Satellite Farming

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An agricultural management strategy that is centred on monitoring, measuring, and responding to crop variability within and between fields is called "satellite farming," "precision agriculture," or "site specific crop management" (SSCM). Precision agriculture research attempts to build a decision support system (DSS) for total farm management to optimise input returns while conserving resources. It is also described as an information and technology-based farm management approach that finds, analyses, and manages variability within fields for optimal profitability, sustainability, and preservation of the land resource. Satellite farming is one of the most innovative and modern forms of organic farming that are becoming more and more popular in the twenty-first century. Reducing the use of farm equipment, water, fertilisers, pesticides, and herbicides can serve as an example of how precision agriculture can be advantageous for both the environment and the economy. Data gathering and processing could be automated and made simpler with precision agriculture. Precision agriculture divides a field into "management zones" based on many factors such as crop productivity, yield rates, pest infestations, pH of the soil, and nutrient position.

Aspects of satellite farming

A broad range of topics are covered by aspects of satellite farming, including the variability of soil resources, weather patterns, plant genetics, crop diversification, machinery performance, and the physical, chemical, and biological inputs used in crop production. The general public believes that satellite farming is limited to large holdings found in wealthy countries. The kind and size of farms do not preclude the deployment of a well-thought-out satellite farming system because satellite farming is adaptable by nature. It offers an opportunity to improve agricultural productivity and product quality. The capacity of satellite farming to maintain uniformity throughout regional and farm-level fluctuations in sowing, fertiliser and pesticide treatment, and harvesting is one of its intrinsic benefits.

Need for satellite farming

Satellite farming offers potential economic and environmental benefits because it requires less water, fertiliser, pesticides, herbicides, and other farm equipment. Rather than controlling an entire field based on some hypothetical average state that may not exist anywhere in the field, a satellite farming technique identifies site-specific differences within fields and adjusts management activities accordingly. Most farmers know that their farms yield differently depending on the topography. These variations may be related to environmental factors, soil conditions, or management strategies. These days, with farms growing in size and the cultivated zones shifting due to annual lease agreements, it is difficult to hold onto that level of field condition information. Data processing and collecting could be automated and made simpler with precision agriculture. It enables the efficient and timely application of management choices on smaller fields inside bigger fields.

Component of satellite farming:

There are several parts to satellite farming, including computers, Global positioning system (DGPS) with differential positioning; remote sensing; geographic information system (GIS); and variable rate applicator

Computers

Satellite farming is supported by a number of technologies, but computers are the most important since they allow precision agriculture. Successful satellite farming requires the acquisition, management, analysis, and production of large amounts of temporal and spatial data. Mobile computing solutions were necessary for farming operations to be carried out while on the go because the farm's office's desk top computers were inefficient.

Remote sensing

For many years, the process of gathering data from a distance—known as remote sensing—has been used to identify crop species and pinpoint fields of stress. The detection and measurement of photons originating from distant materials constitute the process of remote sensing. These photons may be identified and classified based on their class, kind, substance, and spatial distribution; most of them are employed to track reflected radiation (Frazier *et al.*, 1997).

Geographic information system (GIS)

This approach to computerising maps works well. An agricultural GIS's ability to store layers of data such as yields, maps from soil surveys, information collected by remote sensors, crop monitoring reports, and levels of soil nutrients is essential. Thanks to GIS technology, the manager can save field input and output data as separate layers of a map in digital maps and access and use this data for decisions on the next input allocation.

Fig 1 : Application of fertilizer through drones

Source: eos.com

Differential Global Positioning System (DGPS)

With an accuracy of between 100 and 0.01 metres, this navigation system—which is based on a network of earth-orbiting satellites—allows users to collect positional data (latitude, longitude, and elevation) almost instantly (Lang, 1992).

Variable rate applicator

With variable rate technology, the rate of input adjusted in real time with the field to account for changing factors that affect the most efficient rate of application. It has the potential to raise or, in the best scenario, maximise the efficacy of input and profitability of particular regions by concentrating applications where they are needed and at the optimum rate.

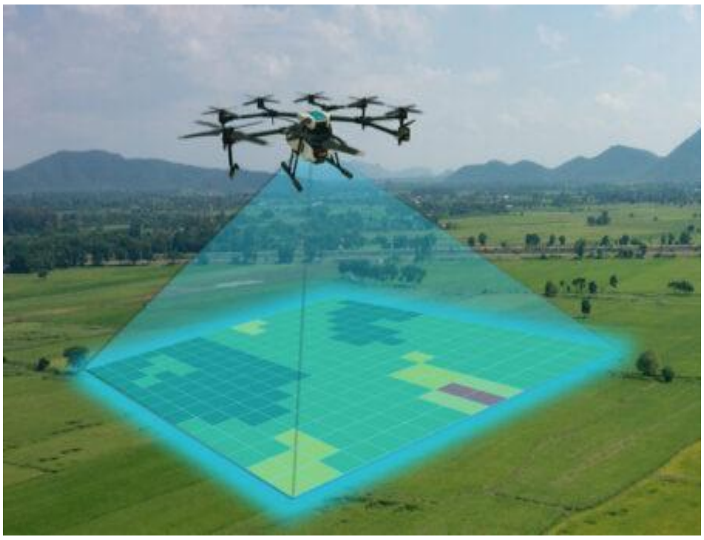

Fig 2: Crop health monitoring

Source: xyonix.com

Fig 3: Introducing precession agriculture technology in fields

Source: extensionaus.com.au

Present scenario in India

While satellite farming has gained a lot of attention in developed countries, it is still relatively new in developing nations like as India. The Central Potato Research Institute in Shimla and ISRO's Space Application Centre has launched a study to investigate the application of remote sensing in precision agriculture. Precision agriculture research has already started at a number of Indian research institutes. An investigation has been initiated by the Place Application Centre (ISRO), Ahmadabad, in the Central Potato Research Station farm in Jalhandhar, Punjab, to explore the role of sensors in mapping variability with respect to place and time. The Indian Agricultural Research Institute has created a plan to carry out exact farming experiments on the institute's land. The Project Directorate for Cropping Systems Research (PDCSR), Modipuram and Meerut (UP), in collaboration with the Central Institute of Agricultural Engineering (CIAE), Bhopal, also initiated variable rate input application in a number of cropping systems (Hazarika and Roy, 2023)

Opportunities

Pests and diseases cause large losses in Indian agriculture. When remote sensing can help identify small problem areas brought on by infections, the timing of fungicide applications can be improved. Recent research conducted in Japan suggests that radio-controlled aeroplanes and near-infrared narrow-band sensors can be used to detect early signs of agricultural stress or damage. In a similar vein, it has been shown that using GIS in conjunction with aerial video footage to precisely map and identify black fly infestations in citrus farms allows for targeted pest management. Precision technologies can help growers by adjusting the timing, quantity, and position of water to more profitably arrange irrigation in semi-arid and arid tropical climates.

Conclusion

Satellite farming has a lot of promise for adoption even if it is still in its infancy in many developing countries, including India. Many developing countries rely heavily on agriculture as a source of pollution; therefore farmers will not adopt precision farming unless it provides a greater rate of return than their current practises, or at least one that is equivalent. Thus, during the early phases of adoption, it is essential to have support from both the public and private sectors. Remembering that not every farm can benefit from every component of precision farming is crucial. For example, the best degree of spatial management or the use of variable-speed applicators is not always necessary on Indian farms.

References

Lang L. GPS + GIS + Remote Sensing: An overview. Earth observation magazine, 1992, 23-26

Frazier BN, Walters CS, Perry EM. Role of remote sensing in sitespecific management. In The state of site-specific management for agriculture. ASA Miscellaneous publications, 1997, 149-160.

Hazarika J, Roy M. Satellite Farming. Advances in Agriculture Sciences. AkiNik Publications, 44, 97-109, 2023.

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