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Nematode Management Strategies in Precision Agriculture

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SUMMARY

Precision agriculture is conceptualized by a system approach to reorganized the total system of agriculture towards a low input, high efficiency, sustainable agriculture. This include several technologies including the global positioning system (GPS), geographic information system (GIS) then miniaturized computer components in field and using remote sensing, mobile computing etc. GPS and GIS has been use for various agriculture purposes including guidance of farm machineries, site specific application and control delivery of nematicides and plant nutrient. Agriculture production system have benefitted from the incorporation of technological advances that mechanised synthetic fertilizer, pesticides to agriculture. However with enlargement of fields and intensive mechanization it has become more difficult to take account of the variability in the fields. So, it relies upon specialized equipment, software and IT services technique to monitor and detect the problem or predict situation based on certain edaphic factors such as soil texture , soil moisture, ph etc. It is also helpful for detecting spatial pattern of crop damage due to nematode and also to develop precise map of field for more effective more economical and ecofriendly approach for application of nematicides.

INTRODUCTION

Precision farming can be defined as the use of information and information technology to make the implement management decision at appropriate scale. Precision farming in other words it is Digital Agriculture involving very large scale farm level mapping, comprehensive database creation on required resources generated through space based inputs and field observation and making a detailed plan of work for maximizing the yield and reducing the cost on inputs using information technology. It relies upon specialized equipment, software and IT services. Nematode management play important role in organic farming and precision farming. In nematode management it is important to remember that nematodes can move only very short distances on their own. Therefore nematodes are mainly spread through lack of sanitation and movement of infected soil and planting material. In order to limit a build up of nematodes, planting equipment and tools should be properly cleaned, and in extreme cases could only be used for the same field. Furthermore only soil and planting material free of nematodes should be used, because once nematodes are introduced into a field they cannot be eradicated. Precision agriculture and nematode management in precision farming a current area of interest in agriculture is usually defined as a site specific approach, tillering soil and crop management. So, precision agriculture relies on various recently developed technologies to guide the precise development of agriculture inputs to specific location within the field. GPS and GIS has been use for various agriculture purposes including guidance of farm machineries, site specific application and control delivery of nematicides and plant nutrient. In some situation, site specific application of a nematicides may save producer moneys and cause less environmental risk than the uniform rate of treatment.

Nematode Management Strategies in Precision Agriculture

Modern computerised harvest management and data systems offer new opportunities for more precise management of nematodes and general crop production. This technology has the potential to improve water use and limit fertilizer and pesticide application on a spatial and temporal basis as dictated by soil fertility and, more important, differential spatial crop yields. The management tool should allow specially prescribed nematode control in high-intensive crop production such as *Radopholus similis* on banana and root knot nematode on potato. Approaches that focus on a harvest index to locate environmental stress should be able to relate nematode kinds and numbers to poor yield and other stress factors.

Nematode identifications and Population Assessments: Due to restrictions in size of samples the number of nematodes that can be examined make it very difficult to fully diagnose the nematodes species present in large

fields. So therefore geostatistical analyses could be interfaced with improved sampling apparatus for more precise measurement of data on nematode population. Image analysis has been adapted to count specific nematodes. Geographic information system (GIS), Global positioning system (GPS), Remote sensing and satellite are used for various agricultural purposes including guidance of farm machineries and control delivery of pesticides and plant nutrient.

Geogarphic information system: this is a computer based system/ tools for mapping and analysing events and places on the earth surface. This is able to capture all type of images, geographical data which are digitally analysed in the last stage in 3-D format.

Basic function of GIS-

- Data acquisition and pre-processing.
- Data based management and verification.
- Spatial management and analysis.
- Geographic output and visualisation.

Advantages of GIS-

- Geospatial data are better maintain in standard format.
- Revision and updating of data are easier.
- Geospatial data and information are easier to work, search, analysis and represent.
- Geospatial data can be shared and exchange fully.
- It create maps with image shown or captured.
- This can be used for vast range of task involving geographic.
- This analyse the data precisely.

Disadvantage-

- It is very expensive.
- It requires large amount of data for analysis to avoid error.
- There is relative loss of resolution.
- Violation of privacy.

Field application of GIS-

- Proved to be very beneficial to those involved in the farming industry.
- Increase production, reduce costs, and manage their land more efficiently.
- GIS applications managed better crop yield estimates, soil amendment analyses, and erosion identification and remediation.
- Crop specific maps, created by combining survey data and satellite imahes, literally provides the lay of the land for farmers and agribusinesses such as seed and fertiliser companies. **.**
- It is used to inform decisions on planting, marketing, and policy.
- Applying GIS to the process of preparing crop estimates has improved accuracy while lowering costs.
- The aerial survey determines which crop is planted in the field represented by each sample point.
- It observed which crop is planted at the sample point and whether it is dry land or irrigated cultivation. Additional information, such as growth problems or areas of double- cropping is also captures.
- The field data is captured and stored in shape file format. This data is uploaded to a central server on a daily basis and imported into a SQL server database.
- The use of GIS has greatly improved crop estimates in many countries and resulted in more cost effective, accurate, and objective grain area estimates.

Global positionin system: GPS is a network that locates places on the earth surface. It is specific to location and position. This is a worldwide radio navigation system consisting of 24 satellites which can provide unique address for each locations of earth surface accurately at any time.

Remote Sensing- it is the collection of information about an object without being indirect physical contact with the object. It is a technology for sampling electromagnetic radiation to acquire the geospatial data from which the information about the object, land surfaces, ocean and atmosphere is obtained.

Application of remote sensing in-

- Crop health analysis, comprehensive mapping and yield estimation.
- Pest and disease outbreak.
- Environmental assesment.
- Monitoring.
- Damage assessment.
- Habitat analysis.
- Survey of water bodies hydrology.

Advantages of remote sensing-

- It covers large area.
- Multisensor.
- Multispectrum in nature.
- Faster extraction of GIS.
- Time efficient.

Disadvantage-

- It needs ground verification.
- It does not offer detail.
- It is not the best tools for small area.

CONCLUSION

Precision agriculture is a concept where data of GPS and GIS, and datas provided by develop machineries like mobile etc. are used and they react according to GIS and GPS data obtained to know the crop maturity, crop ripening and pest attack etc. Agriculture production system have benefitted from the incorporation of these technological advances that mechanised synthetic fertilizer, pesticides to agriculture. However with enlargement of fields and intensive mechanization it has become more difficult to take account of the variability in the fields. It relies upon specialized equipment, software and IT services to monitor and detect the problem or predict situation based on certain edaphic factors. It is also helpful for detecting spatial pattern of crop damage due to nematode and also to develop precise map of field for more effective more economical and ecofriendly approach for application of nematicides.

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