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INTEGRATED PEST MANAGEMENT IN SUGARCANE - A SOCIO ECONOMIC ANALYSIS

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Abstract: To minimize all the ill effects of chemical pesticides and maintain the pest population at minimum level, integrated pest management is the only way to manage the pests within the threshold level and sustain production and productivity. However, such management practices have been largely overlooked by cane growers. This paper deals with the various sociological and economical issues concerned with use of integrated pest management practices in sugarcane. The survey indicated that every farmer had some reason or other for adopting IPM practices, like to get more yield and thereby increase in net profit or increase in productivity, reduced pesticide cost, reduced pollution, improvement in soil health by reducing the use of chemicals and addition of bio-pesticide, parasites, predators and eco-friendly. Nevertheless, they experienced certain constraints of non-availability of good quality bio-agents in time; yet, the farmers favoured the adoption of this technology. The study helps to get a better understanding of the performance of integrated pest management measures in farmer's fields and their perception of this technology.

Keywords: Sugarcane, Integrated pest management, Adoption, Economics, Constraints.

Introduction

Integrated Pest Management (IPM) is a systematic approach used to achieve minimal economic damage to the crops by any natural pest. IPM takes into account all the six crop protection mechanisms, namely chemical, biological, bio-technical, agronomic practices, physical procedures and plant quarantine. As many other tropical crops, sugarcane hosts an important quantity of insects and diseases, some of them being of economic importance for the sugarcane farmers and the industries (Goebel and Salam, 2011).

Sugarcane crop is attacked by a wide range of insect pests all through its plant stages (Williams, 1931; Box, 1953; Williams et al., 1969). Though majority of these are minor pests, a few major pests exist and cause significant damage to all parts of the crop (i.e. root, stalks and foliage) (Williams et al., 1969; Hall, 1988). As many small-scale farmers in developing countries rely heavily on income generated through sugarcane production, losses from pests and diseases can significantly impact on these communities, while the incursion by a new pest or disease could lead to devastating consequences. Despite many years of

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implementation of pest management strategies, some pests remain difficult to manage and their dynamics are still largely unpredictable, with sometimes dramatic yield reduction (Kiritani, 2006; Gregory et al., 2009).

For quite a long time now, IPM is being recommended for sugarcane crop and the impact of the technology has been demonstrated. However, studies indicate that adoption of IPM is still a reservation and the present study aims to get insights into this technology.

Research Methodology

Descriptive type of research design applying ex-post facto approach was used and cane growers adopting IPM measures were selected. The study was purposively carried out in Vellore coop sugar mill, Tamil Nadu as they have been recommending IPM and had also been producing and supplying bio-control agents (*Trichogramma* cards, *Metarhizium* & Granulosis Virus) to the registered cane growers. The operational area of the mill spreads over seven divisions in Vellore and Tiruvallur districts, from which 40 respondents were selected from Millsite division (Kugaiyanellur, Kandipedu & Karigiri villages) and Sholinghur division (Paivalasa and Veeramangalam villages) at random. The particulars were collected using an interview schedule, the sociological appraisal was done through focus group discussions / observations, and yield data were recorded from the individual farms. The data collected were tabulated and analyzed using descriptive statistics.

Results and Discussion

Demographic profile of farmers adopting IPM practices

Demographic profile of the participants indicated that they were mostly of middle age (35-50 years: 52.50%) to old age (>50 years: 37.50%) and literates with up to secondary education (57.50%) and 17.5% of the farmers were graduates; Agriculture was the main occupation for 85.0% of the respondent farmers and 82.50% had more than 10 years of farming experience in sugarcane farming. Majority of them (75.0%) owned more than five acres of land and 67.50% cultivated sugarcane in an area of 2-5 acres. Crop rotation was followed by all the respondents with groundnut, paddy, turmeric, banana or pulses. Hardly 10.0% of the farmers were self-sufficient in implement possession while majority of them either fully or partially depended on hiring. Around 40.0% of the respondents owned livestock such as cows, buffaloes, draught animals and poultry for additional source of income, apart from their own use; Mass media channels used by the respondents were radio, television and newspaper; all of them owned radio/ television and 95.0% had the habit of regularly watching agricultural programs. Regarding newspapers, it was observed that around 55.0% were regular

subscribers of newspapers, out of which 67.5% were found to be regular readers from the source of own and tea stall newspaper. Majority (57.50%) of them had medium level of social participation as they were more into agriculture. Source of information about IPM measures as expressed by 82.50% of the respondents was sugar factory officials followed by Agricultural Department and input dealer.

Adoption level of integrated pest management practices

Table 1. Adoption of various IPM practices (N=40)

Name of the pest	Cultural		Mechanical		Biological		Chemical	
	No.	%	No.	%	No.	%	No.	%
Early Shoot borer	7	17.5	-	-	8	20.0	25	62.5
Internode borer	18	45.0	-	-	22	55.0	-	-
Sucking Pests (woolly aphid, scale, whitefly, mealy bug etc.)	12	30.0	-	-	14	35.0	14	35.0
Subterranean pests (white grub, Termite)	13	32.5	-	-	8	20.0	19	47.5
Rodents, Wild pig	5	12.5	17	42.5	-	-	18	70.0
Total	55	27.5	17	8.5	52	26.0	76	38.0

Chemical method: It is evident from table 1 that 38% of the respondents used chemical pesticides for managing sugarcane pests except for internode borer as the pest remains inside the stalk. *Cultural method:* Agronomic practices like earthing up, trash mulching, detrashing, weeding, propping etc. minimize the pest population and around 27.5% of the farmers adopted these practices. *Biological method:* Biological measures as adopted by around one-fourth of the farmers include release of egg parasitoid *Trichogramma chilonis* for internode borer, *Granulosis* virus for early shoot borer and *Metarhizium anisoplia* to manage the white grub. *Mechanical method:* This method was followed for rat (trapping) and wild pig management.

Majority of the respondents adopted IPM measures for managing early shoot borer as it is a ubiquitous pest in the area. Sucking pests like white fly, scales, woolly aphid, pyrilla and mealy bugs are also widely prevalent in the study area and they adopted IPM practices like detrashing, clean cultivation and spraying of pesticides. Internode borer is managed by the use of *Trichogramma* cards, and pheromone traps. For managing subterranean pests, they resort to chemicals and use of biocontrol agents like *Metarhizium* and *Beauveria.*

Advantages of adopting integrated pest management practices

Advantages of following IPM was obtained in an open ended schedule (Table 2).

Table 2. Advantages of integrated pest management practices (N=40)

Advantages	Frequency	Percentage	Rank
Increase in cane yield	40	100	I
Increase in net profit	40	100	I
Stabilization of productivity	38	95.0	II
Increase in cane weight	35	87.5	III
Increase in cane length	33	82.5	IV
Reduction in pesticide cost	33	82.5	IV
Possibility of multi-ratooning	30	75.0	V
Bio agents improve microbial population	20	50.0	VI
Improvement in soil health	18	45.0	VII
Reduction in weed population	18	45.0	VII
Labour saving	13	32.5	VIII
Increase in pesticide use efficiency	9	22.5	IX

Increase in cane yield and net profit: All the respondents indicated that due to adoption of IPM practices, the cane yield was increased and thereby net profit was increased. The farmers who use bio-pesticide and bio-control agents had reported that they incurred lesser cost then the chemical pesticides. IPM measures when strictly followed completely avert yield loss due to pest infestation.

Stabilization of productivity: Nearly 95.0% of the respondents indicated that due to adoption of IPM practices, the productivity is stabilized due to increased weight and length of the cane. This also creates a conducive environment for the development of soil flora and soil fauna and this makes the soil healthy.

Increase in cane weight and length: Adoption of IPM increases the cane length as well and this was realized by 82.5% of the respondents. Increased cane length gives the crop a better field stand and it adds to the cane weight (87.5%) also.

Possibility of multi-ratooning: Around 75.0% of the respondents reported that due to adoption of IPM practices, the crop remains healthy and there is a possibility of multi-ratooning without much reduction in the yield. A healthy previous crop leads to good germination of stubbles and establishment of a healthy ratoon crop. *Improvement in soil health and reduction in weed population:* Almost 45.0% of the respondents reported that due

to adoption of IPM practices, soil health is restored or improved by the way of using lesser or no chemicals and good crop stand in the field which reduces the weed population.

Constraints in integrated pest management

The constraints faced by farmers in the adoption of IPM practices are as below:

Lake of availability of bio control agents and bio pesticides: Though biological method is a promising technology, there are not many firms producing bio-control agents. Hence 87.5% of respondents felt that enough quantity was not available in time.

Lack of knowledge about the pesticides and its quantity to be applied & method of application: Nearly 80.0% of the respondents faced the problem of lack of knowledge about the pesticides and its quantity to be applied. This was mainly due to day by day commencement of new formulations in the market and insufficient dissemination of information of the method by which it has to be applied.

Height of the crop as barrier for adoption and timely adoption is not possible: After four months, height of the crop will be 7-10 feet. This was a major obstacle for spraying or release of parasite or spreading bio-control agent to entire field. Hence, 75.0% of them felt height as a barrier for adoption of IPM and also reported that timely adoption is not possible due to various reasons like scarce availability of bio-control agents, bio-pesticides, pesticides, pheromone traps, spraying equipments, technical labour etc.

Scarce availability of good quality pesticides, bio-control agents and bio-pesticides: Around 70.0% of the respondents stated that the available chemical formulations or biological inputs were not of good quality.

Less awareness about bio-control agents: Around 65.0% were not having much knowledge about bio-control agents and bio-pesticides usage. Though bio-control agents and bio-pesticides are in vogue for quite some time, the adoption of this technology is yet to gain momentum. Farmers have not yet realized the full benefit of this technology.

High cost of pesticides, bio-control agents and bio-pesticides, laborious work and lack of resistant varieties for major pests: Around 62.5% felt that the cost of the IPM inputs were high and adoption of each practice on time requires more labour. Also, there is a lack of resistant varieties for major pests.

Scarce availability of technical labourers: Around 20.0% faced scarcity in availability of technical labourers as the village labourers were migrating for construction work and as sales persons in shops near the town which would fetch higher wage to them.

Economics involved in IPM practices

Nearly one fourth (27.5%) of the respondents got less than 25% more yield whereas 72.5% of the respondents got 25-50% more yield due to adoption of IPM as compared to average yield of normal practice.

Average yield obtained by the respondents through conventional practice: 28.1 t/ac;

Average yield obtained by the respondents after adopting IPM: 36.3 t/ac;

Yield increase is 8.2 t/ac; Percentage of yield increase due to adoption of IPM is 29.1%

Cost of cultivation without IPM is Rs.48612/ac; Cost of cultivation with IPM is Rs.51425/ac; Additional yield expected on an average is 8 t/ac; Value of additional yield after deducting harvest charges (Rs. 550/t) Cane price Rs.2550/t is Rs.16000/ac; Additional expenses after adopting IPM is Rs.3800/ac; Total additional income (after adopting IPM) = Rs.12200/ac.

Conclusion: IPM for sugarcane cultivation is an important viable technology and also an essential foundation for the development of sustainable sugarcane cultivation. Hence, it is necessary to assess the performance of IPM in sugarcane cultivation and utilize it along with other technologies like integrated nutrient management, integrated disease management, agronomic and water management practices to maximize the productivity.

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