D.T1.4.4 TRANSATIONAL BUSINESS PLAN TO ENHANCE LIKAGES & COOPERATION IN CE PRECISION FARMING

D.T1.4.4 CREA

Version 1

INTRODUCTION

In this document, we are going to present a transnational business plan that identifies mechanisms and specific tech optimizations to be implemented during the pilot actions activities (AT2.2).

Setting up the business plan to enhance linkages and cooperation in CE PF

The core of the Transfarm 4.0 project is the pilot activities, with the aims to implement all the WP1 deliverables in practical manner trough real cases. Background analysis already performed will be useful to set pilot actions, in particular, the industrial specialisations in PF and the farmer needing in terms of technologies to improve their work.
Three different fields of PF in the pilot implementations are planned to be achieved:

-test of new ISOBUS applications;
-remote and proximal sensing;
-smart and big data management.

Test of new ISOBUS applications

A large number of different PF technologies by different manufactures are available nowadays; however, a common communication protocol for tractor and implements is necessary. The mechanical manufacturing sector has replied to this issue with the developing of ISOBUS, to uniform the technological communication among machineries. A proper test is required to set possible applications and verify its simplicity and affordability.
For this reason, the first pilot action 4.0 goal is to test ISOBUS application in a real scale scenario to try out this system application. The possible implications achievable are an increase of studies about this technology, a possibility to increment its performances and to prove new applications for this system.

Transnational-cooperation Pilot Action 1:

- Austria: HBLFA FJ-BLT (PP3)

  - Main contact person: *DI Peter Riegler-Nurscher* from Josephinum Research

- Poland: ARRSA
  - Main contact person: *Jan Sienkiewicz* from ARRSA

Possible farmers in Austria:

- *DI Peter Prankl*, 3250 Wieselburg, Austria

Industrial collaboration in Austria:

- A major Upper Austrian agricultural technology company that includes grasland care, tillage, seeding equipment and digital farming technology (e.g. driving assistance and precision drill technology) is *Pöttinger Landtechnik GmbH* (https://www.poettinger.at/en_us). In the pilot action ISOBUS, HBLFA FJ-BLT (PP3) will collaborate with Pöttinger GmbH to carry out the case study 1.

Possible farmers in Poland:

- not yet clarified

Industrial collaboration in Poland:

- not yet clarified

Explanation of the possible business plan to set open & collaborative environment:

- PP3 prepare the technology industry Pöttinger GmbH to get involved in the pilot action. The engineers are prepared to work within a transnational-collaborative environment. The cooperation with the new Polish partner ARRSA will be coordinated and the further course of action will be discussed and subsequently determined.

- This business plan for the pilot action 1 is the basis for work package 2 to create an overview timetable for when, who and where trials will be carried out in 2021 to enhance the linkages and the transnational cooperation.

Remote and proximal sensing

The modern agriculture requires more data for monitoring of the crop status and growth. The development of sensors, especially the optical sensors, have make accessible sensing technologies to be applied in the farming activities. For this purpose, the second pilot action is aimed to verify the possible application of remote and proximal sensing technologies applied in agriculture. In this regard, it will be assessed systems for remote or proximal sensing and its implications from their adoption. In particular, it will be useful to assess the possibility to increase the farming performances (e.g. reduction of pesticides, improvement of environmental sustainability, etc.) giving to the farmer more knowledge about its farming practices.

CREA, T2i, UNIMAR and AEROBO will be the responsible for this task of the project. The pilot activities will be conducted both in Italian and Slovenian farms.

Italy

CREA firstly will collaborate with university of Padua, department of Land, environment, resources and health, with the group of agricultural engineering guided by Prof. Ing. Marinello. In the contest of Transfarm 4.0 It will be activate a joined PhD program with CREA that will last three year. A student with a M.sc degree will be hired.
He/she will conduct research in the related technologies for this pilot and he/she will publish articles in peer review journal about the results obtained.
On the other hand, a possible industrial partner has been individuated in Maschio Gaspardo Group. Maschio Gaspardo is a leading Italian company on agricultural implements. In particular, they are specialized in tillage, green maintenance, seeding and planting, fertilisation, haymaking and crop protection machineries.
With particular regard on crop protection machineries, the proposal for the second pilot is the realisation of a sprayer for vineyards and orchards ready for the variable rate application of pesticides mediated by low-cost 3D canopy sensors. These sensors will be able to estimate the canopy volume and adapt the spray rate depending on it. In order to perform the variable rate, the sprayer will be equipped with 20 Hz on-off valves pulse-modulated that can change the rate depending on the frequency of nozzle pulsations.
This technology, once perfected and applied in a standard sprayer, will allow the optimisation of pesticide distribution on the crop, with positive implications in terms of efficiency and environmental performances of the operation. In addition, this technology will be designed to be applied also in existing sprayer in order to upgrade them for PF applications.

Slovenia

As part of this pilot project two companies will collaborate from Slovenian side, SMT d.o.o. and AMPS, Peter Lepej s.p., both members of the AE-ROBO-NET cluster. Their role in the partnership is to help develop the solution and evaluate it as a business idea. Due to limitations imposed by COVID-19 situation, the UKC estate, owned by the University of Maribor, will provide testing ground to evaluate the solution in Orchards, and Polič estate Truške, will provide testing ground for vineyard testing of the system in Slovenia. If the situation improves, the testing and evaluation of the proximal sensing pilot project will be available to other farmers interested into the technology.

Explanation of the possible business plan to set open & collaborative environment:

CREA and UNIMAR will involve Maschio Gaspardo, a PF industrial player, to realize an innovative Prototype to get involved in the pilot action with PF purposes. The engineers of all institutions will be prepared to work within a transnational-collaborative environment with the goal to realize a ready-to-market solution in the proximal and remote sensing field.
This goal is in line with the purposes of TRANSFARM 4.0 project, which aims to create transnational linkages among industrial player, research centres and public institution to promote the industrialisation of PF solutions.
The business plan in this scenario, is set to develop an innovative sprayer for pesticide application optimisation. This could entail positive implications in terms of pesticide savings (less costs for the farms) with positive consequences for the impacts of agricultural production chain.

Smart and big data management

As IT and IoT technologies are increased, a large number of public and private data are available today. For this reason, a proper method for their elaboration is required in order to get all the possible intuitions from them.
The pilot action planned in Transfarm 4.0 try to fill this gap. In particular, its aim is to evaluate possible ways for the data management in order to get useful insights for the farmer and for the farming activities.

The effect of climate change is significant in many sectors of the agriculture. Viticulture for example very sensitive to rainfall distribution which influencing phenological stages, vegetative growth, yield and quality of both the grapevine and wine too. In Hungary the average annual rainfall is between 500 and 700 mm, with large differences among the wine regions. Irrigation of the grapevine is still confined to table grape production, but the changing climate lead wine grape growers for the establishment and running irrigation system. The aim of this pilot action is to implement a smart data acquisition system in agriculture, which allows the farmers to monitor and analyses relevant parameters, and to act accordingly. To enable smart data acquisition, a FIWARE system will be created. A FIWARE context broker is the core component, which gathers, manages and provides access to information coming from different sources (for example sensor nodes). According to the FIWARE data acquisition system different irrigation systems in this pilot will be monitored and evaluated concerning canopy microclimate, plant physiological status.

PP8 (Linz Center of Mechatronics GmbH) is responsible for the technical implementation of the pilot action “smart and big data management”. Since LCM has several years of expertise in creating and implementing of sensor systems, no external partners are required for this task. The organization of the model farm as well as the topics related with knowledge in vineyards (business plans, market analysis, …) are part of the project partners (PP6 and PP7).

Pilot experiment in Hungary (nearby Tata) in strong co-operation with LCM (PP8) from Austria and with support of AgroIT (PP7) has been prepared in detail to analyze big data set collected via the sensor network to be implemented in a grapevine irrigation experimental plot with two irrigation technologies and a non-irrigated control, plus manually collected field instrumental validating data records.

Smart and big data management will be provided by LCM (PP8) via a FIWARE data acquisition system. The sensor network will consist of plant sensors (canopy temperature, NDVI, PRI indices, and probably sap flow change indication), soil probes and micro/mesoclimate data loggers, while the field data recording will cover net photosynthetic activity, transpiration, stomatal regulation and plant water status (leaf and stem water potential) measurements, and will be completed with field evaluation of phenology and ripening, supported with chemical analyses.

Basic setup of sensors is under procurement in Austria (LCM, PP8) and probably will be pre-installed and tested *in situ,* as the human virus pandemic will allow it. Further procurement of additional sensors also expected and will be carried out by AgroIT (PP7) according to their

tasks in the project description, in order to complete the sensor network in accordance with the project's goals and to ensure getting statistically correct, reliable results.

Based on the data provided by the sensor network and FIWARE data acquisition system irrigation at István & Nárcisz Mikóczy Family Estate would be supported by physiological and microclimatic data. As soon as the system proves it efficiency in irrigation e.g. water use, plant stress, fruit quality, data support business plan would be offered to growers.

Since irrigation strategy is based on the ecological circumstances of the vineyard, uniform irrigation protocol is possibly not suitable for all terroirs. The data supported by the system would help the growers to establish irrigation strategy based on the soil, microclimate, and physiological status of the given area and grapevine cultivar.

Deliverable D.T2.2.9

Deliverable title: One joint industrial undertaking in big and smart data management (co-design of case study 3)

Description of deliverable:

Technological tryouts of remote sensing *devices & connected IT infrastructures to process realtime crop data by cloud computing. Based on trasn-open innovation Tranf@rm project members, agronomists & farmers according to (D144) to raise innovation*

Deliverable D.T2.2.10

Deliverable title: Small-scale precision farming projects – (case study 3 – bigdata)

Description of deliverable:

Transnational development of estim. 2 PF mini projects concerning within the trajectory BIGDATA & SmartDATA, likely remote sensing based decision support system for field data management & cultivation practice operation based on soil and crops properties. Possible innovation hubs: Austria-Hungary

Deliverable D.T2.2.11

Deliverable title: Test in environment, tech protocols and operational guidelines for case study 3

Description of deliverable:

Test in environment to push industry standard for managing agricultural data & check effective use & sustainability of data extracted from remote sensing-powered precision farming. A pool of model arms concerned. Tech protocols and operational guideline produced

Deliverable D.T2.2.12

Deliverable title Global final report of the case study 3

Description of deliverable:

One report of the case study 2 is delivered at the end of the present activity. It focuses on the transnational approach adopted to conceive new smart solutions, the interactions among Clusters - Farmers - Tech performers. Report covers both mini-projects

Location of the investment

Location of the Szent István University, Campus Buda (PP6):

Nuts0: HU, HUNGARY

Nuts1: HU1, Közép-Magyarország

Nuts2: HU11, Budapest

Nuts3: HU110, Budapest

Location of the Pilot Action:

Nuts0: HU, HUNGARY

Nuts1: HU2, Dunántúl

Nuts2: HU21, Közép-Dunántúl

Nuts3: HU212, Komárom-Esztergom

Preferably, loess territories should be connected into the project as mini-projects/pilot projects. Such places are Pannonhalma or Ászár-Neszmély, in Hungary. The first choice shall be Tata, which is located in Central Transdanubia in Hungary (NUTS1: HU2, NUTS2: HU21, NUTS3: HU212). The exact number and place of the mini-projects should be decided together with the partnership.