



Keys to successfully transition from manual to modernised silviculture – A contractor's perspective

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MAJOR KEYS

1. Processes

- -High level planning
- -Detailed Planning - Compartment Operations Planning

2. Machinery and Equipment

- -machine capability & site matching
- -productivity, availability & utilisation daily monitoring

3. People

- -Competent operational & support staff
- -Skilled operators

4. Support from client

- -Pricing model
- -Joint approach to R&D, time studies

PROCESSES



PLAN FOR:



1. SAFE MOVEMENT
OF PEOPLE &
MACHINES



2. IMPROVED
OPERATIONAL
EFFICIENCIES

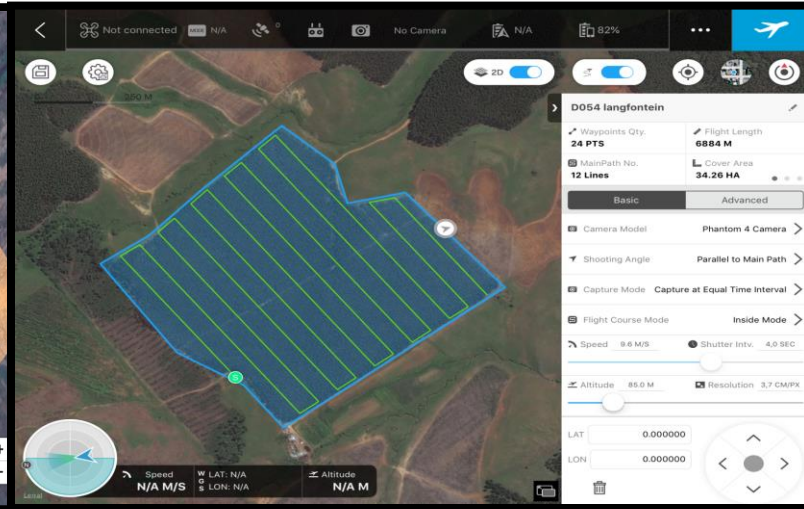
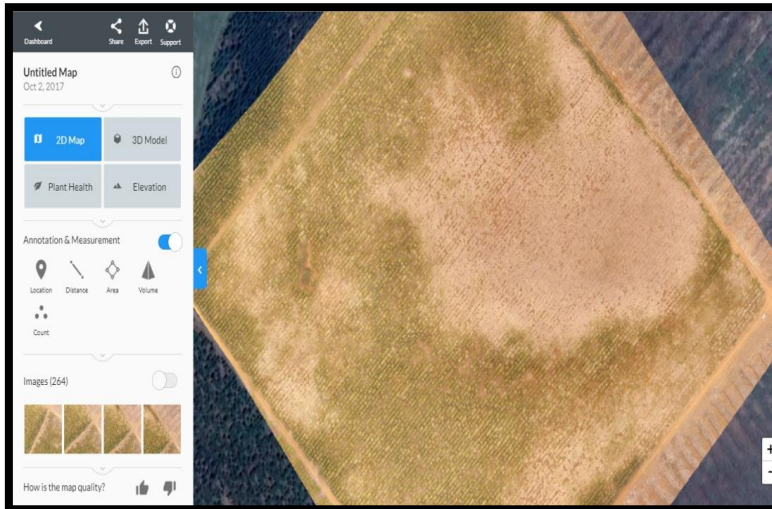


3. IMPROVED
MACHINE
PRODUCTIVITY

HIGH LEVEL PLANNING FOR MECHANISED SILVICS OPS

1. Block felling
2. Brush burning - clean compartments
3. Slope - manual or mechanised
4. Mulching - removing old stump lines

TOOLS -UAVs (DRONES)



DETAILED COMPARTMENT PLANNING

- ▶ Identify obstacles e.g. harvesting residue, stumps, gullies, stones etc.
- ▶ **In-field conditions - determine speed of machinery**
- ▶ **Soil conditions –determine pitting and planting time**
- ▶ **Edge / road banks - determine turning time**

Compartment Planning & Rating

In-field conditions - determine speed					
Factor	Description	Null	1	2	3
1	Converging plant lines	None	1 line of 50	1 line of 30	1 line of 10
2	Direction of lines in relation to slope direction - <i>only where gradient is more than 10%</i>	Down the slope or where slope <10%	0 - 30 degrees to direction of slope	30 - 60 degrees to direction of slope	> 60 degrees to direction of slope ("on the contour")
3	Ground roughness (rocks, harvesting residue, old contour ploughing and erosion gullies)	None	1 to 3	4 to 6	7 to 9
4	Previous ridges	None or no crossing	0 - 20cm	20 - 35cm	> 35cm
5	Visual obstacles	5m or no obstacles	3m	1.5m	None
6	Interrow espacement	> 4.0m	3.25 - 4.0m	2.8 - 3.3m	< 2.8m or interrow stumps
7	Stump height and size	No obstacles	1 to 3	4 to 6	7 to 9

Compartment Planning & Rating

	Factor	Description	Null	1	2	3
	Soil conditions –determine pitting and planting time					
8	Soil / Pitting Conditions	Wet, erosion hazard, based on stones, rocks, stone layer, hardpan and clay etc., rotation/position of old stumps	Pick penetration- full depth	10 – 14cm – moist soft soils and/or not close to old stumps	7 -10 cm harder clay, firm soil, clay, grit, scattered rock or shale	<7cm soil penetration
	Edge / road banks - determine turning time					
9	Road banks	Road bank, side drains, culvert, dead end lines and camber of road	Flat, no obstacles	< 30cm bank	30 - 40 cm bank	> 40 cm bank and / or side drains
10	Turning area condition	Road, open area, old stumps and adjacent compartment - big trees or TUP	Open area, no obstacles	Plantation road	Cambered plantation road, veta and / or harvesting residue	Old stumps
11	Turning circle width (including dead end lines)	Width of turning area in meter	> 10m	Simple turn (6 - 10m)	Multiple turn (4 - 7m)	Multiple turn and / or reverse (< 4m)
			< 30 sec	30 - 60sec	60 sec - 2 minutes	> 2 minutes

CONVERGING PLANT LINES & IMPACT

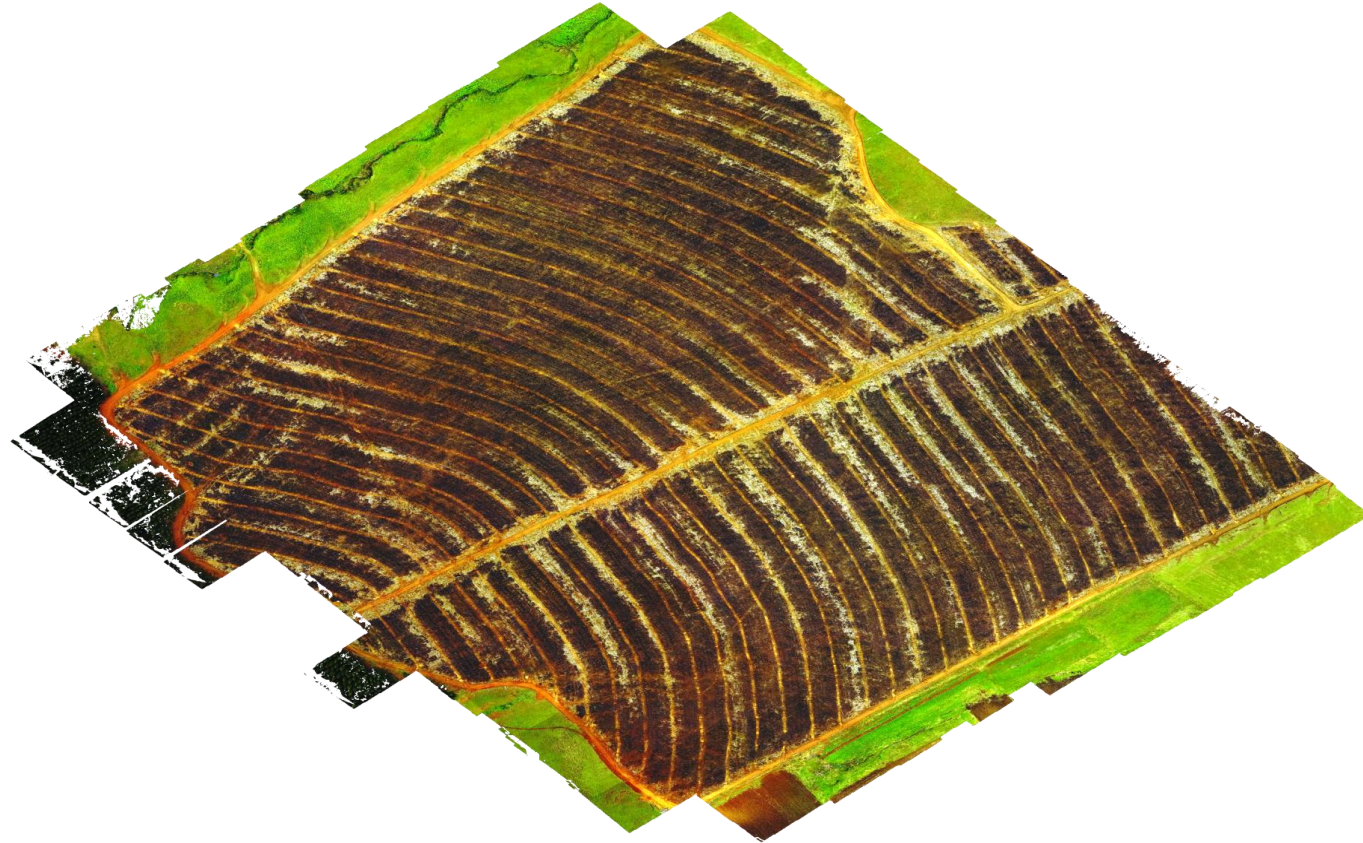


- Converging plant lines - Equipment end up covering less lines than designed for - unproductive.

PROCESSED IMAGE



PROCESSED IMAGE



MACHINERY & EQUIPMENT

Slope Limitations

	Equipment	Wheeled/tracked	Implement attachment	Maximum slope limitation in %
1	Agricultural tractor	2-wheel drive	Any	15%
2	Agricultural tractor	4-wheel drive	Trailer (double axle)	75KW tractor – 15% 90 KW tractor – 20%
3	Agricultural tractor	4-wheel drive	Suspended 3-point link attachment	15%
4	Agricultural tractor	4-wheel drive	Other implements	20%
5	Tool carrier – FIORI & tank	4-wheel drive	Planting	25%
6	Excavator (MPAT)	tracked	N/A	35%

MECHANICAL PITTING



- Team reside in-field for maximum efficiency & productivity.
- Self contained caravan with kitchen, bathroom, toilet and beds for six people
- Solar powered- supplying power for lighting, refrigerator and electronic devices
- Gas installation for cooking and heating bathing water (self igniting system)
- Two shifts, achieves 2 400 pits/shift/machine

SEMI-MECHANICAL PLANTING - FIORI



- Self contained planting unit equipped with two tanks (1500L each), gel mixer and a pump
- Simultaneous application of fertiliser tablet and planting.
- Achieve 7,5 – 10 ha/shift

MARK, PIT, PLANT & FERT - WASSERPLANTER



- Simultaneously mark, pit, plant & fertilise
- The unit has six planting points using high pressure water to drill pits.
- Water tank of 800L and a hydraulic motor to pump water at high pressure
- Achieve 4ha/shift

CHEMICAL INTER-ROW WEEDING - WINDBOX



- Pipes are connected to the windbox (a frame with nozzles covered by canvass to prevent chemical drift)
- Herbicide is sprayed to kill weeds on the interrow
- This system uses 6 people with 2 people per wind box
- Average production is 8ha/shift

CHEMICAL LINE WEEDING - DRIBBLE BARS



- Boom with 6 outlets providing connections for “Y” pieces that runs to the dribble bars
- 800Litre tank mounted on tractor equipped with a PTO driven motor for pumping chemical mix
- 12 workers hold the lances and spray either side of line in pairs
- Achieves 15ha/shift

MECHANICAL WEEDING - FLAIL



- Tractor mounted hydraulic driven unit used for interrow weeding
- Equipped with a shaft with chains that crushes weeds during its high-speed rotation of 700rpm
- The shaft is driven by a hydraulic motor connected to the tractor's hydraulics
- Achieve 7ha/shift

SPRAY DRONE

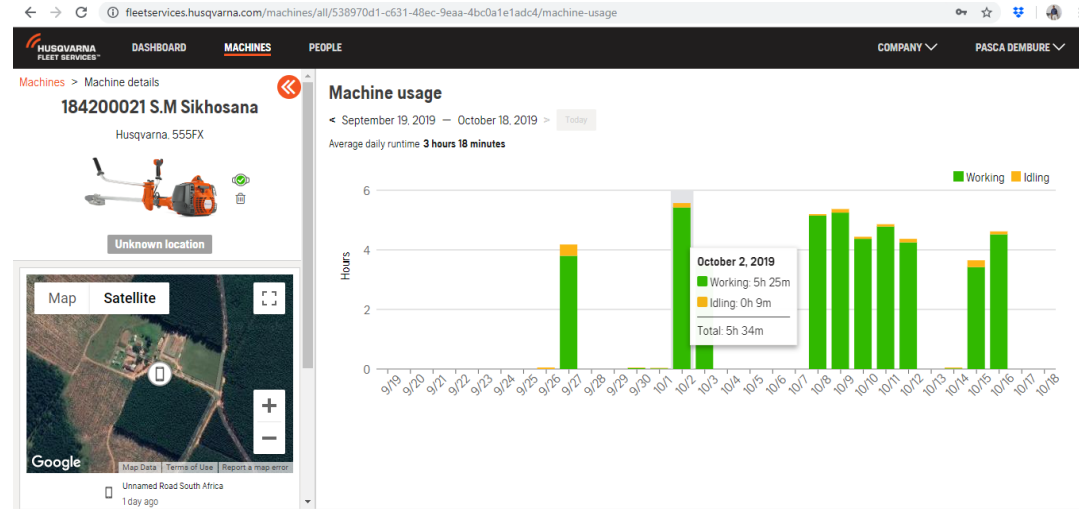


- Agras T16 spray drone
- To be used in pre-plant broadcast spray & tracer belts.
- Multi-rotor drone with 6 propellers, has a 16-litre tank.
- Potential to spray 10 ha/hr (achieved by 4 delivery pumps and 8 sprinklers).
- Battery has a flight time of between 10 – 15 minutes
- Can deliver a max of 30 ltrs/ha and a min of 15 ltrs/ha.

SENSORS ON CLEARING SAWS



Fleet services sensor



The Husqvarna Fleet Services™ sensors gather machine information such as:

- machine statistics (productive machine hours and idle time),
- service overview (when to service or replace),
- machine location, inventory control
- carbon footprint

DAILY PRODUCTIVITY MONITORING

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
						Productivity			Travelling MHRS to work			Working MHRS			Travelling MHRS to camp			
3	Date	Equipment	Copt	Area	Supervisor	# of Trays	Bud. Ha	Prod. (ha)	Open mhrs	Close mhrs	Total mhrs	Open mhrs	Close mhrs	Total mhrs	Open mhrs	Close mhrs	Total mhrs	Tot. AMS b/downs
4	16-Sep-20	Fiori	S061	14,6	Neli	86	7,5	8	3632,9	3634,5	1,6	3634,5	3639,5	5	3639,5	3639,6	0,1	0
5	17-Sep-20	Fiori	S061	14,6	Neli	70	7,5	7	3639,6	3640,7	1,1	3640,7	3645,9	5,2	3645,9	3646	0,1	0
6	07-Oct-20	Fiori	M034	21,8	Neli	107	7,5	10	3646	3646,8	0,8	3646,8	3653,1	6,3	3653,1	3653,9	0,8	0
7	08-Oct-20	Fiori	M034	21,8	Neli	107	7,5	10	3653,9	3654	0,1	3654	3660,1	6,1	3660,1	3660,1	0	0
8	09-Oct-20	Fiori	M034	21,8	Thoko	30	7,5	3	3660,6	3661,6	1	3661,6	3664,1	2,5	3664,1	3664,1	0	0
9	09-Oct-20	Fiori	M032	2,4	Thoko	32	7,5	3	3664,1	3664,2	0,1	3664,2	3666,2	2	3666,2	3666,2	0	0
10	10-Oct-20	Fiori	M036	3,2	Neli	34	7,5	3	3662,2	3667,2	5	3667,2	3670,7	3,5	3670,7	3670,7	0	0
11	10-Oct-20	Fiori	M048	20,8	Neli	45	7,5	4	3670,7	3671,2	0,5	3671,2	3673,9	2,7	3673,9	3673,9	0	0
12	12-Oct-20	Fiori	M048	20,8	Neli	66	7,5	6	3673,9	3675,3	1,4	3675,3	3680,7	5,4	3680,7	3681,7	1	2
13	13-Oct-20	Fiori	M048	20,8	Neli	107	7,5	10	3681,7	3682,5	0,8	3682,5	3690,2	7,7	3690,2	3690,2	0	0
14	14-Oct-20	Fiori	M046	13,8	Neli	39	7,5	4	3693,3	3693,7	0,4	3693,7	3695,7	2	3695,7	3695,7	0	3
15	15-Oct-20	Fiori	M046	13,8	Neli	107	7,5	10	3696,2	3696,9	0,7	3696,9	3704,2	7,3	3704,2	3704,2	0	3
16	16-Oct-20	Fiori	M046	13,8	Neli	107	22	10	3704,6	3705,5	0,9	3705,5	3708,8	3,3	3708,8	3708,8	0	0
17	16-Oct-20	Fiori	M054	30,5	Neli	85	22	8	3708,8	3709,2	0,4	3709,2	3713	3,8	3713	3713,4	0,4	0

Working on LIVE integrated IT system to link PRODUCTION, PROCUREMENT & MANAGEMENT ACCOUNTS.

Foresters to capture data in-field using tablets.

- Labour usage, machine hours, fuel & chemical issues etc.

Data automatically accessed LIVE by management

SUPPORT FROM CLIENT

Good relationship

Pricing

- Manual operations mainly priced using man-day rate
- Mechanical operations pricing to consider
 - a. impact of machinery fixed costs during off season
 - b. logistics

Joint approach to R&D, time and work studies.

PEOPLE

COMPETANT OPERATIONAL & SUPPORT STAFF

- -Qualified Foresters
- -Qualified Supervisors - Supervisor Development Programme
- -Support staff that includes Planning Manager, Drone Operator, HR personnel, Admin, SHE Manager etc.

SKILLED OPERATORS

- -technical & SHE training, annual refresher training

MOTIVATED TEAM

- -production incentives, dividend sharing scheme

Informed Team - Visual Management

- ▶ Improve Visual Management: monthly safety stats & production communicated to teams





THANK YOU



Thuthugani
contractors

