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Advancing Technology: GPS and GIS Outreach Training for Agricultural Producers

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Abstract: The use of the Global Positioning System (GPS) and Global Information Systems (GIS) has made significant impacts on agricultural production practices. However, constant changes in the technologies require continuing educational updates. The outreach program described here introduces the operation, use, and applications of GPS receivers and GIS software valuable to agriculture. Extension professionals can use this program to improve producers' knowledge and skills for implementation on personal operations. A successful program will provide producers and agribusinesses with a management tool that positively impacts the efficiency, productivity, and effectiveness of agricultural operations.

Introduction

The widespread availability of the Global Positioning Systems (GPS) and Global Information Systems (GIS) to the general public opened many doors to the uses of these new technologies, particularly in the agricultural sector (Vardalas, 2005). GPS and GIS are valuable tools that can be used to increase efficiency and productivity in agriculture. Farmers and ranchers can use these technologies for a wide range of applications, including mapping natural resources, marking weed infestations, evaluating insect damage, referencing crop yield, identifying crop stress, and labeling soil types (Stafford, 1999). GIS programs, using the data and associated locations, can provide agricultural businesses an additional management tool to deal with production issues, strategize management decisions, and implement control methods.

However, the uses and applications of GPS and GIS are constantly changing; thus, the need for continuing education is expanding as well. Producers must be informed of new advances in technology and taught how to implement them. Additionally, the uses for new technologies have educational value for agribusiness professionals and youth interested in precision agriculture (Watson, Segarra, Lascano, Bronson, & Schubert, 2005). However, starting a program using new technologies can be overwhelming. Milla, Lorenzo, and Brown (2005) offer many techniques, guides and resources to Extension professionals to help programs

succeed in teaching GIS, GPS, and remote sensing technologies. Extension agents can implement the training program described in this article to provide agricultural professionals with the knowledge and skills needed to operate GPS receivers and GIS software for application on their own operation.

Program Objectives

The goal of the training program is to educate agricultural producers on the fundamentals of GPS and GIS to improve management practices. Specific objectives for the program are that participants will:

- Explain how a GPS receiver functions and receives information.
- Control the basic functions of a GPS receiver.
- Identify the main GPS receiver screens and functions.
- Sync a GPS receiver and upload coordinates into a GIS program.
- Develop a map using ArcView, a GIS program.
- Generate ideas of how to use GPS and GIS for personal and business use.

Curriculum

The two-part program consists of four workshops, ranging from 1 to 2 hours each. The program has been developed to provide hands-on learning with opportunities for participants and instructors to interact. A brief description of each workshop is outlined below.

The **Marking and Navigating Waypoints** workshop guides participants through the following activities: GPS receiver functions, exploring the GPS receiver buttons and screens, marking a waypoint, navigating to a waypoint, navigating around objects, and a discussion of utilization on an agricultural operation.

The **Treasure Hunt** workshop is an effective way to teach participants how to program given coordinates, use multiple screens, and learn what points are needed on a functional map. Participants navigate through a series of flags containing new coordinates that must be programmed into the receiver. Discussion and demonstration follows on changing screens and point selection for maps.

The **Marking Tracks and Routes** workshop teaches the differences between a track and route, presents a demonstration on how to perform these skills, and discusses applications. Each participant marks a track and a route and then switch receivers with another person.

The **Family Fun: Discovering a Geocache** workshop is one of the highlights of the entire program. It integrates what participants have learned in the previous three workshops and allows them to share it with their entire family. Participants meet near the location of a local Geocache, learn about it, and then navigate to it with their families.

The next workshop, **Explore ArcView**, is divided into two separate trainings. The workshop introduces ESRI ArcView, a GIS software program, and guides participants through a GIS tutorial. This allows them to find data on the Internet, download it, adapt it in Microsoft Excel, start a project in ArcView, create a map, and develop a layout to print. The workshop provides time for the instructor to teach participants one-on-one on how to download coordinates from a GPS receiver.

The final two workshops allow participants to **Apply GIS to the Real World**. Participants use a receiver to collect data for a project of interest. Then, they use ArcView to create a functional map. These workshops include discussions of what makes an effective map and the purpose of each individual's map. The instructor also demonstrates how to download an aerial photo from the Internet and includes time to review items in a tutorial.

Evaluations must be conducted throughout all phases of the program. A formal survey evaluation should measure the instructor, the workshop, and future uses of the technologies. Informal evaluations should be conducted as the program progresses to ensure participants are gaining key skills. A long-term evaluation should also be completed to determine if agricultural producers have used the skills gained on their operations.

Conclusion/Recommendations

This program is recommended for use by Extension professionals who work with agricultural producers, agribusinesses, and youth interested in using technology. The workshop outline can be implemented or adapted to create a comprehensive GPS and GIS training. A successful program will provide producers and agribusinesses with an additional management tool that positively affects the profit, efficiency, and productivity of an operation. One potential application is to use GPS and GIS to monitor growth of noxious weeds, which may result in more successful control. The program can also be easily adapted to fit youth. The Treasure Hunt workshop can be implemented as a group activity for 4-H camps or events. The GPS series could be modified for recreational GPS users or family activities.

The program is an integral part of Extension's mission to improve people's lives with current, research-based knowledge. Providing outreach of new technologies can provide extension clientele with tools to increase social, economic and environmental well-being. In today's society, it is becoming increasingly difficult for farmers and ranchers to be economically stable. However, with continued education of management tools, it may become easier for them to be successful.

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