

TZP-UTOPIA-F2F: Toward zero-pollution, an edge utopia in vineyard field.

Part I: Smart-FIELD of the farm, first relevant link of transparent path of grapes in the Farm to Fork value chain. A revue

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Introduction

Data-based farming will represent the agriculture of the future. In this sense, ICT systems have a crucial role in data acquisition, analysis and decision support (DSS), action with variable rate of actuation (VRA) in crops processes, and promotion of agri-food products through the IoT technique. The hardware-software integration of these systems in any agricultural sector allows the farmer to obtain higher harvests with reduced expenses, i.e., a profitable ROI (the first point of view - that of the farmer). The second point of view is at the other end of the F2F value chain - end user, and represents the needs of the end consumer to have quality (healthy) and cheap products. Between these two extreme points of view, the TZP-UTOPIA-F2F concept seeks an optimal path and conforms the F2F Strategy. The paper addresses to horticultural sector of the culture processes in open spaces and focuses the activities of work in vineyards for SF digitization.

Keywords: *precision agriculture, multispectral monitoring of crops, IoT in vineyard smart farming, Towards zero pollution in the farming environment, Smart SCADA core in vineyards*

Why, Smart-FIELD in vineyards

In order to obtain quality and profitable products, farmers from vineyards must respect and even permanently adapt the technological links of the culture system to climatic constraints. Their cost price must cover all the necessary products (fertilizers, pesticides, fuels, etc.) and, at the same time, be competitive on a sufficiently saturated market, such as the European one. Farmers are currently facing two major constraints, the high price of inputs and the demand of consumers to find cheap and healthy products on the market. In this context, we meet the demands of consumers by ensuring a diminishing of the inputs and a traceability system of wine products from the farm, to finished products such as grapes intended for fresh consumption, fresh must or preserved by pasteurization and wines of different types and levels of quality. The system can come to the aid of certification bodies, for example ecological certification, or those that verify and attest the origin and quality of wines. Through various signs provided to manufacturers for application on labels (logos, QR codes), the degree of consumer information increases considerably.

What is needed to solve the problem?

An ICT system durable solves the problem by digitizing the SF vineyard. For data-driven farming is needed the integration of a Web SCADA (data acquisition and processing system). Smart-SCADA core software activities will develop through AI modules the CPS technique for integrating IoT devices with operational applicability in SF vineyards. The interconnection with the UTOPIA platform will add value to the TZP-UTOPIA-F2F concept.

Implementation the Smart-FIELD to prototype level in vineyard SF

Realization of the TZP-UTOPIA-F2F concept brings an extra novelty through the hard- and software elements created for digitization of vineyards SF. Complete automation of farming processes in vineyard SFs through centralized digital management from the farm PC of UAVs, GRS (as MAS) and of execution elements (for ploughing, arable land preparation, sowing, irrigation, protection, stimulation, harvesting, transport and storage), makes easier activity of the farm manager in making decisions regarding ROI. The cross-cutting activities for TRL tasks of Smart-FIELD within the TZP-UTOPIA-F2F concept are shown in Figure 2.

Conclusion

The Smart-SCADA core model of TZP-UTOPIA-F2F concept to be developed and tested in real Pilot farm (Murfatlar) as an easy method and Smart technique to Fostering InnovativE Learning for Digital agriculture-4.0 (Smart-FIELD) is built on four pillars as basic principles: (i) monitoring the NDVI & EVI vegetation index of crop; (ii) TZP - toward zero pollution of crops process; (iii) ROI - Return on Investment, (iv) Transparent traceability of agri-food products between the F2F for the end user and other stakeholders. The basic Smart-SCADA package and AI scalable software modules are based on deterministic mathematical models that define the stated principles.

Smart-FIELD – Easy techniques to promote innovative learning for digital agriculture towards Zero-Pollution, will be addressed through applied research in the Murfatlar Case Study within the TZP-UTOPIA-F2F project, as integrated smart actions in the SF vineyard. Transparent traceability of agri-food products between Farm to Fork for the end user and other stakeholders will be guaranteed for grapes, through the veracity of data monitored and transmitted from smart vineyard. Web Smart-SCADA core software flow of TZP-UTOPIA-F2F concept for SF vineyard as future research directions in agriculture-5.0 is shown in Figure 3.

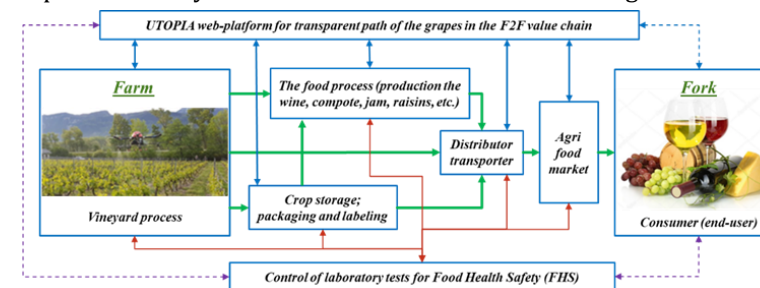


Figure 1 – Transparent traceability of agri-food products from Farm to end-user

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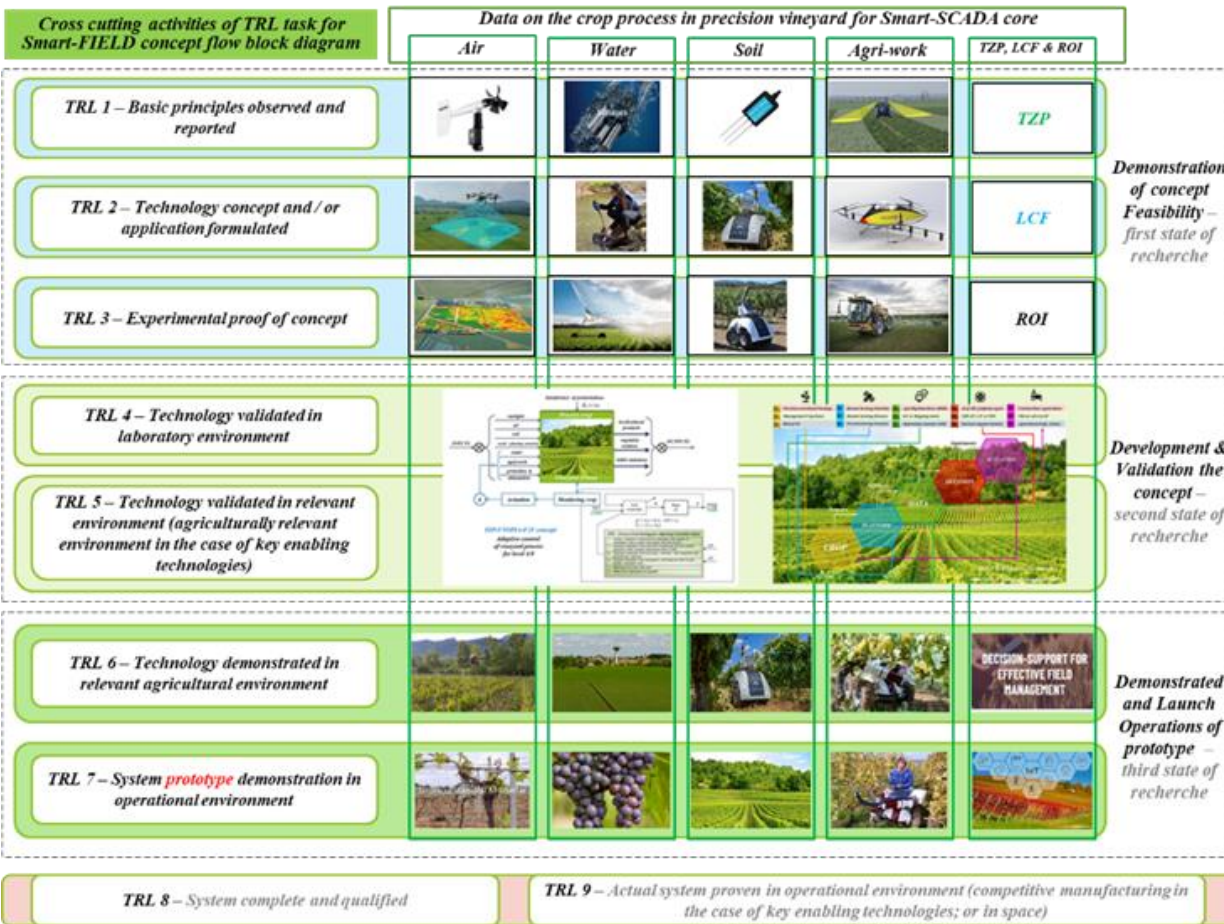


Figure 2 – Cross cutting activities of TRL tasks for the Smart-FIELD and flow to prototype

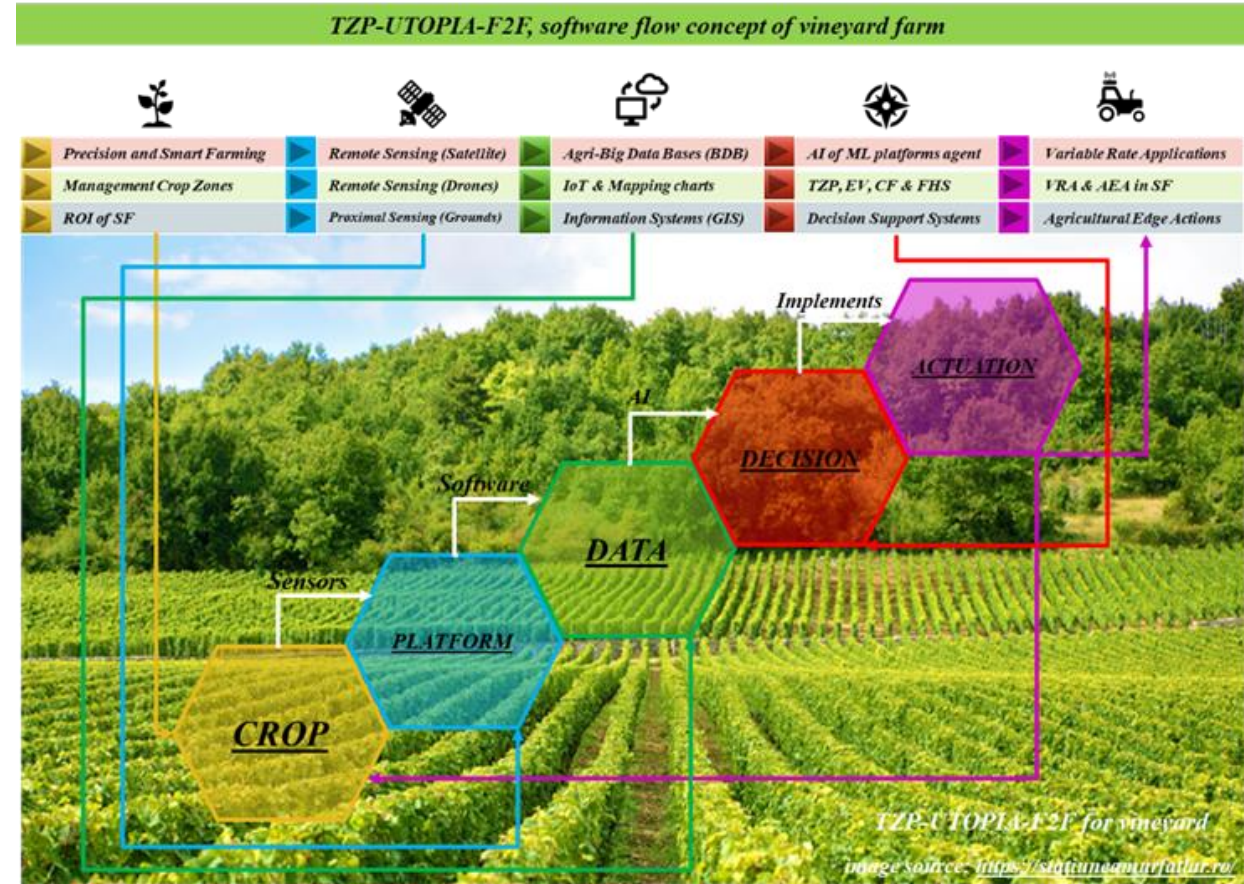


Figure 3 – Smart-SCADA core architecture of flow process from CROP to VRA actuation for data transparency in F2F chain value