

Future Internet for safe and healthy food

Feeding the world within the carrying capacity of planet Earth...

At the start of the 21st Century we have to face an emerging problem: the increase of the world population to nine billion people in 2050 and therefore a doubling of the global food demand. Concurrently, the carrying capacity of planet Earth has already been exceeded with the current way of agricultural production. Further globalisation, climate change, growing welfare in emerging economies, a shift from a fuel-based towards a bio-based economy, and competing claims on land, water and labour will complicate the challenge to feed the world within its carrying capacity, without further polluting or overuse. Food might become a critical factor concerning the world's security. We need radical scientific breakthroughs and new ways of public private cooperation to enable innovations and regime shifts in future agri-food production. Therefore, Wageningen UR, a world-leading research institute, has launched the slogan for agri-food production in the 21st Century: 'Two times more with two times less.'

Transparency in food production on safety, health, quality and sustainability

Beside the global issues of food security and ecological footprint, Europe's focus is more on the issues of safety, health, quality and sustainability, underpinned by the concept of transparency. The European Technology Platform 'Food for Life' therefore emphasises knowledge generation and exploitation as essential in driving an effective innovation agenda. The complexities in reaching transparency are due to complexities in agri-food products and processes, and also due to the dynamically changing open network organisation of the food sector with its multitude of SMEs, its cultural diversity, its

differences in expectations and the ability to serve transparency needs, and its lack of consistent appropriate institutional infrastructure that could support coordinated initiatives towards higher levels of transparency throughout the food value chain.

Europe's potential role in future agri-food production in relation to Future Internet

With its high qualitative knowledge level and dense technological infrastructure and related service industry, Europe has an important potential role in the required knowledge generation and exploitation for global innovation in future agri-food production. European agri-food research institutes and organisations already have an outstanding, worldwide reputation, but this mainly relates to 'classical knowledge', such as breeding, economics, etc. It is expected that the huge challenge for innovation of future agri-food production, in particular, depends on ICT related technology. The following three exemplary cases illustrate this:

- In precision agriculture, using sensor-based geographical information systems, it is possible to closely monitor and control crop development over time at a very

precise level (place and state of crops). Loads of data is generated, but there is a lack of scientific knowledge and models to use this data in software applications for improved decision-making;

- At different points-of-sale in supermarkets and other (internet) shops, loads of data is generated on consumer behaviour, but there is still a lack of scientific knowledge and insight into how this data could be used to better serve the customer or to improve downstream production and logistics;
- Traceability is currently mainly arranged to comply with legal requirements. The possible merits of enhanced transparency and traceability to better serve and inform the customer, to control product flows and guarantee the quality of products have not yet been obtained sufficiently.

This shows that the use of Future Internet (FI) in the agri-food sector can be improved considerably, because FI could help to:

- Observe, collect, organise and streamline large amounts of data in an effective way;

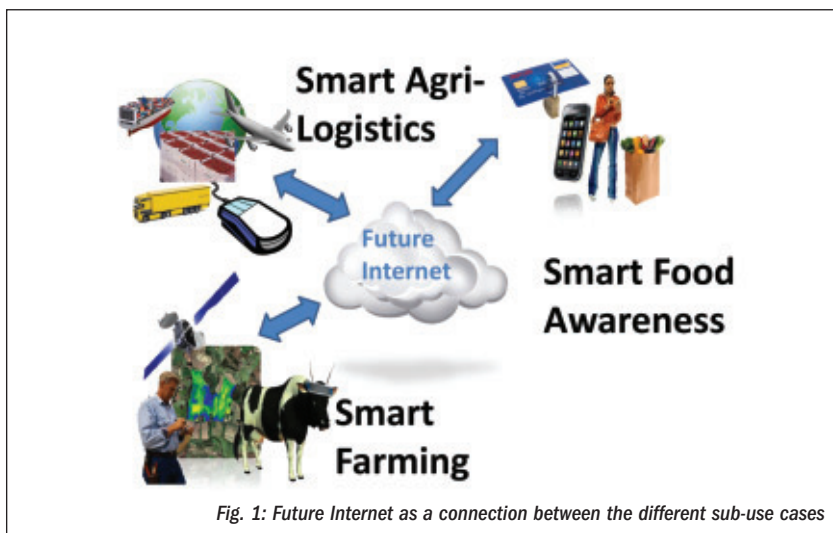


Fig. 1: Future Internet as a connection between the different sub-use cases

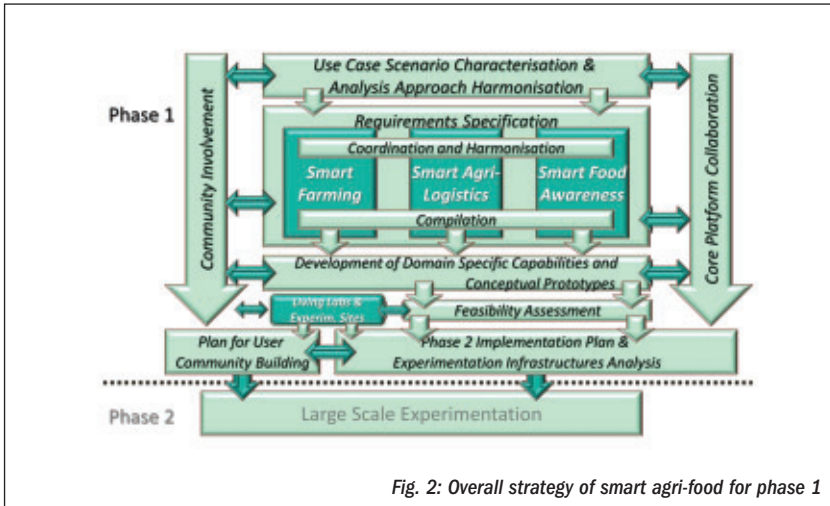


Fig. 2: Overall strategy of smart agri-food for phase 1

- Make knowledge accessible (e-content) and put it in the right context for applications by context-sensitive search;
- Combine knowledge and data in models that are meaningful in the right context.

Hence, investment in FI for future agri-food production is not only a prerequisite for meeting the challenge of future agri-food production, but can also boost the ICT industry in public private partnership with agri-food research institutes.

FI for future smart agri-food production for three sub-use case scenarios

To deal with the complexity of agri-food production and related stakeholder networks, it was decided to define the following sub-use case scenarios (Fig. 1):

- Smart farming – individual treatment of animals, plants or m² of land at the right place and right time through sophisticated sensing and monitoring, decision support and precise application to improve efficiency, productivity, quality, flexibility and chain responsiveness;
- Smart agri-logistics – intelligent matching demand and sourcing followed by smart transport and logistics of agri-food products by, for example, auto-identification, conditioned transport using sensors and control systems, remote-controlled early warning systems, etc;

- Smart food awareness – enabling the consumer with relevant information, for example, concerning safety, availability, health, environmental protection, animal welfare, etc, using chain information systems.

The SmartAgriFood project

The overall objective of SmartAgriFood is to boost the application and use of FI in the agri-food sector by:

- Identifying and describing the technical, functional and non-functional FI specifications for experimentation in smart agri-food production as a whole system, and in particular for smart farming, smart agri-logistics and smart food awareness;
- Identifying and developing smart agri-food specific capabilities and conceptual prototypes, demonstrating critical technological solutions including the feasibility to further develop them in large-scale experimentation and validation;
- Identifying and describing existing experimentation structures and start user community building, resulting in an implementation plan for the next phase.

The agri-food use case is an ideal scenario, providing both the requirements for a tighter integration with advanced internet-based network and service capabilities, as well as an innovative application scenario with one of the highest social and economic impacts. It is essential to apply an integrative strategy to bridge the gap between the vertical supply

chain dimensions (from farm to fork), as well as the highly required domain specific capabilities and the potentials for realising FI Core Platform instances. Hence, the main pillars in phase 1 to accompany the specification of platform requirements and to substantially prepare the large-scale experimentation are the community involvement and the core platform collaboration, as presented in Fig. 2.

What this project means for ordinary citizens is better food, produced with less impact on the environment through better operations based on improved flows of information, and greater knowledge and awareness about the origin of food. For the food chain members from agricultural production through to food processing and retailing, the project promises to contribute to the design of enabling tools for decision-making and controls for lowering of inputs, reducing costs, increasing access to market relevant data for all people and organisations involved, and the recognition that farming and food production is central to our collective future. It includes early deployment, testing and experimentation of the new internet-based solutions. Participating in the project and the awarded EU funding greatly assist the improvement of innovation opportunities and capacities – not only for the countries involved but for the whole of Europe and beyond, particularly for ICT solution providers and the agri-food sector – and foster their collaboration.



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