RESEARCH ARTICLE

CONSTRAINTS AND OPPORTUNITIES IN SUGARCANE RATOON MANAGEMENT - A PERFORMANCE ANALYSIS

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Abstract

'Ratooning' is an integral part of sugarcane cultivation practiced in most of the sugarcane growing countries of the world. In India, more than 50% of the cane area is always under ratoon. Although scientific studies state that ratoon crop leads to increased net returns through reduced cost of cultivation, it is also linked to low cane productivity due to its poor performance. The present study,conducted in Thirukovilur Division,Villupuram district of Tamil Nadu, India, involving sugarcane farmers, attempts to investigate such contrasting claims using descriptive research design. Technology mapping in the study area revealed that the key crop management technologies followed were off-barring, stubble shaving, gap filling through bud chip settlings, polybag seedlings and quartering of clumps, detrashing during fifth month, propping and trash mulching. The advantages of ratooning turned out to be reduced cost of cultivation especially in multiple ratoons, early maturing by a month, stabilization of cane area in a sugar mill, better quality cane, early crushing of cane, conservation of soil quality and structure due to minimal tillage, and less water requirement due to reduced crop duration. The major constraints expressed were high labor for trash disposal, untimely off barring, laborious gap filling, poor ratoon yield and non-suitability of soil for multiratooning. Farmers realized high net returns from ratoon crop through reduced cost of cultivation in spite of reduction in cane yield. Not withstanding several constraints, all the farmers favoured the adoption of ratooning in sugarcane. Although the arguments for a ratoon management are convincing, it should be recommended only when the plant crop or previous ratoon crop was healthy.

Key words: Sugarcane, ratoon management, advantages, constraints

Introduction

Sugarcane is an important cash crop in India both sociologically and economically occupying about 4% of the total cropped area.'Ratooning' or 'stubble cropping', i.e. raising a fresh sugarcane crop from the preceding plant crop stubble regrowth without fresh planting of setts (Sundara 2008), is an integral part of sugarcane cultivation practiced in most of the sugarcane growing countries of the world. Successive ratoon crops are sustained by water and nutrients absorbed by its own new root system (James 2004). In India, raising one to two ratoons is most common, though there are instances of 'multi-ratoons'. More than 50% of the cane area in the country is always under ratoons (Sivaraman, 2009, Gomathi et al. 2013).The percentage of ratoon area is relatively greater in the subtropics than in the tropics. Scientific studies reveal that ratoon crop leads to high net returns due to reduced cost of cultivation. On the other hand, ratoon crop is also related to low cane productivity due to its poor performance. The present study attempts to ascertain the veracity in such contrasting claims of high returns, low cost of cultivation and low productivity.

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Materials and methods

The study was conducted by using descriptive type of research design applying ex-post facto approach and the respondents were selected among sugarcane farmers practicing ratoon crop for at least one season. The locale of study was Thirukovilur division in Villupuram district, Tamil Nadu, wherein four sections *viz.,* Thirukovilur, Arumpakkam, Kanaganandhal and Keelathalanur were selected due to predominance of ratoon crop. A total of 32 respondents, eight from each section, were selected at random for conducting the study.

Results and discussion

The present study focused on the profile of farmers adopting ratoon management practices, technology mapping in ratoon crop, advantages of ratoon management practices, constraints in ratoon management and economics of ratoon crop compared to ratoon crop.

Profile of respondent farmers

The demographic profile of the participants of the study indicated that more than half (53.12%) were middle aged (35-50 years) and literates with up to secondary education (56.25%); agriculture was the main occupation for 84.37% and 25% had more than 25 years of farming experience. Majority of them (71.87%) were small and marginal land holders. Less than 31.25% of the farmers were self-sufficient in implement possession whereas majority (68.75%) possessed some farm implement or other and they partially depend on hiring.The mass media channels used by the respondents were radio, television and newspaper; nearly 90% owned radio / television and had the habit of watching agricultural programmes. Most of the respondents (59.37%) were members of any one of the social organizations like primary agricultural co-operative bank, self-help group, milk society, local body or consumer forum. The source of information about various ratoon management measures as expressed by 71.88% of the respondents was sugar factory officials followed by Agricultural Department officials (12.50%), input dealers (9.38%) and other farmers (6.24%). Crop rotation with paddy was followed by 62.5% and the rest opted for crop rotation with turmeric, pulses and maize.

Technology mapping in ratoon crop

Generally, good ratooning potential and good plant crop are the essential prerequisites of a variety for good ratoons (Chattha and Ehsanullah 2003; Ellis and Mery 2004). The inherent potential of a variety to give better yields in plant and ratoon crops is of paramount importance for sustaining high productivity. Acceptance of a variety by the farmers now depends very much on its ratooning potential (Arain et al. 2011). This has to be combined with basic ratooning operations, *viz.,* stubble shaving, off-barring, gap filling and proper crop management practices like early manuring, control of chlorosis and management of pests and diseases to obtain high ratoon yield (Rajula Shanthy 2009).

There is always a difference between 'what is' and 'what ought to be'. Farmers in the study area were quite prudent in technology adoption (Table 1). Ratoon crop management technologies *viz.,* off-barring was adopted by 93.75% of the respondents followed by stubble shaving (87.50%). Detrashing of the crop during fifth month was followed by 87.50% of the farmers mainly for fodder purpose. Generally, in addition to the cane tops, entire shoots, including the stems, leaves and cane tops, are utilized as fodder (Pate et al.1984; Martin 1997; Kawashima et al. 2002). Propping was done by 71.88% of the respondents as it is a wind prone area.

Table 1. Extent of adoption of various cultivation technologies by sugarcane growers

Technology	No. of respondents	% of respondents
New varieties	18	56.25
Wide row spacing	19	59.37
Basal application of organic manure/ FYM/ pressmud	10	31.25
Stubble shaving	28	87.50
Off-barring and root pruning	30	93.75
Gap filling		
A. Through polybag seedlings	14	43.75
B. Bud chip settling	15	46.87
C. Quartering of clumps	13	40.63
Basal application of P_2O_5 & one third of N&K	29	90.63
Top dressing of N&K in split doses	27	84.38
Application of bio-fertilizer	20	62.50
Release of *Trichogramma chilonis* egg parasitoid	21	63.64
Use of pheromone traps to control sugarcane borers	2	6.25
Spraying of urea + potash solution for drought management	20	62.50
Spraying of Fe_2SO_4 to control iron deficiency	10	31.25
Water management (~30 irrigations)	29	90.63
Detrashing	28	87.50
Propping	23	71.88
Trash mulching	17	53.13

More than 60% of the respondents adopted the technologies *viz.* application of bio-fertilizers like *Azospirillum* and *Phosphobacteria* and spraying of urea and potash at 2.5% for drought management at 110-120 days of the crop. Most of the farmers (59.37%) adopted wider row spacing of 4 to 5 feet and they applied farm yard manure or pressmud @ 2-3 t/ha as basal application.

A serious problem in ratoons is the occurrence of gaps, which when exceeds 20% causes considerable yield loss. Gaps occur because of poor sprouting owing to several reasons: cold or hot weather conditions, poor plant crops, attack of fungal diseases, insect pests, etc. (Bakker 1999). In spite of the fact that gap filling is inevitable, only around 40% of them had resorted to various means of gap

filling through bud chip settlings (46.87%), polybag seedlings (43.75%) and quartering of clumps (40.63%).

More than half of the respondents (56.25%) opted for growing new sugarcane varieties that are high yielders and good ratooners. Almost 53.13% of them adopted trash mulching either by applying in alternate furrows and in situ trash composting by using urea or microbial culture. Other farmers resorted to trash burning though not advocated. Scientifically, trash must be conserved and returned to the soil since it contributes towards organic matter and nutrient status of the soil (Sundara 2008).

The entire dose of phosphorous and one third of nitrogen and potassium were applied as basal by 90.63% of the farmers though at varied levels and 84.38% of them applied remaining nitrogen and potassium as two split doses.

Ratoons are more susceptible to moisture stress due to their shallow root system. Therefore, irrigations are required at frequent intervals, particularly in the early stage. Around 30 irrigations were given by the farmers under normal conditions.

Chlorosis is quite common in the area and is further pronounced in ratoons, more so because of poor nutrient status in the soils coupled with inability of the ratoons to absorb nutrients, particularly in the early stage. This is why on several occasions despite higher initial sprouting, higher mortality of shoots was observed thus leading to poor population. For chlorosis control, ferrous sulphate spray at 0.25% concentration along with urea was done at weekly intervals for young crops. The concentration of ferrous sulphate was enhanced to 0.5% for crops above 60 days age and done up to three sprays.

More than 60% of the respondents used *Trichogramma chilonis* egg cards for internode borer management. Few farmers in this area used pheromone traps as a management measure for borers (6.25%).

Advantages in adopting ratoon management practices

Even though ratoons are poor yielders, they are essential for overall economy of sugarcane cultivation (Hunsigi 1993). They offer several advantages and hence managing them scientifically could help derive full benefits of the ratoons.

The specific advantages are as follows:

- Ratoons are economical due to 25-30% reduction in the operational cost because of saving in the cost of setts and initial preparatory cultivation.
- Ratoons save time as they establish early and in general mature early and, hence, can be harvested early. Farmers can utilize the surplus time to grow other crops or on other enterprises in the farm.
- Ratoons stabilize the cane area of a factory. Each year, the factory will have assured cane area to the extent of ratooning, which is around 40-50% in most areas, therefore every year the effort for planting is limited to 50% of the total cane area required.
- Ratoons often give better quality cane. Therefore, they may help improve sugar recovery at the start of the crushing season.

In well maintained productive ratoons, cost of production per tonne of cane will be less than that of plant crop. Besides, a marginal farmer who cannot spend on inputs for raising good ratoons can still have a 'bonus' crop to sustain himself without much investment. This is one of the reasons for maintaining ratoons in spite of their poor performance.

Specifically, the respondent farmers accrued the following advantages as given in Table 2. All the respondents concurred that ratoon reduces the cost of cultivation. More than 50% farmers felt the advantages of early maturity, stabilization of cane area, better quality cane, substantial cost reduction in multiratooning, and providing canes for early crushing. Less than 50% reported the advantages of conservation of soil quality and structure due to no tillage and reduced water requirement.

Constraints in adoption of ratoon management technologies

Since ratoon crop occupies a major share of cropped area every year, it is imperative that the cane productivity of ratoon crop is also maintained by suitable management measures. Sundara (2008) stated that the major causes for yield decline in ratoons are poor sprouting, decline in soil nutrient status, soil compaction and incidence of pests and diseases.

Table 3 shows that the major constraints in adopting scientific ratoon management practices in their order are: trash disposal involves more labour (75%) followed by high cost for stubble shaving and off-barring (65.63%), untimely off barring operation (53.13%), lack of knowledge and conviction about recommended ratoon management practices (43.75%), gap filling is laborious (40.63%), untimely cutting orders (37.50%), poor ratoon yield (34.38%), non-suitability of the soil for multiratoons (25%) and variety is not suited for ratoon crop (18.75%).

Trash disposal involves more labour : Labour availability is one of the major hurdles faced by cane growers and as such trash disposal is tedious. Due to this, farmers are forced to burn the trash in the field itself.

***Off barring is not done in time* :** This is again due to non-availability of labour or due to non-availability of funds. Soil compaction is one of the major causes for the poor growth of ratoon cane (Kumar et al 2014). Compaction occurs due to long duration of the crop during which as many as 30 irrigations are given in the tropical belt. These irrigations and also movement of labourers for various field operations lead to soil compaction. Because of this problem, movement of air and moisture within soil is affected. This in turn affects development of root system and finally the absorption of nutrients and water. Hence,

Table 2. Perception of advantages in ratoon crop among sugarcane growers

Advantage	No. of respondents	% of respondents
Reduced cost of cultivation	32	100
Ratoon crop matures at least one month early	31	96.88
Ratoons stabilize the cane area in a mill area	28	87.50
Ratoons give better quality cane	20	62.50
Ratoon is considered as a bonus crop	21	65.63
Multiratoons give substantial cost reduction	19	59.38
Ratoons provide cane for early crushing	17	53.13
Conserves soil quality and structure due to no tillage	15	46.88
Water requirement is less due to reduced crop duration	14	43.75

Table 3. Perception of constraints in ratoon adoption among growers

Constraint	No. of respondents	% of respondents
Poor ratoon yield	11	34.38
Variety is not suited for ratoon crop	6	18.75
Gap filling is laborious	13	40.63
Soil is not suited for multiple ratoons	8	25.00
Off barring is not done in time	17	53.13
Trash disposal involves more labour	24	75.00
High cost for stubble shaving and off-barring	21	65.63
Lack of knowledge and conviction about recommended ratoon management practices	14	43.75
Poor yield in plant crop	9	28.13
Untimely cutting orders	12	37.50

besides obtaining a better crop stand, it is important to improve the soil physical conditions for the success of the ratoons.

Gap filling is laborious **:** In large farms, it is difficult to carry out gap filling as vast area has to be covered. Establishment of the settlings used for gap filling also poses problem in certain areas.

Poor ratoon yield : Many times, farmers get a drastic reduction in cane yield between plant and ratoon crop. This may be due to several reasons over which the farmer may or may not have control.

Non suitability of the soil for multiratoons : Most of the farmers' fields in the study area are in gardenland and this does not permit them to go for more than two ratoons.

Economics of management practices in ratoon vs plant crop

The establishment cost of plant cane is much higher than the cultivation cost of ratoon cane, a difference which has been increased by the widespread cultivation of modern vigorous hybrid varieties (Blackburn 1984). In deciding the size of the replanting program, and therefore the area to be ratooned, the cane farmer considers many factors, of which the most important are:

- the balance between the lower yield of cheaper ratoon cane and the higher yield of expensive plant cane
- competition from other high remunerative crops like fodder maize
- determining the net present value considering various factors like cost of plough out and replant, the rate at which money can be borrowed, estimated cane yields, etc.

However, among the attributes of a technology, relative economic advantage is an important criterion for adoption / discontinuance of any new technology. The economics involved in the adoption of ratoon crop vis-à-vis plant crop were worked out as follows:

Quick review of economics

Overall yield analysis

Average yield obtained by the respondents

From plant crop	: 99.63 t/ha
From ratoon crop	: 89.21 t/ha
Difference in yield	: 10.42 t/ha
% of yield decrease in ratoon	: 10.46

Economics involved

Cost of cultivation in plant crop/ha	: Rs. 1,98,710.35
Cost of cultivation in ratoon crop/ha	: Rs. 1,63021.38
Cost of production per ton (plant crop)	: Rs. 1994.48
Cost of production per ton (ratoon crop)	: Rs 1827.39

The study revealed that, from an area of 48.61 hectares owned by 32 farmers, the cane output obtained was 4842.72 tonnes which gave an average yield of 99.63 t/ha. Correspondingly, the ratoon output was 4335.57 tonnes which gave an average ratoon yield of 89.21 t/ha. The cost of cultivation per hectare in plant crop amounts to Rs. 1,98,710.35 as against Rs. 1,63,021.38 in ratoon crop. This narrows down to a marginal reduction in cost of per tonne of cane production from Rs. 1994.48 in plant crop to Rs 1827.39 in ratoon crop.The data also indicated that the average cane yield in ratoon crop was approximately 10 tonnes lesser than plant crop but compared to the cost incurred, it is acceptable to the farmers.

Good management of ratoons is very important to sustain productive crops over a long period. The highest priority in ratoon maintenance is to retain optimum plant population. The window of opportunity for this is often short because of the rapid growth of ratoons, and high demand on labour at a time when land preparation and planting often receive high priority. Consequently, although the arguments for a ratoon management are convincing, it should be recommended only in fields with a healthy plant or previous ratoon crop.

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