ECONOMIC FEASIBILITY OF VARIABLE RATE APPLICATION SYSTEMS FOR COTTON

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Abstract

Variable Rate Application System (VRAS) offers the opportunity to improve economic and environmental sustainability of agriculture by matching levels of input to meet the potentials of the crop at any point in the field. The objectives of this study are to compare the effectiveness of pix and dropp, and the amount of chemical applied in fixed vs. variable rates. Moreover, evaluate the economic feasibility of VRAS for use in cotton production. This study was conducted at the King Ranch, Kingsville, Texas in the 1998 growing season. Twelve rows of cotton were sprayed with either, variable or fixed rates. Fixed application rates were determined by managers of the King Ranch, and variable rates were estimated based on plant height as described by Landivar et. al., 1999. The results showed that there were neither significant increase in yields nor significant difference in effectiveness. However, there was a slightly lower pix rate per acre used and 22% less dropp was used also in variable rate plots. It is important to point out that these results are under dryland conditions. Therefore, under these conditions, it is difficult to justify the use of VRAS for cotton production. Although, technology and cost of implementing VRAS is adequate, yield benefits must be realized in order to justify its use.

Introduction

Cotton is a major agricultural product of the United States, therefore, increasing yields for every acre of cotton planted is a major concern in the cotton industry. Many products and techniques have been evaluated for this purpose over the past several decades with major advances coming from such fields as genetics, tillage practices, irrigation techniques, and plant growth regulation. Advances in these fields, along with harvesting and other equipment advances have helped farmers to gain more productivity and profit from each acre of land in production.

One of many management practices applied to cotton crops is Variable Rate Application Systems (VRAS). VRAS offers the opportunity to improve economic and environmental sustainability of agriculture by matching levels of input to meet the potentials of the crop at any point in the field. It combines knowledge about soils and crop variability with Global Positioning Systems (GPS) and Geographic Information Systems (GIS). These technologies, linked with controllers and direct injection systems, allow the accurate adjustments of application rates as the soil or crop conditions vary across the field. Successful use of VRAS depends on the ability to readily assess field variability and to relate the information to optimum rate of application. These techniques should be easy to use, economical and directly related to crop management.

Materials and Methods

This study was done at the King Ranch, Kingsville, Texas in the 1998 growing season. Twelve rows of cotton were sprayed with either fixed or variable rates. The experiment was divided into three different replication of four rows each. In addition, three different kind of pix (MC, MEP+, and MC/HBC) was used for each replication. Fixed application rates were determined by managers of the King Ranch. On the other hand, variable application rates were estimated based on plant height as described by Landivar et. al. 1999.

Results and Discussion

The results showed that there was no significant different in efficiency of neither the pix nor the drop between fixed and variable application rates. Moreover, there was no significant difference in lint yield per acre. However, there was a slightly lower pix rate per acre used and 22% less drop rate was also used in variable rate plots.

The economic analysis performed revealed interesting results. The lower pix rate per acre did not cover the additional costs of implementing VRAS. To illustrate, some of the costs are the development of a computerized plant height map for the different application rates or the costs of the variable rate application equipment. Therefore, using VRAS, the cost of production per acre would be $0.80 higher than with conventional application (Table 1). Although, the lower dropp rate per acre generated net savings of $1.20 per acre (Table 2). It is important to point out that all of these results are under dryland condition.

Conclusions

It is difficult to justify the use of VRAS in dryland cotton production systems especially the use of pix.

The technology and cost of implementing VRAS is adequate because it is not far from the costs of conventional applications, however, yield benefits must be realized in order to justify its usage.

VRAS may be economically feasible for use in the control of nematodes and Texas root rot. In addition, some of the potential uses of VRAS in cotton production are:

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application of fertilizers, boll openers, seeding rates, and weed control. Even though, VRAS is a technique that still needs some research, it also has a bright future in cotton production.

References

Landivar, J.A.1999. A Variable-Rate Chemical Application System for Cotton in South Texas. Cotton Physiology Conference, 1999 Beltwide Cotton Production Conferences, Orlando, FL.

Table Guide

Table 1 is the analysis of data for pix. The cost of the product is $0.84 oz. The amount used for conventional application was 9.0 oz/ac, and for variable rate application was an average of 8.8 oz/ac. (range 7.0 to 11.0 oz/ac.).

Table 2 is the analysis of data for dropp. The cost of the product is $55.00 lb. The amount used for conventional application was 0.18 lb/ac., while for variable rate was a average of 0.14 lb/ac. (range 0.10 to 0.17 lb/ac.).

Table 1. Economic Analysis of Data for Pix

	Costs of Conventional Application ($/ac.)	Costs of Variable Rate Application ($/ac.)	Additional Benefits ($/ac.)
Cost of Custom Application	3.00	3.50	<0.50>
Cost of Product per Acre	7.60	7.40	0.20
Cost of Plant Height Map	0.00	0.50	<0.50>
Total Costs	10.60	11.40	<0.80>

Table 2. Economic Analysis of Data for Dropp

	Costs of Conventional Application ($/ac.)	Costs of Variable Rate Application ($/ac.)	Additional Benefits ($/ac.)
Cost of Custom Application	3.00	3.50	<0.50>
Cost of Product per Acre	9.90	7.70	2.20
Cost of Plant Height Map	0.00	0.50	<0.50>
Total Costs	12.90	11.70	1.20