1. **INTRODUCTION**

**High Technology Farming** is a broad concept which refers to a wide range of new tools (Robotics, ICT, Big Data, Earth Observation, etc.). The synergic use of these instruments allows the shifting to **the new paradigm of Sustainable Precision Agriculture** (SPF).

The need for a shifting towards this new paradigm is well acknowledged at EU level and some papers from EU Institutions already provide good analysis and suggestions:

* The study “Precision Agriculture and the Future of Farming in Europe”[[1]](#footnote-1), published by the European Parliament Research Service in September 2016;
* The outcomes of the EIP AGRI Focus Group on Precision Farming[[2]](#footnote-2), published by the EIP AGRI Service Point in November 2015.

Tuscany Region has promoted a specific focus on High Tech Farming under the European S3 AGROFOOD Platform[[3]](#footnote-3), as it believes that shifting towards **Precision Farming is of utmost importance for our agricultural system. This technological shift can be compared with the one from animal drawbars to farm machineries and, later on, the green revolution.**

SPF should help rationalizing the use of resources, in order to achieve more efficient processes, which are sustainable and traceable in terms of inputs and operations.

SPF is based on techniques and technologies that complement the complexity of microclimatic, soil, biological and managerial factors. This is referred to as "**spatial intelligence**", which allows inputs and treatments to take place only where, when and how much they are needed.

1. **METHODOLOGIC APPROACH**

**Sustainable Precision Farming means Spatial Intelligence and Precise Management. High Technology Farming represents the tools making it possible.**

High technologies serve the objectives of monitoring, measuring and assessing, being precise, verifying and characterizing the quality of a process. So we can divide those technologies in:

|  |  |
| --- | --- |
| Technology oriented | * **EYES** & **TOUCH** to monitor the single element on wide area (sensors and digital layer) and recognise the effects in each element treated (on board, proximal and remote sensors) * **MIND** to be aware of what, where and when to act in each single productive step (Data, Modeling and Decision Support Systems) * **INTELLIGENT ARMS** to do huge and precise tasks (Machineries, programming/automation, robotic) |
| Services oriented | * **INTELLIGENCE** (Data Management & Prescriptions) * **MEMORY** to be aware on what has been done (telemetrics, traceability, Big data) * **IDENTITY** of agricultural resources and sustainable use at Local & Regional level (territorial complexity, TRL of tools & services, Know-how, KICs and CoPs) |

In order to evolve towards a profitable cooperation through the S3 AGROFOOD Platform, an **important step** is a **cluster/actor analysis** focused on the technology oriented components of high tech farming to help characterizing the agricultural value chains addressed under this sub-thematic platform.

The proposed grid is shown in the following table, where it is required to list various actors (e.g. RTO, Farms/End Users, Enterprises, etc.) belonging to the analysed Value Chain (VC) and to the specific Region. The table distinguishes 5 aspects of high tech farming: EYES and TOUCH (Meteo sensors, Soil sensors, Canopy sensors, Product sensors; On-board/proximal sensors), MIND (Data acquisition, Data analysis, Layers/images, DSS), INTELLIGENT ARMS (Machineries, Programming/Automation, Robotic), technology oriented SERVICES (Installing, Maintenance, Repairing), and educational oriented SERVICES (Training, Demo farms and sites).

Some general examples of technologies and services are:

* Eyes and touch are specific technologies related to visualization or measuring of physical parameters (smart fertirrigation).
  + Meteo sensors: remote (satellite, aerial) or proximal:
    - Agro-Meteorological Weather Stations spread over the territory (proximal)
    - Agro-meteorological data from satellite (remote)
  + Soil Sensors:
    - Multispectral camera for drones or airplane (remote)
    - Humidity sensors connected with weather stations (proximal)
    - Conductivity sensors to assess soil features
  + Canopy sensors:
    - Proximal services (sensors on board of ATV) to monitor canopy features
    - Remote services (on drones) to monitor canopy features
    - Remote services (on light planes) to monitor canopy features
  + Product sensors
    - Monitoring of fruit and vegetable features
    - Photonics devices to assess fruit features or/and animal activity
    - Positioning and activity sensors (animals)
    - Metabolic sensors (animals)
* MIND are ICT that collect and mine data to deliver DSS
  + Data acquisition
    - Digital mapping from proximal and remote sensing
    - Near-Infrared Reflectance technologies for to determinate phisico-chemical composition and classification of agrofood product.
  + Data Analysis
    - Validation of data
    - Quantitative and qualitative prediction models for NIRs techonology
  + Layers
    - Thematic digital layers on different parameters
  + DSS
    - Forecasting models based on gathered data
    - Crop model (irrigation and fertigation)
    - Fraud detection
* INTELLIGENT ARMS
  + MACHINERY
    - Assembled equipment that serve the value chain
  + Automation – programming
    - Software and related systems to control robotic components and devices in innovative smart equipment
  + Robotics
    - Autonomous vehicles
    - Automated arms
* Technical Services
  + Installing/ Mainteinance/Repairing of e.g. Agro-Meteorological Weather Stations or on-line production chain
  + Training / advice in the identification of sensors most suitable for each need.
* Educational Services
  + Installing/ Mainteinance/Repairing of Agro-Meteorological Weather Stations
  + Training
    - Farmers training in synergy with Higher Education trainings and Pilots
    - Sensor management and adaptation to each crop
  + Demo Farms/Sites
    - Referral sites for demonstrating the listed technologies and services.



Participating Regions are requested to fill in one table for each value chain, selecting among the five which were approved at the kick-off event in Florence (6-7 December 2016):

* Tree nursery, Viticulture, Fruits (relatively highly intensive);
* Livestock outdoor;
* Livestock indoor;
* Arable, Cereals, vegetables (outdoor – relatively less intensive);
* Protected cultivation (different types of greenhouses, highly intensive).

First source of information should be the expertise internal to the Regional bodies:

* officers in charge of Rural Development Measures, particularly those related with innovation;
* officers in charge of research programmes;
* officers in charge of Technology Clusters policies;
* etc..

Additional sources could be external experts:

* RTOs (Universities);
* Farmers and Farmers Organizations;
* SMEs and Big Industries;
* Consultants;
* Etc.

Main references for data acquisition are existing regional projects (EARDF and ERDF) and research projects (European, National or Regional).

1. **PROPOSED JOINT ACTION PLAN (based on the discussion at the kick-off event of 6-7 December)**
2. **STEP 1: Enlarging the partnership and defining a common objective and vision**
   1. ***Selection of application domains***

During the kick-off event Regions and participants agreed to work on 5 value chains:

* Tree nursery, Viticulture, Fruits (relatively highly intensive);
* Livestock outdoor;
* Livestock indoor;
* Arable, Cereals, vegetables (outdoor – relatively less intensive);
* Protected cultivation (different types of greenhouses, highly intensive).

Some of the participating Regions have also expressed their interest in acting as co-lead or partner Region. A first overview of the expressed interest is resumed in the following table, but the partnership is open and other Regions can express their interest (or revise their decision). Co-lead Regions have to commit and engage in producing relevant data and assure the participation in meetings and events.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Co-leading regions | | Participating regions | |
| **Tree nursery, Viticulture, Fruits (relatively more intensive)** | | * Tuscany * Galicia * Extremadura * Gelderland * Central Macedonia * Marche | | * West Macedonia * Weser-Ems * Zuid Holland * Limburg * North East Romania |
| **Livestock outdoor** | | * Central Macedonia * Extremadura | | * East Sweden * Tuscany * West Macedonia * Auvergne Rhone Alpes * Galicia * Northern Ireland |
| **Livestock indoor** | | * Galicia | | * Weser-Ems * East Sweden * Central Macedonia * Northern Ireland |
| **Arable, Cereals, vegetables (outdoor)** | | * Tuscany * The Netherlands (TBC) * Extremadura (processing tomato crop) | | * Galicia * East Sweden * Weser Ems * Marche * Central Macedonia * North East Romania * Northern Ireland |
| **Protected cultivation** (different types of greenhouses, highly intensive) | | * Zuid Holland | | * Central Macedonia * Tuscany |

* 1. ***Highlighting the strategic positioning of selected Value Chains***

Each Region should provide some qualitative background information describing key assets (e.g. existing technology clusters; numbers of actors; strategic key players; etc.) and, possibly, also describing how the cooperation through the platform is relevant.

* 1. ***Completing the mapping for each partner Region***

Each partner Region has to complete the cluster/actor analysis on the agreed value-chains in order to map existing competences/actors along them. In this preliminary phase it can be done by using internal expertise and knowledge, and adding some interviews with relevant stakeholders to:

• Identify additional actors

• Identify common challenges/problems encountered by end-users/companies

• Identifying farmers which are using/not using PF and why.

* 1. ***Exploration for Joint Programming***

Co-leading and participating Regions are requested to provide further information concerning:

* Existing programmes and tools that can be used for joint activities and funding in the area of High Tech Farming (e.g. specific allocated budget (no matter if EU, National or Regional); timing of existing calls; etc.);
* Available internal resources (human and financial) to actively participate to the platform.

1. **STEP 2: Creating a pipeline of joint activities**
   1. ***Inception phase – short term agenda: 2017***

Based on inputs from STEP 1, following activities will take place:

* Analysis of the mapping exercise to identify complementarities and gaps (possibly by 1st Trimester 2017) (Extremadura: How is this analysis to be performed? Is there any model available?)
* Selecting and connecting Regions, actors and demo sites (by 2nd Trimester 2017) (Extremadura: There will be joint meetings between the regions with complementary activities?)
* Joint business oriented matchmaking (June 2017 – ERIAFF Conference or other possible EU Initiatives: DG AGRI matchmaking on Digitalization; Event in Portugal in October 2017)
* Develop joint call for proposals under EARDF/ERDF/ESF Operational Programmes (e.g. Operational Groups of the EIP AGRI) – end of 2017.
  1. ***Longer term agenda***

This part of the activity will imply assessing possible cooperation under EU Programmes (INTERREG, Horizon 2020, etc.) and also specific activities for developing future Cohesion Policy and Research & Development initiatives (post 2020 programming).

1. <http://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU(2016)581892_EN.pdf> [↑](#footnote-ref-1)
2. <https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_focus_group_on_precision_farming_final_report_2015.pdf> [↑](#footnote-ref-2)
3. <http://s3platform.jrc.ec.europa.eu/documents/20182/183310/Tuscany.pdf/70146a39-1909-47f9-aa4b-0de1b904fe41> [↑](#footnote-ref-3)