Interreg CENTRAL EUROPE

European Union
European Regional
Development Fund

Transfarm4.0

REGIONAL REPORT ON EXISTING REGIONAL INDUSTRIAL EXCELLENCE NODES IN PRECISION

D.T1.2.1   **Version 1**

Hungary   **04|2020**

Inhalt

1. Hungary[1]

1.1. Overview of regional PA status

According to Kemény et al. (2017) and Takácsné György et al. (2018) PA is present in Hungary since the 1980s-90s, while for many people it is still an unknown way of plant growing or animal husbandry. The authors introduce the results of numerous researches dealing with the evaluation of the PA among the Hungarian growers. Main points of these results are the followings: influenced by the farm size, 50% of the growers know about PA, the use of PA is influenced by the age (mainly people younger than 40 years old adopt PA), farm size, education level. The use of GPS is also influenced by the age of the growers. Practices, for example site-specific soil sampling, guidance system and automatic steering are standard operations. While others are less frequent among the growers for example: guidance systems (more than 50%), autopilot (around 30%), machine control, VRT seeding and fertiliser application (25%). Only around 5% of the growers are applying pest control sensors, drones or precision irrigation.

Takácsné György et al. (2018) reported the results of their representative research based on the answers of 656 (out of approximately 1000) farms. According to the report 95.5% of the growers heard about PA, while 6.9% were involved in PA. Among the cultivated crops winter wheat were grown on the largest surface according to PA. The report details the use of Annual Real-Time Kinematic signal subscription, tractor auto steering and on board computer, self-propelled sprayers, field boundary mapping, field mapping, pest and weed monitoring. Authors report the possible factors influencing the adoption of the PA technologies such as excess investment, farm size, financial possibilities.

One of the most important Hungarian internet portals, www.agroinform.hu provides many up-to-date information about PA for readers both agricultural, horticultural or stock farming.

Among the agricultural sectors horticultural production is an important user of PA methodologies. Both vegetable (for example tomato), fruit (for example apple) and viticulture sector investigate the possible PA solutions for many different aims such as labor shortage, plant protection, nutrient supply. In viticulture main PA technologies are the macro-, mezo-, and microclimatic evaluation and forecast of wine regions, vineyards or even the canopy of a single plant. Climatic data such as radiation, humidity, wind speed and

---

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

direction, temperature provide information about the canopy structure, phenological stages, ripening and qualitative and quantitative properties of the fruits. Also climatic data are the base of plant protection against fungal diseases (eg.: downy mildew, powdery mildew) and pests. UAV based indexes (mainly NDVI) today is still rarely applied even though it helps to detect plant decline or low phytosanitary status. Based on these data missing vegetation is not treated when plant protection is carried out. Continental climate of Hungary requires careful vineyard establishment. Both winter and spring frost can cause damages, in this way DTM (digital terrain model) provides essential information of the lower elevations where frost damage is frequent.

Takácsné György et al. (2018): Precision agriculture in Hungary: assessment of perceptions and accounting records of FADN arable farms. Studies in Agricultural Economics 120. 47-54.

Kemény et al. eds. (2017): A precíziós szántóföldi növénytermesztés összehasonlító vizsgálata. Agrárgazdasági Kutatóintézet. Budapest. 170p.

1.2. High-performing OEMs (HW & Equipment), by technology

1.2.1. Steering Systems

Steering systems are provided (among others) by the following companies: **KITE, Axiál, Agrárin Ltd.**

1.2.2. Tillage/Soil Cultivation and Seeding Equipment

KITE (www.kite.hu) is one of the main agricultural companies in Hungary. Among others the main sectors are seed production, machine and equipment trade together with irrigation, plant protection, fertilization. In viticulture several machines are provided to the sector such as tractors and equipment: sprayers, defoliators, electric pruners, mulching devices, and machines for undervine care.

Bartifarm (www.bartifarm.hu) among others provides machinery for harvest, transport, pruning, frost protection, and soil cultivation.

Sióagrár Ltd. (www.sioagrar.hu) is an agricultural machine and equipment company providing shoot trimmers, soil cultivators, trunk cleaners.

Axiál Ltd. (www.axial.hu) is one of the main companies among the agricultural machinery.

Agrárin Ltd. (www.agrarin.hu) is one of the earliest companies, main products are among others agrometeorology, nutrient supply documentation.

1.2.3. UAV and Drone technology and remote sensing

ABZ Drone (www.abzdrone.com) is a merchant company dealing with drones and related technologies including cameras, sprayers with different services: evaluation of agricultural sites, plant protection. Eurosmart Ltd. (www.eurosmart.hu) is providing drone technologies to the agricultural, architecture, railways, roads and solar panel sector.

Agron Ltd. (www.agron.hu) is providing equipments and education in drone technologies, and evaluation of multispectral imagery.

1.2.4. Plant Breeding & Research

1.2.4.1. Grapevine breeding

Plant breeding has a long history in Hungary, dating back to the beginning of the 20th century. New grapevine cultivars were mainly provided by private breeders or institutes and universities. After the phylloxera epidemic new rootstock cultivars were started to breed by Sandor Teleki. One of the main targets of the breeding was to provide phylloxera resistant cultivars with lime tolerance suitable for the soil conditions in many of the Hungarian wine regions. Based on Teleki's work many rootstocks were quickly spread all around the world, among others: Teleki-Fuhr SO4, Teleki-Kober 5BB, Teleki 5C, Teleki-Kober 125 AA, Teleki 8B and Teleki 10A (Hajdu, 2015) Breeding new rootstocks (for example Georgikon 28) and the evaluation of those are still important research topics. Evaluation of the rootstocks carried out in the Georgikon Faculty of Pannon University (Keszthely) is still important in the Hungarian programs. Another important breeding target is the improvement of the table grape cultivars. In the 19 century mainly local cultivars were in the table grape assortment. It was changed with the introduction and spread of the Chasselas cultivar. Later new cultivars were bred by János Mathiász, Adolf Start, Pál Kocsis and others providing larger bunches and berries or earlier ripening time. Hungary mainly has continental climate which requires frost tolerant grapevine cultivars. In this way it was one of the most important breeding targets in the 20th century. Also an important breeding target is the biotic resistance. The resistance against downy mildew and powdery mildew are two of the earliest aims of interspecific breeding. Nowadays most important breeding centers are the Research Institute for Viticulture and Oenology University of Pécs, and the Pannon University.

Hajdu, E. (2015): Grapevine breeding in Hungary. In.: Eds: Reynolds, A.G.: Grapevine breeding programs for the wine industry. Elsevier. 466.

https://books.google.hu/books?id=LNFzAwAAQBAJ&printsec=frontcover&dq=grapevine+breeding&hl=hu&sa=X&ved=0ahUKEwjO7IuX_oDoAhUHpIsKHXL2AdgQ6AEIKTAA#v=onepage&q=teleki&f=false

1.2.4.2. Grapevine research

Grapevine research in Hungary started at phylloxera epidemic when the Institute of Ampelology, Budapest was established in 1896. During the first decades the main focus of research was on grapevine diseases, then later on, breeding projects were emerging. For effective research a complete network of research stations was constructed involving the most significant vine growing areas of Hungary (i.e. Tokaj, Eger, Badacsony, Pécs-Villány, Mór and Kecskemét). In the 80ies grapevine physiology studies started to get into limelight. Several field experiments dealing with physiological relations of training systems, canopy management, bud loads, row direction, soil covers, fruit zone management, nutrition, rootstocks, cultivars and clones, water relations, terroir, etc. have been conducted and continued in different wine districts in Hungary. During the last 5 years promising remote multispectral and thermal camera observations applying drone (UAV) techniques completed and validated with proximal sensing and biophysical field measurements have emerged.

1.2.5. Animal Monitoring

The OkosFarm (SmartFarm) is a unified installation monitoring, automated system, operating with modern tools and working properly on agricultural farms, as well as promoting energy efficiency as management, a powerful resource, controlled alert when the vehicle is inadequate, and alerting needs during data monitoring. OkosFarm is able to create a customized system for each industry and type of farm and is made up of several other sub-units.

1.3. High-performing service providers, by service

1.3.1. Meteorological data providers and disease forecast

The Hungarian Chamber of Agriculture (NAK) (www.nak.hu) is a public body established in 2013. Today it has 360.000 members representing agriculture, food industry and rural development according to the 3 chamber departments. The main goals are to improve farming circumstances of the members, competitiveness of the sector and living conditions of the rural people. The plant protection portal of the site provides meteorological data and disease forecast information.

BASF is one of the main companies providing products for grapevine plant protection and weed control. Based on the iMETOS system BASF provides meteorological data with risk of diseases (botrytis, downy and powdery mildew and black rot) from more than 60 vine growing regions of Hungary (https://defenso.hu/szolo/allomas-adatok).

Bayer (https://bayer.co.hu/uzletagak/crop-science) is one of the leading agricultural companies providing information about the most important pest and diseases and meteorological information.

Syngenta (https://www.syngenta.hu/service/idojaras) also provides meteorological data information.

Agrontech (www.agrontech.hu) systems were developed to provide meteorological data and decision support systems for the growers to help proper plant management according to the on-site sensors.

WineData (www.winedata.hu) is a monitoring system developed to support grapevine growers. It provides different modules. Environmental data (precipitation, wind directions and speed, temperature, etc.) provided by sensors. Plant protection module follows phenological stages and based on the meteorological data helps the growers to keep the vineyard healthy. Operation monitoring provides on-line real time information on the machines based on GPS data. With the help of the 3 modules, the whole process of vine growing can be monitored, the software assists the administrative tasks of the company, performs economic calculations.

SmartVineyard™ (www.smartvineyard.com) systems were developed by the QuantisLabs Ltd. to provide meteorological data and decision support systems for the growers to help proper plant protection according to the on-site sensors.

The **Research Institute of Tokaj wine region** (www.tarcalkutato.hu) provides weekly meteorological data and information about the presence of pests and diseases.

1.4. High-performing research bodies, by typology

Main research centers of PF in viticulture are Universities and Research Institutes in Hungary.

Szent Istvan University (SZIU) is one of the leading higher education and research institutes in the field of agriculture and horticulture. Among other research areas in the SzIU PF is dealing with horticultural plant production. In **SZIU Viticulture Department** the main research topics are vine physiology, molecular biological background of powdery mildew and black rot infections, vine water status, irrigation, canopy architecture, canopy temperature, ecology of the vineyards, climate change investigations, remote sensing.

National Agricultural Research and Innovation Center (NARIC) Research Institute for Viticulture and Oenology Badacsony and Kecskemet. NARIC provides research and advisory services to the growers and collaborates with higher education organizations. Among the main activities the Institute selects new clones, evaluates newly bred cultivar candidates and maintains genbank for genetic resources. Based on the accredited laboratory soil and plant analysis are provided for the growers for proper plant nutrient management.

Research Institute for Viticulture and Enology of the University of Pecs is the most important grapevine breeding institution in Hungary. Main activities are consultancy (vine nutrition), research and grapevine breeding. Grape collection of the Institute contains more than 1800 accessions. Main research topics are: disease resistance, plant physiology, molecular genetic investigations, clonal selection and evaluation of cultivars.

Research Institute of Tokaj wine region. Main research topics of the Institute are linked to: investigation of yeasts, effect of erosion, soil science, cover crops, and grapevine trunk diseases, climate change investigations.

Eszterhazy Karoly University is located in the Eger wine region. Main research topics are linked to the region such as evaluation of cultivars, plant protection, clone selection, biology of the botrytis infection, downy mildew and black rot.

1.5. Overview of existing networks

Networks between the growers and high-performing research bodies are already existing. The evaluation of the vegetative performance and the qualitative and quantitative monitoring of the vineyards are supported by PF elements. Remote sensing evaluation of vineyards based on UAV were carried out by the **Viticulture Department of SZIU** in Csongrád wine region (Koch winery), Kunság (Gal winery), Eger (Kovacs Nimrod Winery).

In the past 4 years in Tokaj wine region a large state investigation (directed by **Grand Tokaj Ltd.**) was carried out on mapping the different aszu or dry wine producing terroirs. The investigation included LIDAR, multispectral and heat camera technics, vineyards' registration on digital platform, describing soil and microclimatic properties and missing vines for the vineyards of the region. Unfortunately, this data base is closed, only vineyard's owner has access to it.

Agrobot Ltd. and **ABZ Drone** together with Sauska winery made trials on plant protection based on drone sprayings in the Tokaj wine region. Drone spraying is not yet permitted in practice in Hungary.

https://www.agrarszektor.hu/noveny/igy-permeteznek-dronnal-a-sauska-boraszatban-itt-vannak-az-elso-tapasztalatok.19677.html

https://abzdrone.com/blog/sauska-boraszat-tokaj/