

BOTRIVER CATCHMENT ALIEN INVASIVE WEED HARVESTING AND CHIPPING EVALUATION

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Background

- Flower Valley – Botriver Conservancy
Cape Agulhas (Bredasdorp)
- University Stellenbosch
 - » Three students conducted harvesting study
 - » Assisted with chipper studies
- Productivity Management Services
 - » Brad Shuttleworth

Species

- Spider Gum (*Eucalyptus lehmannii*)
- Port Jackson (*Acacia saligna*)
- Myrtle (*Leptospermum laevigatum*)
- Pine regeneration (*Pinus Radiata*)

Spider Gum

- Study 1 – Young dense regrowth 4m, 1-3cm dia, 100% cover
- Study 2 & 3 – Mature dense stand, 12m, 2-15cm, 100% cover



Spider Gum - Harvesting

	Mandays/ha	Tonnes/unit
Study 1(Chip 100ton)		
Chainsaw operators	Nil	
Manual workers	54.9 units/ha	1.83 t/unit
Study 2 (Wood 31ton / Chip 90 ton)		
Chainsaw operators	13.8 units/ha	2.27 t/unit
Manual workers	42.0 units/ha	6.51 t/unit
Study 3 (Chip 107t/ha)		
Chainsaw operators	17.5 units/ha	6.10 t/unit
Manual workers	Nil	

Spider Gum - Chipping

Activity	Study 1	Study 2	Study 3
Total material chipped	4.53 t	3.96 t	5.94 t
Total chipping time	70.12 min	97.59 min	122.79 min
Chipping t/hr (45% utilisation)	3.88 t/hr	2.44 t/hr	2.90 t/hr
Chipper utilisation	45%	46%	44%
Material collection range (dist)	0 – 20m	0 – 35m	10 – 40m
Logger cycle load tonnes	0.071 t	0.078 t	0.081 t
Logger cycles	64	50	70
Chipping t/hr (100% utilisation)	8.56 t/hr	5.26 t/hr	6.70 t/hr



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Spider Gum - Operational Cost

Operation and output data	Plot 1 Young Slash only	Plot 2 Mature Fell & Stack	Plot 3 Mature Fell only
Wood t/ha	0	31.3	0
Chip t/ha	100.2	89.8	106.8
Total t/ha	100.2	121.10	106.8
Labour			
Chainsaw units (R350)	0	13.8	17.5
Labour units (R125)	54.9	42.0	0
Total labour cost	R 6 863	R 10 080	R 6 125
R/t (wood & chip)	R 68.49	R 83.24	R 57.35
Chipping rate (average)	6.84	6.84	6.84
Hour / ha	15.5	13.1	21.7
Cost @ R725/hr	R 11 238	R 9 498	R 15 733
R/t chipping	R 112.15	R 105.76	R 147.31
Total cost	R 18 101	R 19 578	R 21 858
R/t (Wood & chip)	R 181.00	R 161.67	R 204.66
Current chipping performance			
R/t (Wood & chip)	R 255.00 3.88t/hr	R 303.55 2.44t/hr	R 347.57 2.9t/hr

Port Jackson

- Study 1 –, Young dense stand, 4m, 2-5cm, 100% cover
- Study 2 & 3 – Mature stand, 7m, 3 – 15cm, 100% cover



Port Jackson- Harvesting

	Mandays/ha	Tonnes/unit
Study 1 (Wood 31ton Chip 116 ton)		
Chainsaw operators	9.2 units/ha	16.0 t/unit
Manual workers	28.3 units/ha	5.2 t/unit
Study 2 (Wood 25ton / Chip 140 ton)		
Chainsaw operators	5.1 units/ha	32.4 t/unit
Manual workers	18.7 units/ha	8.8 t/unit
Study 3 (Wood 25ton / Chip 145ton)		
Chainsaw operators	5.1 units/ha	33.3 t/unit
Manual workers	12.9 units/ha	13.2 t/unit

Port Jackson - Chipping

Activity	Study 1	Study 2	Study 3
Total material chipped	4.66 t	5.79 t	5.59 t
Total chipping time	64.96 min	60.22 min	79.29 min
Chipping t/hr (53% util)	4.30 t/hr	5.76 t/hr	4.23 t/hr
Chipper utilisation	53%	48%	44%
Material collection range	0 – 18m	0 – 20m	25 – 35m
Logger cycle load tonnes	0.108 t	0.121 t	0.095 t
Logger cycles	43	48	59
Chipping t/hr (100%)	8.14 t/hr	12.0 t/hr	9.71 t/hr

Port Jackson- Operational Cost

Operation and output data	Plot 7 Young acacia	Plot 6 Mature acacia	Plot 8 Mature acacia
Wood t/ha	30.5	25.0	25.0
Chip t/ha	116.5	144.75	139.75
Total t/ha	148.5	169.75	164.75
Labour			
Chainsaw units	9.2	5.1	5.1
Labour units	28.3	12.9	18.7
Total labour cost	R 6 818	R 3 398	R 4 123
R/t (wood & chip)	R 44.91	R 20.01	R 25.02
Chipping rate	9.95	9.95	9.95
Hr/ha	11.7	14.5	14.0
Cost @ R725/hr	R 8 483	R 10 513	R 10 150
R/t chipping	R 72.80	R 72.63	R 72.63
Total cost	R 15 301	R 13 911	R 14 273
R/t (Wood & chip)	R 103.04	R 81.95	R 86.63
Current Chipping performance			
R/t (Wood & chip)	R 178.00	R 127.00	R 170.00

Pine regeneration

- Study 1 – Mature stand, 18m, 8 - 22cm, 100% cover



Pine regeneration- Harvesting

	Mandays/ha	Tonnes/unit
Study 1 (Wood 144ton Chip 132 ton)		
Chainsaw operators	6.0 units/ha	46.0 t/unit
Manual workers	4.0 units/ha	69.0 t/unit

Pine regeneration- Chipping

Activity	Output
Total material chipped	21.17 t
Total chipping time	162.91 min
Chipping t/hr (48% utilisation)	7.80 t/hr
Chipper utilisation	48%
Material collection range	1 – 35m
Logger cycle load tonnes	0.157 t
Logger cycles	134
Chipping t/hr (100% utilisation)	16.19 t/hr

Pine regeneration - Operational Cost

Operation and output data	Plot 11 Mature pine
Wood t/ha	143.6
Chip t/ha	132.3
Total t/ha	275.9
Labour	
Chainsaw units	6
Labour units	4
Three wheeled logger	16 hours
Total labour cost & logger	R 7 800
R/t (wood & chip)	R 27.28
Chipping rate (t/hr)	16.19
Hr/ha	8.2
Cost @ R725/hr	R 5 945
R/t chip	R 21.31
Total cost	R 13 818
R/t (Wood & chip)	R 48.59
Current Chipping performance	
R/t (Wood & chip)	R 70.39

Three wheeled loader

Transport distance	Min/cycle	Cycle/hr	T/hr @0.105 t/cycle	T/hr @0.150 t/cycle
5m	1.213	49.5	5.20	7.4
10m	1.263	47.5	4.99	7.1
15m	1.433	41.9	4.40	6.3
20m	1.511	39.7	4.17	6.0
25m	1.550	38.7	4.06	5.8
30m	1.630	36.8	3.87	5.5
35m	1.860	32.3	3.39	4.8

Operational costing

Species	Current cost range (R/t)	Potential cost range (R/t)
Spider gum	~ R 255.00 – R 348.00	~ R 147.00 – R 186.00
Acacia	~ R 127.00 – R 178.00	~ R 82.00 – R 103.00
Pine	R 70.00	R 48.00

Study Observations

- Current operational efficiency
- Chipper location
 - » Extraction distance – three wheeled loader
 - » Chipper positioning infield (tractor/self powered)
 - » Transport access
- Transport (bin vs. truck)
- Chipper feed (logger vs. self feeding)
- Species selection & yield density
- Solid wood & chip vs. Chip only

Summary

- High volumes of alien invasive species are available
- Harvesting already available via WfW teams ideally would be commercially viable
- Economical viability
 - » Price for resource
 - » Transport lead distances