support the implementation and the coordination of the Hungarian Digital Agricultural Strategy the government has identified the highest priority measures and has set up government decisions to enact measures to support the implementation.

Government Decrees 1895/2020. (XII. 9.) and 1470/2019. (VIII. 1.) were enacted to provide a detailed action plan of the Digital Agrarian Strategy (DAS) of Hungary and to focus on the highest priority actions on providing the budgetary resources necessary for the full performance of the tasks, and on the promotion and coordination of the digitization of the Hungarian agriculture.

In these decisions the government has specified the provided central budget support for the priority segments in agriculture.

In order to operate the Digital Agricultural Academy, the central budget provides support for financing the tasks for the implementation of the National Info communication Strategy (NIS). The decision has stated the yearly budget for supporting the NIS from the period of 2020 to 2027. The average annual budget for this period is 497’649’899 Hungarian Forints (HUF).

The Government also determines the central budget support of HUF 11,925,000,000 to raise the capital of the National Stud Farm and Farm Private Limited Company in Mezőhegyes. This action aims to support the development of agricultural machinery and technologies, solutions, including a test environment suitable for testing to develop into a digital agricultural model economy.

Also, the government supports the sale of household agricultural products and the recycling of agricultural waste. Digital distribution and the development of sales-sharing methods, shortening commercial chains (by exploring the use of blockchain solutions), and developing recommendations to help achieve these goals are also prioritized. For this purpose, the central budget reserves 670'000'000 HUF.

Efforts are being made to support the preparation of the "Next Generation EU Planning" (RRF) projects. The projects are introduced for the implementation of the following actions:

- Providing free access to data for the Agricultural Parcel Identification System for farmers. 230'000'000 HUF budget is assigned for this action, annually starting from 2024.
- Development of a system for examining the effects of digital switchover on competitiveness ("Smart Test Farm System") at the National Agricultural Research and Innovation Center. 400'000'000 HUF budget is assigned for this action, annually starting from 2024.
- Establishment of the National Food Chain Data Center on the basis of the National Food Chain Security Office, ensuring the social utilization of the data generated in agriculture and the adequate achievement of sectoral data integration by collecting, processing, and operating a knowledge base. 309'000'000 HUF budget is assigned for this action, annually starting from 2024.
- Facilitation of the use of precision technologies used by producers through the location service and the modernization and extension of the reference network (GNSS) and the extension of the availability of the location service, making it accordingly free of charge. 110'000'000 HUF budget is assigned for this action, annually starting from 2024.

For the preparation of the "Next Generation EU Planning" - projects, the government assigns 250'000'000 HUF.