Using ArcIMS to Facilitate Decisions by the Farm Management Team (909)

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Submitted Abstract: Farm management decisions are best when they incorporate the views of specialists from many areas. But a problem exists in sharing data among those involved in the decision-making process. ArcIMS has proved useful in sharing data sets and providing a mechanism for discussion of an optimum farm management strategy. Using ArcIMS in the decision-making process allows farmers and their advisers to make more efficient use of inputs in crop production lessening environmental impact and strengthening the farmer's bottom line.

“No amount of sophistication is going to allay the fact all your knowledge is about the past and all your decision are about the future.” – Ian E. Wilson

The business model for producing agricultural products has changed and continues to change. The farmer of the past was well known for being independent and self-reliant. Gone are the days when a farmer makes all of his business decisions independent of outside input. Producers today by necessity solicit input from many sources. They may work with many landowners, farm managers, consultants, and input suppliers. All of these people have information that is important in making good decisions for the farming operation. While it is true that all data is historic information, we use that information and make many judgments based on that information. We should use the best information available and have knowledgeable people involved in making decisions of importance.

In addition the agricultural producer may have to balance the interests of a number of different parties in order to please those that have an influence in their farming operation. There are economic and financial concerns based on market conditions. There are environmental concerns. There are constraints on what can be done within the confines of governmental programs. All of these concerns must also be taken in to account when making farm management decisions.

Most of the data sets of information relating to farm management decisions need to be shared among a number of people in order to have the greatest impact. Sharing geo-referenced data sets in map form allows all involved to see the data visually. ArcIMS can allow interested parties to view and take part in the decision making process from different locations and at a time that is convenient to them.

As an example of a decision making process let us look at the process of making a fertilizer recommendation. Fertilizers are considered a variable expense of crop production. They are in most cases a significant cost in crop production. Crops in some situations can be grown with no additional fertilizer added but in many cases at a diminished yield and profitability. In order to make a fertilizer decision it is advisable to have a recent test of the soils nutrient values.
In the past, nutrients such as phosphate and potassium might have been applied in a uniform rate over the whole field based on a calculation of amounts removed on the average field yield. We now have the capability to apply nutrients on a site-specific basis. There are often additional costs involved in application of nutrients in a site-specific manner such as, geo-referenced soil testing, cost of creating nutrient application maps and the higher cost of the application equipment. The additional fertilizer costs and the estimated profit from additional yield or savings from reduced costs would need to be considered in the fertility decision.

The tests of nutrient samples from field are taken in geo-referenced locations (fig. 1). The person taking the sample may be different than the person that runs the analysis of the sample so the sample locations and the results need to be merged into the same data set. This data set of information on nutrient levels would be used to determine what optimum level of nutrients need to be applied to the field on a site specific basis. Other data sets of information could go into the decision to add fertility, such as past yield levels. Past yield levels could be used to determine actual nutrients removed in different areas of the field instead of using a simple average.

Fig.1 Phosphorus fertility map with darker shades representing higher levels of fertility. Sample points overlaid
This information can then be transformed into a map. This map can be reviewed by all those involved in the decisions for fertility applications. The possible people involved in this decision might be a farm manager who might look at the economics of the applications, an agronomist who would look at the agronomics of fertility application, the farmer who might look at the practicality of the rates to be applied. Some applications of additional nutrients might increase yield but might not be economically viable. In some instances the level of fertility nutrient application might be able to be reduced without reduction in yield. Making the best recommendation would mean getting input from those with specialized knowledge in different areas to make the best recommendation.
An agronomist would look at the soil fertility data and make a recommendation based on the test. This data could be posted on the ArcIMS site for others involved in the decision making process to review and comment on. The agronomist could make any changes based on the comments and a final recommendation could be made. The applications maps could be sent to a company that applies the fertilizer and then they could return an as applied map that shows how closely the application matches the recommendation map. After the crop is harvested a map of yields could be compared to see if the fertilizer is going to the places where the highest nutrient removal is occurring. It is generally thought that the areas that have the highest yields have had the highest nutrient removal over time so that replacing nutrients in these areas would have the most benefit.

All fields are different and need individualized attention. Having these data sets available in an ArcIMS web site would allow specialists to work together from remote locations in a timely manner. Making data sets available in this manner improves collaborative input and facilitates group decision-making. This improved decision making process should add to the efficient use of inputs and benefit the farmers bottom line.
Acknowledgements

My thanks to the United Soybean Board, Dr. Harold Reetz of the Potash and Phosphate Institute and Quentin Rund of PAQ Interactive Inc.

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