



A Study on Utilization of Farm Equipment in Sugarcane Cultivation

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Cultural operations for sugarcane production are arduous especially planting, interculture, plant protection and harvesting. Modern sugarcane machinery and labour saving devices reduce the cost of sugarcane production, help in completion of operation in time, reduce human drudgery and enable efficient utilization of resources with better quality work output. It helps in increasing overall production and productivity. Therefore the present study is focused on the utilization of farm mechanization in sugarcane cultivation with a sample of 200 sugarcane growers. The data was collected from each respondent through a personal interview method with the help of a structured interview schedule. The study indicated that majority of the sugarcane growers were utilizing farm equipment at medium level. Variables like educational status, farm size, farming experience, annual income, innovativeness, availability of machinery, participation in farm machinery related training, scientific orientation and cropping intensity showed a positive and significant relationship with the utilization of farm equipment.

Keywords: Utilization, Farm equipment, Sugarcane cultivation

Sugarcane is one of the important cash crops in India. It is the main source of sugar, gur and khandsari in the country. It is cultivated in an area of about 4.9 million ha with a production of 68 tonne/ha (Anon, 2011). Total production of sugarcane has been increasing steadily from 300 million tonne in 1999-2000 to 340 million tonne in 2010-2011.

The energy consumption in production of sugarcane is the highest as compared to many other crops such as potato, wheat, maize, paddy, sorghum *etc.* Sugarcane production is labour intensive requiring about 3300 man hours for different operations. Considering the present trend of availability of labour for sugarcane production, it has been experienced that use of modern machinery is inevitable. Use of machinery helps in labour saving, timely operation, reduction in drudgery, improving quality of work, reducing the cost of operation and effective utilization of resources. In India considerable R & D work for design and development of agricultural implements and machinery for few operations have been carried out for other crops. In case of sugarcane crop, machinery has been developed. However, the adoptions of these implements and machinery have not been up to the desired level. Thus, there is a considerable mechanization gap, especially in the area of sugarcane planting, inter culture, plant protection, harvesting and ratoon management. Therefore it is necessary that concentrated efforts be made for adoption, development and popularization of sugarcane machinery for various cultural operations. So the present study entitled on "Utilization of farm equipment in sugarcane cultivation" was taken up.

Materials and Methods

The research was carried out in Villupuram and Erode districts of Tamil Nadu using *ex post facto* research design during 2012-13. Villupuram and Erode districts were purposively selected for the study considering the maximum area under sugarcane cultivation. From each district, two blocks were selected, from each block, three revenue villages were selected and accordingly six revenue villages were selected.

A sample of 200 sugarcane growers was selected by using proportionate random sampling technique from the selected four blocks. A structured interview schedule was prepared and administered to the sugarcane growers for collecting the required data. In this study, utilization has been operationalised as the extent to which the farmers have utilized the farm equipment in sugarcane cultivation. By having a elaborate discussion with the agricultural scientists, local extension workers and progressive farmers 52 recommended farm implements and machineries were studied. The responses were dichotomous in nature as 'utilized' and 'not utilized'. Two scores were given for every response of utilization and one for non- utilization.

Based on the total scores, the respondents were categorized into low, medium and high using cumulative frequency method. Percentage analysis was used to get meaningful interpretation about their pattern of utilization of different farm machineries, equipments and implements.

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Results and Discussion

It is inferred from Table 1 that majority of the sugarcane growers (69.00 per cent) had medium level utilization of farm equipment, 16.00 per cent of the respondents had high level of utilization followed by 15.00 per cent of the respondents who had low level of utilization towards farm equipment.

Table 1. Distribution of respondents according to utilization on farm equipment (n=200)

| Sl.No. | Category | Number | Per cent |
|--------|----------|--------|----------|
| 1. | Low | 30 | 15.00 |
| 2. | Medium | 138 | 69.00 |
| 3. | High | 32 | 16.00 |
| | Total | 200 | 100.00 |

It could be understood that most of the respondents possessed medium to high level of utilization. This trend might be due to the possible reason viz., better educational status, medium levels of innovativeness, information source utilization and it was observed that attitude towards farm mechanization is positive and much preferred because of easy availability at the field itself. This finding drives support from Persis (2007).

Distribution of sugarcane growers based on their farm equipment wise utilization.

1. Field preparation: It is known from Table-2 that cent per cent of the sugarcane growers used rotavators and nearly cent per cent of the sugarcane growers used cultivator (99.00 per cent) followed by disc plough (89.00 per cent), heavy duty ridger (89.00 per cent), power tiller (87.50 per cent), furrower (82.00 per cent), bund former (79.00 per cent), harrow (78.50 per cent) and leveller (74.00 per cent). More than half of the sugarcane growers used Mould Board plough (66.00 per cent), country plough (64.00 per cent) and tractor operated tiller (56.50 per cent) and less than one third of the sugarcane growers used trencher (31.50 per cent), clod crusher (28.00 per cent) and irrigation channel former (27.00 per cent) followed by only a few per cent of the sugarcane growers used tractor operated Pit digger (9.50 per cent) and laser leveler (8.50 per cent).

2. Setts preparation and planting: Majority of the sugarcane growers (82.50 per cent) used sett cutter followed by only few per cent of the sugarcane growers used bud chipping machine (8.50 per cent) and tractor drawn semi automatic planter (4.00 per cent).

3. Earthing up: More than three fourth of the sugarcane growers used spade (93.00 per cent), disc off barrer (76.50 per cent) and more than half of the sugarcane growers used mini tractor (69.00 per cent) and hand hoe (51.50 per cent).

4. Weeding & Intercultural: It could be observed from Table-2 that more than half of the sugarcane growers used power weeder (71.00 per cent), rotary

weeder (66.00 per cent), tractor operated cultivator (56.00 per cent), detrasher (51.00 per cent) followed by roto incorporator (21.50 per cent) and self-propelled weeder mulcher (11.00 per cent).

5. Irrigation: Majority of the sugarcane growers (71.50 per cent) used drip-surface irrigation followed by drip- sub surface (17.00 per cent).

6. Plant protection: Majority of the sugarcane growers used power sprayer (92.00 per cent), knapsack sprayer (67.50 per cent) and boom sprayer (63.50 per cent) followed by tractor operated mist blower (14.00 per cent).

Table 2. Distribution of sugarcane growers based on their farm equipment wise utilization.(n=200)

| Sl. No. | Equipment | Number | Percentage |
|---------|--------------------------------------|--------|------------|
| 1. | Field preparation | | |
| a. | Country plough | 128 | 64.00 |
| b. | M.B plough | 132 | 66.00 |
| c. | Bund former | 158 | 79.00 |
| d. | Cultivator | 198 | 99.00 |
| e. | Harrow | 157 | 78.50 |
| f. | Rotavators | 200 | 100.00 |
| g. | Clod crusher | 56 | 28.00 |
| h. | Leveller | 148 | 74.00 |
| i. | Furrower | 164 | 82.00 |
| j. | Tractor operated tiller | 113 | 56.50 |
| k. | Tractor operated Pit digger | 19 | 9.50 |
| l. | Power tiller | 175 | 87.50 |
| m. | Disc plough | 178 | 89.00 |
| n. | Laser leveler | 17 | 8.50 |
| o. | Heavy duty ridger | 178 | 89.00 |
| p. | Irrigation channel former | 54 | 27.00 |
| q. | Trencher | 63 | 31.50 |
| 2 | Planting the setts | | |
| a. | Sett cutter | 165 | 82.50 |
| b. | Bullock drawn planter | 0 | 0 |
| c. | Bud chipping machine | 17 | 8.50 |
| d. | Tractor drawn semi automatic planter | 8 | 4.00 |
| 3 | Earthing up | | |
| a. | Hand hoe | 103 | 51.50 |
| b. | Disc off barrer | 153 | 76.50 |
| c. | Spade | 186 | 93.00 |
| d. | Mini tractor | 138 | 69.00 |
| 4 | Weeding & Interculture | | |
| a. | Power weeder | 142 | 71.00 |
| b. | Tractor operated cultivator | 112 | 56.00 |

| | | | |
|-------|--|-----|-------|
| c. | Rotary weeder | 132 | 66.00 |
| d. | Detrasher | 103 | 51.50 |
| e. | Self-propelled weeder mulcher | 22 | 11.00 |
| f. | Roto incorporator | 43 | 21.50 |
| <hr/> | | | |
| 5 | Irrigation | | |
| a. | Drip-surface | 143 | 71.50 |
| b. | Drip- sub surface | 34 | 17.00 |
| c. | Sprinkler | 0 | 0 |
| <hr/> | | | |
| 6 | Plant protection | | |
| a. | Knapsack sprayer | 135 | 67.50 |
| b. | Tractor operated mist blower | 28 | 14.00 |
| c. | Boom sprayer | 127 | 63.50 |
| d. | Power sprayer | 184 | 92.00 |
| <hr/> | | | |
| 7 | Harvesting | | |
| a. | Sickle | 184 | 92.00 |
| b. | Whole stalk harvester | 8 | 4.00 |
| c. | Combined harvester | 23 | 11.50 |
| d. | Self propelled billet type | 0 | 0 |
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| 8 | Ratoon management | | |
| a. | Tractor drawn stubble shaver cum trash mulcher | 65 | 32.50 |
| b. | Tractor drawn rotary trash collector | 51 | 25.50 |
| c. | Detrasher | 121 | 60.50 |
| d. | Power tiller | 167 | 83.50 |
| e. | Rotavator | 189 | 94.50 |
| f. | Ripper | 136 | 68.00 |
| g. | Cultivator | 162 | 81.00 |
| h. | Ridger | 180 | 90.00 |
| i. | Bund former | 165 | 82.50 |
| j. | Trash chopper | 67 | 33.50 |

7. Harvesting: It could be observed from Table-2 that majority of the sugarcane growers used sickle (92.00 per cent) followed by combined harvester (11.50 per cent) and whole stalk harvester (4.00 per cent).

8. Ratoon management: More than three fourth of the sugarcane growers used rotavator (94.50 per cent), ridger (90.00 per cent), power tiller (83.50 per cent), bund former (82.50 per cent) and cultivator (81.00 per cent) followed by ripper (68.00 per cent), detrasher (60.50 per cent), trash chopper (33.50 per cent), tractor drawn stubble shaver cum trash mulcher (32.50 per cent) and tractor drawn rotary trash collector (25.50 per cent).

Association and contribution of profile characteristics on extent of utilization of sugarcane growers towards farm equipment

The relationship between the characteristics of sugarcane growers and their extent of utilization

about farm equipment was worked out by means of correlation analysis and the results have been furnished in Table-3.

In the case of sugarcane growers, the correlation analysis among 18 independent variables and utilization revealed that, the variables education, farm size, annual income, innovativeness, availability of machinery, participation in farm machinery related training, scientific orientation and cropping intensity showed a positive and significant relationship with the extent of utilization. Age and labour availability had a negative and significant relationship with the utilization of farm equipment. The results of multiple regression analysis showed a Rvalue of 0.706 which indicated that 70.60 per cent variation in utilization of farm equipment in sugarcane cultivation (Table 3). The strength of contribution of these variables could be explained as an unit increase, *ceteris paribus*, in farm size, farming experience annual income, innovativeness, availability of machinery, participation in farm machinery related training and scientific orientation would increase the utilization of farm equipment in sugarcane cultivation by 0.767, 1.013, 2.947, 1.272, 0.134, 0.875 and 0.140 units, respectively.

Farm size had positive and significant relationship with the utilization of farm equipment. Since large size of farm provides a favourable condition for the adoption of an innovation. Many of the farmers belong to the big farmer's category. Hence result is substantiated. Annual income had positive and significant relationship with the utilization of farm equipment and hence, majority of the respondents apart from cultivation involved in value addition. Innovativeness had positive and significant relationship with the utilization of farm equipment. This might be due to the reason that the sugarcane growers have gained adequate education, with rich farming experience, maintained more contact with extension agency, possessing more farm size and earned annual income as stated elsewhere may influence the sugarcane growers to be innovative, which could have triggered their innovativeness as the mentality to know more and gain more, out of sound exposure and handsome of finance to invest and innovate. Annual income and innovativeness increases the utilization because the farmers with high level income would be able to purchase or hire farm equipment for utilization.

Highly experienced farmers normally know about effectiveness of the modernized farm implements and machinery. Those farmers who had more land holdings and agriculture alone as their source of income normally adopt the improved farm implements in order to get more income from farming even during labour scarcity. By utilizing various information sources they might have been aware of the success stories of the farmers and might have used more implements and machinery. Since scientific orientation and training participation are the function of utilization, they might have also increased the

Table 3. The association and contribution of profile characteristics on extent of utilization of sugarcane growers towards farm equipment

| Sl.No | Profile characteristics | Correlation 'r' | Regression ('b' value) coefficient | SE of 'b' | 't' value |
|-------|---------------------------------------|-----------------|------------------------------------|-----------|-----------|
| 1 | Age | -0.162* | -2.237 | 0.456 | -4.908** |
| 2 | Educational status | 0.499** | 0.357 | 0.294 | 1.215 NS |
| 3 | Occupational status | 0.006NS | -0.243 | 0.356 | -0.683 NS |
| 4 | Farm size | 0.381** | 0.767 | 0.346 | 2.215* |
| 5 | Farming experience | 0.125NS | 1.013 | 0.367 | 2.763* |
| 6 | Area under sugarcane cultivation | 0.061NS | 0.000 | 0.013 | -0.013 NS |
| 7 | Annual income | 0.637** | 2.947 | 0.521 | 5.658** |
| 8 | Innovativeness | 0.415** | 1.272 | 0.420 | 3.031* |
| 9 | Information source utilization | -0.033NS | -0.157 | 0.093 | -1.688 NS |
| 10 | Social participation | 0.002NS | 0.066 | 0.105 | 0.630 NS |
| 11 | Economic motivation | 0.102NS | -0.102 | 0.066 | -1.551 NS |
| 12 | Risk orientation | -0.023NS | 0.072 | 0.041 | 1.765 NS |
| 13 | Credit orientation | 0.049 NS | -0.469 | 0.333 | -1.408 NS |
| 14 | Avilability of machinery | 0.485** | 0.134 | 0.048 | 2.822* |
| 15 | Participated in farm related training | 0.443** | 0.875 | 0.251 | 3.486** |
| 16 | Scientific orientation | 0.402** | 0.140 | 0.049 | 2.886* |
| 17 | Labour availability | -0.624** | -1.563 | 0.481 | -3.253** |
| 18 | Cropping intensity | 0.263** | 0.020 | 0.013 | 1.513 NS |

R2 = 0.706

F = 24.18**

*P < 0.05;

**P < 0.01;

NS–Non-significant

utilization rate. These are the possible reasons why these variables have shown positive relation with extent of utilization.

Majority of the respondents attend farm machinery related training organized by SAU, KVK, NGO, AMRC, CIAE, Sugar mills and SBI. Hence participated in farm machinery related training and scientific orientation had positive and significant relationship with the utilization of farm equipment. Availability of machinery had positive and significant relationship with the utilization of farm equipment. Since the custom hiring facility offered by the government, cooperative society, sugar mills, KVK and progressive farmers and the hiring ability of farmers to hire and purchase farm machinery has made easy availability of farm implements and machinery.

The negative significant variable is age and labour availability. This is negatively significant at one per cent level and its co-efficient value is -2.237 and -1.563. Thus, for unit increase in age and labour availability will contribute decrease 2.237 and 1.563 units in utilization of sugarcane growers towards farm equipment.

Age had negative and significant relationship with utilization of the respondents. This may be due to, as years pass by, a farmer accumulates experiences that are mostly successful in nature along with occasional failure in crop production, crop management etc. layer by layer. Whenever situation demands, he recalls those experiences to solve present conflict problem by his own. If this strategy fails to give the answer then he will seek the opinion from his friends and relatives in tune with recommendation offered by the officials.

Hence age is not a deciding variable with respect to utilization.

Labour availability had a negative and significant relationship with the utilization of farm equipment. The probable reason for this result might be due to migration of people, besides participation towards MNREGP had created a situation of labour scarcity. Hence they had to utilize farm machinery.

Conclusion

The present study revealed that sugarcane growers had medium level utilization of farm equipment. In the context of increasing commercialization of agriculture, mechanization is very important. There has been increase in the use of farm machinery in Indian Agriculture as it contributed to the increase in output due to timeliness of operations and increasing precision in input application. In conclusion, though mechanization has improved the state of agriculture in certain parts of the country, it is still a bottom of the pyramid story and it will remain so unless concrete measures are taken to propel farmers towards adoption of efficient farm mechanization practices especially in the farm equipment space. Given the right focus from various stake-holders, farm mechanization has the potential to play a critical role in increasing farm productivity and improving rural employment generation.

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