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Strategic implementation of site specific crop management in Indian agriculture for biodiversity conservation

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Abstract

Site specific crop management is based on a set of resources that allow field variability management. The main idea is to identify areas which present different levels of productivity, and offer an individual treatment for each of them, managing these differences. Site specific farming basically depends on measurement and understanding of variability, the main components of site specific crop farming management system must address the variability. It requires the requisition, management, analysis and output of large amount of spatial and temporal data. In Indian prospective for sustainable Bio diversity through precision farming the changes in agricultural policies are also necessary to promote the adoption of precision farming. There are basically two policy approaches: regulatory policies and market based policies. The former refer to environmental regulations on the use of farm inputs and later refer to taxes and financial incentives aimed at encouraging growers to efficiently use farm inputs. Along with the policy measures efficient and productive agricultural land use, ensuring a sufficient income for farmers, can be brought in line with nature conservation objectives as a result of which farmers are prepared to adapt their farming methods to enhance biodiversity and that ecoinnovation, Also Indian farmers need financial as well as non-material support to better align their economic interests with biodiversity targets.

Keywords: Strategic implementation | Environmental Adoption | Agri-environmental measures | biodiversity conservation

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Introduction

The Site specific crop farming management is the application of technologies and principles to manage spatial and temporal variability associated with all aspects of agricultural

production for improving production and environmental quality. The success in site specific agriculture depends on the accurate assessment of the variability, its management and evaluation in space-time continuum in crop production. The agronomic feasibility of precision agriculture has been intuitive, depending largely on the application of traditional arrangement recommendations at finer scales. The agronomic success of precision agriculture has been quite convincing in crops like sugar beet, sugarcane, tea and coffee. The potential for economic, environmental and social benefits of site specific agriculture is largely unrealized because the space-time continuum of crop production has not been adequately addressed. Successful implementation of precision agriculture depends on numerous factors, including the extent to which conditions within a field are known and manage, the adequacy of input recommendation and the degree of application control. The enabling technologies of site specific agriculture can be grouped in to fine major categories: Computers, Global Positioning System (GPS), Geographic Information System (GIS), Remote Sensing (RS) and Application control. The various aspects of precision agriculture encompass a broad array of topics including variability of the soil resource base, weather, plant genetics, crop diversity, machinery performance and most physical, chemical and biological inputs used in crop production. The present paper tried to show the strategic implementation of Site specific agriculture for farmers in developing country like India to achieve efficient crop production with sustainable bio diversity conservation. Site specific crop management farm practices collects and interprets huge amount of data from the field so as to understand the causes of variability and propose strategies for field management, biological species geographic distribution models, based on ecological niche concepts, combine species presence and absence points with environmental biotic and abiotic data, in order to generate models that describe probabilistic distributions of that species – represented as geographical distribution maps for biodiversity conservation.

Conceptual Framework

Site specific crop management is Defined as Information Technology Based, Relatively Better Management System that Identifies, Procures, Analyzes & Manages, Natural Variability Amongst the Fields &Optimizes Productivity, Profitability, Sustainability, which Protects the Land Resources and bio diversity

Review of Literature

Site specific crop management is based on a set of resources that allow field variability management. The main idea is to identify areas which present different levels of productivity, and offer an individual treatment for each of them, managing these differences. This concept dates from the 80s and started a revolution in the resources management (Robert, 2002). Since site-specific management, site-specific farming, or precision farming, alternative names for precision agriculture, has been directed to

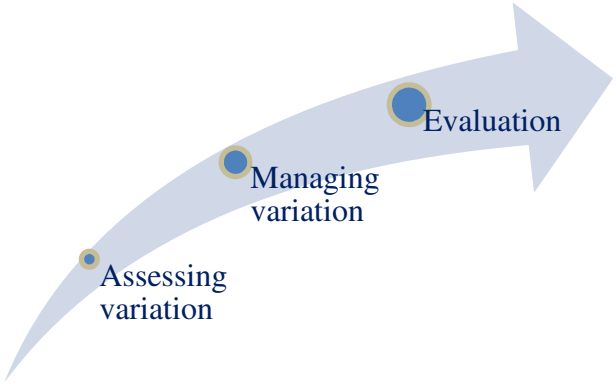
intensive data and technology usage, resulting in relevant researches, such as those presented in Plant (2001), Zhangh et al. (2002) and Korduan et. al (2004), and a large amount of products, systems and devices for rising production profitability, improving production quality and helping environment protection. Some examples of precision agriculture purposes include soil properties study for the application of fertilizers in variable rate, and the main aims and other potential benefits of its adoption are to increase productivity, sustainability, crop quality, food safety, rural welfare and economic development. Its users have many information systems to choose from, but usually the systems are monolithic and able to perform specific tasks only, e. g.Productivity management or soil fertilizer mostly furnished by equipment manufactures and with no relationship between each other. Nevertheless, precision agriculture requires the integration of the tools used in all steps performed, requiring from the user the expertise to deal with many software packages, with different GUIs (Graphical User Interface) and data formats, and sometimes demanding other software packages for data conversion, in order to use the output of a package as the input for the next (Murakami, 2006).There are also more complete packages, which incorporate database and field equipment connectivity, GIS (Geographical Information System) functionalities and other useful characteristics for precision agriculture. Despite that, many authors identified relevant requirements that they do not cover (Saraiva, Massola, Paz, 1997; Saraiva, Massola, Cugnasca, 1998; Lütticken, 2000; Sorensen et al., 2002; Pedersen et al., 2003; Korduan, Bill, Böling, 2004; Adrian, Norwood, Mask, 2005): decision support systems and management must be designed for meeting producers specific needs; systems should have GUIs that could be customized for different user profiles, because a friendly interface is paramount for users with little software expertise; easy and automated methods, programmable according to the user rules, should be able to be included, and the user should be able to control and access analysis functions and parameters, in order to be able to try new and more applicable solutions; rule-based knowledge should be possible, so as to refine and adapt the system to local practices and preferences, reducing learning curve and technical support needs; systems should be interoperable with other software packages, local or remote, via Internet, using open patterns – these are fundamental for integration with distributed and legacy systems; systems should have scalability, metadata support and low cost.

Accomplishments of Site specific crop management in Bio Diversity conservation

- Address Poverty Alleviation, Enhance Quality of Life & Food Security
- Socio Economic Need for Enhanced Productivity per Unit of Land, Water and Time.
- Increased Land Degradation, Depletion of Water Resources in India,
- Environment Pollution due to Increased Use of Fertilizers and Chemicals.

- Improved Crop Yield by Efficient Application of Chemical, Fertilizer & Energy Costs.
- Increase Profit Margin & Enable Better Management Decisions

Basic Steps in Adoption of site specific crop management farm practices



Strategies for implementation of site specific crop management farm practices

A strategy for implementation of site specific crop management in bio- diversity conservation includes:

- Predictive approach: based on analysis of static indicators (soil, resistivity, field history, *etc*.) during the crop cycle.
- Control approach: information from static indicators is regularly updated during the crop cycle by:
  - sampling: weighing biomass, measuring leaf chlorophyll content, weighing fruit, *etc*.
  - remote sensing: measuring parameters like temperature (air/soil), humidity (air/soil/leaf), wind or stem diameter is possible thanks to Wireless Sensor Networks
  - Proxy-detection: in-vehicle sensors measure leaf status; this requires the farmer to drive around the entire field.
  - Aerial or satellite remote sensing: multispectral imagery is acquired and processed to derive maps of crop biophysical parameters.

Obstacles in adoption of Site specific crop management farm practices

There are many obstacles to adoption of site specific farming in developing countries in India are as follows.

- Culture and perceptions of the users
- Small farm size
- Heterogeneity of cropping systems and market imperfections
- Land ownership, infrastructure and institutional constraints
- Lack of local technical expertise
- Knowledge and technical gaps

Conclusion

In Indian prospective for sustainable Bio diversity through precision farming the changes in agricultural policies are also necessary to promote the adoption of precision farming. Along with the policy measures efficient and productive agricultural practices must be adopted like:

- Agriculture must create biodiversity conservation.
- Genetic diversity in Agriculture must be maintained.
- Farmers must be made partners in nature conservation.

- The competitiveness of farms must not suffer.
- Ensure contractual nature conservation on a voluntary basis and Agri-environmental measures.
- Provide financial incentives and advice for biodiversity-friendly practices.
- Farm practices must integrate biodiversity protection into farming.
- Assure standard solution for maintaining biodiversity.
- Promote agricultural research and innovation serving biodiversity.

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