

Maluleke et al. 2024 - Comparing the financial benefits of different grain production systems in South Africa's summer rainfall region

General macro-assumptions			
Social discount rate	7%		
Acquisition cost - farming operation as going concern	Hectares	R/ha (Capital cost; if bought)	Capital cost (if bought)
(includes 100 head of cattle and implements)			
- Croplands: Field 1	100		-
- Croplands: Field 2	100		-
- Croplands: Field 3	100		-
- Croplands: Field 4	100		-
- Croplands: Field 5	100		-
- Croplands: Field 6	100		-
- Croplands: Total	600	-	-
- Grazing area (veld and permanent pasture)	400		-

Selling price	Gross	Net
- Maize (R/t, after 10% marketing commission)	R3 743,55	R3 369,20
- Soya (R/t, after 2% marketing commission)	R8 248,74	R8 083,77
	2020/21	2021/22
- Weaners - 200kg (R/kg) - A class	R47,98	R53,94
- Long weaners - 350kg (R/kg) - B class	R43,69	R52,23
- Cows/Bulls - C class	R41,85	R47,98

Inflation	
- Revenue	5,0%
- Cost	6,0%

Cost of cattle:		Weight of animals	kg	LSU to animal ratios (based on metabolic mass):	
- Bulls (per animal unit)	R50 000	- Short weaners: Mixed system	200	- Short weaners: Mixed system	0,544
- Cows (per animal unit)	R15 000	- Long weaners: Integrated system	350	- Long weaners: Integrated system	0,828
- Operating cost (per day per animal unit)	R4,00	- Cows	525	- Cows	1,123
- Grazing area (veld and permanent pasture): tDM/ha	3	- Bulls	800	- Bulls	1,540
# cows per bul	20	- LSU	450	DM required as % of body weight	tDM required per year per LSU
Fertility rate (calves born per cow% in the herd)	75%	Mortality rate	2%	2,70%	4,4
Opening stock: Number of cows	100				

RA 65% utilization rate phased in over 4 years starting at 40% in year 1			
-	1	2	3
40%	48%	57%	65%

Change in yield:	
- CT (Conventional) after 20 years	100%
- CA/NT (no-till) after 10 years	100%

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- RA (integrated system) after 10 years	100%
Input efficiency (fertiliser, herbicide, pest control):	
- CT (Conventional) after 20 years	110%
- CA/NT (no-till) after 10 years	100%
- RA (integrated system) after 5 years	50%

CT - Conventional production systems: Mixed farming system

Capital cost (same across all three regions)			
		600	HA
ITEM	Purpose/Function/Task	Number	Unit price: Current (R)
Tractor 136 kW	Soil preparation, planting, transporting and spraying	2	2 113 244,00
Tractor 95 kW	Stalk chopper, spraying, fertilizer, transporting and service of planters	2	1 213 340,00
Tractor 72 kW	Planting; general use	2	572 119,00
Kverneland CLC 2 11 teeth	Deep till	3	445 219,51
Rovic Handicult 31 teeth	Preparation of seedbed	2	385 178,60
Planter 8 row with spray	Plant	2	1 161 306,31
Compact Plus 1 200lit spray	Weed control and pesticide application	2	373 804,50
Amazone 1 500lit distributor	Fertilizer application	1	162 426,00
20 t trailer	Transport of grain and water	2	364 870,00
15 t trailer	Transport of grain and fertilizer	2	296 390,00
8 t de-bulking trailer	Grain management	1	205 440,00
Harvester	Harvesting	1	6 700 000,00
Other			
Other			
Other			
Other			
Other			
kW		136	2
		95	2
		72	2

Operating costs						
Cost item	Mpumalanga		Maluti		North West	
	1 - Maize (RR - Conventional)	3 - Soy				
	7,0	2,0	5,0	1,8	5.9	1,8
Seed	3 143,25	1 240,63	1 513.05	1 104.24	1 014,07	724,57
Fertiliser	5 177,20	3 160,00	3 206.05	1 796.02	2 010,94	1 508,13
Lime	229,77	-	584.33	-	272,81	232,67
Fuel	1 067,99	886,35	1 107.30	858.93	715,50	715,50
Reparation	714,05	524,83	856.13	691.65	500,85	500,85
Herbicide	1 376,10	1 360,30	876.24	988.30	776,36	696,03
Pest control	873,01	365,75	908.68	670.86	-	-
Input insurance	387,52	275,07	275.24	409.52	653,40	188,54
Grain hedging	1 450,08	828,62	708.02	326.67	806,25	242,17
Harvest insurance	753,71	536,03	493.06	1 078.34	56,03	70,56
Interest on production R/ha	642,91	390,05	755.56	394.34	408,37	297,06
Cover crop	-	-	-	-	-	-

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Total Direct Allocated Variable Cost (R/ha)	15 815,59	9 567,63	11 083.66	8 318.86	7 214,57	5 248,07
Overhead cost R/ha	1 223,92	1 067,28	1 279.81	869.66	1 455,60	1 455,60
Cost per ha before marketing cost R/ha	17 039,51	10 634,91	12 563.46	9 188.51	8 670,18	6 703,68

CA/NT - No-till: Mixed farming system

Capital cost (same across all three regions)			
		Plant	HA
ITEM	Purpose/Function/Task	Number	Unit price: Current (R)
Tractor 136 kW	Soil preparation, planting, transporting, and spraying	2	2 113 244,00
Tractor 95 kW	Stalk chopper, spraying, fertilizer, transporting and service of planters	2	1 213 340,00
Tractor 72 kW	Planting; general use	2	572 119,00
Kverneland CLC 2 11 teeth	Deep till	3	445 219,51
Rovic Handicult 31 teeth	Preparation of seedbed	2	385 178,60
Planter 8 row with spray	Plant	2	1 161 306,31
Compact Plus 1 200lit spray	Weed control and pesticide application	2	373 804,50
Amazone 1 500lit distributor	Fertilizer application	1	162 426,00
20 t trailer	Transport of grain and water	2	364 870,00
15 t trailer	Transport of grain and fertilizer	2	296 390,00
8 t de-bulking trailer	Grain management	1	205 440,00
Harvester	Harvesting	1	6 700 000,00
No-till planter 8 ry	Planting cash crops	1	1 904 749,80
Other			
Other			
Other			
Other			
kW		136	2
		95	2
		72	2

Operating costs						
Cost item	Mpumalanga		Maluti		North West	
	2 - Maize (GSA - Min till)	4 - Soy (GSA Min till)	2 - Maize (GSA - Min till)	4 - Soy (GSA Min till)	2 - Maize (GSA - Min till)	4 - Soy (GSA Min till)
	7,0	2,0	5,0	1,8	5,9	1,8
Seed	3 265,35	1 242,14	1 513,05	1 104,24	1 349,48	883,40
Fertiliser	5 177,20	2 792,00	3 206,05	1 796,02	2 080,20	1 391,13
Lime	229,77	-	584,33	-	536,14	557,39
Fuel	963,14	623,09	775,11	601,25	405,00	472,50
Reparation	670,47	439,51	856,13	691,65	283,50	330,75
Herbicide	1 204,39	1 204,07	876,24	988,30	990,10	891,89
Pest control	842,18	365,75	908,68	670,86	-	-
Input insurance	387,52	277,52	275,24	409,52	653,40	188,54
Grain hedging	1 429,88	736,29	708,02	326,67	806,25	242,17
Harvest insurance	791,40	540,82	493,06	1078,34	56,03	74,43
Interest on production R/ha	635,86	349,40	755,56	394,34	429,61	301,93
Cover crop						
Total Direct Allocated Variable Cost (R/ha)	15 597,15	8 570,61	10 951,47	8 061,18	7 589,70	5 334,14

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Overhead cost R/ha	738,84	499,46	788,50	573,97	1 106,26	1 106,26
Cost per ha before marketing cost R/ha	16 335,99	9 070,07	11 739,96	8 635,15	8 695,96	6 440,40

CA/RA production systems: Integrated farming system

Capital cost (same across all three regions)			
600HA			
ITEM	Purpose/Function/Task	Number	Unit price: Current (R)
Tractor 168 kW CAB	Planting, transporting and spraying	1	2 724 223,21
Tractor 95 kW CAB	Stalk chopper, spraying, fertilizer, transporting and service of planters	1	1 213 340,00
Tractor 67 kW OS	Planting; general use	1	572 119,00
Kverneland CLC 2 11 tand	Deep teeth preparation	1	372 798,70
No-till planter 8 ry	Planting cashcrops	1	1 904 749,80
No till planter 3 m	Planting cover crops	1	631 300,00
Compact Plus 1 200 Lit Spray	Weed control and pesticide application	2	373 804,50
Amazone 1 500 Lit Distributor	Fertilizer application	1	162 426,00
20 t trailer	Transport of grain and water	2	364 870,00
15 t trailer	Transport of grain and fertilizer	2	296 390,00
8 t de-bulking trailer	Grain management	1	205 440,00
Harvester	Harvesting	1	6 700 000,00
Other			
Other			
Other			
Other			
Other			
kW		168	1
		95	1
		67	1

Operating cost: Mpumalanga							
Cost item	1 - Maize	2 - Maize + WCC	3 - Soy	4 - Soy + WCC	5 - Double cover crop	6 - Summer Cover Crop	7 - Winter Cover Crop
	3 - Mpu - Standerton	3 - Mpu - Standerton	3 - Mpu - Standerton	3 - Mpu - Standerton			
Cash crop yield: t/ha	7,00	7,00	2,00	2,00		1 - Low cost	1 - Low cost
Utilised cover crop: tDM/ha		2,00		2,00	12,00	10,00	2,00
Seed	2 530,00	2 530,00	500,00	500,00	1 126,00	826,00	300,00
Fertiliser	2 840,90	2 840,90	847,90	847,90	239,90	239,90	-
Lime	-	-	-	-	-	-	-
Fuel	705,41	705,41	816,41	816,41	351,50	175,75	175,75

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Reparation	493,78	493,78	489,84	489,84	210,90	105,45	105,45
Herbicide	326,62	326,62	739,87	739,87	326,62	326,62	-
Pest control	-	-	-	-	-	-	-
Input insurance	249,12	249,12	485,67	485,67	-	-	-
Grain hedging	1 056,77	1 056,77	952,87	952,87	-	-	-
Harvest insurance	508,75	508,75	946,43	946,43	-	-	-
Interest on production R/ha	344,84	344,84	169,70	169,70	112,75	83,69	29,06
Cover crop							
Total Direct Allocated Variable Cost (R/ha)	9 188,69	9 188,69	6 081,18	6 081,18	2 897,67	2 022,41	875,26
Overhead cost R/ha	964,60	964,60	964,60	964,60	964,60	482,30	482,30
Cost per ha before marketing cost R/ha	10 153,29	9 493,06	7 045,78	7 045,78	3 862,27	2 504,71	1 357,56

Operating cost: Maluti							
Cost item	1 - Maize	2 - Maize + WCC	3 - Soy	4 - Soy + WCC	5 - Double cover crop	6 - Summer Cover Crop	7 - Winter Cover Crop
	3 - Mlt - Marquard	3 - Mlt - Marquard	3 - Mlt - Marquard	3 - Mlt - Marquard			
Cash crop yield: t/ha	5,00	5,00	1,80	1,80		1 - Low cost	1 - Low cost
Utilised cover crop: tDM/ha		2,00		2,00	10,00	8,00	2,00
Seed	1 800,00	1 800,00	140,00	140,00	1 670,00	1 200,00	470,00
Fertiliser	1 512,00	1 512,00	-	-	-	-	-
Lime	-	-	-	-	-	-	-
Fuel	652,68	652,68	704,48	704,48	352,43	176,68	175,75
Reparation	522,14	522,14	563,58	563,58	281,94	141,34	140,60
Herbicide	1 420,00	1 420,00	1 310,00	1 310,00	870,00	370,00	500,00
Pest control	60,00	60,00	60,00	60,00	30,00	30,00	-
Input insurance	192,67	192,67	455,02	455,02	-	-	-
Grain hedging	616,57	616,57	353,22	353,22	-	-	-
Harvest insurance	345,14	345,14	1 198,16	1 198,16	-	-	-
Interest on production R/ha	477,35	477,35	166,68	166,68	192,26	115,08	77,18
Cover crop							
Total Direct Allocated Variable Cost (R/ha)	8 300,56	8 300,56	5 471,15	5 471,15	3 596,63	2 183,10	1 413,53
Overhead cost R/ha	1 192,50	1 192,50	1 192,50	1 192,50	1 421,25	596,25	825,00
Cost per ha before marketing cost R/ha	9 493,06	9 493,06	6 663,65	6 663,65	5 017,88	2 779,35	2 238,53

Operating cost: North West							
Cost item	1 - Maize	2 - Maize Intercrop	3 - Sunflower	4 - Sunflower Intercrop	5 - Double cover crop	6 - Summer Cover Crop	7 - Winter Cover Crop
	2 - North West	2 - North West	2 - North West	2 - North West			

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Cash crop yield: t/ha	5,85	5,85	1,83	1,83		2 - High cost	2 - High cost
Utilised cover crop: tDM/ha		2,00		2,00	17,00	12,00	5,00
Seed	1 349,48	1 349,48	883,40	883,40	1 441,46	728,48	712,98
Fertiliser	2 080,20	2 080,20	1 391,13	1 391,13	1 056,61	1 056,61	-
Lime	536,14	536,14	557,39	557,39	546,77	546,77	-
Fuel	405,00	405,00	472,50	472,50	237,00	142,00	95,00
Reparation	283,50	283,50	330,75	330,75	165,90	99,40	66,50
Herbicide	990,10	990,10	891,89	891,89	400,00	200,00	200,00
Pest control	-	-	-	-	-	-	-
Input insurance	653,40	653,40	188,54	188,54	-	-	-
Grain hedging	806,25	806,25	242,17	242,17	-	-	-
Harvest insurance	56,03	56,03	74,43	74,43	-	-	-
Interest on production R/ha	338,67	338,67	271,62	271,62	236,72	185,03	51,69
Cover crop							
Total Direct Allocated Variable Cost (R/ha)	7 498,76	7 498,76	5 303,83	5 303,83	4 084,45	2 958,28	1 126,17
Overhead cost R/ha	1 091,70	1 091,70	1 091,70	1 091,70	1 125,00	562,50	562,50
Cost per ha before marketing cost R/ha	8 590,47	8 590,47	6 395,53	6 395,53	5 209,45	3 520,78	1 688,67

