ISAH-INDIAN JOURNAL OF ARID HORTICULTURE
2019, Vol. 1(2):87-90

Short Communication

Site specific agriculture

Monika Karnawat, S.K. Trivedi, Deepak Nagar and Rohitashav Nagar
School of Agricultural Sciences, Career Point University, Alniya, Kota (Rajasthan)
Corresponding author's E-mail: dean.agriculture@cpur.edu.in
(Received: 21.01.2020; Accepted: 08.06.2020)

An agricultural production system is the consequence of a complex interaction of seed, water and agro-chemicals together with fertilizers and pesticides. Therefore, careful management of all inputs is imperative for the sustainability of such complicated system. The focal point on enhancing the productiveness barring thinking about the ecological impacts of the enter resources has resulted into environmental degradation. Increasing environmental cognizance of the widespread public is necessitating us to regulate agricultural management practices for sustainable conservation of natural sources such as water, air and soil quality, whilst staying economically profitable. The productivity can be elevated except any detrimental effect by using maximizing the aid enters efficiency. It is also certain that availability of labour for agricultural recreation is going to be in quick grant in future. The time has now arrived to carry statistics technology and agricultural science together for extended financial and environmentally sustainable crop production. This offers start to Precision Agriculture or Precision Farming or we also coined this as Site Specific Agriculture. In precision agriculture well timed collection and analysis of the spatial and temporal variant data of crops, soils and surroundings is important. This can be finished by means of new emerging statistics applied sciences such as Global Positioning System (GPS), Geographical Information System (GIS), remote sensing, yield monitors, IOT based totally gadget *etc*.

What is precision farming ?

Precision farming refers to the precise application of agricultural inputs with appreciate to soil; weather and crop need in order to enhance productivity, quality, profitability in agriculture. It is a complete system designed to optimize manufacturing by the use of a key factor of information, technology, and management, so as to increase manufacturing efficiency, improves product quality, enhance the efficiency of crop chemical use, preserve strength and protect environment. Thus, precision farming is an appealing thought and its principles quite naturally lead to the expectation that farming inputs can be used greater effectively, with subsequent upgrades in earnings and environmentally less burdensome manufacturing (Nandurkar *et al.,* 2014).

Need of precision farming

The international food gadget faces bold challenges today that will amplify markedly over the subsequent 40 years. Much can be executed at once with contemporary applied sciences and knowledge, given adequate will and investment. But coping with future challenges will require extra radical modifications to the meals machine and funding in lookup to grant new solutions to novel problems. The decline in the total productivity, diminishing and degrading natural resources, stagnating farm incomes, lack of eco-regional approach, declining and fragmented land holdings, alternate liberalization on agriculture, confined employment opportunities in non-farm sector, and world climatic variation have emerge as primary concerns in agricultural boom and development. Therefore, the use of newly emerged technological know-how adoption is seen as one key to amplify agriculture productivity in the future. Instead of managing an entire discipline based totally upon some hypothetical common condition, which might also not exist somewhere in the field, a precision farming strategy acknowledges site-specific differences inside fields and adjusts management moves accordingly. Farmers typically are conscious that their fields have variable yields throughout the landscape.

Tools of precision parming

Global positioning system (GPS)

Global Positioning System satellites broadcast signals that allow GPS receivers to calculate their position. This information is provided in real time, meaning that continuous position information is provided while in motion. Having precise location information at any time allows soil and crop measurements to be mapped (Kim *et al.*, 2008). GPS receivers, either carried to the field or mounted on implements allow users to return to specific locations to sample or treat those areas. Uncorrected GPS signals have an accuracy of about 300 feet. To be useful in agriculture, the uncorrected GPS signals must be compared to a land-based or satellite-based signal that provides a position correction called a differential correction. The corrected position accuracy is typically 63-10 feet. In Missouri, the Coast Guard provides differential correction beacons that are available to most areas free of charge (Suma *et al.*, 2017). When purchasing a GPS receiver, the type of differential correction and its coverage relative to use area should be considered.

GPS is a navigation gadget based totally on a community of satellites that helps users to file positional records (latitude, longitude and elevation) with an accuracy of between one hundred and 0.01 m. GPS lets in farmers to hit upon the actual position of discipline information, such as soil type, pest occurrence, weed invasion, water holes, boundaries and obstructions. There is an automatic controlling system, with light or sound guiding panel (DGPS), antenna and receiver. GPS satellites broadcast signals that enable GPS receivers to calculate their position. The gadget approves farmers to reliably become aware of area places so that inputs (seeds, fertilizers, pesticides, herbicides and irrigation water) can be utilized to an character field, primarily based on performance criteria and preceding enter applications.

Geographic information system (GIS)

GIS utility in agriculture such as agricultural mapping plays an important role in monitoring and administration of soil and irrigation of any given farm land. This agriculture and agricultural mapping act as a necessary device for administration of agricultural quarter *via* obtaining and implementing the correct statistics into a mapping environment (Vidya *et al.*, 2013). The utility in agriculture also helps in administration and manipulate of agricultural resources. GIS agriculture technology helps in improvement of the present systems in following areas:

- Irrigated landscape mapping
- Application development for GIS agriculture
- Soil and irrigation amendment analysis
- Suitability assessment studies
- Erosion identification and remediation
- Agricultural mapping for detailed vegetation cover and monitoring
- Change detection studies and developing crop models
- Damage and land degradation assessment studies
- Elevation models for efficient drainage

Agricultural drones

Drones are being used in agriculture in order to beautify number of agricultural practices. The methods ground-based and aerial primarily based drones are being used in agriculture are crop fitness assessment, irrigation, crop monitoring, crop spraying, planting, and soil and area analysis (Wang *et al.*, 2010). From the drone data, we can draw insights regarding plant fitness indices, plant counting and yield prediction, plant peak measurement, cover mapping, subject water posing mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed stress mapping, and so on. The drone collects multispectral, thermal, and visual imagery for the duration of the flight and then lands in the same area it took off.

Smart greenhouses

In precision farming, protected cultivation is additionally region for enhancing yield and best and growth. Greenhouses manipulate the environmental parameters through manual intervention or a proportional control mechanism. As guide intervention consequences in manufacturing loss, energy loss, and labor cost, these strategies are less effective (Nalajala *et al.,* 2017). A smart greenhouse can be designed with the assist of IoT; this format intelligently video display units as properly as controls the climate, disposing of the want for manual intervention.

Greenhouse automation

In addition to sourcing environmental data, weather stations can automatically alter the stipulations to in shape the given parameters. Specifically, greenhouse automation systems use a comparable principle. For instance, Farmapp and Growlink are also IoT agriculture merchandise providing such skills amongst others. GreenIQ is also an interesting product that makes use of clever agriculture sensors (Lakshmisudha *et al.*, 2011). It is a clever sprinklers controller that approves you to control your irrigation and lighting systems remotely.

Predictive analytics for smart farming

Crop predication performs a key role. It helps the farmer to figure out future sketch concerning the manufacturing of the crop, its storage, advertising strategies and hazard management. To predict production charge of the crop synthetic network use information gathered *via* sensors from the farm. This statistics consists of parameters such as soil, temperature, pressure, rainfall, and humidity. The farmers can get a correct soil data either by the dashboard or a personalized cellular application (Bhatia *et al.,* 2015). In precision farming, smart agriculture gadgets are weather stations, combining various smart farming sensors. Located across the field, they collect various data from the environment and send it to the cloud. The provided measurements can be used to map the climate conditions, choose the appropriate crops, and take the required measures to improve their capacity (*i.e.* precision farming).

Grid soil sampling and variable-rate fertilizer (VRT) application

Variable-rate advances (VRT) are programmed and may be applied to various cultivating tasks. VRT frameworks set the pace of conveyance of homestead inputs relying upon the dirt kind noted in a dirt guide. Data extrapolated from the GIS can control forms, for example, seeding, manure and pesticide application, herbicide choice and application at a variable rate justified place at the perfect time. VRT is may be

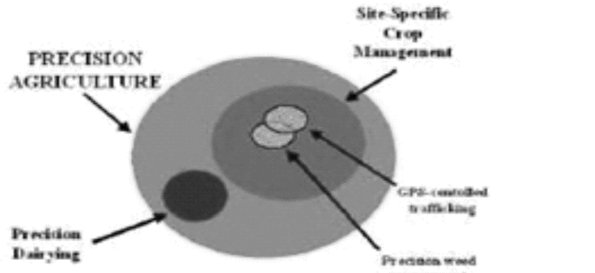

Fig.1. Precision agriculture and its application areas

the most generally utilized PFS innovation in the United States. Matrix soil testing utilizes the same standards of soil examining however builds the force of examining. Soil tests gathered in an orderly framework likewise have area data that permits the information to be mapped. The objective of matrix soil testing is a guide of supplement needs, called an application map. Tests might be gathered for more than one territory of a field which falls in to a similar scope of yield, soil shading, and so forth. Furthermore, along these lines a similar zone. Framework soil tests are examined in the research facility, and a translation of harvest supplement needs is made for each dirt example. At that point the compost application map is plotted utilizing the whole arrangement of soil tests. The application map is stacked into a PC mounted on a variable-rate manure spreader. The PC utilizes the application map and a GPS beneficiary to coordinate a item conveyance controller that changes the sum or potentially sort of compost item, as per the application map.

Cattle monitoring and management

Just like crop monitoring, there are IoT agriculture sensors that can be attached to the animals on a farm to monitor their health and log performance (Gutiérrez *et al.,* 2013). This works similarly to IoT devices forpet car. For example, SCR by Allflex and Cowlar use smart agriculture sensors to deliver temperature, health, activity and nutrition insights on each individual cow, as well as collective information.

Crop management

One more type of IoT product in agriculture and another element of precision farming are crop management devices. Just like weather stations, they should be placed in the field to collect data specific to crop farming; from temperature and precipitation to leaf water potential and overall crop health, these can all be used to readily collect data and information for improved farming practices (Yoo *et al.,* 2010). Thus, can monitor crop growth and any anomalies to effectively prevent diseases or infestations that could harm yield. Arable and Semios can serve as good representations of how this use case can be applied in real life.

Financial aspects

PA applications are viewed as proficient when the extra continues realized through reserve funds in capital and more significant returns surpass the extra consumption fundamental for the procurement and utilization of the PA innovation. While the expenses for the assortment of information and choice models just as the application and route innovation are known and can be generally precisely calculated, the advantages of PA techniques must be generally assessed, as they are de-swinging upon different elements, some of which can't be impacted (for example climate designs) and the impacts not out of the ordinary turn out diversely as indicated by the development step, the field inside site heterogeneity, the harvest developed and the power of generation. Through site explicit nitrogen treating, the mineral manure cost on heterogeneous fields can be decreased by about 7% or 14 kg N/ha by and large, with yields staying steady or up to 6% higher. Investment funds in the utilization of manure are likewise conceivable in the region of basal dressing and liming, anyway the impacts on yield are not deserving of notice. The use of PA additionally achieves positive outcomes in plant insurance: When applying herbicides an affirm period of about half of the sum spread (a range of 10 to 90%) can be spared. Moreover while applying fungicides utilizing the CROP Meter, reserve funds of the request for 10 to 20% appear to be attainable; comparative figures remain constant for the use of development controllers. There indicate extensive reserve funds to be made in fuel utilization with site explicit soil treatment. Site explicit planting can genius duce constructive outcomes (same yield with a decreased planting force) with push crops (for example maize). There are no outcomes so far accessible with regards to the monetary impacts of an outwardly supporting or programmed direction framework. It can anyway be expected, that capital reserve funds are conceivable through the decrease of regularly happening covers while developing the dirt and applying natural manure.

Conclusion

Therefore, the paper proposes a thought of consolidating the most recent innovation into the agrarian subject to turn the regularly occurring methods for farming device to contemporary techniques in this way making simple profitable and temperate trimming. Some diploma of mechanization is presented empowering the thinking of gazing the subject and the product stipulations inner some long-separate extents making use of cloud administrations. The factors of activity like water sparing and work sparing are commenced using sensors that work therefore as they are modified. This concept of modernization of farming is straightforward, realistic and operable. As relying upon these parameter esteems rancher can barring tons of a stretch pick which fungicides and pesticides are utilized for enhancing crop creation. The paper pursuits at making agriculture clever using automation and IoT technologies. The highlighting aspects of this paper consists of smart GPS primarily based far off controlled robot to perform tasks like; weeding, spraying, moisture sensing, chicken and animal scaring, preserving vigilance, *etc.* Secondly, it includes clever irrigation with smart manipulate based totally on real time area data. Thirdly, clever warehouse administration which includes; temperature maintenance, humidity upkeep and theft detection in the warehouse. Controlling of all these operations will be through any far flung clever system or laptop related to Internet and the operations will be carried out through interfacing sensors, Wi-Fi or ZigBee modules, digicam and actuators with micro-controller and raspberry pi.

Table 1. Table of sensor name with parameters are using in precision farming

S.No.	Sensor Name	Parameters Captured
1	ECH2O soil moisture sensor	Soil temperature, soil moisture, conductivity
2	Hydra probe II soil sensor	Soil temperature, salinity level, soil moisture, conductivity
3	MP406 Soil moisture sensor	Soil temperature, soil moisture
4	4 EC sensor (EC250)	Soil temperature, salinity level, soil moisture, conductivity
5	Pogo portable soil sensor	Soil temperature, soil moisture
6	107 -L temperature Sensor	(Beta Therm 100K6A1B Plant Temperature Thermistor)
7	237 leaf wetness sensor	Plant moisture, plant wetness, plant temperature
8	SenseH2TM hydrogen sensor	Hydrogen, plant wetness, CO_2, plant temperature
9	Field scout CM1000TM	Photosynthesis
10	YSI 6025 chlorophyll sensor	Photosynthesis
11	LW100, leaf wetness sensor	Plant moisture, plant wetness, plant temperature
12	TT4 multi -sensor	Thermocouple Plant Moisture, Plant temperature
13	13 TPS -2 portable	Photosynthesis, plant moisture, CO_2
14	LT -2 M (leaf temperature sensor)	Plant temperature
15	CI-340 hand -held	Photosynthesis air temperature, air humidity

References

Amani, A. and Label, T. 1986. Lagrungian Kriging for the estimation of Sahelian rainfall at small time steps. *Journal of Hydrology*, 192:125-127.

Bhatia, S., Patel, S., 2015. Analysis on different data mining Techniques and algorithms used in IOT, pp.82-85

Joaquín, Gutiérrez, J., Villa-Medina, F., Nieto-Garibay, A. and Miguel Ángel Porta-Gándara, 2013. Automated Irrigation System Using a Wireless Sensor Network and GPRS Module. *IEEE Transactions on Instrumentation and Measurement*, 0018-9456.

Kim, Y., Evans, R. and Iversen,W., 2008. Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network. *IEEE Transactions on Instrumentation and Measurement,* 1379-1387.

Lakshmisudha, K., Hegde, S., Cole, N., Iyer, S. 2011 Good particularity most stationed cultivation spinning sensors. *State-of-the-art weekly going from microcomputer applications*, 11:146.

Nalajala, P., Hemanth Kumar, D., Ramesh P and Godavarthi, B. 2017. Design and Implementation of Modern Automated Real Time Monitoring System for Agriculture using Internet of Things (IoT). *Journal of Engineering and Applied Sciences*, 12:9389-9393.

Nandurkar, S. R., Thool, V. R. and Thool, R. C. 2014. Design and Development of Precision Agriculture System Using Wireless Sensor Network", *IEEE International Conference on Automation, Control, Energy and Systems* (ACES).