


# Chapter 10

## The Role of Artificial Intelligence and Machine Learning Models to Optimize Fertilizer Consumption for Sustainable Agricultural Growth: AI for Precision Agriculture

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### **ABSTRACT**

*Agriculture and food are very important and basic needs for humans. From ancient*

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*time human started to feed themselves with the help of grains and animal's products. Later agriculture sector revolutionized with the production of various crops. Rice, wheat and pulses are grown at large to feed the worldwide population. World population is increasing rapidly. In 2000 worldwide population was 600 crores which becomes 800 crores in 2025. To feed a large population, farmers have to yield more crops with a limited resources. Farmers were using traditional methods for a long period to grow the crops, but these traditional methods are not enough to feed the growing population. AI and data driven approaches can help a lot modern agriculture sector by analyzing the data of soil quality, weather conditions, need of nutrients, pesticides and fertilizers. By collecting a large real time data with the help of sensors, drones and AI enabled machinery, can help a lot farmers to know the exact demand of crops as per the conditions.*

## **ROLE OF AI AND DATA DRIVEN APPROACH IN MODERN AGRICULTURE:**

In this chapter role of Artificial Intelligence and data-driven approaches to analyse the need for fertilizers will be explained. Fertilizers and pesticides help to grow more yield, but overuse of fertilizers is also harmful to the health of humans, soil, and the environment. It is very important for the farmers to know the exact number of fertilizers to be used as per the needs of crops.

Artificial Intelligence has revolutionary applications in so many sectors. Artificial Intelligence can also play a crucial role in optimizing fertilizers and pesticide consumption in crop yield. AI can help to analyse the exact need for fertilizers and pesticides according to the soil quality, environmental and weather conditions, and type of crop by analysing the data collected by drones, GPS, and other technologies. Shaikh et al. (2022) reviewed the trend of drone sensors in modern agriculture. Paul et al. (2022) analyzed the need of technology in modern agriculture to measure the soil moisture, need of irrigation and nutrients. Javaid et al. (2023) discussed the role of AI and modern technologies in the agriculture sector. Technology is helping a lot farmers by finding the need of fertilizers, gap or distance between the seeds, plant depth and weather forecast. Companies are also working on the integration of AI and technology to improve the farming skills. Ben & Hanana (2021) found that by 2050 world population will increase to 9 billion by 2050 to feed a large population food production have to be increased by 70% which can be serious challenge for agriculture sector. Looking for the population growth and need of increasing the food productivity they found the need of AI and machine learning models to be applied in agriculture sector. Goel et al. (2021) found that by 2030 world's largest population will be living in the developing countries only, for this a need of data

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