

The effects of time of planting and harvesting on yield parameters of sugarcane at SRI

P. M. Hoey¹ and A. H. M. D. Hossain

Sugarcane Research Institute, Ishurdi, Pabna, Bangladesh

ABSTRACT

The effects of differing times of planting and harvesting on various yield parameters of 11, 12, 13 and 14 month old crops planted in November, December, January and February of 1979-80 were studied at SRI (Sugarcane Research Institute). Both germination and tillering were significantly greater for the November planted cane than for all other planting dates. The October sugar recoveries (the earliest harvests) were significantly less than for all other treatments. There was a significant increase in recoveries for all treatments harvested in November and December, regardless of planting date. Sugar recoveries stayed at this level for the remainder of the experiment.

Yields appear to be both planting and harvesting dependant. Significant differences in millable canes and yields can be attributed to planting date. The effects of harvesting date are less pronounced. Generally, only cane harvested after February yielded significantly less cane.

INTRODUCTION

Sugarcane (*Saccharum spp*) in Bangladesh is planted from November to February (Anon. 1977-78). The crushing season usually commences in mid to late November and continues until March (Anon. 1977-78). It may be longer or shorter for individual mills and or for individual seasons, but the average season is approximately 120 days. It would be ideal if a planting and harvesting regime could be devised that would ensure maximum yields and recoveries from the standing crop throughout the crushing season.

It has been shown (Anon. 1979) that planting date has an effect on eventual yields in Bangladesh. Early planting gives increased yields. A similar effect has been reported in Taiwan (Chen and Tse, 1969). It has been shown elsewhere (Behl and Singh 1961, Hsia. *et. al.*, 1965) that harvesting date can effect the eventual yields of the crops. The effects of harvesting date per se has not been studied in this country. However, the effects of a combination of planting and harvesting dates has been investigated (Anon. 1981). The results have been variable. Results at SRI (Anon. 1979) have shown that there are increases in recoveries with maturity for several varieties. This trend has been reported for other areas (Barnes 1974, Humbert, 1968).

Because of the variation in planting and harvesting dates that exist within the industry, it would be beneficial to quantify the effects of these two factors on the various yield parameters of a crop of cane. An experiment was set up at SRI to test these effects.

¹Agronomy Adviser, Bangladesh Australia Sugar Industry Project, Sugarcane Research Instt. Ishurdi, Pabna.

MATERIALS AND METHODS

An experiment to test the effects of time of planting and harvesting on the eventual yields of sugarcane was set up in Block A-3 of SRI farm. The variety used was ISD. 16. The experiment was laid out in the field in a split plot design. Time of planting was allocated to the main plot with time of harvest as the sub plot.

The treatments were as follows :—

Time of planting	Time of harvest
November 1979 (N)	H ₁ : October 1980 (11 month crop) H ₂ : November 1980 (12 month crop) H ₃ : December 1980 (13 month crop) H ₄ : January 1981 (14 month crop)
December 1979 (D)	H ₁ : November 1980 (11 month crop) H ₂ : December 1980 (12 month crop) H ₃ : January 1981 (13 month crop) H ₄ : February 1981 (14 month crop)
January 1980 (J)	H ₁ : December 1980 (11 month crop) H ₂ : January 1981 (12 month crop) H ₃ : February 1981 (13 month crop) H ₄ : March 1981 (14 month crop)
February 1980 (F)	H ₁ : January 1981 (11 month crop) H ₂ : February 1981 (12 month crop) H ₃ : March 1981 (13 month crop) H ₄ : April 1981 (14 month crop)

All treatments were replicated four times. Trenching was carried out at a spacing of 3.5 feet. Aretan-6 treated three eyed setts were planted by hand in all treatments. A fertilizer mixture consisting of 1.19 pounds of urea per plot, 3.56 pounds of TSP per plot and 2.37 pounds of Potash per plot was applied basally to the trench before placement of the sett. A further application of 2.37 pounds of urea per plot was applied as a top dress at late tillering. Plot size was 21 feet by 30 feet.

Data collected throughout the experiment were germinations, tillering, millable cane, yields and sugar recoveries. statistical analysis was carried out at the end of the experiment.

RESULTS AND DISCUSSION

From the results in Table 1, it can be seen that the time of planting of the crop has a significant effect on both germination and tillering. Both germination and tillering were greater for the November (early) planted cane than for the other treatments. Further to this, observations in the earlier part of the experiment tended to suggest that germinations

Table 1. The effect of planting date on germination and tillering.

Germination Percentage		Tillers per Plot	
Treatment	Mean	Treatment	Mean
November plant	50.00 b	November plant	51.93 b
December plant	36.11 a	December plant	39.66 a
January plant	37.95 a	January plant	42.37 a
February plant	36.84 a	February plant	36.31 a

*Numbers with the same letters do not differ significantly.

for the earlier planted cane was faster than for the late planted cane. Date to first emergence data were compared to temperature data collected for the same period. From this, it appeared that there was a depression of emergence with a fall in temperature. Quantitatively observations suggest that there was a delay of emergence of about one day for every degree drop in temperature. Temperature influencing germination has been reported elsewhere (Barnes 1974, Humbert 1968).

If crops of equal duration are compared (Figures 1 and 2, Table 2), then the following can be seen. Only the February planted cane yields significantly less cane when 11 month crops

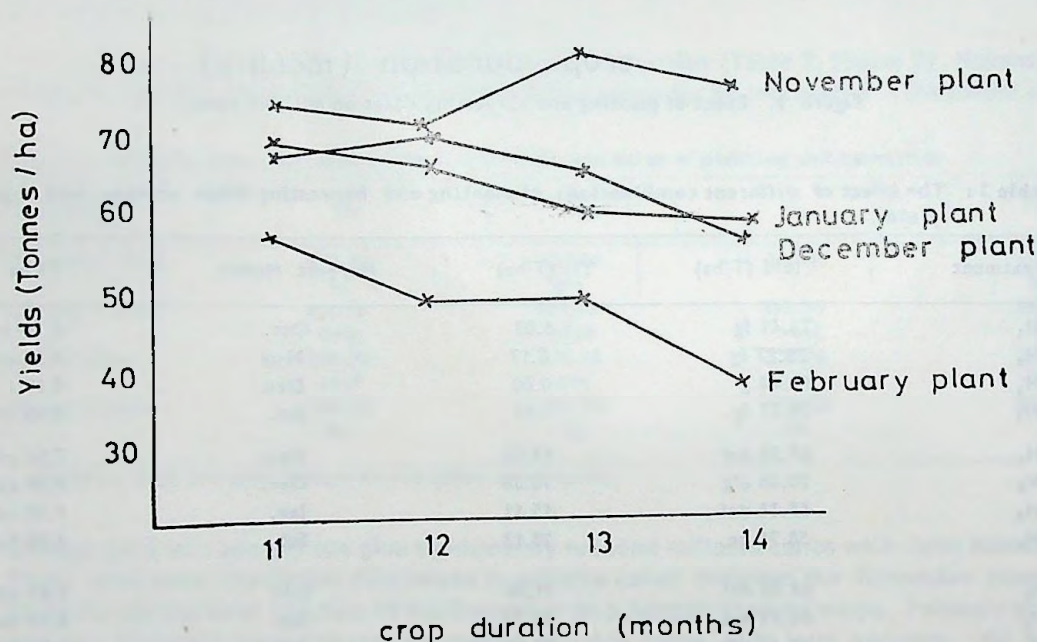


Figure 1. Effect of planting and harvesting dates on yields.

are compared. In other words, crops planted in November, December and January will give statistically similar yields if grown for 11 months. The same situation applies for crops of 12 months duration. With crops grown for 13 months, there is a decrease in yields with later planting date. November planted cane of 13 months duration gave the highest yields of sugar and cane for any of the treatments. The 13 month crops planted in December and

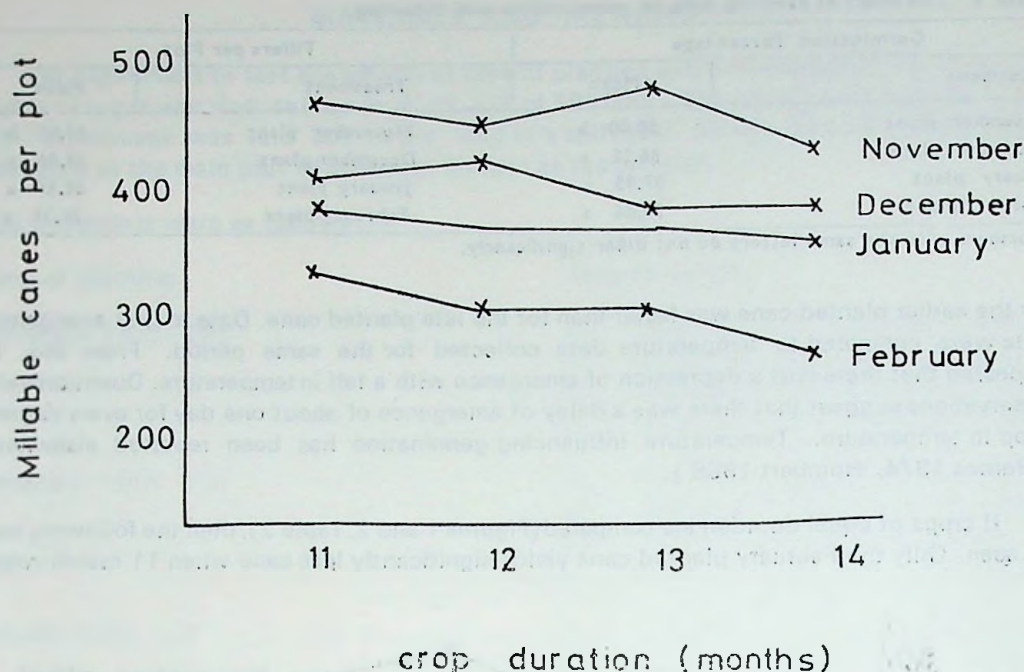


Figure 2. Effect of planting and harvesting dates on millable canes.

Table 2: The effect of different combinations of planting and harvesting dates on cane and sugar yields.

Treatment	Yield (T/ha)	YH (T/ha)	Harvest Month	TS/ha
NH ₁	74.41 fg	6.03	Oct.	6.50 bc
NH ₂	72.27 fg	8.17	Nov.	7.38 cd
NH ₃	80.44 g	0.00	Dec.	9.29 f
NH ₄	75.77 fg	4.67	Jan.	9.05 ef
DH ₁	67.36 def	13.08	Nov.	7.14 cd
DH ₂	70.06 efg	10.38	Dec.	7.89 cd
DH ₃	65.33 def	15.11	Jan.	7.60 cd
DH ₄	58.31 bc	22.13	Feb.	6.98 bcd
IH ₁	68.86 def	11.58	Dec	7.83 cde
JH ₂	66.73 def	13.71	Jan.	8.05 de
JH ₃	60.43 cde	20.01	Feb.	6.94 bcd
JH ₄	59.60 bcde	20.84	March	6.76 bcd
FH ₁	57.78 bcd	22.66	Jan.	6.95 bcd
FH ₂	48.23 ab	32.21	Feb.	5.74 b
FH ₃	49.35 bc	31.69	March	5.73 b
FH ₄	37.53 a	42.91	April	4.23 a

* Numbers with the same letters do not differ significantly.

January give significant reductions in yields when compared to the November crop of equal duration. However, these two crops did not differ significantly from each other. The February planted crop gave further significant reductions in yields. Crops of 14 months duration give results similar to the 13 month crops, the yields decreasing with later planting date. Again, the November planted crop gives the best yields. There are significant reductions in yields for the December, January and February planted crops. The December and January planted crops give statistically similar yields.

Yields were shown to be both planting and harvesting dependant. The effects of planting and harvesting were not independant of each other. It appears that time of planting, within limits, is the major factor governing yields. From both figure 1 and table 2, it can be seen that harvesting date had no significant effect on the eventual yields of November planted (early) cane over the range of dates tested. In the December and January planted cane, there was a similar trend. December and January planted cane, if harvested before the end of January of the following year, gave no significant reductions in yields. After this, yields declined significantly with later harvest dates. February planted cane gave reduced yields with later harvest dates. Generally, November planted cane gave the greatest yields irrespective of harvest time. December and January planted canes gave similar yields but were less than November planted cane. February planted cane gave further reductions in yields with later harvests.

A similar situation existed for millable cane production (Table 3, Figure 2). November planted cane gave the greatest number of millable canes for all treatments. December and

Table 3: Millable canes per plot as affected by different dates of planting and harvesting.

Treatments	H ₁	H ₂	H ₃	H ₄
November plant	474.00 hi	459.00 ghi	480.50 i	430.00 fghi
December plant	411.75 defg	422.50 efgh	384.50 cdef	386.00 bcd
January plant	389.50 cdef	370.75 cde	379.00 cdef	359.50 bcd
February plant	337.75 bc	307.00 ab	306.25 ab	257.75 a

* Numbers with the same letters do not differ significantly.

January planted cane did not give significantly reduced millable canes with later harvests. There were some significant differences in millable canes between the November planted harvests and the later harvests of the December and January planted crops. February planted cane showed a trend towards decreasing millable canes with later harvests. All harvests for the November planted canes had significantly greater numbers of millable canes than for the February planted canes. Decreasing millable cane with increasing age-at-harvest has been reported elsewhere (Humbert 1968, Hsia, et. al. 1965).

Sugar recoveries tended to increase with later harvests. There was a slight drop in recoveries at the end of the harvests but it was not significant (Table 4, Figure 3). October sugar recoveries (the earliest harvest) were significantly less than for all other treatments.

Table 4 : The effect of different treatments on recovery percentages.

Treatments	H ₁	H ₂	H ₃	H ₄
November plant	8.74 a	10.21 b	11.55 d	11.94 d
December plant	10.60 bc	11.26 cd	11.64 d	11.97 d
January plant	11.37 cd	12.06 d	11.49 d	11.35 cd
February plant	12.02 d	11.90 d	11.62 d	11.28 cd

*Numbers with the same letters do not differ significantly.

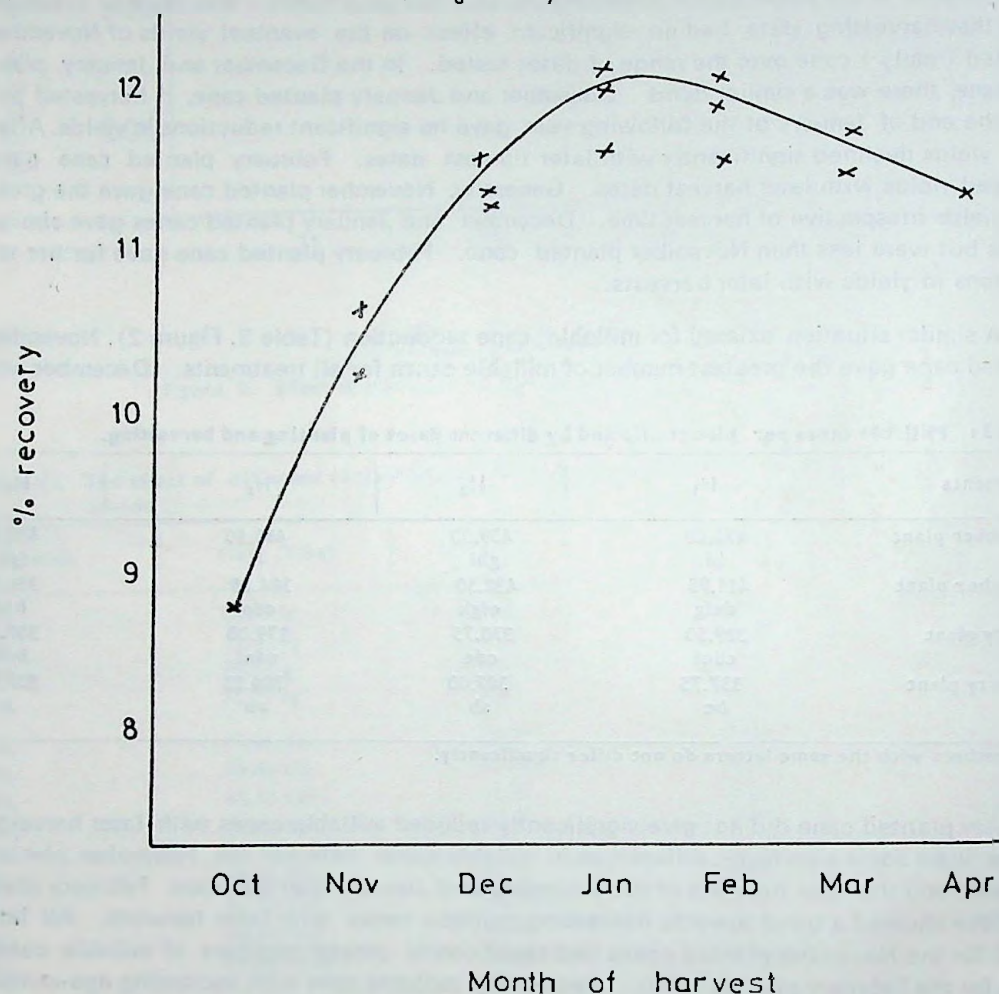


Figure 3. Change in recovery percentages with harvesting dates.

There were significant increases in recoveries for all treatments harvested in November and December, regardless of planting date. Sugar recoveries stayed at this level for the remainder of the experiment. There was a slight drop in recoveries for treatments

harvested after February but this was not significant. The data suggested that sugar storage was under the influence of environmental effects as all cane, regardless of planting date, showed a rapid increase in stored sugar from November to January. This period is equivalent to the colder months at SRI. The beneficial effect of cooler weather on maturity of cane has been reported elsewhere (Barnes 1974, Humbert 1978, Mathur & Behari 1980).

The results show that for ISD. 16 grown at Ishurdi, maximum yields and sugar recoveries are obtained when it is planted in November and December and harvested between December and January of the following year. Other combinations of time of planting and harvesting may result in losses of up to 50 percent. It seems possible that these results could also apply to other varieties in other cane growing areas of Bangladesh.

ACKNOWLEDGEMENT

The authors would like to acknowledge the assistance of Mr. M. A. Kashem, Scientific Assistant, who helped considerably with the field work for this study. The authors would like to thank Mr. Abdul Gafur, Assistant Statistician, for his help with the statistical analysis.

REFERENCES

- Anonymous, 1977-1978. The Sugar Commission, Report of 1977-1978, Dacca. M. I. S. Department, Bangladesh Sugar and Food Industries Corporation.
- Anonymous, 1979. Annual Report. (Special Issue), 1973-1978. Sugarcane Research Institute, Publication No. 5, July 1979. p 23-88
- Anonymous, 1980. Annual Report, 1979 & 1980. Sugarcane Research Institute Publication No. 19, January 1981, p 24-37.
- Behl, K.L., and Singh, H. 1961. Yields and quality of sugarcane as affected by different dates of harvesting and application of irrigation during the hot months. *Indian Sugar*. 11 (4) : 565-579
- Barnes A. C. 1974, The Sugar Cane. 2nd. ed. Aylesbury : Leonard Hill Books.
- Chen, R.S., and Tse, C.C. 1969. Effect of planting time and planting density on the yield of plant and ratoon of Autumn-planted Sugarcane. *Taiwan Sugar*. January-February p. 20-23
- Humbert, R. P. 1968. The growing of Sugarcane. Revised edition. Amsterdam : Elsevier Publishing Company.
- Hsia Yu-Jen. Hu Toung-Li and Chen Rong-Shyan, 1965. Effects of harvest time on the sugar content and yield of NCo. 310 sugarcane variety. *Taiwan Sugar Quarterly Special Issue-Taiwan Sugar Experimental Station*. July- September. 20-28
- Mathur, P. S. and Behari, C. 1980. Growing sugarcane in different states in India. 2nd. ed. (revised). Sahibabad : Directorate of Sugarcane Development. Government of India, Ministry of Agriculture.