

THE LA MERCY PROJECT

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Abstract

The La Mercy project commenced in 1974 when the Experiment Station acquired the lease of the land expropriated for the La Mercy airport. The objectives of the project are:

- to provide as much practical information as possible to the South African sugarcane grower on the adaptability of mechanized operations to different conservation methods;
- to provide performance and cost data on all methods and operations;
- to compare the performances of different cane harvesting machines and systems.

Records and observations indicate that crop cover is the most important conservation factor, even more so than field layout because soil erosion was observed only in unplanted or recently planted fields. The performance of mechanical harvesters was affected by crop yield and recumbency, steepness of slope, conservation structures, short rows and narrow headlands. The La

Mercy project afforded the Experiment Station the opportunity to establish performance standards for most machines and machine systems used for sugarcane production so that their performance under typical coastal and well defined field conditions can now be predicted.

Introduction

The first four years of the La Mercy project, were reported by Fourie & de Beer¹ in 1979. This report covers the next four years and summarizes the practical information obtained on the adaptability of mechanized operations to different conservation methods; provides performance (cost) data on all methods and operations and compares the performances of different cane harvesting machines and systems.

Four different conservation methods or layouts were described in detail in the previous paper. The field boundaries for each of the layouts are shown in Figure 1. Area 4 is 33 hectares in extent and the other three are 26 hectares each.

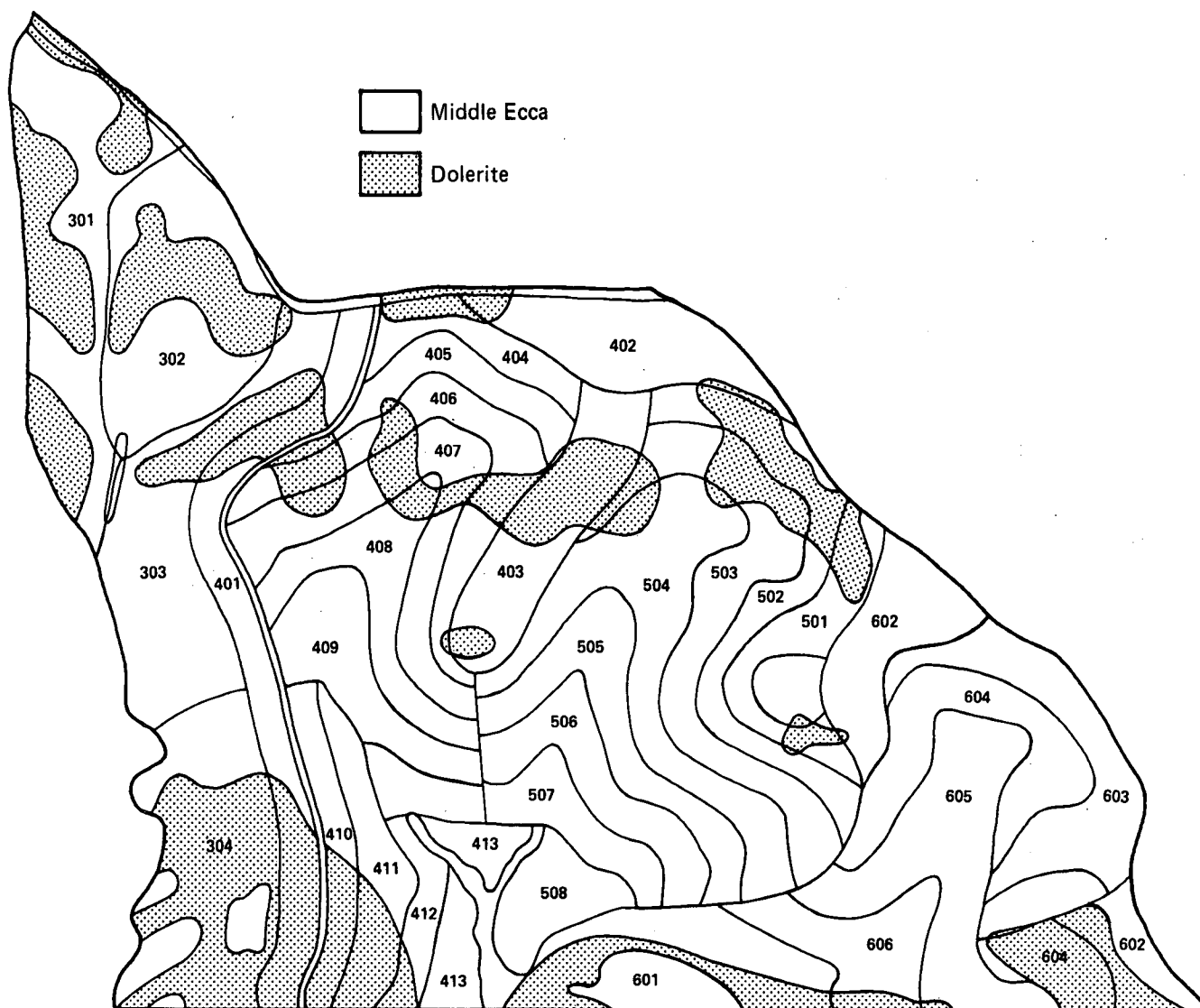


FIGURE 1 Field boundaries for each of the layouts.

Time studies were done on all operations involved in cane production. The tractor hours, labour and materials required for each task were recorded. It was expected that by comparing costs and machine performance for a number of crop cycles, the effect of the layout design on machine efficiency could be deduced.

Field Layouts and Conservation

The first heavy rains to affect the La Mercy project occurred in the autumn of 1976 when unplanted and recently planted fields in Areas 4 and 5 were badly damaged. However waterways and terraces performed well and required very little repair. Two fields in Area 6 with cane which had just germinated were severely damaged as were newly grassed waterways.

The first major flood to affect La Mercy occurred during the first week of February 1977 when 220 mm of rain fell. The well established waterways coped well with the large volumes of runoff water but the more recently established waterways suffered the greatest damage.

Cane was well established in Areas 3 and 4 and the dense canopy provided maximum protection against soil movement, even in field 304 which was very steep. The stability of the Rydalvale series soil in Area 3 was apparently a major factor in limiting soil loss. Because the terraces and waterways were

well established and protected, they were able to dispose of the runoff water effectively. Only in Area 5 were some fields damaged because the cane had recently been planted and canopy formation was incomplete. Runoff intensities were markedly greater in these areas and as a result terraces were overtopped at the approaches to the waterways. The only damage which occurred in Area 6 was where artificial breaks were not completely grassed and ruts formed across the breaks. Soon before it rained, field 603 was slashed and the regrowth sprayed with Roundup to simulate minimum tillage so that the intended harvesting cycle for the area could be completed. Where this was done, the trash and dying crop afforded adequate protection.

The next major period of runoff occurred when 141 mm of rain fell from 28 to 30 August 1981. Because cane had almost reached the full canopy stage over the whole of Area 3, little surface damage was evident. Some movement of soil occurred at the lower ends of the steeper interrows. The soil surface in recently harvested fields in Area 4 was smooth and flat but there was no erosion. In Area 5, sheet erosion occurred in the recently harvested fields below terraces which had overtopped because of inadequate channel capacity. In Area 6, the soil surface in the interrows where the cane canopy was incomplete, had capped and slight sheet erosion occurred. Rills were also washed onto breaks at the lower edges of some panels even though the cane was fully canopied.

TABLE 1

Field characteristics and problems encountered by mechanical harvesters in the four layouts (Rating: 0 = no problem; 4 = severe problem)

| Field | Area ha | Av. slope % | Max. slope % | Problems with | | | | | Lines /ha | Average line (m) |
|-------|---------|-------------|--------------|---------------|-------|------------|------------|---------------|-----------|------------------|
| | | | | Head-lands | Slope | Structures | Short rows | Row direction | | |
| 301 | 8,0 | 10 | 36 | 1 | 2 | 2 | 0 | 2 | 76,4 | 87,3 |
| 2 | 7,0 | 17 | 42 | 4 | 3 | 4 | 2 | 2 | 52,6 | 126,7 |
| 3 | 6,6 | 8 | 14 | 0 | 0 | 3 | 0 | 0 | 15,8 | 421,9 |
| 4 | 7,1 | 21 | 42 | 1 | 2 | 2 | 0 | 2 | 29,7 | 224,5 |
| | | | | | | | | | 45,1 | 147,8 |
| 401 | 5,2 | 7 | 18 | 0 | 0 | 0 | 0 | 0 | 6,5 | 1 025,6 |
| 2 | 3,7 | 7 | 14 | 0 | 2 | 0 | 0 | 0 | 17,6 | 378,9 |
| 3 | 4,1 | 14 | 25 | 3 | 1 | 0 | 0 | 0 | 11,7 | 569,8 |
| 4 | 1,6 | 15 | 26 | 1 | 1 | 3 | 2 | 0 | 25,6 | 260,4 |
| 5 | 2,0 | 12 | 25 | 0 | 0 | 1 | 0 | 1 | 22,0 | 303,0 |
| 6 | 3,7 | 7 | 14 | 0 | 0 | 0 | 0 | 2 | 13,2 | 505,1 |
| 7 | 4,2 | 14 | 24 | 1 | 1 | 0 | 0 | 1 | 18,3 | 364,3 |
| 8 | 3,1 | 10 | 19 | 1 | 0 | 0 | 4 | 0 | 27,7 | 240,7 |
| 9 | 3,0 | 9 | 14 | 1 | 0 | 0 | 3 | 1 | 33,3 | 200,2 |
| 10 | 1,9 | 9 | 18 | 1 | 0 | 1 | 0 | 0 | 15,3 | 435,7 |
| 11 | 2,6 | 11 | 25 | 0 | 0 | 0 | 0 | 0 | 23,8 | 280,1 |
| 12 | 2,2 | 12 | 27 | 2 | 2 | 1 | 0 | 0 | 30,5 | 218,6 |
| 13 | 1,9 | 11 | 18 | 2 | 4 | 0 | 1 | 0 | 100,9 | 66,1 |
| | | | | | | | | | 21,2 | 314,5 |
| 501 | 2,6 | 20 | 37 | 4 | 4 | 2 | 3 | 1 | 38,8 | 171,8 |
| 2 | 4,0 | 18 | 31 | 0 | 3 | 2 | 3 | 3 | 19,3 | 345,4 |
| 3 | 5,5 | 15 | 26 | 1 | 2 | 2 | 2 | 2 | 22,2 | 300,3 |
| 4 | 6,3 | 16 | 36 | 2 | 2 | 3 | 4 | 3 | 23,5 | 283,7 |
| 5 | 3,6 | 14 | 20 | 0 | 1 | 1 | 2 | 1 | 42,8 | 155,8 |
| 6 | 2,8 | 11 | 16 | 3 | 0 | 0 | 0 | 0 | 44,6 | 149,5 |
| 7 | 1,9 | 7 | 16 | 3 | 0 | 0 | 0 | 0 | 51,6 | 129,2 |
| 8 | 2,0 | 7 | 12 | 3 | 0 | 0 | 4 | 0 | 63,0 | 105,8 |
| | | | | | | | | | 33,1 | 201,4 |
| 601 | 5,0 | 14 | 32 | 2 | 3 | 0 | 2 | 0 | 40,4 | 165,0 |
| 2 | 3,2 | 7 | 16 | 0 | 0 | 0 | 0 | 0 | | |
| 2 | 1,6 | 14 | 18 | 0 | 0 | 0 | 0 | 0 | 126,6 | 53,1 |
| 3 | 4,2 | 14 | 21 | 2 | 1 | 1 | 0 | 0 | 23,8 | 280,1 |
| 4 | 3,9 | 9 | 14 | 0 | 0 | 1 | 1 | 0 | | |
| 4 | 1,6 | 14 | 19 | 1 | 0 | 0 | 0 | 1 | 31,3 | 213,0 |
| 5 | 5,7 | 12 | 18 | 2 | 0 | 0 | 3 | 0 | 34,0 | 196,1 |
| 6 | 2,7 | 12 | 19 | 1 | 1 | 1 | 0 | 0 | 53,7 | 124,1 |
| | | | | | | | | | 41,7 | 159,9 |

After five years of drought, the rainfall from July 1983 to January 1984 (except September 1983) was higher than normal. Precipitation rates were low enough to allow most of the rain to be taken up by the soil. However, the project area received 24,5 mm in 20 minutes on 2 January 1984, an intensity equivalent to 73,5 mm per hour. The extent of sheet and rill erosion in the fields was again proportional to the stage of crop canopy and specific erodibilities of the two prevailing soil series, Rydalvale and Windermere. Well grassed waterways, terraces, breaks and roads with the correct dimensions all functioned adequately.

The underground drainage systems installed in all four layouts performed satisfactorily but required maintenance during the wet seasons. They were effective in eliminating wet areas in the fields but in areas 4 and 5, the soil near the upper ends of the main waterways, where they were joined by tributaries remained wet. The affected areas have now been drained by extending the open channels from the lower reaches of the main waterways further up the slope, and since cane has been planted, the problem appears to have been solved.

The elimination of the wet areas in fields contributed to good cane growth and full canopy was achieved quickly, thus soil protection was improved indirectly.

Field Layout and Mechanization

Area 3

Crossing the terraces with machines in Area 3 was more difficult than was expected. Planting was done mechanically with a County 4WD (equal size wheels) tractor. The sudden increase in slope (effectively to 42%, Table 1) when crossing terrace banks in steep areas caused the County to crab and slide which was hazardous at times.

These problems were worse for mechanical cutting because the drop into the water carrying portion of a terrace, when approached from above, was too steep. The lower sides of the terraces were much too steep and the topper swung too far across to reach the tops of the row being cut and base cutting was also poor. These problems were encountered with all the harvesting machines but were worse for larger machines such as the McConnell II. An advantage of this layout was that where the rows ran across the slope but slightly downhill in steep areas (slopes of 34%), fewer problems were experienced with mechanization than when rows were on the contour.

It was concluded that it is difficult to construct a terrace broad enough for use as an extraction road, with sufficient channel capacity to cater for runoff water, and yet be so designed that machines can traverse it with ease. Where there are rapid changes in slope and aspect, the long line system should not be implemented because cane rows would have to cross the terraces. Area 3 would nevertheless be the most difficult area to mechanize, regardless of the conservation system imposed on it because of its uneven topography.

Area 4

Slopes in Area 4 are more gentle and regular than in Area 3 so mechanized operations were more efficient. Mechanical planting was relatively easy but the many short rows in fields 408 and 409 caused efficiency to drop. When approaching a terrace from below gradients increased rapidly and some short rows could only be cut mechanically by entering the field from the terrace above. Little difficulty was experienced with short rows when the harvester could enter the terrace from above and it is therefore preferable to have short lines running into a lower terrace rather than into a terrace bank above.

A problem encountered with most harvesters when cutting the plant crop was that the ridges in some fields were too high. In some instances (fields 403, 412, 413) headlands were also too narrow to allow the machines to turn around quickly. The

Bell cutter could only cut downhill in some sections (403) even after some modifications had been made to improve traction.

It was concluded that Area 4 could have been laid out according to any of the other conservation systems and still been acceptable for mechanized sugarcane farming.

Area 5

Row lengths in Area 5 were well suited to mechanical planting but near the waterways where the short lines had one end on the lower side of a terrace, planting was difficult, as was the case in Area 4. This caused machines and especially harvesters to crab and there was erratic base cutting. This problem was worse in fields 501, 502, 503 and 504, and some headlands (fields 501, 504, 506, 507, 508) were also too narrow for quick turning. Short rows and poor row direction were the major factors making mechanical cutting in fields 501, 502, 503, 504, 505 and 508 difficult.

It was recognized that row spacing would have to be accurate in Area 6 if subsequent operations including replanting by the minimum tillage method, were to be done mechanically. A planter was mounted on a County 4WD tractor and although some wet areas caused problems this operation proceeded well. The Sasex cane cutter had no difficulties with cutting the plant crop except in some fields where gullies had been washed across the rows. Turning was difficult in fields 601, 603 and 606 and field 601 was the most difficult to cut because of the steep slopes and short rows which also occurred in field 606.

The problems which were encountered by mechanical cutters as a result of field layout are summarised in Table 1. According to these ratings, most problems were encountered in Areas 3 and 5.

The access by machines to the fields in all weather conditions was significantly improved by the underground drainage systems which were installed in all four areas.

Comparing Field Layouts in Terms of Machine Efficiency

The effects of inflation complicate cost comparisons of operations done at different times; tractor hours and man-days expended on each operation are more convenient measures of field performance.

Because cane yields and the times and seasons of harvest differed from area to area, the differences in machine efficiency could not be ascribed to field layout alone. This is illustrated by the performance of the Midway cane cutter in Field 508, which was cut three times by this machine at rates of 10,5, 14,3 and 7,6 tons per hour (or 0,25, 0,13 and 0,22 hectares per hour) for yields of 42, 112 and 34 tons per hectare in 1980, 1982 and 1983 respectively. The performance of the Midway in different fields within a layout also varied much more than did its average performance between layouts.

A further attempt was made to quantify differences between fields and to establish relationships between machine performance and slope and number of lines per hectare. The rows in all fields were counted and measured. A performance factor which is graded from 0 to 10, was obtained from the product of slope and number of lines per hectare and was calculated for each field (Table 1). The higher the index, the more difficult

TABLE 2

Correlation coefficients between indices, lines/ha, slope, litres/ha and hours/ha

| | Lines/ha | Slope | Litres/ha | Hours/ha* |
|----------|----------|-------|-----------|-----------|
| Index | 0,89 | 0,70 | 0,33 | 0,28 |
| Lines/ha | | 0,39 | 0,15 | 0,10 |
| Slope | | | 0,42 | 0,38 |

* unless specified, hours means tractor hours

operations in that field should be. This hypothesis was tested in both soil engaging and non-soil engaging operations. A correlation matrix is listed in Table 2.

Some correlation with fuel and time expended per hectare was shown only for slope and the conclusion was that the field records, which included time of travel to and from fields, were not sufficiently precise to show the effect of slope and number of lines (ie number of turns required per hectare). The result was that specific operations and systems, rather than fields or layouts were evaluated.

Mechanization Standards

Mechanization standards are affected by factors such as row length, land slope, soil type, yield and width of headland. Time studies were used to analyse accurately specific operations at La Mercy and in some instances, these results were combined with field records to establish the mechanization standards listed in Tables 3, 4, 5 and 6 (see also Meyer & Worlock²).

TABLE 3

Mechanization standards for field operations of 35 to 58 kW tractors

| Operation | Complete operation h/ha | Standard/pass h/ha | Field efficiency % | Fuel l/ha |
|--------------------------------------|-------------------------|--------------------|--------------------|-----------|
| Removal of scrub | 8,3 | | | 34,20 |
| Land planing | 6,3 | 1,6 | | 31,90 |
| Waterway construction | 0,9 | | | |
| Conservation terrace construction | 10,0 | | | |
| Ripping | | 1,0 | 87 | |
| Chisel plough | | 1,4 | | 11,70 |
| Shallow plough, row only | | 1,9 | | 10,81 |
| Shallow ploughing | | 3,0 | 88 | 22,10 |
| Plough, 2 furrow mouldboard, 200 mm | | 3,8 | 88 | 29,50 |
| Disc harrow | | 1,2 | 78 | 10,20 |
| Planting, 1 furrow | | 5,9 | 42 | 26,50 |
| Fertilizer application, ratoons | | 0,6 | | 1,22 |
| Slash verges, waterways, etc | | 3,3 | | 11,31 |
| Mechanical cultivation | | 1,3 | | 4,80 |
| Stubble shaving | | 3,0 | | 15,10 |
| Windrowing trash | | 1,1 | | 2,29 |
| Boom sprayer (4 rows) | | 0,6 | 59 | 1,50 |
| Boom sprayer + hand lances (6 rows) | | 0,5 | | 1,30 |
| Roundup, boom + hand lances (8 rows) | | 0,4 | | 1,00 |
| La Mercy toolbar, minimum tillage | | 2,3 | 88 | 13,57 |

TABLE 4

Fuel and lubricant consumption and tractor: clock hour ratio for selected machines

| Tractor | Hours operated | Fuel consumption l/h | Lubricant consumption (l/h) | | Ratio tractor: clock/hours |
|-----------------------------|----------------|----------------------|-----------------------------|--------------|----------------------------|
| | | | Engine | Transmission | |
| MF 135 | 5 486 | 2,6 | 0,066 | 0,030 | 0,88 |
| MF 165 | 7 227 | 3,6 | 0,112 | 0,040 | 0,85 |
| JD 2130 | 6 549 | 5,9 | 0,089 | 0,043 | 0,88 |
| Ford 4000 | 5 275 | 4,1 | 0,065 | 0,120 | NR |
| Ford 4600 | 838 | 4,8 | NR | NR | 0,80 |
| Ford County | 4 713 | 5,7 | 0,089 | 0,056 | 1,14 |
| Ford 5000 (+ Midway cutter) | 670 | 5,8 | NR | NR | 1,43 |

TABLE 5

Mechanization standards for harvesting and loading cane

| Operation | Tons/field hour | Fuel consumption l/t | Topping efficiency* % |
|--|-----------------|----------------------|-----------------------|
| Mechanical cutting: (cane yielding c 80 t/ha) | | | |
| Edgecombe | 25 | 0,26 | 49 |
| Midway | 20** | 0,29 | 44 |
| Sasex | 14 | 0,37 | 50 |
| Bell (cut + stack) | 7 | 0,62 | 43 |
| Loading: Bell: | | | |
| Load box trailers from sausage windrows | 8 | 0,48 | |
| Stack from sausage windrows | 11 | | |
| Load box trailers from windrow | 24 | 0,22 | |
| Small pushpile, slewing loader (maximum slope 25%) | 24 | 0,40 | |
| Transloading: Mobile hydraulic crane | 31 | 0,21 | |
| Hauling single stack trailers | | 0,22 l/t.km | |

* Stalks topped correctly, will depend on recumbency of cane

** 31 t/field clock hour

TABLE 6

Loading and unloading standards for single stack trailers

| Trailer type | Chain/cable handling (min) | Loading (min) | Unloading* (min) | Time (min/ton) (excluding travel) |
|--------------|----------------------------|---------------|------------------|-----------------------------------|
| Box | 4,6 | 5,4** | 2,3 | 3,0 |
| Self-loading | 5,9 | 1,2 | 1,8 | 2,4 |

* Unloading by mobile transloading crane

** Loading by Bell loader

Cane production operations at La Mercy were divided into their constituent elements and cumulative timing techniques were used to measure the field parameters that affect each element of the different operations. The results so obtained can now be used to predict the performance of similar equipment operating in other situations (Murray & Meyer³).

Development of Mechanization Systems

Semi-mechanized harvesting systems

A number of systems for loading and transporting cane cut mechanically were tested at La Mercy, each being evaluated over an extended period so that its practicality could be reliably assessed. The results obtained from the different systems of handling burnt cane are listed in Table 7. The standard for comparison for cutting and stacking cane manually is 4 tons/man-day and for most private growers, manual stacking of the cane for self-loading trailers is presently the cheapest option.

When choosing a handling system for mechanically cut cane, field losses and cane quality must also be considered. The data in Table 8 can be used as a guide in this respect.

Cleaning and stacking green cane which was cut by the Midway cutter, was done manually at a rate of 5,6 tons per man-day. The amount of extraneous matter decreased from 11 to 4% during the three week trial period and cane loss was only 1,9%. The Midway was able to handle cane yielding up to 90 t/ha without clogging.

Results of this project show that growers can substantially reduce their labour requirements for harvesting burnt or unburnt sugarcane by gradually replacing labourers with machines as the need arises.

TABLE 7

Labour productivity for various systems of handling burnt sugarcane cut mechanically by the Sasex, Midway and Edgcombe cutters (Systems 1 to 8) and Bell (Systems 9 to 11) (including all field labour but excluding drivers)

| System | Tons/ man-day |
|---|------------------|
| 1 Manual stacking, self-loading trailers | 7,5 |
| 2 Forming small bundles manually, mechanical stacking*, self-loading trailers | 9,8 |
| 3 Manual windrowing and topping**, mechanical loading into box trailers | 6,0 |
| 4 Manual windrowing, mechanical loading into box trailers | 10,0 |
| 5 Mechanical stacking* after manual topping** in the sausage, self-loading trailers | 6,2 |
| 6 Mechanical stacking*, some manual cleaning of stacks, self-loading trailers | 11,7 |
| 7 Mechanical stacking*, self-loading trailers | 14,9 |
| 8 Mechanical windrowing*, manual topping**, mechanical loading into box trailers | 10,2 |
| 9 Bell cutting and stacking, self-loading trailers | 13,6 |
| 10 Bell cutting and stacking, hand cleaning and topping | 8,7 |
| 11 Bell cutting and loading into box trailers | 26,5 |

* by Bell loader

** Many tops missed by mechanical topper due to lodged crane, removed by hand

TABLE 8

Cane losses and quality of mechanically cut burnt cane

| Handling system | Stalks topped correctly % | Extraneous matter % | Infield loss | |
|---|---------------------------|---------------------|-------------------|------------------|
| | | | Before gleaning % | After gleaning % |
| Cut by S,M,E,* manual stacking, self-loading trailers | 34 | 4,3 | 2,6 | 2,0 |
| Cut by S,M,E, manual windrowing, load by Bell into box trailers | 35 | 5,6 | 1,7 | 1,3 |
| Cut by S,M,E, load directly by Bell into box trailers | 32 | 3,9 | 3,9 | 2,3 |
| Bell cut and load into box trailers | 23 | 9,4 | 1,9 | 1,8 |

* S, M, E: Sasex, Midway, Edgcombe cane cutters

Infield cane haulage systems

A complete harvesting and handling system was developed which consisted of the cane being cut mechanically, windrowed manually and then loaded mechanically into two box trailers parked in the field with only one tractor taking each of the trailers alternately to a loading zone (Meyer & Worlock³).

Over a 200 day harvesting season, 20 000 tons of cane would be harvested, loaded, transported and transloaded by 18 people or 0,9 man/1 000 tons.

Handling and distributing fertilizer

Two commercial hoisting systems and a system using a gantry which was built at La Mercy to handle half-ton bags were compared with the conventional method of handling fertilizer in 50 kg bags (Meyer & Worlock⁴). Total costs per hectare for the tractor-mounted crane, the trailer gantry and the conventional system were very similar. The trailer-mounted crane system was more expensive, primarily because of the high capital cost of the crane. Labour requirements for the conventional system were four times higher than for any of the systems using the half-ton bags. Other methods of handling fertilizer are to be evaluated at La Mercy.

Cane eradication and seedbed preparation systems

Standards for systems of cane eradication and seedbed preparation are listed in Tables 9, 10 and 11.

TABLE 9

Winter cane eradication and seedbed preparation: heavier soils

| Operation | h/ha | £/ha |
|---|------|------|
| Conventional mechanical: plough twice | 7,8 | 59,0 |
| disc harrow four times | 4,7 | 40,8 |
| Total | 12,6 | 99,8 |
| Improved mechanical: shallow plough | 3,0 | 22,1 |
| disc harrow twice | 2,4 | 20,4 |
| plough | 3,9 | 29,5 |
| disc harrow twice | 2,4 | 20,4 |
| Total | 11,7 | 92,4 |
| Utilizing chisel ploughs: chisel with points | 1,4 | 11,7 |
| chisel with sweeps | 1,4 | 11,7 |
| chisel with sweeps | 1,4 | 11,7 |
| chisel with points | 1,4 | 11,7 |
| disc harrow | 1,2 | 10,2 |
| Total | 6,8 | 57,0 |

TABLE 10

Winter cane eradication and seedbed preparation: lighter soils

| Operation | h/ha | £/ha |
|---------------|------|------|
| Rotary harrow | 3,0 | 20,6 |
| Disc harrow | 1,4 | 12,0 |
| Total | 4,4 | 32,6 |

TABLE 11

Cane eradication using minimum tillage in spring and summer

| Operation | h/ha | £/ha |
|------------------|------|------|
| Spray six rows | 0,5 | 1,5 |
| La Mercy toolbar | 2,3 | 12,1 |
| Total | 2,8 | 13,6 |

For land preparation in winter in heavier soils, a chisel plough fitted with the listed sweeps is recommended as it is effective and requires little time and effort. In summer, minimum tillage should be used where spraying is followed by a single pass of the La Mercy toolbar (a single ripper tine followed by two sets of two discs each) to prepare a seedbed wide enough for a planter to fit between the old rows. Alternatively, a ridger can be fitted to the toolbar if planting is to be done by hand.

Conclusions

Variations in field conditions, especially in respect of yield, have masked the effect of field layout on machine performance to a large extent. For any layout where cane rows are aligned across the slope, where there are stable, well grassed waterways in all natural depressions and where the sugarcane crop is fully canopied, soil protection will be adequate. The stage of crop canopy proved to be the deciding factor in the extent of erosion but trash spread on the ground was a good substitute. Soil type and inherent resistance to erosion nevertheless play a major role in limiting erosion on bare fallow areas.

Efficient underground drainage systems to eliminate wet areas caused by excess ground water are a pre-requisite to even, well grown cane and maximum accessibility by machines to the field.

Work at La Mercy will continue because valuable information on field layouts and the performance of machines still needs to be obtained. Without the facilities that exist at La Mercy, the Experiment Station would not have been able to test adequately or to develop machines and mechanized production systems.

Acknowledgements

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