BRAZILIAN PRECISION AGRICULTURE RESEARCH NETWORK

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ABSTRACT

The adoption of adequate technologies for food, biomass and fiber production can increase yield and quality and also reduce environmental impact through an efficient input application. Precision agriculture is the way to decisively contribute with efficient production with environment protection in Brazil. Based on this, recently Embrapa established the Brazilian Precision Agriculture Research Network, with the objective of knowledge generation, tools and technologies development to enhance the agricultural production systems, and to increase the competitiveness and sustainability of Brazilian agribusiness. The project is composed by 214 researchers, 19 research centers, 15 experimental fields, comprising four Brazilian ecosystems and the soybean, maize, wheat, rice, cotton, pasture, eucalyptus, pines, grapes, peach, orange and sugar cane crops. All research areas are being mapped for soil fertility and electrical conductivity, elevation, remote sensing and yield and the results are stored in an online data bank. Several knowledge areas are integrated for optimization of financial

resources and results. Research, development and innovation will be focused on those crops responses to PA, as well as on the development and adaptation of tools and technologies to improve of PA. Project staff is being trained in PA concepts, tools and technologies, as geostatistical treatment of data collected and GIS. Training courses and technologies transfer for technicians and producers are being organized. Academic and extension events will support partnership between private and governmental sectors to enhance PA adoption. The PA Network is also promoting the dialogue between the agribusiness, private, public and third sector. In the near future expect results are the dissemination of the AP concepts and technologies and make AP present in the daily Brazilian agricultural activities incorporating technologies and practices for sustainable management.

INTRODUCTION

The Precision Farming is a system of integrated management information based on the concepts and technologies that influence spatial and temporal variability in crop yields. The PA technologies are designed to detect, monitor and manage the spatial and temporal variability of agricultural production systems seeking to optimize them.

In the first phase of the PA in Brazil the attention was focused on technologies such as agricultural machinery equipped with GPS receivers and the generation of yield maps especially for corn and soybean crops. The new PA phase progressed beyond the equipment, became an information system that can be applied to all production systems that exhibit variability in both large and small properties. Thus, the current demands for AP has focused on the management of variability, to understand that when dealing with different attributes crop increases the economic return and minimize the damage to the environment. This approach presents challenges to the technologies and knowledge on production systems previously considered uniform, as management techniques not previously considered the great variability of production and quality now detected. Therefore, the AP may contribute to the agricultural activity with management measures adapted to the reality of rural producers in the country, as a tool for continuous innovation in the field.

So, the objectives of Brazilian Precision Agriculture Research Network are knowledge generation, tools and technologies development to enhance the agricultural production systems, and to increase the competitiveness and sustainability of Brazilian agribusiness.

RESULTS AND CONCLUSION

Several knowledge areas has been integrated for optimization of financial resources and results. The project team is composed by 214 researchers, from 19

Embrapa research centers and mare than 50 partners from university, companies, other research institute, farmers and farmers associations.

Since PA applies the concept of spatial variability of the factors influencing the agricultural production, there is a need on tools to acquire, treat and transmit the data from the fields, transforming then to useful information for site-specific management. Several instruments, sensors, methods, computing programs and a wireless sensors network platform have been developed or adapted. Results already obtained are: tools to measure soil organic matter, soil humidity and plant diseases; assay bench top system for fertilizers and agrochemicals application; instrumented sphere for fruit and vegetables impact evaluation; modeling, image processing and computational vision; wireless sensors network; robotic and on-board systems for machines and agricultural implements.

The field research strategy of the project is based on the implementation of 15 Pilot Research Units comprising four Brazilian region, involving mainly annual crops (soybean, maize, wheat, rice, cotton) and perennial crops (grape, peach, apple, sugarcane, citrus, eucalyptus, pines and pasture). All research areas are being mapped for soil fertility and electrical conductivity, digital elevation model, remote sensing and yield and the results are stored in an online data bank. In all plots the spatial and temporal variability of crops and soil properties are mapped aiming to identify zones for site-specific management and subsequent monitoring of changes resulted from interventions. Other activities involve the adjustment of decision-making methodologies for control of the biotic agents responsible for stresses in the crops.

Soil electrical conductivity has been measured using commercial (Veris, EM38) or prototype sensors. The data repository was established using PHP and JavaScript languages with a data converter tool, based on MapServer and i3Geo softwares. The repository of the AP Network has WebGIS functions, and thus enables the display of the collected data in map form.

As the PA adoption is occurring slower than originally planned in many sectors of Brazilian agribusiness, this project also aiming systematizes and strengthens the innovation process of PA Network.

Research, development and innovation will be focused on those crops responses to PA, as well as on the development and adaptation of tools and technologies to improve of PA. Project staff has been trained in PA concepts, tools and technologies, as geostatistical treatment of data collected and GIS.

Methodologies for evaluating the impact and estimate the AP adoption trend and rate are being established. Training courses and technologies transfer for technicians and producers are being organized. Academic and extension events will support partnership between private and governmental sectors to enhance PA adoption.

The PA Network is also promoting the dialogue between the agribusiness, private, public and third sector. In order to strengthen the public perception of the PA and its importance to Brazil there are communications strategies as a homepage (http://www.macroprograma1.cnptia.embrapa.br/redeap2), publications (http://www.macroprograma1.cnptia.embrapa.br/redeap2/publicacoes/publicacoes -da-rede-ap/capitulos) and press relations.

All aspects related to intellectual property are observed throughout all the project activities, as well as evaluation of the activities of the innovation potential of the technologies.

So, project expected impacts are the development, adaptation and validation of strategies to assess the variability and to define practices appropriate to the site-specific approach, taking into account the peculiarities of the production systems in Brazil.