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SOUTH AFRICAN SUGARCANE RESEARCH INSTITUTE

MECHANISATION REPORT No. 2

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MECHANISATION REPORT NO. 2

2025 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:**

TRADITIONAL SYSTEM: **Operations:**	FUEL: (l/ha)	COST: (R/ha)
Deep plough (2f rev disc)	30	1434
Disc Harrow	16	940
Plough (2f rev disc)	30	1434
Disc Harrow	16	940
Disc Harrow	16	940
Ridger only	10	859
TOTAL:	**118**	**6547**

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

CONVENTIONAL SYSTEM: (HEAVY SOILS) **Operations:**	FUEL: (l/ha)	COST: (R/ha)
Shallow (100mm) 2f m/b 1way (May)	20	1286
Disc harrow (June)	16	940
Plough (200-250mm) 2f m/b 1way (Aug)	25	1437
Disc harrow (150mm) (Aug)	16	940
Ridger only	10	859
TOTAL:	**87**	**5462**

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

CONVENTIONAL SYSTEM: (LIGHT SOILS) **Operations:**	FUEL: (l/ha)	COST: (R/ha)
Shallow (100mm) rotary hoe (May)	25	1607
Disc harrow (100mm) (June)	8	582
Disc harrow (100mm) (Aug)	8	582
Ridger only	10	859
TOTAL:	**51**	**3630**

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

MINIMUM TILLAGE SYSTEM (SANDY SOILS) **Operations:**	FUEL: (l/ha)	COST: (R/ha)
Full cover spray Glyphosate 360gm/l @ 8l/ha (1 labour-day)	0	259
from Oct to Mar onwards (8l/ha)	0	1200
Min tiller (2r rotary hoe+ridgers+fert appl in interrow (Oct-Mar)	15	1632
TOTAL:	**15**	**3091**
Add stool plough- improved efficacy	12	742

Note: The efficacy of chemical stool eradication in heavier soils is improved if the stools are undercut (±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):**

NO TILLAGE SYSTEM (SANDY SOILS) **Operations:**	FUEL: (l/ha)	COST: (R/ha)
Full cover spray Glyphosate (1 labour-day)	0	259
from Oct to Mar onwards @ 8l/ha	0	1200
Ridger only	10	859
TOTAL:	**10**	**2318**

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

REDUCED TILLAGE SYSTEM - MANUAL (SANDY SOILS) **Operations:**	FUEL: (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Chipping (May) @ 40 labour days/ha	0	0	40	10364	10364
Ridger only	10	859	0	0	859
TOTAL:	**10**	**859**	**40**	**10364**	**11223**

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 R**259,11** per day (9 hours);
- Glyphosate (360 g/l) costs R150,00 per litre (assumed retail price)

1. **Machine planting**

MACHINE PLANTING	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	3178	10	2591	5769
Pre-emergent herbicide	3	202	1	259	461
Top dress fertilizer	3	245	1	259	504
Post-emergent herbicide	3	202	1	259	461
Hand-hoeing grasses	0	0	10	2591	2591
Spot spray	0	0	1	259	259
TOTAL:	**30**	**3827**	**24**	**6219**	**10046**

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

2. **Semi-mechanical planting**

SEMI MECHANICAL PLANTING	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	589	1	259	848
Planting	0	0	20	5182	5182
Covering	12	965	0	0	965
Pre-emergent herbicide	3	202	1	259	461
Top dress fertiliser	3	245	1	259	504
Post-emergent herbicide	3	202	1	259	461
Hand-hoe	0	0	10	2591	2591
Spot spray	0	0	1	259	259
TOTAL:	**25**	**2203**	**35**	**9069**	**11272**

3. **Manual planting**

MANUAL PLANTING	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Ridging only	10	859	0	0	859
Fertiliser application	0	0	1	259	259
Planting	0	0	20	5182	5182
Covering	0	0	5	1296	1296
Pre-emergent herbicide	0	0	1	259	259
Top dress fertiliser	0	0	1	259	259
Post-emergent herbicide	0	0	1	259	259
Hand-hoe	0	0	10	2591	2591
Spot spray	0	0	1	259	259
TOTAL:	**10**	**859**	**40**	**10364**	**11223**

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**

CANE BURNT & TOPS WINDROWED	Fuel (l/ha)	Mech Cost: (R/ha)	Labour-days per ha	Labour cost (R/ha)	Operation cost (R/ha)
Raking tops	4	269	0	0	269
Topdress fertiliser	3	245	1	259	504
Post-emergent herbicide (long term)	3	202	1	259	461
Hand weed	0	0	10	2591	2591
TOTAL:	**10**	**716**	**12**	**3109**	**3825**

2. **Cane burnt and tops left scattered**

CANE BURNT & TOPS LEFT SCATTERED	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	777	777
Topdress fertiliser	3	245	1	259	504
Post-emergent herbicide (long term)	3	202	1	259	461
Hand weed	0	0	8	2073	2073
TOTAL:	**6**	**447**	**13**	**3368**	**3815**

3. **Mulch blanket**

MULCH BLANKET	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	777	777
Topdress fertiliser	0	0	1	259	259
Spot spray, twice	0	0	2	518	518
Hand weed	0	0	4	1036	1036
TOTAL:	**0**	**0**	**10**	**2591**	**2591**

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 = R681 per ha x 20 ha = R 13610

  Cost for slashing = R 13610 x 4 = R 54441

  Cost per hectare under cane = R 54441 ÷ 200 ha = **R 272,21 /ha**

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

Costs are based on a 60 kW tractor: R 340.61 /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)	Work-ing width (m)	Effic-iency (%)	No. of passes (no.)	Lighter soils						Heavier soils					
					Speed (km/h)	Work-rate (h/ha)	Annual utilis-ation (hours)	Imple-ment cost (R/h)	Opera-tion cost (R/ha)	Fuel (l/ha)	Speed (km/h)	Work-rate (h/ha)	Annual utilis-ation (hours)	Imple-ment cost (R/h)	Opera-tion cost (R/ha)	Fuel (l/ha)
Subsoil: single tine	30000	1.2	90	1	4.0	2.31	46	85.43	986	15	3.0	3.09	62	65.32	1253	20
Ripper : 3 tine	60000	1.5	90	1	4.0	1.85	37	208.78	1017	20	3.0	2.47	49	161.33	1239	25
Plough : 2f rev mb-shallow	120000	0.8	85	2*	4.5	3.27	131	138.27	1565	16	4.5	3.27	131	138.27	1565	20
2f rev mb	105000	0.8	85	2	4.5	3.27	131	120.99	1508	20	4.0	3.68	147	110.56	1659	25
2f mb beam-shallow	27000	0.8	80	2*	4.5	3.47	139	29.70	1286	16	4.5	3.47	139	29.70	1286	20
2f mb	27000	0.8	80	2	4.5	3.47	139	29.70	1286	20	4.0	3.91	156	27.17	1437	25
2f-3f disc plough	47000	0.8	85	2	4.5	3.27	131	54.16	1290	25	4.0	3.68	147	49.49	1434	30
3f rev mb	147000	1.2	85	2	4.5	2.18	87	237.20	1259	28	4.0	2.45	98	214.54	1361	32
chisel plow -5 tine	135000	2.0	90	4**	5.0	1.11	89	221.77	625	15	4.5	1.23	99	203.46	672	18
Disc harrow: light, <150mm, 3pt hitch	80000	1.8	80	3	6.0	1.16	69	162.55	582	8	5.0	1.39	83	139.18	666	10
heav , >150mm, 2.4m trailed	200000	2.0	80	3	5.0	1.25	75	366.67	884	12	4.5	1.39	83	335.95	940	16
Stool plough:	26250	1.2	90	1	-	-	-	-	-	-	5.5	1.68	34	100.14	742	12
Weeding: 2 row cultivator	29000	2.4	85	2	6.0	0.82	33	113.73	371	4						
Rotary hoe: very fine tilth	121000	2.0	85	1	2.6	2.26	45	369.73	1607	25						
normal tilth	121000	2.0	85	1	3.5	1.68	34	473.69	1369	18						
Min. tiller: rotary + ridger/bedformers	140000	2.4	80	1	2.6	2.00	40	474.25	1632	15						
Lime box: 3m wide	80000	3.0	50	1	6.0	1.11	22	458.55	888	4						
Fert. spreader: (2 row) 500kg mounted	30000	2.0	50	1	4.5	2.22	400	24.06	810	8						
Fert. spreader: (pendulum) 500L mounted	53000	4.0	50	1	4.5	1.11	200	55.52	440	4						
Fert. spreader: (1D broadcast) 500L	15000	6.0	50	1	5.0	0.67	120	19.44	240	3						
Fert. spreader: (2D broadcast) 1000L	86000	6.0	65	1	5.0	0.51	92	137.51	245	3						
Herbicide applicator: (boom) 4-600L	41000	6.0	70	2	4.5	0.53	212	41.93	202	3						
Herbicide applicator: (boom) 800L	64000	10.0	70	2	4.5	0.32	127	79.42	133	3						
Mist blower (300-500L mounted)	97000	18.0	70	1	3.5	0.23	41	311.83	148	2						
1 furrow ridger	24250	1.2	90	1	4.5	2.06	41	76.75	859	10						
2 furrow ridger + 2 fert applicators	39000	2.4	90	1	4.5	1.03	21	231.70	589	5						
3 furrow ridger + 3 fert applicators	50000	3.6	90	1	4.5	0.69	14	439.29	535	3						
Coverer: (one row per pass)	34000	1.2	85	1	4.5	2.18	44	102.54	965	12						
Planter: 1 row min till cane	137000	1.2	45	1	3.0	6.17	123	174.21	3178	22						
Planter: 2 row min till cane	242000	1.8	60	1	2.5	3.70	74	463.40	2978	22						
Planter: fine seed drill/planter	126000	1.8	60	1	4.0	2.31	46	365.13	1634	14						
Rake or windrow tops:	19000	2.5	90	1	6.0	0.74	133	22.78	269	4						
Grader-land plane:	40000	2.0	80	3	4.5	1.39	83	69.59	570	15						
Verge control: M/D (slash 10% total area)	44000	1.5	80	4	4.0	2.08	167	53.07	820	11						
Verge control: H/D (slash 10% total area)	70000	2.0	80	4	4.0	1.56	125	94.92	681	12						

Mar 2025

* Same plough used for shallow ploughing and conventional ploughing

** Used for stool eradication (2 passes) + 2 passes for seedbed prep.

*** Estimated value