VTT's vision of the era of smart and consumer-centric food production

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We are moving into the era, where food production and digitalisation will merge to form a new food economy. The transition is already under way - led by consumers. Together with companies in the sector, VTT Technical Research Centre of Finland has created three change paths towards the Food Economy 4.0. They are based on identifed drivers and emerging technologies.

Internationalisation, urbanisation and ageing are transforming the consumers and the living environment. In the future food must be produced for demanding consumers with clearly smaller environmental burden. Our future food will be based on more efficient use of raw materials; foods are more plant based and made from novel kind of ingredients.

Digital technologies and services will be in a key position in Food Economy 4.0. Consumer-centric business activities will take into account individual needs and values. Smart online retail combined with agile distribution, new service models using emerging technologies, and customized food production close to the consumer are examples of the transition under way. Big Data combined with smart interaction between processes, actors and consumers via IoT is increasing convenience and transparency.

Together with food industry representatives, VTT's multi-disciplinary team of experts has created three change paths for the transitioning food production and distribution, and presented new business opportunities

based on these paths. The Food Economy 4.0 roadmap published by VTT in February 2017 describes new ways of thinking about the production, delivery and purchase of food.

From mass production to individual solutions

In addition to safe and tasty, consumers want healthy and easily available food. Ethical values and local production are also important. Digital services and production technologies will increase the possibilities of consumers to make product and service choices in line with their own needs and values. Combining personal and product data will enable matchmaking of one´s dietary needs with food offering. Smart packaging and automated monitoring of the quality and quantity of food will ease the lives of consumers both within and outside households.From traditional food supply chain to agile production and distribution

Personalised food production will also change production processes. Food supply is becoming a more networked and consumer-driven business environment. This transition is driven by digitalisation, new production, distribution technologies, and service-based business models.

Online platforms offer a cooperation channel and marketplace for producers capable of scaling their deliveries for end consumers or the food industry. New web-based solutions are creating market models in which small producers can connect to bigger consumer groups. The development of distribution and logistics systems plays a key role in agile food production.

In the new food economy food is more often prepared for the consumer directly, at the point of purchase. Grocery stores could have elements of production units. The current development of service robotics and 3D printing is improving the ability of vending machines to prepare

personalised portions.

Well-being for the planet

In addition, ensuring food production while using natural resources sustainably is a global challenge. Centralised production, long transport distances and storage cause a great deal of waste at different stages of the current food supply chain. Agile production and distribution with smart quality control can also tackle this challenge.

More efficient use of natural resources and food raw materials as well as novel solutions to produce food ingredients are in a key role of future food economy. Biotechnology and insect farming are valid examples of future production technologies. Transition from horizontal to vertical food production is accelerating.

Three change paths

VTT's Food Economy 4.0 roadmap describes three change paths, which form an integrated ecosystem. Information flows in the ecosystem affect the consumer's purchasing decisions while, through his or her purchasing decisions, the consumer can create an ecosystem in which raw materials are produced sustainably and used efficiently, with a view to the further processing of raw material flows.

Many examples show that we already are moving along change paths. The first to move and those who best serve the customer will be the winners in the new digital environment. In addition to cross-border technologies, out-of-box thinking and rapid prototyping pave the way ahead.