INTEGRATION OF COTMAN INTO AN EXISTING SCOUTING PROGRAM

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Abstract

COTMAN, a computerized system to aid in cotton management, is a tool producers and consultants are integrating into their management programs. This survey evaluated various methods in which COTMAN could be integrated into an insect scouting program and compared changes in scouting techniques and other management decisions. Four Arkansas COTMAN users who attended training sessions and used the program in their daily activities in 1996 were surveyed. The survey represented over 20,000 acres of cotton. COTMAN data was collected during a 10 week period utilizing published guidelines. The whole plant search method of insect scouting was used by crop advisors participating in this survey. The time required of personnel to collect COTMAN data in the field ranged from 20 to 23 minutes per field visit. Of the 21 minutes required to collect COTMAN and insect scouting data by the same field crew, 6 minutes were required for COTMAN. Time spent in the office and traveling between fields varied for field personnel. Additional time required of management for interpretation and development of recommendations and ranged from 3 to 15 hours per week. The direct cost of labor and travel ranged from $1.27 to $1.75/ac for once a week, and $3.49/ac for twice a week data collection of COTMAN. The direct cost of labor and travel was determined to be $4.80/ac when COTMAN and insect scouting was collected by the same field crew. These costs did not include overhead or return to management. Total fruit counts and percent small square set determinations were eliminated from scouting procedures as a result of COTMAN. These time savings can allow for COTMAN and insect scouting to be performed by the same crew in a similar time frame as that required for the traditional insect scouting. Those surveyed indicated that COTMAN provided quality control measures to their scouting programs because of the strong cross-check for early- and mid-season square set and insect activity, especially in the terminal of the plant. Recommendations by COTMAN for insecticide and crop termination were used with a high level of confidence by those responding to this survey. COTMAN can be integrated into an existing insect scouting program and can benefit the producer as well as those providing the service.

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Introduction

COTMAN is a computerized expert system to aid in cotton management (Bourland et al., 1994). A particular strength of this program involves end-of-season management decisions. These are based on the period of susceptibility of bolls to insect damage measured by heat unit accumulaton beyond white flower (Bagwell and Tugwell, 1992) and the integration of crop and weather information (Zhang et al., 1993) to aid in insecticide termination and harvest initiation. As COTMAN continues to be developed, additional variables to aid in early-season management are being fine-tuned. COTMAN offers the producer or crop advisor valuable information with regard to the vegetative and reproductive status of a field and can act as a check and balance for an insect scouting program. Although information exists from on-farm experiences of COTMAN (Klein et al., 1994), time requirements for the use of COTMAN and it's impact on other management practices are not well documented.

The objective of this study was to survey COTMAN users who were implementing the program in their daily activities and evaluate various methods in which it can be integrated into a scouting program and compare how insect scouting techniques and other managment decisions were modified.

Data and Methods

Selected COTMAN users who attended training sessions and participated in a pilot program in 1996 were surveyed. Four case studies comprised of one producer and three crop advisors representing different methods of implementing the program were evaluated (Table 1). COTMAN data was collected during a 10 week period using recommended procedures including field size ($\leq$50 to 60 acres), number of sites per field (4 sites), and number of plants per site (10 plants). The whole plant search method of insect scouting was used by all crop advisors participating in this survey. Crews consisting of two people collected COTMAN and/or insect scouting data with the exception of case study one, in which one person collected COTMAN data and operated independently of a crop advisor.

Time required to complete various components of data collection and interpretation for COTMAN were calculated from survey responses. The amount of time necessary to collect COTMAN information, was calculated by subtracting travel and office time of field personnel from the total hours worked weekly, divided by the number of field visits per week. An hourly rate of $7.00 was applied to the time requirements for field personnel. This expense combined with travel was divided by the acres monitored by each crew to derive a cost on an acre basis. In support of the COTMAN program, additional time requirements of the producer or crop advisor were required. This involved some data handling in the office and interpretation of COTMAN output. An hourly rate of $50.00 was used to

estimate expenses of management level personnel. The sum of expenses for field personnel and the additional time requirements from management were calculated and expressed per acre to derive a total cost. This survey did not include cost for overhead or return to management. Information regarding the detection of stress and identification of problem fields by COTMAN compared to insect scouting, the quality control aspect of COTMAN, and the insecticide termination and harvest initiation components of COTMAN and their level of confidence in these procedures were also polled in this survey.

Results and Discussion

Time Requirements

The amount of time necessary to collect COTMAN information is a major concern for those who contemplate implementing this program. The amount of travel required of field personnel and time spent in the office handling data can influence this greatly. Although each of the case studies differed greatly, the time required to sample each field was very similar ranging from 20 to 23 minutes (Table 2.) However, when the same crew collected both COTMAN and insect scouting data, the time required for COTMAN was greatly reduced.

The differences between case studies were more obvious when time spent in the office handling data and travel were considered (Table 3). The time requirements for field personnel in case studies one, two, and three would be similar if comparisons were adjusted to the same COTMAN sampling frequency.

Various strategies were used by management for data handling outside of the field. In case study four, field personnel were not used for data transfer or analysis while field personnel in other case studies were used for these tasks. Time was required of management for interpretation of output and development of recommendations and ranged from 3 to 15 hours per week (Table 4). The use of field personnel to assist in data transfer and analysis can reduce the time required of management for these tasks.

Cost

Total cost for field personnel including travel combined with the additional time requirements for management ranged from $1.27/ac for once a week collection to $4.80/ac for twice a week COTMAN and insect scouting (Table 5). It is important to remember that fields in case studies one and two were sampled once a week while fields in case study three were sampled twice a week. If COTMAN sampling for the first three case studies were adjusted to the same frequency with all other factors remaining constant, case studies one and three would have identical cost per acre and be slightly more costly than case study two. Case study three possessed a disadvantage compared to case study two in that hours of travel per crew were 50% greater. Although case study four appeared to be much more costly than all others, the cost figure of $4.80 included insect scouting at a sampling frequency of two times per week. On the basis of these case studies, once a week COTMAN sampling could be performed at a cost of less than $2.00 per acre in most situations; however, cost of overhead and return to management were not included.

Modification of Insect Scouting Procedures

COTMAN users which offered insect scouting as a component of their program modified the whole plant search method for insects. Percent small square set was eliminated from the insect scouting procedure because this information is part of the SQUAREMAN portion of the COTMAN program. Total fruit counts were eliminated in case studies two and four. As a result of modifications to insect scouting procedures, insect scouting crews effectively sampled more fields as reported in case study two, or allowed for COTMAN and insect scouting to be accomplished by the same crew in a similar time frame as that needed just for the traditional insect scouting procedures as demonstrated in case study four.

Field level personnel capable of conducting insect scouting procedures can easily be trained to collect COTMAN data. It would be very difficult to forge COTMAN data to match insect scouting data and vice versa. Therefore, it is not imperative to have separate crews for each operation. Advantages exists for either method and should be considered carefully before implementing the program.

Quality Control

Achieving adequate early season growth and development is important in preserving yield potential. Maintaining a balance between reproductive and vegetative development is especially critical during this time. COTMAN provides a very sensitive measure of early season stress as well as square retention allowing for early detection of problem fields. All COTMAN users who provided insect scouting services indicated the strong cross-check for early- and mid-season square set and insect activity, especially in the terminal of the plant.

All COTMAN users reported the use of heat unit (HU) accumulation beyond cutout (NAWF=5 or latest possible cutout date) as the basis for insecticide termination (350 to 450 HU) and harvest-aid applications (850 HU). Users reported a high level of confidence in these techniques.

Summary

COTMAN can easily be integrated into an existing scouting program. The time requirements and cost are manageable. A field crew of two people were capable of collecting COTMAN data in a range of 20 to 23 minutes per field averaged across a ten week period. Time requirements for travel and data handling and transfer outside of the field will impact the amount of time remaining for data collection in the field. The use of separate crews to collect field data

is the most common approach; however, the use of the same crew to collect both COTMAN and insect scouting data may be the most cost effective approach for some especially if travel is excessive. COTMAN will allow for the elimination of small square set and total fruit counts from insect scouting procedures resulting less time required per field for insect scouts. The use of COTMAN will require additional time from the person providing the service or the producer to interpret output and formulate recommendations or management plans.

Based on these case studies, once a week data collection of COTMAN would cost the person providing this service less than $2.00 per acre without consideration for overhead or return to management. COTMAN can serve as a tool for quality control of an insect scouting program as well as providing the producer a sensitive measure of early- and mid-season stress and fruit retention allowing for early detection of problem fields. End-of-season recommendations regarding insecticide termination and harvest initiation were used with a high degree of confidence by the users participating in this survey. The integration of COTMAN into an existing scouting program can benefit the producer and the person providing insect scouting services.

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Table 1. A comparison of methods in which COTMAN and insect scouting were integrated in on-farm situations.

Case Study	COTMAN User	Scouting Crews		Insect Scouting Frequency	COTMAN Monitoring Frequency
		COTMAN	Insects	(# /wk)	(# /wk)
1	Producer	1	--	--	1
2	Crop Advisor	2	4	1	1
3	Crop Advisor	1	1	2	2
4	Crop Advisor	2[†]		2	2

[†] The same crew collected COTMAN and insect scouting data.

Table 2. Summary of the number of acres and fields in which COTMAN was implemented and the average time required to sample one field.

Case Study	Acres	Fields	Field Visits/ Crew/Week	Minutes/ Crew/Field
1	2,177	52	52	22
2	11,000	201	100	20
3	2,500	40	80	23
4	4,354	87	87	21[†]

[†] Six minutes were required for COTMAN and 15 minutes for insect scouting.

Table 3. Average time allocation and travel associated with COTMAN for field personnel during the 10 week season in 1996.

Case Study	Field (hrs/wk)	Office (hrs/wk)	Travel (hrs/wk)	Total (hrs/wk)	Travel[†] (miles/wk)	Cost[‡] ($/ac/yr)
1	19	3	8	30	76	1.06
2	34	2	4	40	40	1.04
3	30	4	6	40	220	2.49
4	30	0	10	40	392	3.08[§]

[†] Travel cost = $0.28/mile.

[‡] Field labor cost = $7.00/hour.

[§] Includes COTMAN and insect scouting. COTMAN cost based on time allocation is $0.88/ac.

Table 4. Additional time requirements for management level personnel associated with the implementation of COTMAN during the 10 week season in 1996.

Case Study	Time (hrs/wk)	Cost[†] ($/ac/yr)
1	3	0.69
2	5	0.23
3	5	1.00
4	15	1.72

[†] Management labor cost = $50.00/hour.

Table 5. Total cost of field personnel including travel and additional time requirements of management level personnel incurred through the implementation of COTMAN.

Case Study	Field Personnel ($/ac/yr)	Management ($/ac/yr)	Total ($/ac/yr)
1	1.06	0.69	1.75
2	1.04	0.23	1.27
3	2.49	1.00	3.49
4	3.08[†]	1.72	4.80[†]

[†] Includes COTMAN and insect scouting. COTMAN cost based on time allocation for field personnel and total cost are $0.88 and $3.92/ac, respectively.