Chapter 7
A Fuzzy-Based Sustainable Solution for Smart Farming

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ABSTRACT

Agriculture is an important sector in many developing countries, but the traditional methods are not sufficient to produce a good amount of crop. Moreover, the natural calamities are also destroying a large portion of the crop. Hence, this chapter proposes a prototype model, AgriHelp, to address an agricultural issue using fuzzy logic. The model takes two parameters as input: when and where the farmer wants to sow the crop. Using this information along with available dataset, AgriHelp extracts the expected min-max temperature, rainfall and soil type in the region in the specified season and suggests the best-suited crop to the farmer. The model can further be extended by incorporating more features.

INTRODUCTION

Agriculture is one of the life-sustaining aspects of a country's economic system. It is an important sector in many developing countries like India as several acres of land is used to grow various kinds of crops such as staples, vegetables, spices, pulses, etc. India is leading the world in producing a huge variety of staples. By exporting the different products, a nice amount of revenue is generated every year. India is the second largest producer and exporter of spices ("Spice Board", n.d.). Globally, it ranks second in rice and tea production. The agriculture sector counts 16%of total GDP in Indian economy (Datt and Mahajan, 2011).

The agriculture sector has two-fold advantages. It renders employment opportunities to numerous individuals on a large scale and at the same time, it fulfills the need of society to live a healthy life. It is an imperative source of their livelihood. Moreover, life can't be imagined without the hard work of

farmers. They are the one who works behind the scene as an indirect source in placing the food on our dining table. On the other side of the coin, agriculture is an imperative source of the farmer's livelihood.

Though more than half of the total acquired land is used for agriculture in India, it contributes only 16% to the total GDP in the economy. There are many reasons behind this non-performance in the agriculture sector. One of the most important reasons is poverty and illiterateness among farmers. Although many times, the government comes forward with various policies ("Programmes and Schemes", n.d.) but due to lack of access to the actual data and appropriate analysis, it fails to extend help to the actually needy farmers ("Reducing Poverty", n.d.). Even the government sets various forums to provide consultancy (Agropedia, n.d.) related to various agricultural issues. However, very few farmers are benefitted by such programs due to unawareness about these services and new technologies. Sometimes, even if they are aware, they are not able to utilize the resources to improve the quality and production of the crops as it requires high investment. Their dependence on natural resources and the use of traditional technologies is another cause of hindrance towards achieving the aim of economically viable production.

Nevertheless, the main challenge is thrown by our mother, Nature. Extensive use of natural resources and hazardous chemicals has to lead to serious environmental issues such as climate change, global warming and pollutions. Many times, it results in unexpected rainfall which further causes either flood or drought. It precipitates devastation of a large portion of crops every year. Due to the high cost of seeds, pesticides and other growing equipment, farmers spent a lot of money in growing the crop. Even sometimes they take a loan for bearing the associated investment. As time passes, the farmer is in a handful of debts and it is very difficult for him to survive and fill the needs of his family. Many farmers are unable to bear this loss and sometimes they decide to end their life. As per the latest report of the year 2018, 639 farmers have committed suicide between March and May 2018 in Maharashtra, India (News18, n.d.). Some decide to quit the farming and do something else. According to the report (DowntoEarth, n.d.) the stress, poor income, no future prospects are some of the reasons for stepping out this kind of decisions. Due to these reasons, even farmers don't want their children to choose agriculture as a career option.

As per the survey (DowntoEarth, n.d.) conducted through 18 states, it is revealed that 70% of farmer respondents prefer to do something else other than farming. The main reason for their decision is low crop yield. According to them, the main causes of low production are either pest attack or unpredictable weather conditions like a flood, drought, unnecessary rains, etc. Sometimes, the farmer explores the non-eco-friendly solution like an excessive amount of pesticide to increase the crop yield. As a result, the quality of the crop and land fertility gets affected. Recently farmers of Maharashtra and Odisha conducted a rally and walked 180 KMs for demanding compensation of their crops (India News-Times of India, n.d.).

In some states, governments provide support and compensation to deal with the loss due to these situations. The government also launched few schemes related to agriculture insurance. But these schemes are valid only for farmers having more land area. To get the support of the government, farmers have to complete a number of formalities. They have to show proper evidence. These practices discourage the farmers and force them to sell their land for some other purposes like factories, buildings, etc. If this process continues in a similar fashion, in the coming decades, we will be short of agricultural land and it would be impossible for us to fulfill the food demand of such a highly populated country.

Since independence in 1947, Indian agriculture crossed a long journey but there is very less improvement in the conditions of framers. India achieved a number of landmarks in technology advancements but still, these technologies are not beneficial for the farmers. A large population of farmers is illiterate and they are not aware that how to take benefits from these technological advancements in their agri-

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