

## Chapter 15

# The Agricultural Innovation Under Digitalization

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### ABSTRACT

*This chapter aims to discuss how the rapid evolution of digital technologies is creating opportunities for new agricultural business models. First, it provides an overview of what the authors consider to be part of the digitalization in agriculture. Then it addresses the emergence of a community of practice based upon the data exchange and interconnections across the agricultural sector. New business opportunities are presented first through an overview of emerging start-ups, then discussing how the inventor farmer profile could create opportunities for new business models through the appropriation of technologies, eventually highlighting the limits of some classic farm business models. Finally, the chapter presents an example of farmer-centered open innovation based on the internet of things and discusses the related business model. The conclusion provides some perspectives on the use of agricultural digitalization to increase the share kept by farmers in the value chain of agricultural productions.*

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## INTRODUCTION

Agriculture in the 21st century should produce sufficient high-quality food, for more than 9 billion inhabitants, without increasing the surface of production, while limiting ecological impact. The production's increase should be about 70% (World Population Prospect, 2012). Historically, during the second half of 20th century, the intensification of agriculture has been supported by mechanization, plant breeding and chemistry, with some bad consequences over the long term, like pollution and loss of biodiversity.

So, farmers have to decrease the inputs (pesticides, fertilizers, energy, and soil cultivation) and to increase the outputs (production) over the same global surfaces. According to FAO – Food and Agriculture Organization of the United Nations –, the global challenge for agriculture is to produce more with less, in keeping with sustainability (FAO, 2016). Agriculture and farming are inherently linked to food with two aims: enough production and good quality. However, the global increase for both encounter the physical limits of the planet. Waste has to be controlled, water use should be optimized and its quality increased, chemicals and energy inputs should decrease, and biodiversity should be at least maintained. At the same time, it is forecasted an increased innovation in plant breeding, including “orphan crops” (Vanderschuren, 2012), probably a growing amount of livestock and an increased role of urban agriculture. New Business Model (BM) for the food industry are requested and nutrition will be a priority for consumers (Trautler et al. 2018).

This situation leads to a deep paradigmatic change. The soil should no more be used as a simple substrate to which all the necessary elements should be added. It has to be recognized as a global system integrating physical elements, chemical and biochemical elements, and living beings. The mass of living beings in the soil is generally much higher than our domesticated animals which put a hoof on the ground. The interactions of the soil, the plants and the climate define the core of the productive system. The aim of agriculture is to obtain the maximum production, through minimum inputs and so to optimize the functionalities of any element of the system, living or inert. For a farmer, the time is to be spent in thinking about how to organize crop rotations, intercrops, double and even triple plant cultivations, how to maintain the productivity of the soil and the biodiversity of the whole agro-ecosystem, how to sell at the best price a good quality production, how to provide useful energy without buying fossil energy, how to decrease the production costs. The aim of the activity of the farmer cannot be any more a simple producer whose all actions are answers to demands. In order to be adapted to local conditions, it appears that agriculture will become more and more diversified, including both urban agriculture and aquaculture. This new paradigm transforms the farmer job. To be able to increase production by overcoming these constraints, the approach must be globally and radically changed. The agriculture world must leave a simplifying and homogenizing model to move towards a systemic approach in which interactions are increased at different levels. This means being able to produce in a sustainable way, according to the pedo-climatic context and the needs of the territories. Agriculture should be both more and more precise and flexible in a context of global growth (Trautler et al. 2018).

Generally speaking, digitization is the process of producing information into a digital format. It produces a collection of a finite number of signs taken from a countable set of valid signs. Digitization “is of crucial importance to data processing, storage and transmission, because it allows information of all kinds in all formats to be carried with the same efficiency and also intermingled” (McQuail, 2000). Digitizing means the conversion of analog source material into a numerical format through which is provided a discrete representation; hence it is a reduced or restricted point of view about the use of digital tools.

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