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SWOT ANALYSIS TO HIGHLIGHT CRITICALITIES AND ASSET IN PRECISION FARMING UPTAKE

Hungary

Version 1
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1. SWOT analysis – Hungary[1]

1.1. General Information/Overview

SWOT ANALYSIS TO HIGHLIGHT CRITICALITIES AND ASSETS IN PRECISION FARMING RECEPTION IN HUNGARY

1.2. SWOT Overview

STRENGTHS	WEAKNESSES
• several agricultural equipment manufacturers and dealers are present • latest technologies are available to the farms • high occurrence of stakeholders could generate a good competition in favour to the development and spread of new technologies • largest farmers generally are interested in new technologies due to their high affinity towards innovations to increase their farm's sustainability and improve its management (e.g. simplifying bureaucracy, lowering pesticide use, etc.) • educational system teaching PF practices • reduction of environmental footprint • rising of start-up companies dealing with PF services • agricultural fairs, exhibitions and workshops on precision farming	• overall size of farms is generally small • high average age of farmers • cost of PF technologies is too high for small-medium enterprises, not favouring the spread of PF • limited availability of PF sensors' data for the farmers • high GPRS prices • in hilly zones, with high hand labour demand, mechanization is limited • restricted availability and high price of satellite and GIS data, maps for farmers • farmers are linked to their traditional methods • low salaries, weak education level and missing skilled manpower • missing competence in response to EU calls
OPPORTUNITIES	**THREATS**
• increase of young farmers with higher education level • rising of start-up companies dealing with PF • research projects conducted by universities and research centres • reduction of environmental footprint • mitigation of negative agronomic effects of climate change • lower use of input materials • less work consuming processes • demand from the consumers of more safety food with a certain origin • support of free availability of satellite and GIS data, maps for farmers • marketing advances of higher food safety (inland and abroad) • water saving irrigation technologies • developments and innovation in IT • rising of start-up companies dealing with PF services	• resistance to PF innovation • uncontrolled failure of field sensors • critical security level of field equipment (sensors, data loggers, solar panels, cables, etc.) • low GPRS performance, communication failures • unexpected data losses • internet attacks • enhancement and extremes of climate change • uncertainty of the market • unwanted spread of sensible data linked to the farmers • crucial changes in policy • missing competence in response to EU calls • cutback in EU sources and diminution of project calls

[1] provided from: Szent Istvan University (SZIU) – Researcher Prof. *Dr. Borbala Balo*, et.al (2020)

1.3. Strenghts

Several agricultural equipment manufacturers and dealers are present, latest technologies are available to the farms in Hungary, and high occurrence of stakeholders could generate a good competition in favour to the development and spread of new technologies.

Generally the largest farmers are interested in new technologies due to their high affinity towards innovations to increase their farm's sustainability and improve its management (e.g. simplifying bureaucracy, lowering pesticide use, etc.).

We have educational system teaching PF practices, rising of start-up companies dealing with PF services, frequent agricultural fairs, exhibitions and workshops on precision farming.

Adopters of precision farming in Hungary are primarily younger than 40 years old, have higher education and cultivate more than 300 hectares of land, which is consistent with international experiences.

About 44 per cent of farmers use GPS, and among farmers under the age of 40 years this share can reach 48 per cent. Site-specific soil sampling, the use of guidance systems and, increasingly, automatic steering can be considered to be standard management practices. More than half of the precision farmers use guidance systems, and around 30 per cent of them use autopilot, followed by machine control, VRT seeding and fertiliser applications (25 per cent).

1.4. Weaknesses

Precision farms emerged in Hungary in the last 15 years, but for many people it is still an unknown concept. Only half of the crop producers have heard about it, but this percentage depends on the farm size. Most of the farmers that believe that PA does not fit to their farm size have fewer than 200 hectares of land, and 83.6 per cent of the respondents that emphasized the lack of financing opportunities are traditional small-scale producers.

The most important hindering factor for the penetration of precision farming in Hungary among arable farms is the high investment costs. Economic considerations appeared to be an important aspect in the decision to adopt, as can be documented by ranking factors that were taken into consideration. Fifty-two per cent of the respondents indicated the excess investment cost as the main barrier to widespread

adoption of PA. Fifteen per cent of the respondents indicated that the technology cannot work effectively for their farm size, and according to 12 per cent of the respondents, there are no adequate financial possibilities for the additional expenditures.

The applications of sensors for pest control, drones and precision irrigation are still at the inception phase: the rate of their application is only around 5 per cent.

In order to lower the additional investment costs of PA, technologies are usually introduced sequentially. However, this approach to adoption may seem inefficient and time consuming compared to adoption of complete, possibly complementary technologies.

Restricted availability and high price of satellite and GIS data, maps for farmers and, sometimes missing competence in response to EU calls may also represent some weakness.

Although profitability is critical to the adoption decision by farmers, several studies only estimate changes in input use and yield, and the reported data are sometimes rather variable. For example, automatic machine guidance is expected to result in a 10-25 per cent decrease in fuel consumption, weed detection can reduce the herbicide use by 6-81 per cent, and precision irrigation typically enables 25 per cent water savings. For site specific nitrogen management the input use saving ranges from 6 to 46 per cent, and the yield increase from 1 to 10 per cent.

Most scholars have approached the expected economic effect of PA from decreasing input costs. A recent survey, 51.1 per cent of the farmers reported a decrease in variable costs. The increase of input use can be explained by the low initial level of fertiliser use, quite common among arable farms in Hungary. However, the amount of fertiliser itself is not the issue that really matters. The real question is how the efficiency of use changes. Therefore, the yield level and associated nutrients need to be studied.

Main barriers to the adoption of PA according to the farmers (in decreasing order of importance) are excessive investment cost, not suited to the farm size, lack of appropriate financing, lack of appropriate knowledge, lack of experience of using PA, distrust of new technology, lack of services, lack of time to adopt PA, lack of advisory services.

1.5. Opportunities

Adopters of precision farming are primarily younger than 40 years old, have higher education and cultivate more than 300 hectares of land, which is consistent with international experiences.

The profitability of PA technology adoption increases with the years after adopting the technology.

Beyond the economic benefits, lower environmental impact (reduction of residual nitrogen in soils by 30 to 50 per cent) is also mentioned.

The introduction of precision fertilisation and pest management applications would cause a decrease in the input use.

Precision farming in case of the main arable crops (winter wheat, maize, oilseed rape, sunflower) increases yield, with cost and profitability benefits compared to current conventional agronomy practices.

The exact input application results in a more efficient nutrient utilisation and less negative environmental impact. And even if input use and production costs increase under PA, yields can grow enough to increase profit.

The impact of adoption is initially small but during this period knowledge and skills are gained and important data are collected. Then, once sufficient data and skills are present, the gains from adoption of PA technology could grow quickly to a point where the benefits are largely realised and further gains are limited.

PA technologies can be applied successfully also in medium sized or in small farms, partly based on own equipment and partly through common machinery usage (i.e. machinery rings), as well as of course by services.

Main drivers of PA adoption according to the farmers (in decreasing order of significance) are higher profitability, more and/or more detailed information, would be part of an area-based subsidy, would be a measure in a RDP (rural development program), compatibility among technologies, higher market price (e.g. by certification), support of machinery used by farmers' group, would be part of a 'greening' payment, would be part of an AEP (agri-environmental policy) subsidy, availability of data recording mobile apps.

1.6. Threats

It is widely accepted that the economic potential or profitability of PA depends on the farm size, heterogeneity of agricultural land cultivated by the farm, the applied technology mix (both PA and non-PA), the cultivated crops, and the experiences and ICT skills of the farmers.

Owing to the many complex factors, profitability cannot be demonstrated in all cases. A significant increase in profitability could be confirmed only in those farms that apply PA for at least three years. Accordingly, 62.2 per cent of the respondents reported some increase in profitability, while 17.8 per cent realised a fall in crop income. The fact that many farmers have not realised/perceived any direct increase in their profitability is a real barrier to the wider adoption of PA. That higher profitability would be the main driver for PA was reported by 28.2 per cent of the respondents.

More than half of the respondents indicated the high investment cost as the main barrier to adoption. A lack of appropriate financing was listed in third place among the barriers; at the same time the need for subsidies appears in third place among the drivers. Our view is that precision crop production can be one of the means of enhancing the green component, as an environmentally-friendly farming practice, drafted within the direct subsidy system of the EU's Common Agricultural Policy proposed for the 2020-2027 planning period.

Low salaries, weak education level and missing skilled manpower may also represent a real threat.