

CHEMICAL STOOL PRUNING

By T. M. C. BOEVEY

South African Sugar Association Experiment Station, Mount Edgecombe

Abstract

The introduction of mechanical harvesters in the mid 1960s brought about a fundamental change in the approach to field and cane row management. Fields planned for mechanisation require interrows which are uncluttered by root material and which will allow the smooth passage of mechanical harvesting equipment.

In 1987 the SASA Experiment Station "Pretrasher" was introduced, a machine which was primarily developed to remove the trash from standing cane to assist in the control of eldana borer. This further underlined the need for efficient cane row management techniques, particularly in maintaining an even cane face and consistent interrow width, if cane breakage and trampling were to be avoided.

The need for a machine to meet these requirements led to the development of the "chemical stool pruner", which operates on the principle of killing the unwanted portion of the cane row with herbicide.

A field trial to ascertain the extent to which stool pruning affects various agronomic factors was conducted, and the results are discussed.

Introduction

Commercial cane on the SASA Experiment Station La Mercy farm is harvested almost entirely mechanically. Prototype harvesting machines, designed by the Experiment Station, are first developed and tested on the La Mercy farm before being released as commercially viable machines. The standardisation and optimisation of a proven base cutter design led to the need to contain the cane row width in late stage ratoon crops, otherwise it was necessary to increase the number of workers required to cut the remaining cane by hand.

The results of studies on the effect of stripping cane leaves from nearly mature cane showed that the incidence of damage from eldana borer could be substantially reduced (Carnegie and Smaill, 1982). The cost of this operation, if carried out manually, is relatively high, requiring about 150 man days per hectare. The feasibility of using a machine to perform this task was investigated and led to the design and development of the SASA Experiment Station prototype "Pretrasher". The Pretrasher is driven between the cane rows and the action of rotating drums that are fitted with spring tines, removes the trash from the cane and lays it in the interrow. The need for an even cane façade and an uncluttered interrow ahead of the machine is essential to achieve a satisfactory result.

At harvest, cane is either burnt before cutting or cut green and manually stripped of leaves by the cane cutter. The successful adaptation of the mechanical front-end cutter, to trash and top the cane in the row adjacent to the one being cut; further emphasised the need for an even cane façade.

The most common types of stool pruners are usually of the plough disc or rotary tiller types, both of which remove the unwanted part of the cane stool and deposit it in the

interrow. The limitations of these types of stool pruners are that the material left in the interrow hampers the smooth passage of the pretrasher, which, because it must be narrow enough to fit between the rows, also has a very low ground clearance to enable it to maintain stability on steep slopes.

Method

The chemical stool pruner was constructed on a toolbar which is mounted on a tractor three point linkage.

The brackets of the two rolling coulters are bolted to the toolbar and are set 500 mm apart. The coulters act as mechanical seals with the ground and also shield the chemical spray from reaching the untreated part of the row. If required, they will also penetrate the ground far enough to sever the superficial root system below the growth zone, thus preventing translocation of chemical across the roots.

A 300 litre herbicide tank is mounted above the coulters and holds the chemical to be sprayed. The chemical is sprayed onto the unwanted portion of the row through two nozzles mounted 400 mm above the ground, one on each side of the coulters. The nozzles used are the 45003 Spraying Systems Teejets which cover half the interrow per side plus 30% overlap. The nozzles are directed slightly forward so that the coulters guard the untreated part of the row. In addition, rubber sheets suspended from each end of the toolbar prevent spray drift from reaching the outer rows.

The vehicle is designed to operate at about 6 km/h but this will depend on the prevailing condition of the cane interrow. The chemical is pumped from the tank via a suitable strainer to the nozzles at a delivery rate of 2,5 l/min per nozzle at a pressure of 150 kPa. A 12 volt battery drives the Flojet pump mounted beneath the tank.

Procedures

In 1989 a trial was conducted to establish the effect of stool pruning on agronomic factors, particularly plant population, tons cane per hectare, tons sucrose per hectare and stalk length. Roundup was used to kill the unwanted part of the stool and was applied at a rate of 8 l/ha.

The experiment was laid out in 12 replications, each consisting of four control and four treated rows. Two panels of cane were used, one being treated in September (lower panel) and one in December (upper panel).

Each nett plot size was two rows of 1,5 m x 20 m, separated by guard rows on each side. Half the plots were sited at the edge of each panel and half midway down the field (see Figure 1).

Disturbance to the superficial root system was minimal compared with conventional methods of stool pruning, where root disturbance is inherent in killing the unwanted parts of the stool.

The trial was conducted on a Shortlands form soil and agronomic details are listed in Table 1.

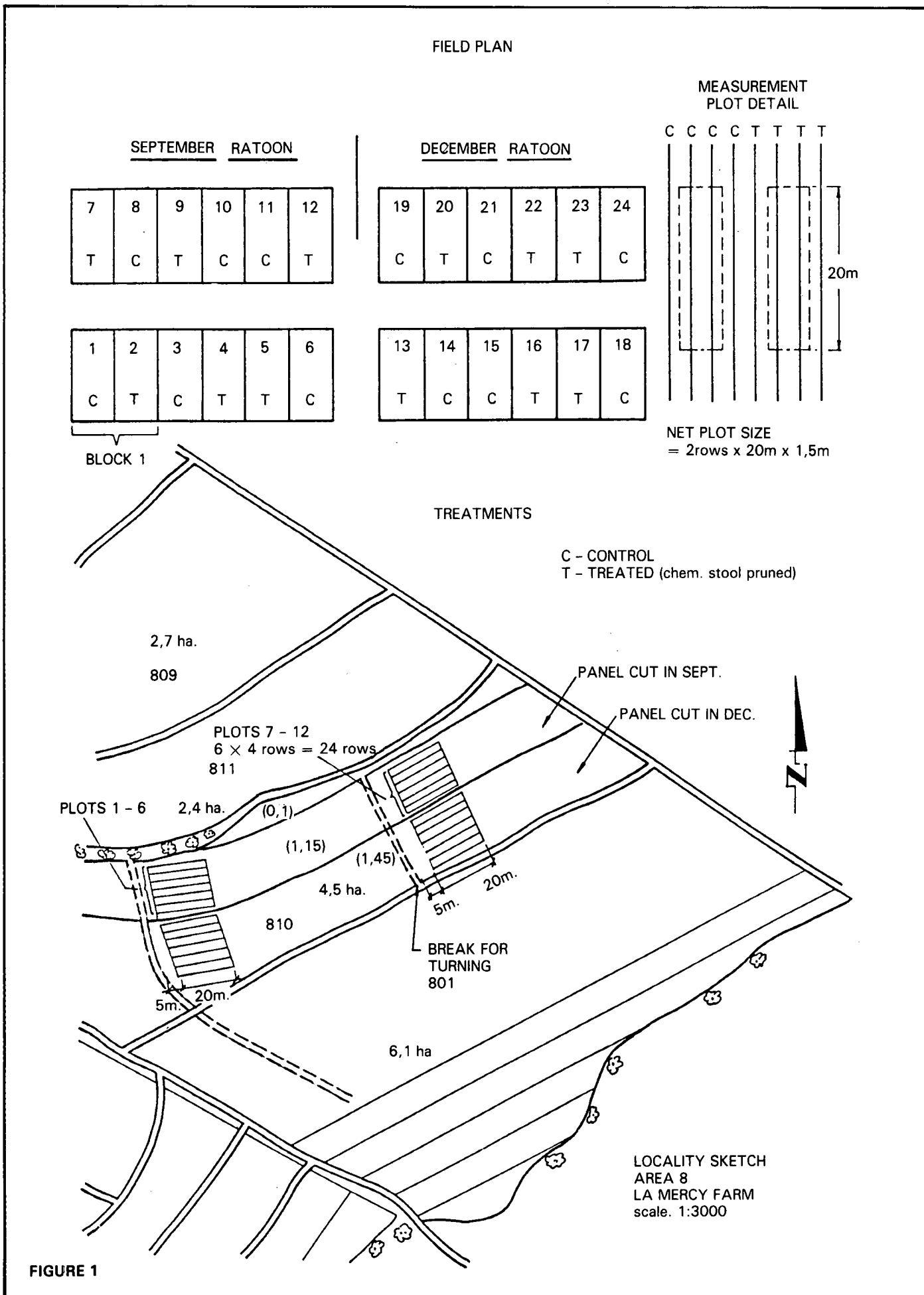


FIGURE 1

Table 1
Agronomic details of the trial

Variety	: NCo376
Row spacing	: 1,5 m
7th ratoon harvested before pruning	:
Age at pruning	: 12 weeks
Soil system	: Umzinto coast lowlands
Soil form	: Shortlands
Fertilising	: As prescribed by the Fertiliser Advisory Service
Weed control	: The stool pruning operation made the initial weed control regime unnecessary; in subsequent ratoons normal weed control was practised.

Table 2 shows that the site chosen for stool pruning contained some late stage ratoon cane, which showed no signs of moisture stress or disease and was therefore considered suitable for the purposes of the trial. In practice, however, it would be preferable to prune earlier stage ratoon cane, before the stools become too wide and more plant growth has to be destroyed. A speedy recovery in yield is desirable, and this aspect of the operation must be balanced against the cost of pruning cane in the same field more frequently.

Table 2
Chronological order of the trial

Year	Month	Details	Ratoon
1989	August	lower panel harvested	R 7
	November	upper panel harvested	R 7
1989	November	lower panel stool pruned	R 8
	January '90	upper panel stool pruned	R 8
1990	September	lower panel harvested	R 9
	November	upper panel harvested	R 9
1991	September	lower panel harvested	R10
	November	upper panel harvested	R10

Results

The results (Table 3) for the September and November ratoons were combined and expressed as a percentage difference between the treated and control plots. The results indicated that there was no statistical evidence of a difference in response at the 5% level between the treated and control plots.

Table 3
Average response from the trial representing the difference between control and treated plots

	Treated - Control	SED	LSD (0,5)	% + SED
t cane/ha	- 2,20	± 2,65	5,90	-2,0 ± 2,4
suc % cane	0,10	± 0,21	0,47	0,7 ± 1,5
t suc/ha	- 0,05	± 0,30	0,67	-0,3 ± 2,0
stalk population	- 28,00	± 7,70	17,00	-14,1 ± 3,9
stalk length	- 0,05	± 2,90	6,40	0,0 ± 1,4

Figure 2 shows that stalk population was reduced to 17,5% below the level of the control plots for the first ratoon following pruning, after which the population increased slightly to 14,5% lower than control. Tons cane and tons sucrose per hectare, as well as stalk length, were initially reduced but reverted to nearly the same levels as those recorded before stool pruning.

Conclusions

Although the prototype machine was built with the intention of pruning one row at a time, it would be more economic if at least three rows were treated simultaneously; in which case, each coulter should be individually sprung to accommodate any irregularities on the ground.

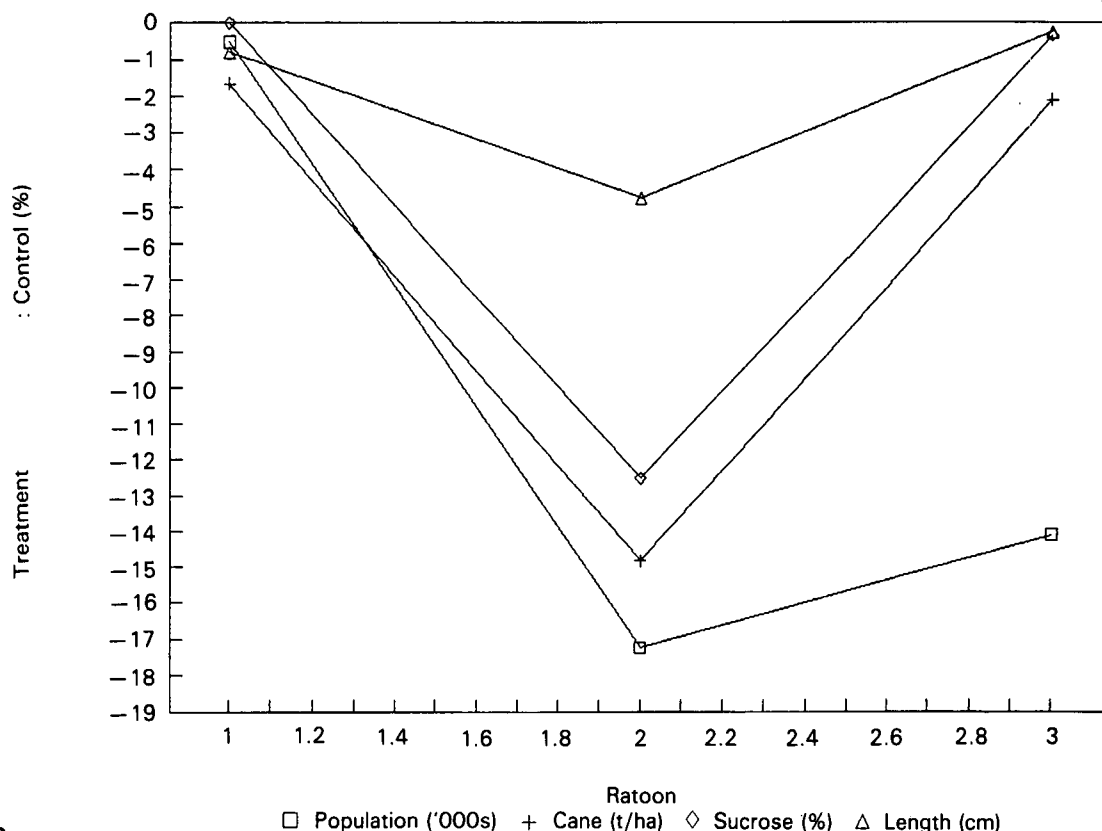


FIGURE 2

The cost of the initial decline in yield, in the first ratoon after pruning, must be offset against the reduction in the cost of weed control in the season after pruning and against the saving if re-planting is delayed. Two ratoons after pruning will see a return to normality for all agronomic aspects except stalk population, which will persist for several more ratoons before pruning once again becomes necessary.

From a visual observation it was apparent that there was a reduction in the number of workers required to cut the stalks left by the harvester. Had pruning been done after the fourth or fifth ratoon, there would have been no need to increase the number of workers in the first place. The sheer façade of the row is expected to reduce cane losses from trampling in the pre-trashing, de-trashing and harvesting operations.

REFERENCES

Carnegie, AJM and Smaill, RJ (1982). Pre-trashing of sugarcane as a means of combating the borer *Eldana saccharina* Walker. *Proc S Afr Sug Technol Ass* 56: 78-81.