Socio-Economical Profile and Constraints in Adoption of Sugarcane Technologies by Farmers in Villupuram District, Tamil Nadu

T. Rajula Shanthy[1], L. Gunasridharan[2], L. Saravanan[3]

1. Principal Scientist and Head (Ext.), 3. Sr. Scientist (Ento.), ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu, 2. Cane Officer, Kallakurichi Cooperative Sugar Mills, Villupuram, Tamil Nadu

Corresponding author e-mail: rajula.sbi@gmail.com

ABSTRACT

The present investigation was carried out with the objectives to analyze the socio-economic status of the cane growers, to know the level of technology adoption and to identify the constraints in adoption of sugarcane technologies by interviewing 80 growers from different villages of the command area of Kallakurichi II Cooperative Sugar Mills Ltd, Villupuram, Tamil Nadu. It was found that 59.0 per cent of the respondents had secondary school level education and 11.25 per cent had graduation level. Income profile of the farmers showed that 57.5 per cent were of 1.0 to 2.5 lakh income category. Majority of the respondents had access to mass media and were members in any one of the Institutions engaged in agricultural productivity. Major technologies adopted by sugarcane growers were basal application of organic manures (90.0%), wider row spacing (84.0%) and stubble shaving (80.0%). The constraints encountered by most of the respondents in adoption of sugarcane production technologies were non-availability of sugarcane setts, high cost of organic manures, non-availability of inorganic fertilizers in time, non-availability of pheromone traps and lure and non-availability of bio-agents for the management of borer insect pests, high cost of stubble shaving and off-barring, lack of knowledge about gap filling practices in case of ratoon management, high cost of harvesting, scarcity of labourers during the season and high labour cost. Distribution of technology related printed materials, conducting pre-season campaigns and study tours were some of the suggestions made by cane growers to increase the rate of adoption of technologies to increase sugarcane productivity.

Key words*: Sugarcane growers; Adoption; Constraints; Sugarcane technologies; Productivity;*

Sugarcane is a major commercial grown in Tamil Nadu state, India occupying an area of 2.18 lakh hectares producing 18.98 million tonnes of sugarcane with average productivity of 87.1 tonnes/ha during 2016-17 (*http://sugarcane.dac.gov.in/Statistics APY.pdf*.).However, the average yield in some specific areas in Tamil Nadu state is about 104 tonnes per ha and certain growers have touched a record production of more than 200 tonnes per ha. It is thus evident that the recorded yield might touch the potential yield at least under favourable soil and climatic conditions. There had been considerable improvement in the productivity levels in the past, but have more or less stagnated over the last two decades. In the last two years, area and cane yield has started declining; the reasons for poor performance could be both natural and manmade. The natural reasons relate to weather (mainly rainfall), pest and diseases which affect the yield and quality. The manmade causes relate primarily to the levels of adoption of recommended practices and growing low yielding varieties. Every year, many new technologies are being introduced by Sugarcane Research Stations after conducting field trials. However, when the farmers adopt it in a large scale, they face a lot of problems which they may or may not realize. Yield constraints have become an important feature of sugarcane farming system in India throughout the cropping year. To achieve the targeted production of 450 million tonnes by the year 2020, it is imperative to bridge the gap between potential yield and actual yield. To achieve this, farmers have to adopt all recommended

package of practices/technologies in their fields. To ensure adoption of technologies, on large scale, it is necessary to resolve the constraints faced by the farmers while adoption. Hence, it is essential to know the constraints to improve the yield of sugarcane crop. Keeping this in view, this investigation was conducted with the objectives *viz.*, to study the socio-economic profile of farmers cultivating sugarcane crop; to know the level of technology adoption; to analyze the constraints involved in cane cultivation and to formulate strategies to alleviate the constraints faced by cane growers in adoption of technologies in their fields.

METHODOLOGY

The study was conducted among the registered cane growers in Kallakurichi II Cooperative Sugar Mills Ltd. factory area comprising Kallakurichi (Full) and Sankarapuram (Part) taluks, of Viluppuram District, Tamil Nadu. The variety Co 86032 occupies a major share in the reserved mill area. This area was purposively selected and 80 sugarcane growers were chosen as respondents randomly.

The tool used for the study was the pre-designed and pre-tested interview schedule. The variables operationalized in the present investigation comprised age of the respondents as adopted by *Kothandapani (1992)*, educational status, occupational status, farming experience and sugarcane cultivation experience as adopted by *Arulraj (1984)*, crop rotation, operational holding, implements possessed, annual income, mass media participation as adopted by *Ahmed (1997)*, social participation and sources of information about new sugarcane varieties as categorized by *Krishnamoorthy (1988)*.

The respondents were interviewed for the sugarcane technologies *viz.*, adoption of new varieties, wide-row spacing to enable mechanization, basal application of organic manure/FYM/press mud, sett treatment with fungicide, basal application of phosphorus fertilizer, spraying of pre-emergence herbicide, installation of drip irrigation, application of bio-fertilizers, release of *T. chilonis* egg parasite card, spraying of urea + potash solution for drought management, application of ferrous sulphate to control iron deficiency, detrashing, propping, trash mulching, use of pheromone traps to control borers, stubble shaving, off-barring and root pruning and gap filling in ratoon crop.

The constraints were categorized under the heads like, new varieties, crop production, crop protection,

ratoon management and others. The primary data were analyzed with standard statistical methods like frequency, percentage and ranking to draw the results.

RESULTS AND DISCUSSION

Profile of sugarcane growers : The profile of the participants in the present investigation revealed that 99.0 per cent of the sugarcane growers were middle and old aged persons. *i.e.*, they were above 35 years old. *Roop Kumar et al.,(2017)* also reported that most of the sugarcane growers in western Uttar Pradesh belonging to the age group of 31 to 50 years. Ninety-four per cent of the respondents had above primary level of education in which 59 per cent of respondents have secondary school education and 11.25 per cent were graduates. This low level of educational status might be one of the reasons for non-adoption of recommended technologies in their fields.

Around 77.5 per cent of the respondents totally dependent on agriculture as occupation. Over 80.0 per cent had more than 10 years of experience in sugarcane cultivation and 96.0 per cent them of them were farmers with more than 10 years of cultivation experience.

Sugarcane–Paddy–Sugarcane and Sugarcane–Tapioca–Sugarcane were the crop rotations followed by 75.0 per cent of the farmers. Other crops like turmeric, pulses and maize occupied 11.0 per cent and fallow occupied 14.0 per cent. Among the sugarcane growers, 55.0 per cent were medium land holders whereas 31.0 per cent were small and marginal and only 14.0per cent were large farmers. The study indicated that size of land holding as such had no influence on the varieties grown. Most of the growers had the basic implements like spade, country plough and some had cultivator and rotovator. They tend to hire tractor and other implements like power tiller, disc plough and mini tractor etc. during the seasons. Demonstration of modern implements like trash chopper, deridging implements were well received by the farmers and would gain momentum in the days to come.

The study on income profile of the farmers showed that 20.0 per cent of them came under less than 1 lakh, 57.5 per cent came under 1.0-2.5 lakh and 22.5 per cent of them came under more than 2.5 lakh income category. The analysis indicated that income level of farmers did not have any relationship with non-adoption of technologies.

All the respondents possessed either radio or television or both. Seventy-two per cent had the habit of

listening or watching agricultural programmes. As high as 76.3 per cent had the habit of reading news related to agriculture and 86.3 per cent was reading newspaper regularly. Similarly, *Roop Kumar et al.,(2017)* reported that most of the farmers were utilizing radio and television as information source to gain knowledge about sugarcane production technologies. This indicated that farmers had greater access to mass media and thus could be used for popularizing the latest technologies among cane growers.

It was found that most of the respondents (76%) were members of any one of the social organization like Primary Agricultural Co-operative Bank, self help group, milk society, local body and consumer forum. Out of them, 5.0 per cent were office bearers and 19.0 per cent of the respondents do not belong to any organization. It indicates that these social organizations could be used to channelize and popularize sugarcane technologies.

Adoption of recommended sugarcane production technologies : Production and productivity of crops is mainly governed by the judicious and balanced use of inputs and technology. Timely and proper use of inputs in a scientific manner has a significant impact in achieving optimum productivity. The information on the adoption levels of different components of recommended sugarcane production technology is presented in Table 1. It was found that sugar factory field level functionaries like Cane Inspectors and Cane Officers were the prime source of information of new varieties (79.0%). Only 21.0 per cent reported that they received information from other farmers. The major technologies adopted by the farmers were basal application of organic manures (90.0%), wider row spacing (84.0%), stubble shaving (80.0%), off-barring and root pruning(75.0%), application of bio-fertilizer (73.0%) and adoption of new varieties (68.7%). The technologies which were least adopted by the farmers were trash mulching, propping and basal application of phosphorous fertilizer. The farmers in this area were not familiar with pest management practices in sugarcane.

Relationship between socio-economic profile and adoption of sugarcane technologies : The relationship between the socio-economic characteristics of the respondent farmers with their level of adoption was worked out using correlation analysis as given in Table 2.

Out of 11 independent variables selected for the study, except occupational status and crop rotation followed by the respondents, all the other nine variables

Table 1. Technologies adopted in various stages of cane cultivation the respondents (N=80)

Technologies	No.	%	Rank
Basal application of organic manure/ FYM/ Pressmud	72	90.00	I
Wide row spacing	67	83.75	II
Stubble Shaving	64	80.00	III
Off-barring and root pruning	60	75.00	IV
Application of Bio-fertiliser	58	72.50	V
New Varieties	55	68.75	VI
Spraying of Pre-emergence weedicide	49	61.25	VII
Release of *T. chilonis* egg parasite	47	58.75	VIII
Installation of Drip Irrigation	42	52.50	IX
Detrashing	41	51.25	X
Gap filling	38	47.50	XI
Sett treatment with fungicide	34	42.50	XII
Spraying of Urea + Potash solution for drought management	32	40.00	XIII
Spraying of Fe_2SO_4 to control iron deficiency	30	37.50	XIV
Basal application of Phosphorous fertilizer	29	36.25	XV
Trash mulching	27	33.75	XVI
Propping	6	7.50	XVII

Table 2. Relationship between profile of sugarcane farmers with level of adoption of technologies (N=80)

Independent variable	Correlation coefficient ('r' value)
Age	0.019[NS]
Educational status	0.35*
Occupational status	-0.118[NS]
Size of land holding	0.148[NS]
Experience in farming	0.174[NS]
Experience in sugarcane cultivation	0.368*
Crop rotation followed	-0.014[NS]
Farm implement possession	0.412*
Income level	0.089[NS]
Mass media exposure	0.558*
Social participation	0.479*

*Significant at 0.01 percent level; NS=Non-Significant

had positive correlation with the level of adoption of sugarcane technologies. Among the respondents, three-fourth had agriculture as their primary occupation and the rest were into other enterprises but were almost on par in technology adoption. Crop rotation followed generally depends on the water availability and marketability of the produce and hence a negative relation was seen.

Independent variables viz., educational status, experience in sugarcane cultivation, farm implement possession, mass media exposure and social participation

showed positive significant relation with adoption. Higher the education more the curiosity to acquire information and that leads to high adoption of new technologies. Farmers with more than 10 years of experience in sugarcane farming were widely prevalent in the sample and they tried to improve cane productivity by following latest technologies and varieties. Quite a few respondents had owned almost all the farm implements needed for sugarcane cultivation and others had hired on lease. Mass media messages gained through radio and television channels help to create awareness on new technologies as reflected in the analysis. Most of the respondents were members, if not office bearers in at least one organization in the village leading to exchange of information and thereby increased adoption of technologies.

Constraints in adoption of technologies :

Constraints in adoption of new variety : Variety is the pivot around which the whole sugar industry revolves. Every year, new sugarcane varieties are released by the Sugarcane Research Stations. However, farmers face certain constraints in adopting the new varieties. Such constraints are documented and ranked in Table 3. The study showed that nearly 70.0 per cent of the respondents reported non-availability of setts in time as the major constraint in adoption of new variety. The new varieties need more inputs and thereby high cost of cultivation as reported by 68.0 per cent. The other constraints in their order of importance were fear of taking risk (64.0 %) and assumption that the new variety does not give higher yield than the existing variety (63.0%). The findings of *Lahoti et al., (2010)* also showed that non-availability of setts in time, non-availability of good quality organic manures, high cost of organic and inorganic fertilizers and pesticides were the major constraints in sugarcane production in Maharashtra.

Constraints in adoption of crop production technologies: For realizing the full genetic potential of a sugarcane variety, farmers have to adopt the appropriate production technologies. More often, farmers face specific constraints in adopting the production technologies and these results in decreased cane productivity. It was found that 69.0 per cent of the respondents reported high cost of organic manures as the major constraint in adoption of technologies in crop production followed by non-availability of inorganic fertilizers in time (66.0%),

Table 3. Constraints in adoption of new variety

Technologies	No.	%	Rank
Non-availability of setts in time	56	70.00	I
Need more inputs and thereby high cost of cultivation	54	67.50	II
Fear of taking risk	51	63.75	III
Does not give higher yield than the existing variety	50	62.50	IV
High transport cost	46	57.50	V
Lack of awareness about new varieties	44	55.00	VI
New varieties are prone to more pests & diseases than the existing variety	37	46.25	VII
Lack of conviction	35	43.75	VIII
Not suited for local condition	29	36.25	IX
High flowering percentage	27	33.75	X
Prone to lodging	24	30.00	XI

Table 4. Constraints in adoption of crop production technologies (N=80)

Technologies	No.	%	Rank
High cost of organic manures	55	68.75	I
Non-availability of inorganic fertilizers in time	53	66.25	II
Clogging in drip irrigation	51	63.75	III
Non-availability of organic manures	48	60.00	IV
Trash mulching increases rodent problem	47	58.75	V
Non-availability of sett treatment chemicals in time	44	55.00	VI
Non-availability of bio-fertilizers in time	43	53.75	VII
Complicated nature of trash mulching	41	51.25	VIII
Detrashing & propping involves additional expenses	32	40.00	IX

non-availability of organic manures (60.0%) and trash mulching increases rodent problem (59.0%) (Table 4). More or less similar constraints were faced by sugarcane growers from Maharashtra as reported by *Lahoti et al., (2017)*, from Punjab by *Devi and Chahal (2013)* and from Assam by *Ahmed et al. (2016)*. However, the order of ranking of constraints differ from place to place due to socio economic status of the growers, biotic and abiotic factors prevalent in a region, institutional support, infrastructure availability etc.

Constraints in adoption of crop protection technologies: Incidence of pests and diseases pose a major threat to sugarcane cultivation. Though specific measures are available to manage the pests and diseases, farmers face a lot of constraints in adopting them. They are pointed out and ranked in Table 5. Majority of the respondents (93.0%) reported non-availability of traps and pheromone

lures as the major constraint in adoption of technologies in crop protection followed by lack of adequate knowledge about pheromone traps (79.0%), non-availability of *T. chilonis* egg parasite cards in time (75.0%) and non-availability of plant protection chemicals in time (71.0%).

Table 5. Constraints in adoption of crop protection technologies (N=80)

Technologies	No.	%	Rank
Non-availability of pheromone traps and lures	74	92.50	I
Lack of adequate knowledge about Pheromone traps	63	78.75	II
Non-availability of *T.chilonis* egg parasite cards in time	60	75.00	III
Non-availability of plant protection chemicals in time	57	71.25	IV
Some chemicals cause irritation and allergy	51	63.75	V
Lack of knowledge about correct management measures	50	62.50	VI
Non availability of management measures for yellow leaf disease / red rot	47	58.75%	VII

Table 6. Constraints in adoption of ratoon management technologies (N=80)

Technologies	No.	%	Rank
High cost for stubble shaving and off-barring	51	63.75	I
Lack of knowledge about gap filling practices	43	53.75	II
Lack of knowledge and conviction about ratoon management practices	36	45.00	III
Poor yield in plant crop	34	42.50	IV
Piece-meal harvest leading to poor ratoon crop	33	41.25	V
Poor ratooning capacity of the variety	26	32.50	VI

Constraints in adoption of ratoon management technologies : Ratoon crop occupies a major share of at least 50.0 per cent of the cropped area every year *(Sundara, 2011)*. Hence, it is imperative that the cane productivity of ratoon crop is also maintained by suitable management measures. The study showed that 64.0 per cent of the respondents reported high cost for stubble shaving and off-barring as the major constraint in ratoon management. This was followed by lack of knowledge about gap filling (54.0%) and lack of knowledge and conviction about recommended ratoon management practices (45.0%) (Table 6). The findings of *Ajay and Rajesh (2010)* also showed similar constraints which were responsible for poor adoption of technologies and

consequently low yield in sugarcane ratoon in Uttar Pradesh. *Other constraints in adoption of technologies :* Apart from the above constraints, there were many other factors that had constrained sugarcane cultivation. They are listed and ranked in Table 7. It was found that 98.0 per cent of the respondents expressed high cost of harvesting as the major other constraints followed by scarcity of labourers during the season (94.0%), high labour cost (90.0%) and high cost of inputs (89.0%). Similarly, the findings of *Ahmed et al., (2016)* from Assam revealed that non-availability of labourers during peak period and high cost of agricultural chemicals ranked as prime constraints in Assam. Several other studies including *Satyajeet et al.,(2019)* had reported that scarcity of labour and high cost of labour are the major impediments in present day agriculture.

Table 7. Other constraints in adoption of technologies

Technologies	No.	%	Rank
High cost of harvesting	78	97.50	I
Scarcity of labourers	75	93.75	II
High labour cost	72	90.00	III
High cost of inputs	71	88.75	IV
Low cane price	53	66.25	V
Lack of credit facility	44	55.00	VI
Delayed cane payment	07	8.75	VII

Suggestions to increase the adoption of technologies: Due to the advancement in scientific approach towards agriculture, many new technologies are available for adoption. It is not the dearth of technology that haunts Indian agriculture today, but the non-availability of adequate knowledge about the technologies to the intended clients. Adequate technical support is needed to increase the rate of adoption. The suggestions as indicated by sugarcane growers are presented in Table 8. At least 61.0 per cent of the respondents opined that financial support was highly necessary for adoption of technologies, followed by pre-season campaigns, (67.0%), study tours (61.0%) and arranging field days (51.0%). About 72.0 per cent of the respondents opined that distribution of printed materials was necessary for getting knowledge, followed by experimental trials and demonstrations (47.0%) to get convinced and finally providing subsidies for the technology (45.0%) like drip irrigation which involves high initial cost. Efforts by the cane Department of the sugar mills have to be strengthened in spreading the technology as suggested by 42.0 per cent of the respondents (Table 7).

Table 8. Suggestions to increase the adoption of technologies (N=80)

Suggestions	Highly Necessary		Necessary	
	No.	%	No.	%
Pre-season campaigns	15	18.75	53	66.25
Distribution of printed materials	18	22.50	57	71.25
Field days	35	43.75	40	50.00
Experimental trials and demonstrations	37	46.25	36	45.00
Financial support	48	60.00	18	22.50
Providing subsidies for the technology	36	45.00	33	41.25
Efforts by the Cane Dept. of the sugar mill	33	41.25	37	46.25
Study tours	30	37.50	48	60.00
Farmers' training program	31	38.75	38	47.50

CONCLUSION

This paper attempted to know the socio-economic status of cane growers; the adoption levels of recommended sugarcane technologies and to identify the constraints faced by famers in Villupuram district, Tamil Nadu. Income of the famers has to be increased by integrated farming system, as majority of their income was less than 2.5 lakh. The technologies could be popularized through mass media like radio, television and newspaper as most of them had access to them. Most of the respondents were members in various Institutions engaged in agricultural productivity (like Primary Agricultural Co-operative Bank, self help group, milk society etc.) hence, it would be appropriate to promote collaboration among them for boosting sugarcane productivity. Some of the important technologies like gap filling, sett treatment with fungicide, drought management practices and basal application of phosphate fertilizers were not practiced widely. To ensure enhanced productivity they are to be popularized. Constraints like non-availability of setts, high cost of organic manures, non-availability of inorganic fertilizers, non-availability of pheromone traps and bio agents, high cost of harvesting and labour and scarcity of labourers during the season are to be addressed at various levels. Certainly, pre-season campaigns, distribution of printed materials and study tours would enhance the knowledge of the growers about the technologies which would in turn reflect in sugarcane productivity.

REFERENCES

Ahmed G. Muhiadeen. (1997). Study on the perception of cane growers and non growers towards cane development programme in sugar factories. *M.Sc (Ag) Thesis*, TNAU, Coimbatore.

Ahmed, P; Nath, R.K. and Sarmah, A.C. (2016). Production constraints of sugarcane cultivation in Tinsukia district of Assam. *Intl. J. of Agri. Sci.*, **8** (62): 3540-3541.

Ajay, K.S. and Rajesh Kumar. (2010). Knowledge, adoption and constraints in sugarcane ratoon production technology: Research Analysis. *Bhartiya Krishi Anusandhan Patrika,* **25** (2-4):113-119.

Arulraj, S.(1984). Threshold in innovation decision on sugarcane variety. *Ph.D. Thesis*, TNAU, Coimbatore.

Devi, A.A. and Chahal, S.S.(2013).Socio-economic constraints perceived by cane growers in sugarcane production in Punjab. *Indian J. of Eco. and Dev.*, **9** (2): 93-113.

Kothandapani, K.R. (1992). A study on the yield gap and constraints analysis in sugarcane with special reference to Ambur co-operative sugar mills Ltd. *M.Sc (Ag) Thesis*, TNAU, Coimbatore.

Krishnamoorthy,N. (1988). Farm analysis on information management and adoption of technological units of low cost seed treatment practices by small and marginal farmers. unpub: *M.Sc (Ag) Thesis*, TNAU, Coimbatore.

Lahoti, S.R; Chole R.R. and Rathi, N.R.(2010). Constraints in adoption of sugarcane production technology. *Agril. Sci. Digest.* **30**(4): 270-272.

Roop Kumar, Yadav, R.N. Mishra A.K., Akshay Kumar and Sunil Kumar. (2017). Study on socio-psychological, socio-economical profile and constraints faced by the sugarcane growers in Meerut District of Western Uttar Pradesh. *Progressive Agri.,***17**(1):168-171.

Satyajeet, Yadav,V.P.S. Yadav, S.P. and Sharma, U.K.(2019). Constraints faced by farmers in adoption of organic farming. *Indian Res. J. Ext. Edu.* **19**(1):89-90.

Sundara, B. (2011). Agro-technologies to enhance sugarcane productivity in India. *Sugar Tech,* **13**(4): 281-298.

● ● ● ● ●