

SURVEYS TO ASSESS THE RESPONSE OF OPEN INNOVATION PERFORMERS IN THE PILOT ACTION

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1. Introduction

The project Interreg Transfarm 4.0 aims to bring innovation in the sector of precision farming, creating a new collaborative model of innovation in agriculture considered a traditional sector. This was realized bringing together in a collaborative environment the knowhow of the different actors of the production chain: researchers, producers, consultants, development agencies and end users. The project developed in three phases, it started with the scouting of the necessities of the market, identifying the requirements of the actors of the production chain. Starting from the needs risen on the surveys in the five regions, developer teams were created to foster new applications on three key areas of the precision farming: ISOBUS application, remote and proximal sensing, big and smart data management. The target for the prototype realized during the project was a TRL 7, system prototype demonstration in operational environment. During the project all the three trials were tested the field and as well farm demonstration took place. In particular case study 1, ISOBUS application, was run in Austria and Poland, case study 2, remote and proximal sensing, was run in Italy and Slovenia, and case study three, big data management, was run in Hungary and Austria. The present deliverable has been developed at the end of the field test during different divulgation and peer-to-peer exchange events. PP collected feedback from the different target groups and stakeholders on the pilot actions to accelerate the market uptake and gather suggestion for technology future improvements.

2. ISOBUS application

2.1. Austria

Josephinum Research Centre worked in cooperation with Pöttinger on a device which shall prepare the seedbed in an optimal way to favorite the plant emergence and consequently the yield. The result was a stereo-camera mounted on a power-harrow connected with a tractor with class three Isobus-connection. The roughness was evaluated with the camera and the tractor responded with an increase or decrease of driving speed. The Seedbed Control was presented in many occasions. Some important events were the expert-meeting with the agricultural-chamber of Austria and a local contractor, the agricultural fair in Ried (9.-12.September 2021) and the Innovation-Farm field day (11.June 2021). The system has been seen from many different people from the Austrian ministry of agriculture to machinery producers, farmers and consultants. All these stakeholders provided an encouraging opinion about the Pilot Action. The contractor and the agricultural chamber were quite positive about the technique. With the increasing demand of services provided, a simple machine which does most of the job is important for employing people who do not have that much agricultural background. Many farmers visited the fair in Ried and asked about the Seedbed Control. They were interested about the possibility of upgrading their existing machineries and asked if its



already purchasable. On The other side, some of the farmers showed some doubts about the financial part. It was understandable, because there are many power-harrow which are not fully utilized on the farms already and farm have oversized machine park. On the Innovation-Farm field day the Seedbed-Control was shown to the Austrian minister of agriculture. She was impressed by the technique and was confident that precision farming sector and its applications are going to find their way on the market.

A great feedback was the interest of a power-harrow manufacturer from Italy. Over our Italian project lead-partner CREA, the manufacturer asked, if the system is already available on the market and its technical details. Again another delightful sign of the high request of the precision farming application from multiple stakeholders.

2.2. Poland

Regional Development Agency S.A. from Bielsko-Biala (ARRSA) invited for the cooperation within the pilot action specialists in implementation of innovative solutions in agriculture from The University of Agriculture in Krakow, Hugo Green Solutions - agri innovation Spin-off of the University of Agriculture in Krakow and The Innovation Center of the University of Agriculture in Krakow Ltd.

This document has been developed on the basis of the collected feedback from different target groups on the pilot activities. The actions taken were aimed to accelerate the implementation of the pilot tested activity and to collect suggestions for future improvements of the pilot.

ARRSA, together with invited institutions, presented the system at various agricultural development events including the 6th Green Smart City Forum (28-29.10.2021) and Innovators Meetings (21.10-04.11.2021). Feedback was collected during the dissemination of details of the pilot action and discussions with the public about the system. Other feedback was collected by the partners during project presentations to farmer associations and other representatives. Pilot Action cooperation partners and researcher and other staff also forwarded information about that action within their own networks and during bilateral meetings with sector professionals.

The opinion of Polish farmers on the presented solutions is positive. Farmers are interested in innovative solutions allowing for greater efficiency of farmer's work, optimization of costs and increase of productivity as well as time saving, which is especially important for achieving economic profitability of farms in changeable weather conditions. Therefore, farmers are looking for solutions such as precision seeding, variable rate fertilisation and other precision farming methods. However, taking into account the specificity of Polish agriculture, which is dominated by small and medium-sized farms, the offer of precision farming products should



be adequately adjusted, so that not only the largest farms can feel the benefits of modern solutions.

Implementation of the dedicated technologies allowing for precise seeding according to the current condition of the soil, weather and fertility level is highly expected result which will benefit to the farmers.

Manufacturers expect that results of the Pilot Action will be further spread out to rise their knowledge about newest research results and make them implement and invest into most modern technologies allowing for the better communication of the machines and most efficient use of possibilities and advantages offered by the technology.

This also requires a lot of new machineries to be utilised in the agri sector. Modern equipment, which is still in the minority within the small size farmers, gives the advantage of new technologies and transitions of farming into modern precision farming. The need of that transition is widely understandable. Braking some financial barriers is an ongoing process, and new equipment is being introduced and technologies used.

3. Remote and proximal sensing

This case study 2 involves Italy and Slovenia , in particular LP Crea and T2I for Italy and the university of Maribor and AEROBO for Slovenia. The partnership developed a system applicable to mistblowers present in the market able to read the presence of the plant open and close the nozzles to spray according to their presence, this system is developed to reduce the use of PPPs (plant protection products) and the drift produced by the mistblower.

3.1. Italy

LP Crea and T2I presented the system in different occasions, in particular at Vite in Campo (07.2021), EIMA (10.2021) and Fieragricola (03.2022), feedbacks has been collected during the exhibitions in occasion of presentations and discussions with the public about the system. Other feedbacks have been collected by partners in occasion of the presentation of the project to farmers' associations and other representatives. In general, all the feedback collected were positive, farmers and subcontractors in particular found the system very useful, affordable, it bypasses most of the precision farming limitations and obstacles emerged in the survey (e.g. skills required for implementation, maintenance, costs) and respond to their needs. Positive feedbacks have been collected also from manufacturer and agricultural machine producers. In these meetings, the interest has been mainly focused on the electronic component, the SLAM algorithm and the triggering system. Especially for SMEs in which R&D department can't afford a stable and long-term staff open innovation system has been a topic of confrontation. Another important category that has been interviewed were the farmers field consultants, most of them appreciated the system, especially for its affordance for small farmers and foresight toward reduced PPPs usage.



3.2. Slovenia

The University of Maribor and a Slovenian cluster specialized in electronics called AE-ROBO-Net are project partners from Slovenia. We presented the prototype developed in pilot project 2 at various events and fairs in Central Europe. In Slovenia, we introduced the system's operation to the general public at demo days at the AGRA 2021 fair in the period from 21 to 26 August. Visitors showed great interest and asked if the system was already commercially available. They were especially interested in the principle of operation and the cost of the system's investment. Some of the visitors asked about the percentage of FFS saved and the feasibility of using a sprayer in small orchards and vineyards. We also broadcast a video at the fair, created when we tested the pilot 2 system. Politicians and decision-makers also visited the fair and were very interested to ask about the details of the system at our stand. An event on "Digitalisation in Agriculture" was also held during the fair. At this event, Dr. Jurij Rakun presented the details of the project and pilot action 2. The event took place live and online. We also visited high schools, where we introduced students to precision agriculture. All pilot projects with a focus on 2 pilots were presented. Students generally show an interest in the precision agriculture and, consequently, in the developed prototype. However, we note that many students still do not know exactly which technologies fall under precision agriculture and what they are designed for. In September 2021, we presented the pilot action to the visitors (attended VIRAL Erasmus+ meetings) from the Balkan countries. The visitors were specialists in the field of agriculture, ICT and agricultural entrepreneurship. They have shown great interest and perceived many opportunities for use in permanent plantations. We also received positive responses from agricultural consultants, who saw how effective the system is. We should not forget to mention the producers interested in further cooperation. As already mentioned, together with our partners, we have also presented our innovation at fairs in Italy, such as Vite in Campo 2021 (Veneto), EIMA 2021 (Bologna), Fieragricola 2022 (Verona).

4. Big and Smart Data Management

Austria (Linz Center of Mechatronics GMBH) and Hungary (Hungarian University of Agriculture and Life Sciences) established a sensor network at the Neszmély wine region (Mikóczy and Mikóczy Family Estate, Tata) to evaluate microclimatic conditions and plant physiological status of vine plots with different ecology/topography and irrigation strategy. Data provided by the sensors were then transferred through the MeterGroup's network to Linz.

By using a FIWARE system, the data from the sensors can be accessed via a web server. Farmers and other interested actors can log in to this server, where they can monitor and analyze the parameters of interest

4.1. Hungary

Hungarian University of Agriculture and Life Sciences introduced the pilot action in many events and occasions. Since the establishment of the sensor network and on-line platform



Big&Smart Data Management Pilot Action was introduced to BSc and MSc students studying in the horticultural engineer and viticulture and oenology engineering BSc and MSc of the Institute of Viticulture and Oenology of the MATE. During the excursions detailed explanation of the network was carried out with the help of the external expert of the pilot and the owner of the vineyard, in the context of research and cultivation benefit respectively. We introduced the pilot to growers, and representatives of viticulture associations. Pilot action was also introduced at the Interreg CENTRAL EUROPE Roundtable (29th April 2021). Hungarian University of Agriculture and Life Sciences (MATE) PP6 participated on the “Digitalization in the viticulture sector” online conference on 20th October 2021. After the workshop, PP6 got several requests from researchers and technology providers to collaborate in the topic of PF. For example, Sencrop (<https://sencrop.com/eu/>) requested an on-line meeting where the company introduced the technology they provide. Further collaboration with the company is in process. Kertészet és Szőlészet (Horticulture and Viticulture) printed magazine requested two papers about precision viticulture. We got positive feedback from the growers, students and interested audience. The general opinion is that the PF technologies are useful in viticulture and deeper understanding of the terroir and plant physiology is required. We got requests from PF companies and technology providers to merge the obtained data to achieve more important results and validate each other’s data. From the education point of view, we observed that students are more interested in PF since we introduced the pilot action and included precision technologies in the courses with the help of the pilot.

4.2. Austria

Linz Center of Mechatronics presented the pilot action on several occasions. An online article introducing the planned pilot action was published at the web page of “Leitbetriebe Austria” in December 2020. In February 2021, a print article and an online article describing the pilot action was launched at “Kronen Zeitung”. The articles resulted in consistently positive feedback, even from areas outside of agriculture. In October 2021, we introduced the pilot action at a workshop at the “Internationales Forum Mechatronik”. On this occasion, various aspects of precision farming were discussed with representatives of politics, stakeholders, and people from research and development. All parties emphasized the need for sensor technology and big data in sustainable and future-oriented agriculture. An article in print and online format was published at “Oberösterreichische Nachrichten” highlighting various promising opportunities, such as digitization, the use of drones, and the use of sensor data in agriculture. Furthermore, discussions with teachers from technical high schools relevant to the topic of precision farming were performed. In summary, great interest was declared in the presented big and smart data acquisition system, and more general in the results and findings gathered during this pilot action.