FOODIE – Open Data for Agriculture

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The agriculture sector is a unique sector due to its strategic importance for both European citizens (consumers) and European economy (regional and global) which, ideally, should make the whole sector a network of interacting organizations. Rural areas are of particular importance with respect to the agro-food sector and should be specifically addressed within this scope.
There is an increasing tension, the like of which is not experienced in any other sector, between the requirements to assure full safety and keep costs under control, but also assure the long-term strategic interests of Europe and worldwide. In that sense, agricultural production influences, and is influenced by water quality and quantity, ecosystems, biodiversity, the economy, and energy use and supply. The seasonality and ubiquity of agriculture make agricultural practices and production amenable to efficient synoptic monitoring. Besides, food supplies depend on trends in the natural environment, including weather and climate, freshwater supplies, soil moisture and other variables. At the same time, modern agriculture has a major impact on the environment while damaging biodiversity. Unless they are sustainably managed, farms and pastures can cause erosion, desertification, chemical pollution and water shortages. These risks need to be monitored and managed by devising in effect. Therefore, from this it can be concluded that the balance between food safety and food security will be important task for future farming worldwide, but also for farming knowledge management.

Spatial Information is increasingly playing an important role in society and also in agriculture. For both livestock and arable farming, spatial information is continuously playing an important role. Spatial information is needed for spatial location and monitoring of animals, virtual fencing for animals and machines, remote sensing for soils, crops and animals, fleet management and control of farm machines, unmanned aerial vehicles, auto steering and auto-guidance, and for spatial allocation and timing of management applications. Technologies for documentation of production processes to enhance traceability along the food chain will increase. Geographical Positing Systems (GPS) is seen to become the future agricultural technology in terms recording field data collection, yield mapping automated Variable Rate Applications (VRA) in seeding and fertilizing amongst others. The current knowledge management requires deep knowledge of areas such as sensor protocols, handling of sensor data in an internet infrastructure, agro-meteorological modelling, etc.
Agriculture requires the collection, storage, sharing and analysis of large quantities of spatially referenced data. For this data to be effectively used, it must be transferred between different hardware, software and organisations. These data flows currently present a hurdle to uptake of precision agriculture as the multitude of data models, formats, interfaces and reference systems in use result in incompatibilities. Management of huge amounts of data is a challenge. Sensors in the fields, buildings, vehicles or satellites provide data on high time-frequency and data accumulate fast. Without smart sensors and better developed data management (including data quality algorithms) the amount grows overwhelming and remains unused. Spatial data quality is considered to consist of several aspects which may be categorised as data completeness (amount of missing features), Data Precision (positional accuracy or degree of details), Data accuracy (attribute accuracy) and Data Consistency (absence of conflicts of spatial elements). Agricultural data often have also temporal dimension, thus called spatiotemporal data, consistency in time is also considered.

Spatio-temporal data are increasingly collected by remote or in-situ sensors rather than by field campaigns. The wireless communications have several benefits, but also pose challenges to the data exchange reliability and power supply. Sensor calibration and deployment as well as maintenance of sensors need resources and technical skills and increase the costs of data acquisition). Both increasing amount of data and awareness of data quality issues highlight importance that metadata are attached to sensor data.
The availability of data and the benefits of Spatial Decision Support Systems (SDSS) in linking datasets together are seen today in different software and systems for farm management. To achieve this linkage the report recognised two essential factors: locational references, data documentation and exchange standards. However, for application in FMIS systems and local and regional authorities, there are often problems with data not explicitly and standardly spatially referenced, the data relate to a variety of different areas which do not match or nest into each other and the boundaries.
The most difficult information to access for a single farm is, to understand who are the potential information providers at macro level and how to collect information on macro level. This global (geographical scale and over time) sectorial information is the most important for any long time and strategic planning. In fact, to understand the market trends, the changes in the medium term weather conditions, the changes in the European subsidies systems etc. and the influence of this information on the operational plans of a farm are essential for assessing the profitability of the farm.
Such type of global information exists on the market, but accessing such information in the right time it a difficult exercise for most small farmers. In reality, this information is available for the big food industry and for the associated business partners; accessing and using this information in an effective way for supporting the farmers in their decision and in the formalisation of their plan is a separate story. So, farmers are usually under strong stress as they are fully in the hands of the food industry and associated businesses. The key question, or better the point that the project intends to approach and experiment is, how to support collection and/or access to macro or global information from the immediate visibility and use by farmers, integrating this with the other level of information access and decision support systems.

To facilitate integrating and deploying services over FOODIE, and trying to assure FOODIE success in the mid-term, consortium will take into account state of the art and expected evolution of management services and data marketplaces for the next years. In that sense, FOODIE will seek and provide the following innovative aspects:

- Cloud deploying of basic and standardized services, which will decrease not only deploying costs but also production and maintenance, costs. Cloud deployment will also make easier integration and realize the vision of a "network of data-hubs", sharing data and services to provide a new data exploitation ecosystem where data is enriched by composition. Collaboration among hubs will enable a market for *data brokerage*, kind of data hub which do not store data but locates, summarizes, enrich and disaggregate data to provide vertical services of high added value.
- Easily discoverability and composability of services. Not only data and services published and deployed by FOODIE will follow (de facto) standards as far as possible, but guides to build and deploy services over FOODIE will be publicly available so any service can not only be easily found by end users or third party companies but also can, with the adequate access management, be reused alone or by composition with other services to provide a richer or a particular solution. This approach will also enable a personalization market realized by third-party, specialized companies in vertical markets.

- "Pay as you go" paradigm. Services or data published by FOODIE can be free or non-free. For instance, FOODIE will provide for free a global agriculture sector balanced scorecard and a non-free repository where key indicators for the agriculture sector may be obtained and combined by all stakeholders to make their own balanced scorecard. FOODIE may also go a step further providing analysis based on free indicators to provide free, white papers or sample reports and non-free, only for subscription members, reports. This paradigm will enable third parties as for instance consultancy companies to sell consultancy services (reports, etc.) on top of FOODIE information.
- Reward mechanisms for data sharing. Open data are the key value of FOODIE, but also volunteered data and knowledge shared among user's communities. FOODIE will promote participation of stakeholders and end users (high value data owners) in terms of "the more information you provide to the hub, the more data and services for free you will enjoy". Also, this approach will help to build virtual communities and exploit social knowledge.
- Clear Return of Investment (ROI) for the end user. The current economic situation makes reduction of costs a strategic pillar of a large number of companies. FOODIE must develop a business model which, during the marketing process, clearly demonstrate the value of services in ROI terms (i.e. FOODIE may include a simulator which calculates, asking a few questions about a crop, reduction of costs by rationalizing the use of fertilizers, water… thus quickly amortizing the cost of the service)
- Multi-device/multiplatform/multipurpose front-ends. FOODIE will include mechanisms allowing users to exploit information and services by means of graphical and intuitive interfaces. Standards as HTML5 widgets for visualization will be preferred to assure compliance with mobility devices, as they provide automatic means to perform interface adaptation according to specific hardware and software capabilities.