Chapter 4
Digital Technologies for Smart Agriculture

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ABSTRACT

This chapter will provide the reader with an introduction to the modern emerging technologies like cloud computing, machine learning, and artificial intelligence used in agriculture. Then a glimpse of complete crop cycle follows, including seven steps, namely crop selection, soil preparation, seed selection, seed sowing, irrigation, crop growth, fertilizing and harvesting; and how these digital technologies are helpful for the crop cycle is also explained in this chapter. The rest of the chapter will explain the merger of the modern digital technologies with the agricultural crop cycle and how the future farming will work.

1. INTRODUCTION

By year 2050 world population is expected to hit a number of 960 crores (World Resources Report 2013–14). It will be required to produce double the quantity of food than now being produced. This will test the agricultural innovations being made which will help us to achieve this goal. To fulfill the human requirements, it will be required to revolutionize a new agricultural era by introducing advanced technologies to the field and bringing them on same platform by using modern digital technologies. The industry has undergone major developments over the last century.

In 1990 it was required to put 37 percent of the total labour force of America, to plough 5.7 million farms, to bring meals to the tables of 76 million people, whereas in year 2005 this percentage has reduced to 2.5 percent to feed 321.4 million of American population (World Resources Report 2013–14).

These changes have allowed human beings to excel in other fields of life as well, than to restrict themselves to the farm fields working day and night to fulfill the basic necessity of food. World is head-

ing towards an era of smart farming where machines will grow crops for human beings and that too without human intervention. Growth of crop will be monitored by small sensors and cameras position in the field, data gathered from these sensors will be collected and processed by the processors and data in easy to understand form is provided to the farmers on their interface devices or smart phones in the form of alerts and analysis reports. To deal with problems like weeds drones and robots will be used to identify them and shoot them with a beam of laser or streak of pesticides. This process will reduce the use of chemicals on the crops by up to 90% as compared to conventional process of blanket spraying. Current advancements and innovations have reached to the level of autonomous pickers and gatherers of strawberries and few vegetables, but these are separate for different crops. Now the addition of next echelon will be creation of plucking robots that can switch between different crops by selecting the appropriate program. The everlasting thrust of human being for progression and development in all the fields of life has not left the vast area of agriculture untouched. It was just a couple of years back, when the common man had got access to the GPS technology and the electronic control system had made their way to the vast arena of agriculture. Different sensors were deployed in the field to sense different agricultural parameters and provide information to the farmers and scientists about growth of crop and related problems, like poor crop quality in an area, presence of pests and weeds, improper/ excessive irrigation and imbalance of the chemical composition of soil. Though now a lot of data was available to the farmer, but still the major task of collecting all this data, maintaining record of the same and further collating all the available data (on basis of different crops, geographical areas, different weathers and different type of different types of seeds, fertilizers and pesticides used) and finally to thread all these datum beads into a string to fruitfully use them, (Singh, P., Dixit, V., & Kaur, J. 2019) (Parasher, Y., Singh, P., & Kaur, G. 2019)

Figure 1. Digital Technologies used in Agriculture
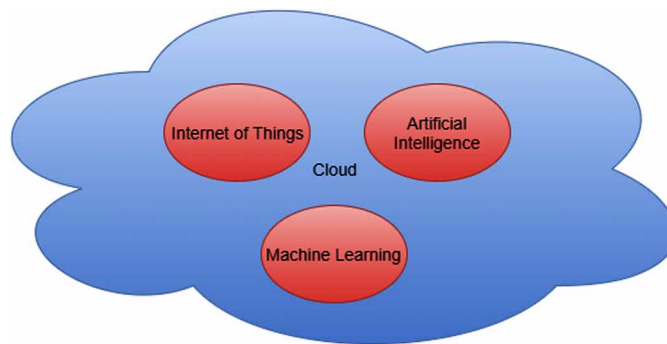
2. DIGITAL TECHNOLOGIES USED IN AGRICULTURE

However, it still cannot be claimed that precision agriculture has been widely established in crop production, but is moving on to achieve it at a good pace by making use of advanced digital technologies. Different technologies being adapted for agricultural advancements are as shown in Figure 1.

1.   Internet of things (IoT)

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