INSTITUTE OF APPLIED RESEARCH IN SUSTAINABLE ECONOMIC DEVELOPMENT – IPADES

DIGITAL AGRICULTURE

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From the second half of the last century agriculture has made impressive transformations, mainly tropical agriculture, whose leadership is Brazil. The interface between Agronomy and Ecology has advanced very much in Brazil and promoted sustainable production systems with increased productivity and lower advance on new areas for planting.

In the current century these gains, and with greater efficiency, are counting on the support of new tools, such as the Internet of Things (in English, Internet of Things - IoT). This works with a digital system that shows what the producer is planting, when will reap and when production will come to the market, among other information concerning the application of inputs, and operation of machinery and irrigation systems.

Global trends and forecasts for the planet indicate that over the next 50 years the main challenges of humanity will be energy, water, food, environment and poverty. In this scenario, the world agriculture is under strong pressure to ensure food security and provide clean energy in a sustainable way. The global scenario envisaged is critical with the world population reaching 9 billion inhabitants in 2050, growing scarcity of land and water resources, climate change and extreme events, levels of income *per capita* and urbanization in constant growth and declining productivity in some countries.

Today there is not longer any more separation between the physical and virtual worlds, connected to facilitate the life of people. Behind this idea is the concept of Agriculture 4.0 (Agri 4.0), also called digital agriculture, a clear reference to the Industry 4.0, innovation which began in the German automobile industry and who now conquest factories of various segments, due to the complete automation proportionate to the productive processes. (VDMA VERLAG, 2016).

The Agri 4.0 employs computational methods for high performance, network of sensors, Communication machine-to-machine (M2M), connectivity between mobile devices, Cloud Computing, methods and analytical solutions for processing large volumes of data and build systems to support the decision-making process of management. In addition, help to raise the indices of productivity, efficiency in the use of inputs, reduction of labor costs, improve the quality of work and the safety of workers and reduce the impacts to the environment. Includes agriculture and livestock of precision, automation and robotics in agriculture, as well as techniques of bigdata and the Internet of Things.

The internet of things is already a reality. Every day more "things" (machines, cities, infrastructure elements, vehicles and residences) connects to the internet to inform their situation, receive instructions and even practice actions based on information received. The possibility of linking the physical world to the Internet and other networks of data has profound implications for society and the economy. The Internet of Things makes it possible to monitor and manage operations hundreds of miles away, track goods that cross the ocean or to detect the occurrence of pests or diseases in the plantation. More than the next evolution of information technology, the Internet of Things redefines the way we interact with the physical world and makes forms mediated by computing - until then impossible - to produce, do business, manage public infrastructure, providing security and organise the lives of people.

It is estimated that there are already more than 15 billion connected devices around the world, including smartphones and computers. It is expected that in the next decade this value will increase dramatically, reaching 35 billion devices in 2025, or five times the world population. The growing number of devices connected to intelligent systems that can share, process, store and analyze data between itself will result in the connection of billions of machines and other devices to networks and the creation of new data. In this way, you will need smart techniques for management and analysis of data to extract meaningful insights. Thus, it is essential the development of various sectors associated with technology, such as telecommunications services, cloud computing and data analysis (data analytics). (CONSULTA Pública, 2016).

The use of Information and Communication Technologies (ICT) and the new digital technologies is a path with no way back in the rural world, in the era of the Agro 4.0. The TIC is propelling spring and integrating such innovation within and outside of the productive chain to be used in applications in genetic improvement and bioinformatics, in pre-production; precision agriculture and various equipments in

production; improvements in logistics and transport in post-production. All of these technologies and innovations will be increasingly connected, assisting in decision-making and rural management.

Agriculture is the economic activity more dependent on climatic conditions. In addition to influencing the growth, development and yield of crops, the climate affects the relationship of plants with insects and microorganisms, or not favoring the occurrence of pests and diseases. The agrometeorogical monitoring consists in the continuous and systematic collection of weather data for the production of information of interest or agricultural use. Systems that integrate in a coordinated way and simultaneously the roles of collection, transmission and processing of data can provide information meteorological and agricultural updated in near real-time. There are several agricultural practices that can benefit from information agrometeorológicas, highlighting: soil preparation, planting, fertilization, irrigation, pest control, harvesting etc. Estimates of productivity, quality of production and favorability to the occurrence of diseases also require meteorological data. (MONTEIRO; OLIVEIRA, NAKAI, 2014).

Brazil, an important player in the world, agriculture has much to gain from this new digital tool in its agriculture, so as to contribute positively to meet the challenges posed. The planted area is very large, with farms the size of some small countries. How to inspect them and monitor the production in the face of new environmental demands, labor, food security and practices increasingly sophisticated crops?

The environmental demands for at least two decades began to be a serious problem for the cattle ranchers. The catle created in the Amazon biome have difficulty marketing, because the farms, without environmental certification, were linked to the cadastre of desmatadoras. Even those with the certificate could buy animals to areas that are not certified. The solution come by tracing the animal's life. With the pressure of the Public Prosecutor, the big stores started to adopt the tracking, as a guarantor of that animals are not coming from areas not certified as environmentally friendly.

In agriculture, the segment of the sugar cane stockmarket is already harvested under control of digital tool. The use of agrochemicals, the digital tools allow the use of the product of Spartan mode, increasing the profit margin of the farmer, the better protect from contamination, protecting the environment and the consumer.

But, there is not yet a complex system that tell the farmer how to use exactly without waste. There are some attempts in Brazil aimed at the rational use of

agricultural inputs, for example, the application of manure as organic fertilizer. It is already possible to gather and spread the dung evenly in the crop.

With the help of satellite images that show the production of the previous year, you can see which stands in the field of cultivation produced well and those that have produced less than expecte. With this information it is planned the next fertilization, and a truck prepared for the application of fertilizer will do the job.

The digital agriculture is expanding, therefore, their knowledge, research, systematization and method they deserve recognition from the academy. In addition, function in 2009 was created the upper course Mechanization and Precision Farming, in the College of Technology (FATEC), Marília (SP). It is a course for the training of technologists to agricultural mechanization and big data for agribusiness. It is the second of its kind in the world, the other is in Oklahoma, in the United States. The Fatec form in three years technologists who understand mechanics and cmputing science and has a lot of curiosity to know how these complicated machines. The center Paul Souza, who manages the Fatecs, aims to expand this experience, even because São Paulo is a condition favorable to innovation.

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