

# 2024



SOUTH AFRICAN SUGARCANE  
RESEARCH INSTITUTE

## MECHANISATION REPORT No. 2



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# MECHANISATION REPORT NO. 2

2024 UPDATE

## SYSTEMS AND COSTS OF LAND PREPARATION, PLANTING AND RATOON MANAGEMENT

The costs given in the following tables are based on replanting 20 hectares per year and using new equipment with 60 kW 2WD tractor costs based on an annual usage of 1000 hours. Expensive implements are under-utilised and this results in high implement costs. The larger the area to replant, the greater the utilisation of the implement and hence its cost per unit of area will be reduced. The examples merely serve as a guide and growers should carefully compare the operations included and adjust these to suit their systems, if necessary. Growers are referred to the table on the last page for costs of individual operations.

### LAND PREPARATION

Operations involving land smoothing, drainage and conservation structures are considered to be part of soil and water conservation and will therefore not be considered in this exercise on land preparation.

The main objectives in land preparation are assumed to be:

- to effectively destroy the old crop
- to prepare a seedbed for planting.

The two categories of soil to be considered in this exercise are:

- i) heavier soils (loams and clays)
- ii) lighter soils (loamy sands and sands).

The operations listed in the tables that follow may be considered to be the basic minimum, the number of harrowings for example being dependent on factors such as the presence or absence of grass weeds, soil moisture content, season of operation and volunteers. If a lime application operation is required, please refer to the table on the last page for individual operation costs.

#### 1. Traditional system:

<b><u>TRADITIONAL SYSTEM:</u></b>	<b>FUEL:</b>	<b>COST:</b>
<b>Operations:</b>	<b>(l/ha)</b>	<b>(R/ha)</b>
Deep plough (2f rev disc)	30	1457
Disc Harrow	16	817
Plough (2f rev disc)	30	1457
Disc Harrow	16	817
Disc Harrow	16	817
Ridger only	10	867
<b>TOTAL:</b>	<b>118</b>	<b>6232</b>

2. **Conventional tillage system (heavier soils):**

<b>CONVENTIONAL SYSTEM: (HEAVY SOILS)</b>	FUEL:	COST:
<b>Operations:</b>	(l/ha)	(R/ha)
Shallow (100mm) 2f m/b 1way (May)	20	1289
Disc harrow (June)	16	817
Plough (200-250mm) 2f m/b 1way (Aug)	25	1442
Disc harrow (150mm) (Aug)	16	817
Ridger only	10	867
<b>TOTAL:</b>	<b>87</b>	<b>5232</b>

3. **Conventional tillage system (sandy soils):**

<b>CONVENTIONAL SYSTEM: (LIGHT SOILS)</b>	FUEL:	COST:
<b>Operations:</b>	(l/ha)	(R/ha)
Shallow (100mm) rotary hoe (May)	25	1603
Disc harrow (100mm) (June)	8	558
Disc harrow (100mm) (Aug)	8	558
Ridger only	10	867
<b>TOTAL:</b>	<b>51</b>	<b>3586</b>

4. **Minimum tillage system, chemical (heavier soils) - Option 1:**

<b>MINIMUM TILLAGE SYSTEM (SANDY SOILS)</b>	FUEL:	COST:
<b>Operations:</b>	(l/ha)	(R/ha)
Full cover spray Glyphosate 360gm/l @ 8l/ha (1 labour-day)	0	248
from Oct to Mar onwards (8l/ha)	0	1200
Min tiller (2r rotary hoe+ridgers+fert appl in interrow (Oct-Mar)	15	1617
<b>TOTAL:</b>	<b>15</b>	<b>3065</b>
Add stool plough- improved efficacy	12	749

**Note:** The efficacy of chemical stool eradication in heavier soils is improved if the stools are undercut ( $\pm 100$  mm) by using a stool plough one week after spraying. This will increase the costs as indicated in the table above.

5. **No-tillage system, chemical (sandy soils):**

<b>NO TILLAGE SYSTEM (SANDY SOILS)</b>	FUEL:	COST:
<b>Operations:</b>	(l/ha)	(R/ha)
Full cover spray Glyphosate (1 labour-day)	0	248
from Oct to Mar onwards @ 8l/ha	0	1200
Ridger only	10	867
<b>TOTAL:</b>	<b>10</b>	<b>2315</b>

6. **Reduced tillage system, manual (sandy soils) – Option 2:**

<b>REDUCED TILLAGE SYSTEM - MANUAL (SANDY SOILS)</b>	FUEL:	Mech Cost:	Labour-days	Labour	Operation
<b>Operations:</b>	(l/ha)	(R/ha)	per ha	cost (R/ha)	cost (R/ha)
Chipping (May) @ 40 labour days/ha	0	0	40	9929	9929
Ridger only	10	867	0	0	867
<b>TOTAL:</b>	<b>10</b>	<b>867</b>	<b>40</b>	<b>9929</b>	<b>10796</b>

**Note:** Irrespective of the system of crop eradication used, the cost of hand labour for roguing must be added to the above costs.

## PLANTING

In comparing the various planting methods, the following assumptions are made:

- flat culture is desirable;
- some fertiliser is required in the planting furrow;
- plant cane warrants one pre- and one post-emergent application of herbicide for weed control;
- the cost of materials is the same for all systems and is excluded from these comparisons;
- one labourer costs **R248,22 per day** (9 hours);
- Glyphosate (360 g/l) costs **R150,00 per litre** (assumed retail price)

### 1. Machine planting

<b><u>MACHINE PLANTING</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Machine planting (at 1ha/day)	22	2962	6	1489	4451
Pre-emergent herbicide	2,5	205	1	248	453
Top dress fertilizer	3	246	1	248	494
Post-emergent herbicide	2,5	205	1	248	453
Hand-hoeing grasses	0	0	10	2482	2482
Spot spray	0	0	1	248	248
<b>TOTAL:</b>	<b>30</b>	<b>3618</b>	<b>20</b>	<b>4964</b>	<b>8582</b>

\* This value can range typically from 6 to 10 labour days per hectare depending on labour productivity.

### 2. Semi-mechanical planting

<b><u>SEMI MECHANICAL PLANTING</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Ridging and Fert applic (2 row)	5	590	1	248	838
Planting	0	0	20	4964	4964
Covering	12	972	0	0	972
Pre-emergent herbicide	3	205	1	248	453
Top dress fertiliser	3	246	1	248	494
Post-emergent herbicide	3	205	1	248	453
Hand-hoe	0	0	10	2482	2482
Spot spray	0	0	1	248	248
<b>TOTAL:</b>	<b>25</b>	<b>2218</b>	<b>35</b>	<b>8688</b>	<b>10906</b>

### 3. Manual planting

<b><u>MANUAL PLANTING</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Ridging only	10	867	0	0	867
Fertiliser application	0	0	1	248	248
Planting	0	0	20	4964	4964
Covering	0	0	5	1241	1241
Pre-emergent herbicide	0	0	1	248	248
Top dress fertiliser	0	0	1	248	248
Post-emergent herbicide	0	0	1	248	248
Hand-hoe	0	0	10	2482	2482
Spot spray	0	0	1	248	248
<b>TOTAL:</b>	<b>10</b>	<b>867</b>	<b>40</b>	<b>9929</b>	<b>10796</b>

Operations such as the application of nematicides and filtercake and seed-dipping, are excluded as they are specific to soil types and season. Costs of materials were excluded in the planting costs.

## RATOON MANAGEMENT

Within the industry there are three common situations which require different management.

Relatively few operations are required in the management of ratoon crops but weed control is the most difficult to cost as there is no best procedure. The type and number of operations depends on factors such as time of harvest, soil type and the spectrum and density of weeds that occur.

Operations such as subsoiling, stool pruning, furrow-forming and nematicide application are not included as they are not generally necessary.

### 1. Cane burnt and tops windrowed

<b><u>CANE BURNT &amp; TOPS WINDROWED</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Raking tops	4	273	0	0	273
Topdress fertiliser	3	246	1	248	494
Post-emergent herbicide (long term)	3	205	1	248	453
Hand weed	0	0	10	2482	2482
<b>TOTAL:</b>	<b>10</b>	<b>724</b>	<b>12</b>	<b>2979</b>	<b>3703</b>

### 2. Cane burnt and tops left scattered

<b><u>CANE BURNT &amp; TOPS LEFT SCATTERED</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Spread tops and clean up	0	0	3	745	745
Topdress fertiliser	3	246	1	248	494
Post-emergent herbicide (long term)	3	205	1	248	453
Hand weed	0	0	8	1986	1986
<b>TOTAL:</b>	<b>6</b>	<b>451</b>	<b>13</b>	<b>3227</b>	<b>3678</b>

### 3. Mulch blanket

<b><u>MULCH BLANKET</u></b>	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Spread residue & tidy field	0	0	3	745	745
Topdress fertiliser	0	0	1	248	248
Spot spray, twice	0	0	2	496	496
Hand weed	0	0	4	993	993
<b>TOTAL:</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>2482</b>	<b>2482</b>

#### For all systems:

- material costs are excluded
- add verge control:

Assume 10% of total area will be slashed 4 times annually i.e) 10% of 200 ha = 20 ha

Cost per slashing = **R691** per ha x 20 ha = **R 13821**

Cost for slashing = **R 13821** x 4 = **R 55285**

Cost per hectare under cane = **R 55285** ÷ 200 ha = **R 276,43 /ha**

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**PERFORMANCE STANDARDS AND COSTS FOR MECHANICAL SUGARCANE PRODUCTION SYSTEMS: 200HA CANE FARM REPLANTING 20HA/YR**

Costs are based on a 60 kW 2wd tractor: **R 346.44** /hour + implement cost NB: The operational costs per hectare shown below are for 1 pass only; For steep or poorly laid out fields these figures below must be inflated

Machinery and equipment	Cost price (Rand)	Working width (m)	Efficiency (%)	No. of passes (no.)	Lighter soils						Heavier soils					
					Speed (km/h)	Work-rate (h/ha)	Annual utilisation (hours)	Implement cost (R/h)	Operation cost (R/ha)	Fuel (l/ha)	Speed (km/h)	Work-rate (h/ha)	Annual utilisation (hours)	Implement cost (R/h)	Operation cost (R/ha)	Fuel (l/ha)
Subsoil: single tine	29500	1.2	90	1	4.0	2.31	46	86.66	1003	15	3.0	3.09	62	66.20	1274	20
Ripper : 3 tine	56500	1.5	90	1	4.0	1.85	37	202.91	1017	20	3.0	2.47	49	156.68	1242	25
Plough : 2f rev mb-shallow	105000	0.8	85	2*	4.5	3.27	131	124.29	1538	16	4.5	3.27	131	124.29	1538	20
2f rev mb	105000	0.8	85	2	4.5	3.27	131	124.29	1538	20	4.0	3.68	147	113.51	1691	25
2f mb beam-shallow	22000	0.8	80	2*	4.5	3.47	139	24.85	1289	16	4.5	3.47	139	24.85	1289	20
2f mb	22000	0.8	80	2	4.5	3.47	139	24.85	1289	20	4.0	3.91	156	22.72	1442	25
2f-3f disc plough	46000	0.8	85	2	4.5	3.27	131	54.45	1310	25	4.0	3.68	147	49.73	1457	30
3f rev mb	140000	1.2	85	2	4.5	2.18	87	232.54	1261	28	4.0	2.45	98	210.21	1364	32
chisel plow -5 tine	135000	2.0	90	4**	5.0	1.11	89	228.02	638	15	4.5	1.23	99	209.08	686	18
Disc harrow: light, <150mm	65000	1.8	80	3	6.0	1.16	69	135.96	558	8	5.0	1.39	83	116.32	643	10
heavy, >150mm	140000	2.0	80	3	5.0	1.25	75	264.37	764	12	4.5	1.39	83	242.13	817	16
Stool plough:	25000	1.2	90	1	-	-	-	-	-	-	5.5	1.68	34	98.41	749	12
Weeding: 2 row cultivator	27000	2.4	85	2	6.0	0.82	33	109.25	372	4						
Rotary hoe: very fine tilth	115000	2.0	85	1	2.6	2.26	45	361.93	1603	25						
normal tilth	115000	2.0	85	1	3.5	1.68	34	464.15	1362	18						
Min. tiller: rotary + ridger/bedformers	132000	2.4	80	1	2.6	2.00	40	460.78	1617	15						
Lime box: 3m wide	76000	3.0	50	1	6.0	1.11	22	449.89	885	4						
Fert. spreader: (2 row) 500kg mounted	28000	2.0	50	1	4.5	2.22	400	22.81	821	8						
Fert. spreader: (pendulum) 500L mounted	50000	4.0	50	1	4.5	1.11	200	53.41	444	4						
Fert. spreader: (1D broadcast) 500L	13500	6.0	50	1	5.0	0.67	120	17.96	243	3						
Fert. spreader: (2D broadcast) 1000L	81000	6.0	65	1	5.0	0.51	92	133.15	246	3						
Herbicide applicator: (boom) 4-600L	39000	6.0	70	2	4.5	0.53	212	40.66	205	3						
Herbicide applicator: (boom) 800L	63000	10.0	70	2	4.5	0.32	127	80.22	135	3						
Mist blower (300-500L mounted)	95000	18.0	70	1	3.5	0.23	41	314.94	150	2						
1 furrow ridger	23000	1.2	90	1	4.5	2.06	41	75.09	867	10						
2 furrow ridger + 2 fert applicators	37000	2.4	90	1	4.5	1.03	21	227.06	590	5						
3 furrow ridger + 3 fert applicators	47000	3.6	90	1	4.5	0.69	14	426.75	530	3						
Coverer: (one row per pass)	32000	1.2	85	1	4.5	2.18	44	99.51	972	12						
Planter: 1 row	130000	1.2	45	1	3.0	6.17	123	169.66	3186	22						
Planter: 2 row min till	230000	1.8	60	1	2.5	3.70	74	453.24	2962	22						
Planter: seed drill/planter	120000	1.8	60	1	4.0	2.31	46	358.50	1632	14						
Rake or windrow tops:	18000	2.5	90	1	6.0	0.74	133	22.13	273	4						
Grader-land plane:	40000	2.0	80	3	4.5	1.39	83	71.58	581	15						
Verge control: M/D (slash 10% total area)	42000	1.5	80	4	4.0	2.08	167	51.69	829	11						
Verge control: H/D (slash 10% total area)	69000	2.0	80	4	4.0	1.56	125	95.84	691	12						

\* Same plough used for shallow ploughing and conventional ploughing

\*\* Used for stool eradication (2 passes) + two passes for seedbed preparation