Eucalypt coppice management for rurally based, small-scale timber growers in South Africa

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Background

- Eucalypts were introduced into South Africa late in the 19th century, initially as a source of timber for the mining industry, but by the late 1980's they were most commonly planted for pulp
- Most eucalypts have the ability to regenerate via coppice shoots, which are then selectively thinned for the re-establishment of commercial plantations
- As such, all the past coppice management research in South Africa was exclusively focused on maximizing timber volume production alone

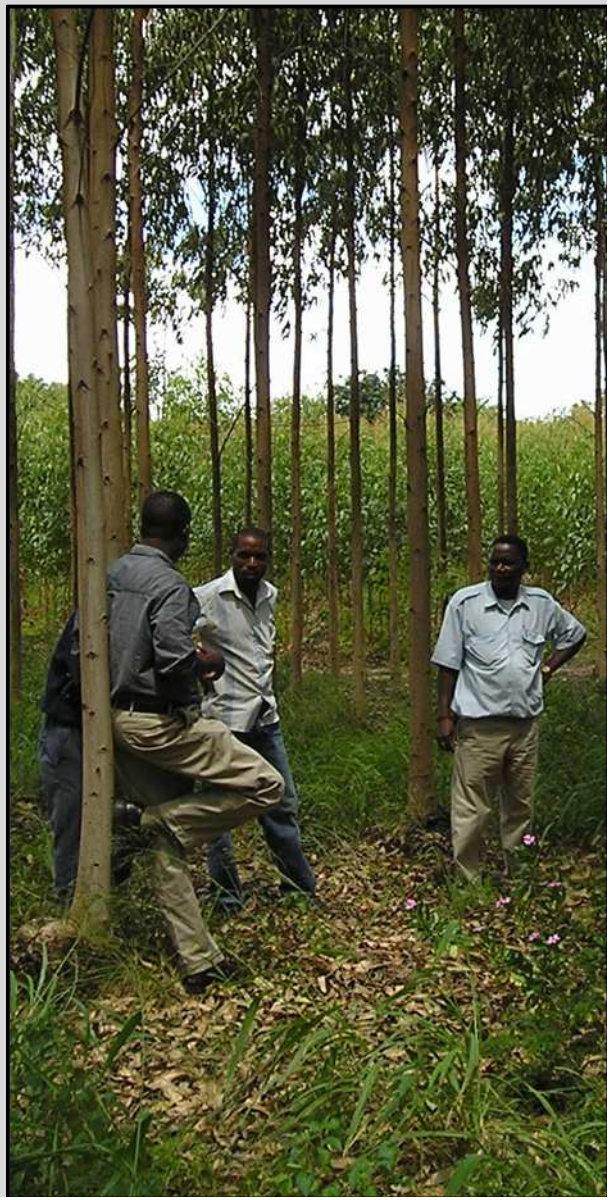
Commercial coppice management recommendations

a) 1st reduction to 2 stems per stump at 3-4 m in height

b) 2nd reduction to original stocking at 7-8 m in height

The increasing importance of rurally based small-scale timber growers in SA forestry

- There are ca. 25 000 emerging growers that own 55 000 ha planted to trees (±2.25 ha each)
- But, a change in SA land reform policies has meant that ±50% of currently afforested land is under “land claim”
- This will result in a change in ownership of existing areas under plantations (emerging growers)
  - Smaller units of land
  - Different end objectives
  - Constant revenue



Laths and poles used extensively for building

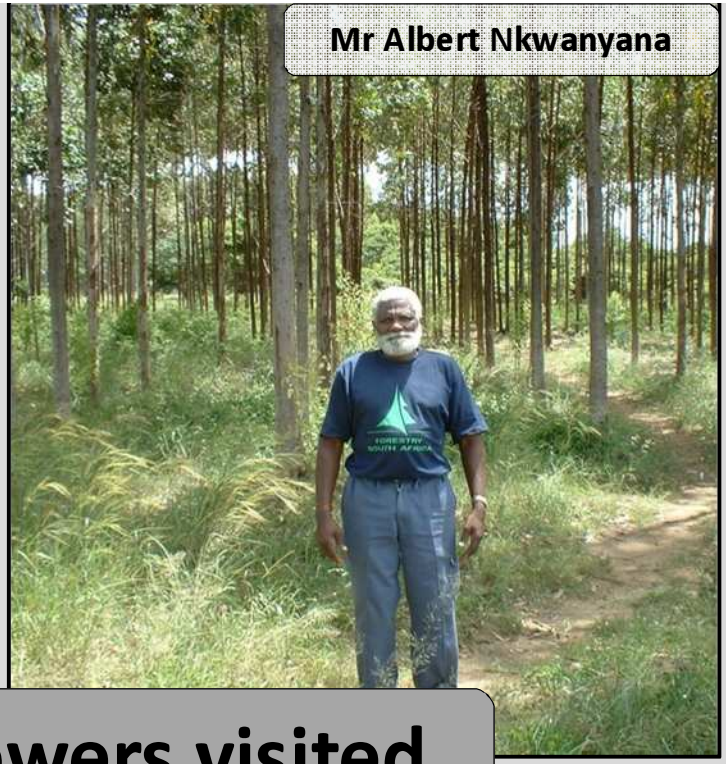
Rural and Urban

Droppers and Laths used extensively for fencing

Rural and Urban

Small-scale timber growers visited

Mr Mzibeni Mthiyane



Mr Albert Nkwanyana

Mrs Emelina Tembe

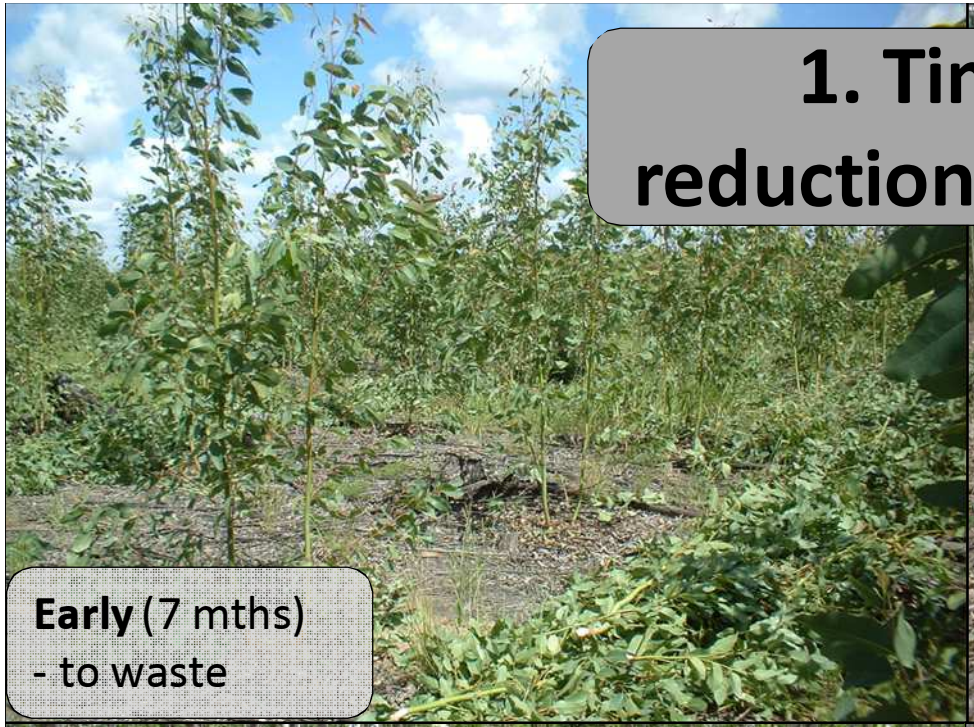
Mrs Zikhokhile Nkwanyana

- The management of these stands was found to be varied with no consensus amongst the different growers as to the best management practices for any specific product!

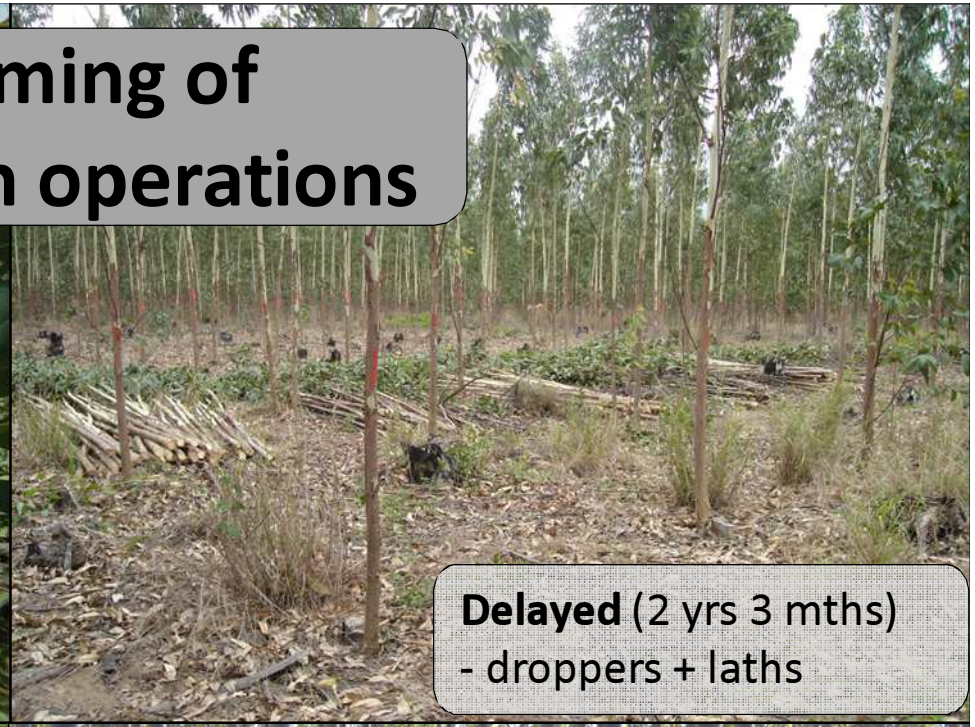
- In contrast to commercial companies, these growers require constant product throughout the rotation, either for personal use or cash-flow.
- In addition, input costs are low as the owners of these small units of land provide most of the labour themselves.

- A trial was initiated in 2005 in the sub-tropical region of Zululand, South Africa, on a recently felled *Eucalyptus grandis* x *E. camaldulensis* stand
- Thirteen different multiple-use management treatments were replicated 3 (RCBD), with each plot consisting of 100 stumps

1. Timing of reduction operations

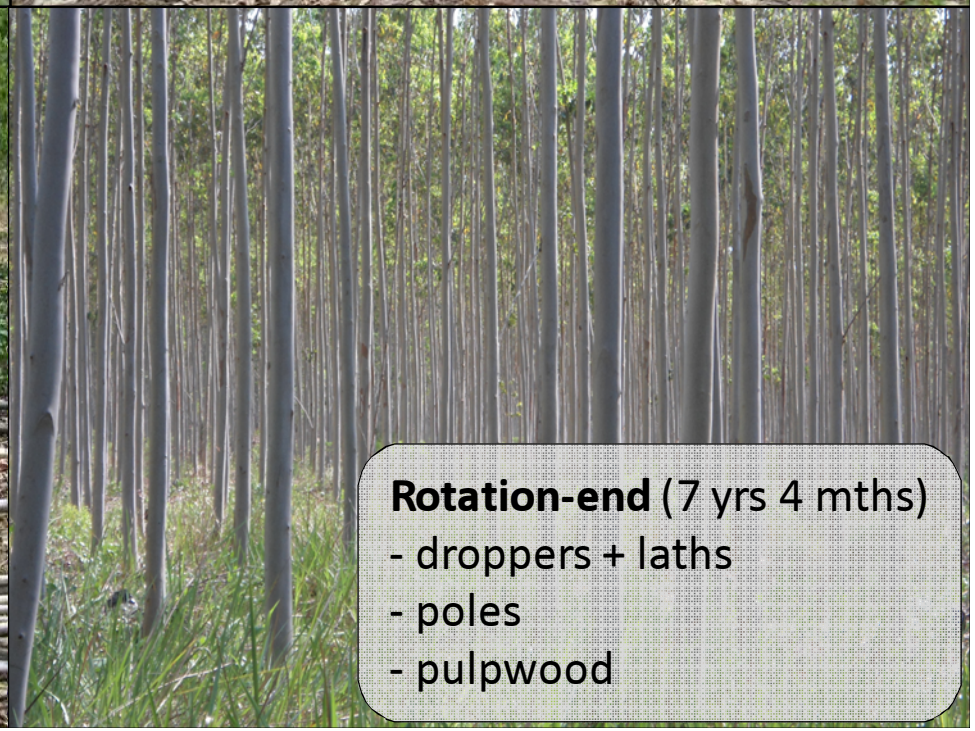


Early (7 mths)
- to waste

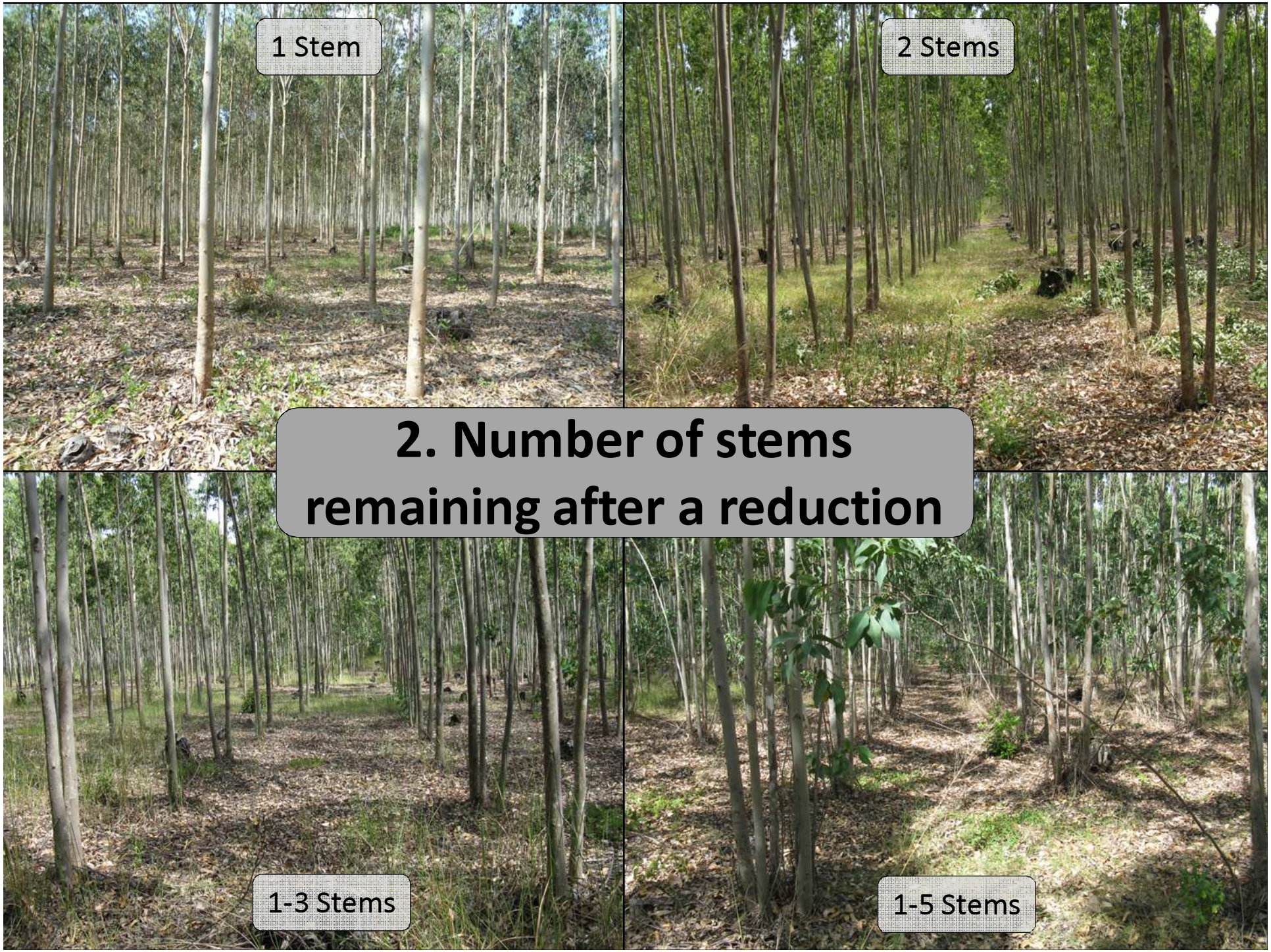


Delayed (2 yrs 3 mths)
- droppers + laths

Late (5 yrs 7 mths)
- droppers + laths



Rotation-end (7 yrs 4 mths)
- droppers + laths
- poles
- pulpwood


1 Stem
2 Stems
2. Number of stems remaining after a reduction
1-3 Stems
1-5 Stems

3. Additional Treatments

Continual
Smallest coppice stems removed from ⅓ of the stumps within each plot at each reduction event and whole plot at rotation end

Thin from top
Largest coppice stems removed from ⅓ of the stumps within each plot at each reduction event and whole plot at rotation end

Measurements and Assessments

- Stems removed at each reduction event and at rotation-end were measured in terms of numbers removed, diameter and height

- Operational costs (labour units and input costs) based on stem size and numbers removed were obtained, as were the product-specific market prices, to determine the best treatment(s) for the specific objectives of the grower

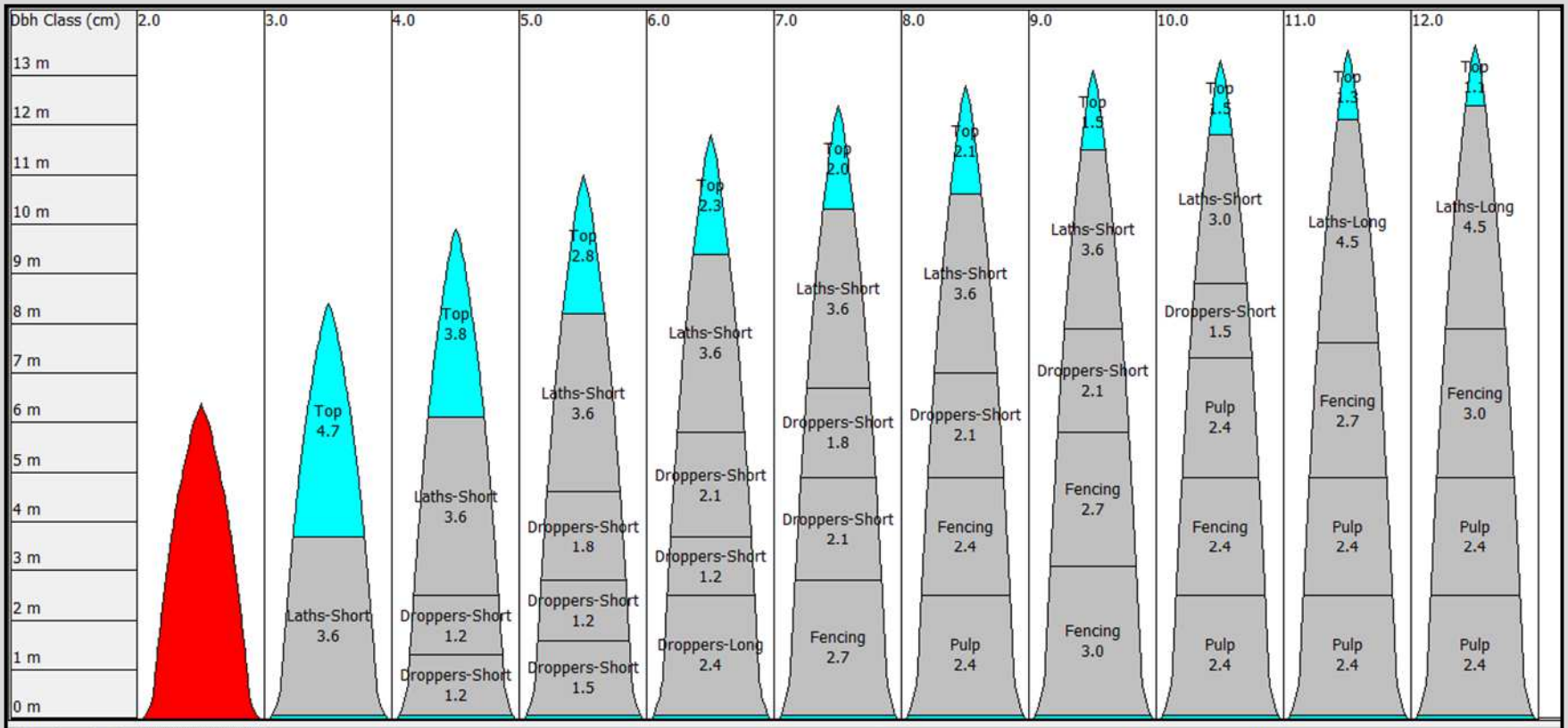
Bucking procedure

(Mondi-developed "Pulpwood Scenario Analysis Tool")

- An 'optimized' bucking algorithm was used to maximize value, as there was differentiation in terms of the price of products

Product	Length (m)	Top-end underbark diameter (mm)
Droppers	1.2 - 2.4	32 - 50
Laths	3.0 - 4.5	20 - 25
Poles	2.4 – 3.0	50 - 75
Logs (for pulpwood)	2.4	> 50

Output = information on product, input costs and profit



Dbh Class (cm)	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
Height (m)	6.331	8.380	9.871	10.956	11.746	12.322	12.740	13.045	13.267	13.428	13.546
Frequency	458.700000	904.200000	419.300000	419.300000	432.400000	576.600000	799.400000	602.800000	157.300000	39.300000	26.200000
UVol (m3)	0.000000	0.001736	0.004474	0.008418	0.013261	0.019129	0.025831	0.033793	0.042488	0.052121	0.062672
Total Vol (m3)	0.000000	0.002484	0.005202	0.009022	0.013929	0.019887	0.026857	0.034805	0.043699	0.053520	0.064251
Stump Vol (m3)	0.000000	0.000084	0.000150	0.000235	0.000340	0.000463	0.000605	0.000767	0.000947	0.001146	0.001364
Trim Vol (m3)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Waste Vol (m3)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Top Vol (m3)	0.000000	0.000665	0.000578	0.000369	0.000328	0.000295	0.000422	0.000245	0.000264	0.000252	0.000214
UVol (m3/ha)	0.000000	1.569423	1.876104	3.529685	5.734108	11.029553	20.649008	20.370145	6.683432	2.048374	1.642005
Total Vol (m3/ha	0.000000	2.246188	2.181262	3.783000	6.022840	11.466862	21.469885	20.980247	6.873925	2.103336	1.683371
Stump Vol (m3/h	0.000000	0.075744	0.062883	0.098642	0.146836	0.266929	0.483869	0.462122	0.148952	0.045046	0.035748
Trim Vol (m3/ha)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Waste Vol (m3/h	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Top Vol (m3/ha)	0.000000	0.601021	0.242275	0.154674	0.141895	0.170380	0.337009	0.147981	0.041541	0.009917	0.005618

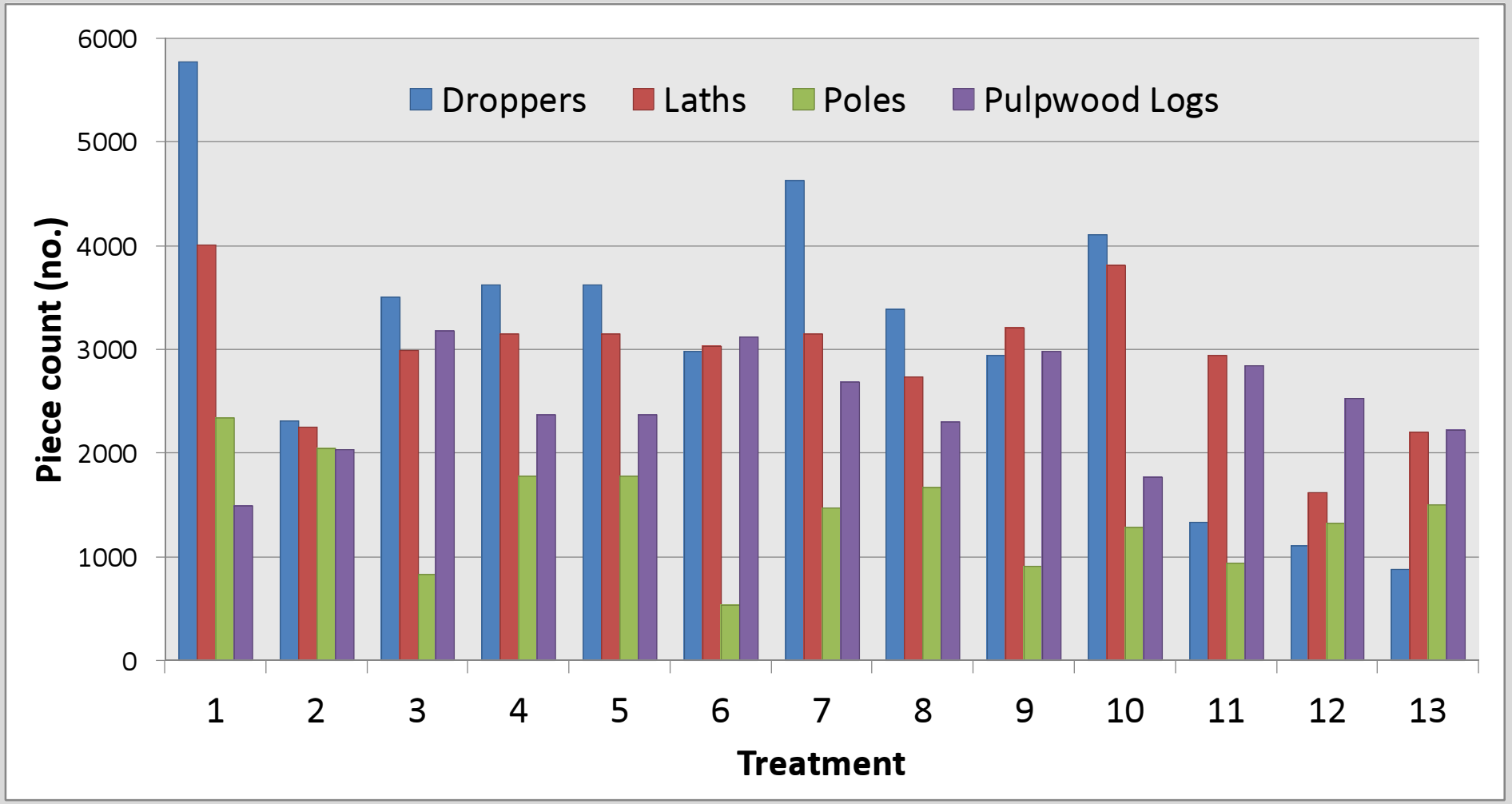
Output evaluated against 4 scenarios (requirements from coppice stands relative to ownership and size of operation)

Scenario	Scale of operation	Description (need for products/income)	Growers requirements from their coppice stands				
			Mixed products throughout rotation	Mixed products and pulpwood at rotation-end	Only pulpwood at rotation-end	Input costs NB	Profit NB
1	**Small** (<5 ha)	• Continuous need for products • Income not that important	Yes	Yes	No	No	No
2	**Small** (<5 ha)	• Continuous need for products • Income important	Yes	Yes	No	No	Yes
3	**Medium** (>5 ha)	• Continuous need for products • Income important • Need for rotation-end products	Yes	No	Yes	Yes	Yes
4	**Commercial Company** (>5 ha)	• Keep input costs low • Maximise product/profit at rotation-end	No	No	Yes	Yes	Yes

Scenario 1: Small-scale grower

- Continuous need for products - **Income not important**

- **<u>Maximum mixed-product during the rotation and at rotation-end</u>**
- Maximum number of times mixed-product removed over whole rotation



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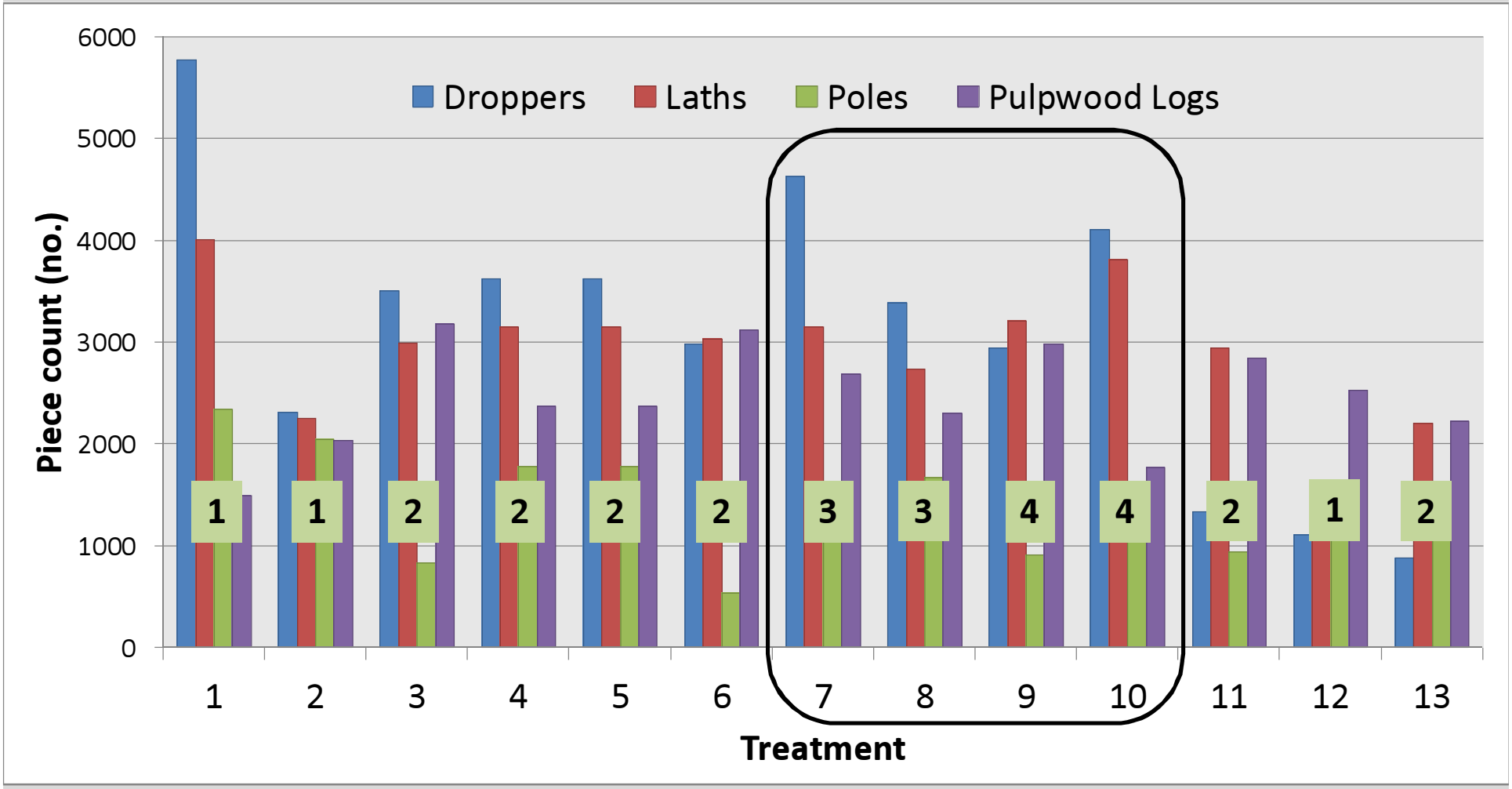


Scenario 1: Small-scale grower

- Continuous need for multiple products - **Income not important**

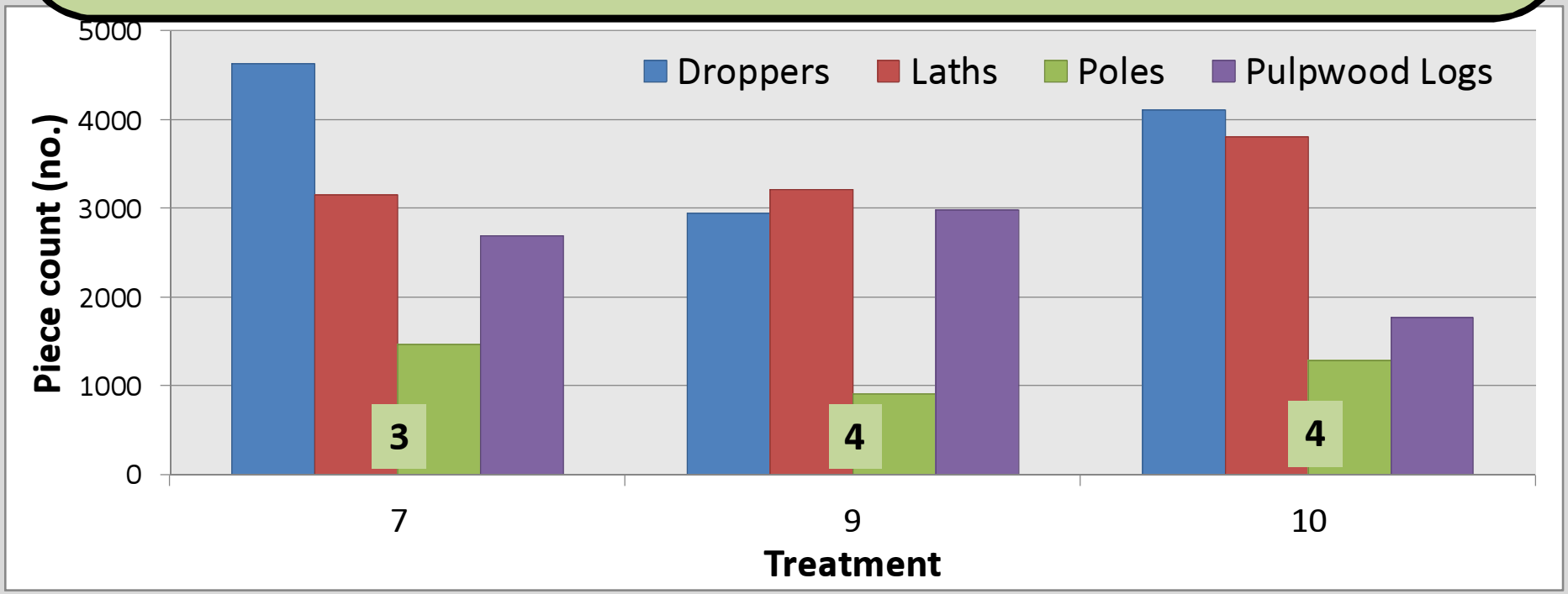
<u>If product required 3x over rotation:</u>

7. ***Delayed reduction to 1-5 stems*** followed by a ***Late reduction to 1-3 stems*** is the best in terms of product total and spread

<u>If product required 4x over rotation:</u>

9. ***Continual*** if pulpwood at rotation-end not that important

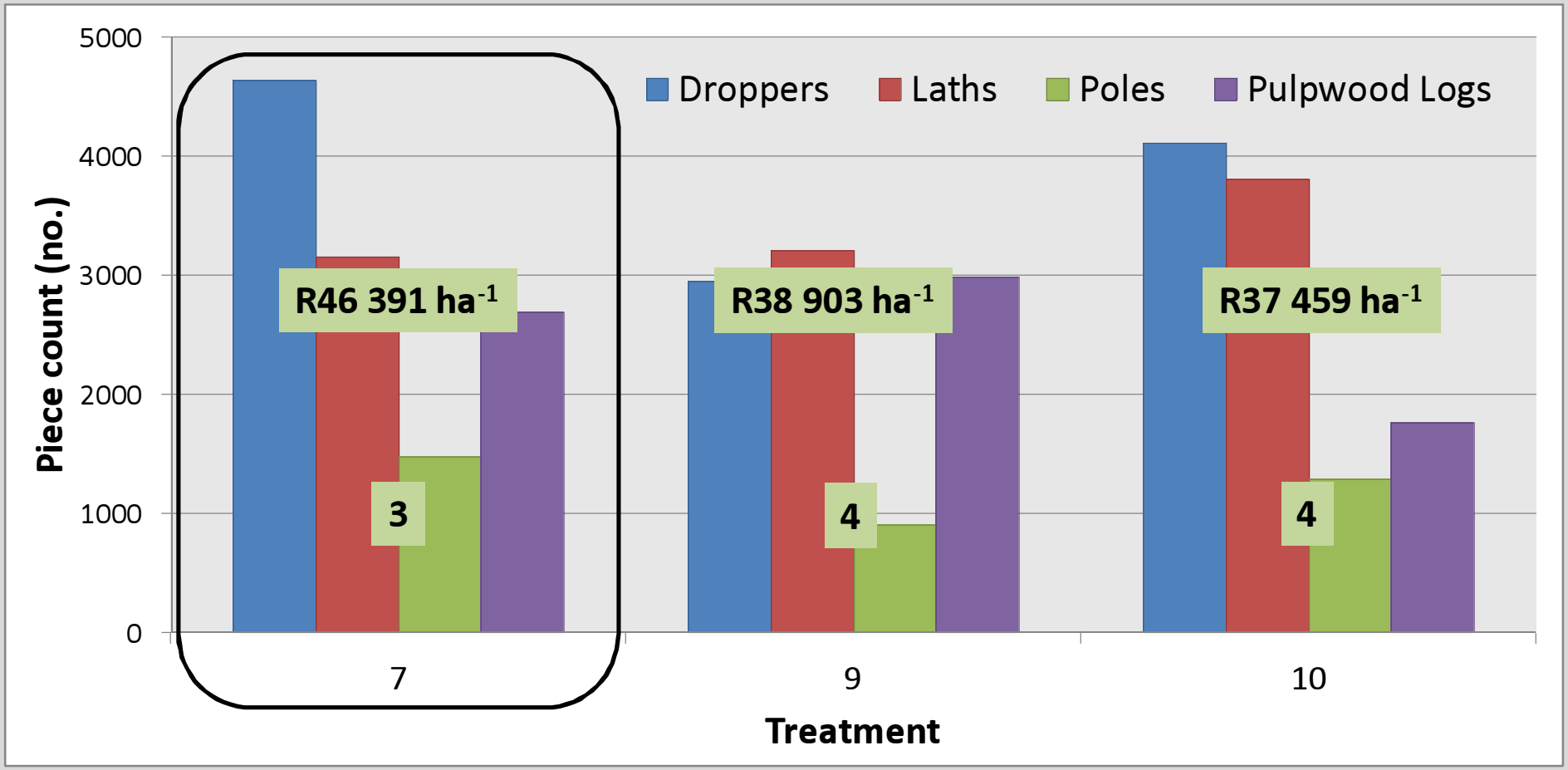
10. ***Thin from top*** if pulpwood at rotation-end is important



Scenario 2: Small-scale grower

- Continuous need for products - **Income important**

- Maximum mixed-product during the rotation and at rotation-end
- Maximum number of times mixed-product removed over whole rotation
- **<u>Maximum profit that can be made without the inclusion of input costs</u>**



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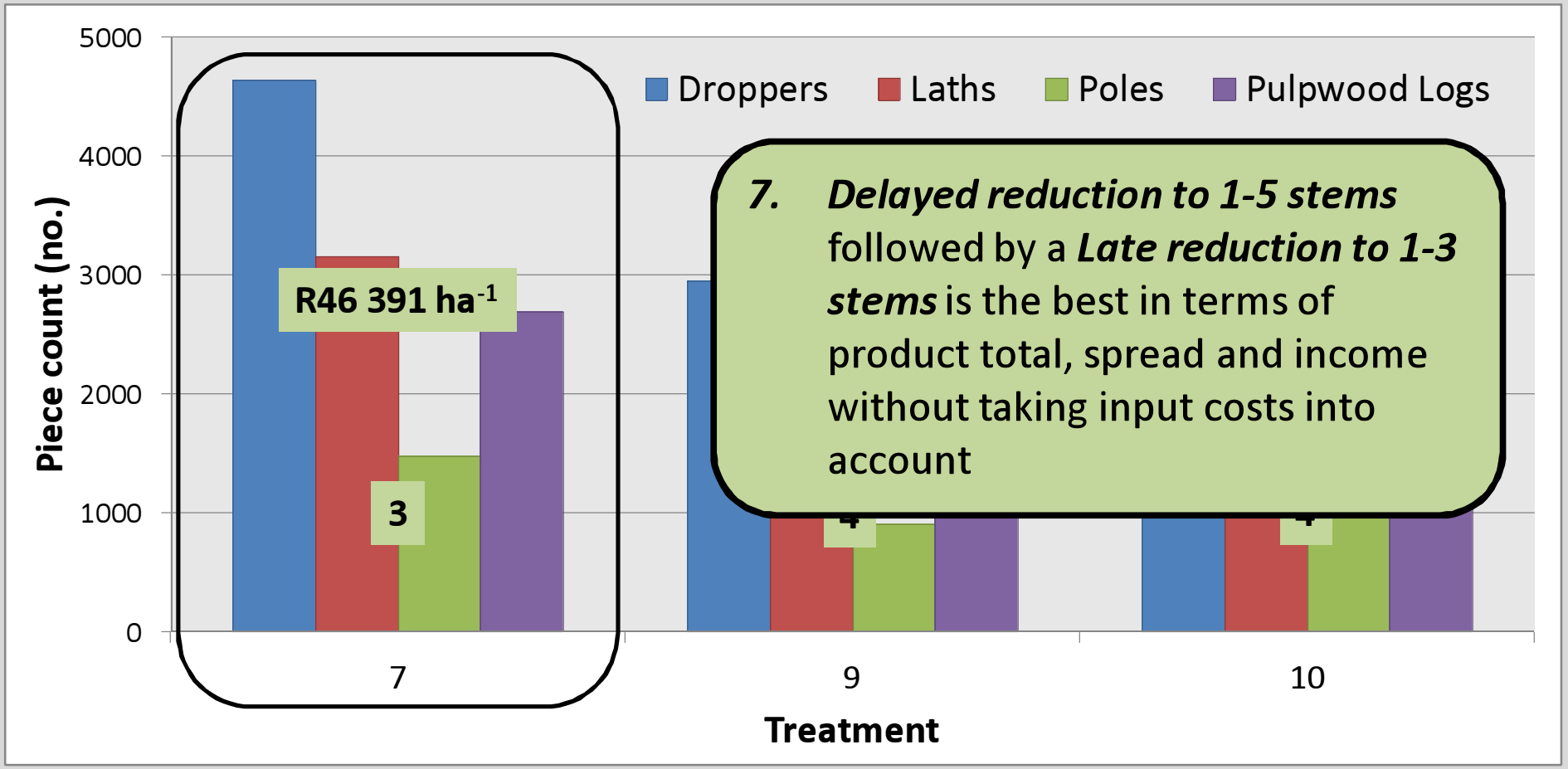
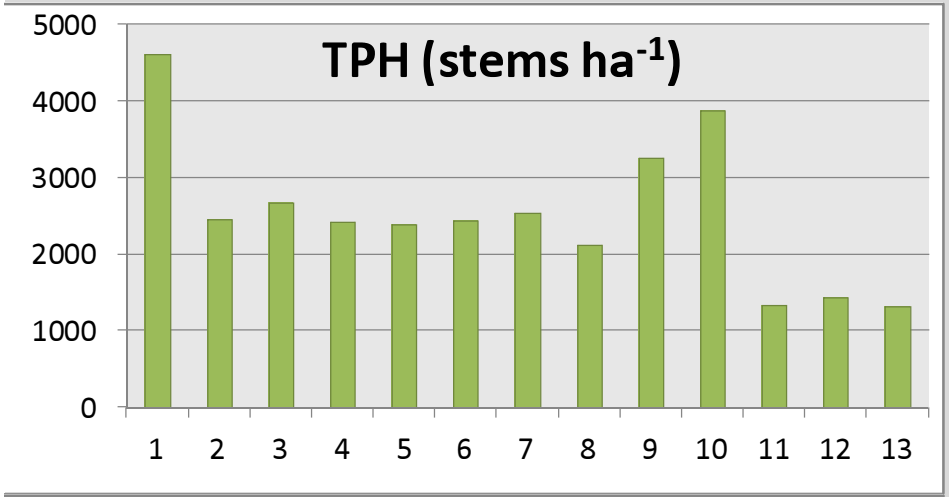


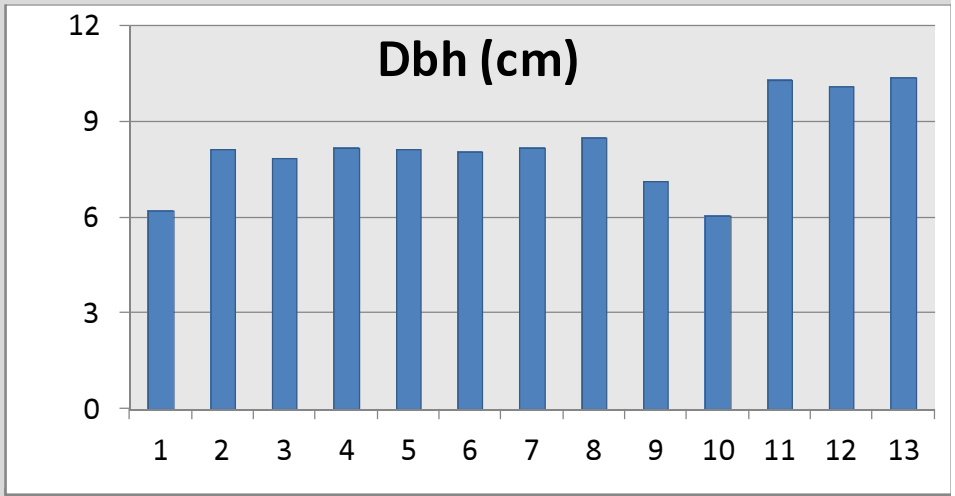
7. ***Delayed reduction to 1-5 stems*** followed by a ***Late reduction to 1-3 stems*** is the best in terms of product total, spread and income without taking input costs into account

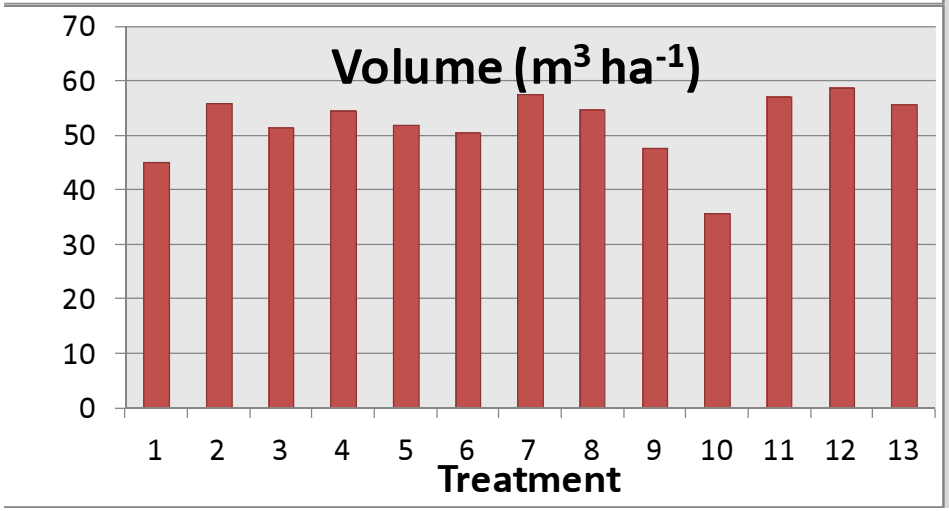
Scenario 4: Commercial company

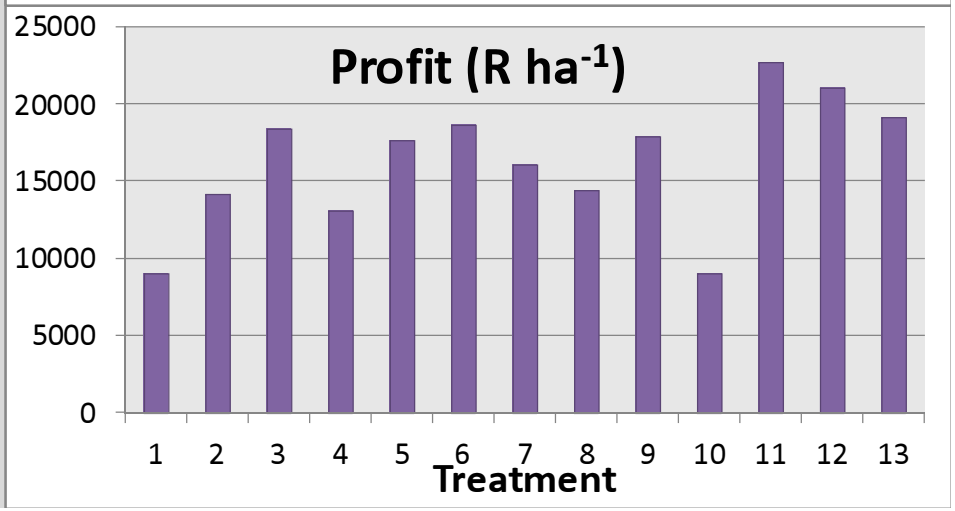
- Maximum pulpwood and profit at rotation-end (lowest input costs)

- Fewer, larger stems to harvest at rotation-end
- Highest pulpwood volume and income from pulpwood
- Lowest input costs without compromising rotation-end volume









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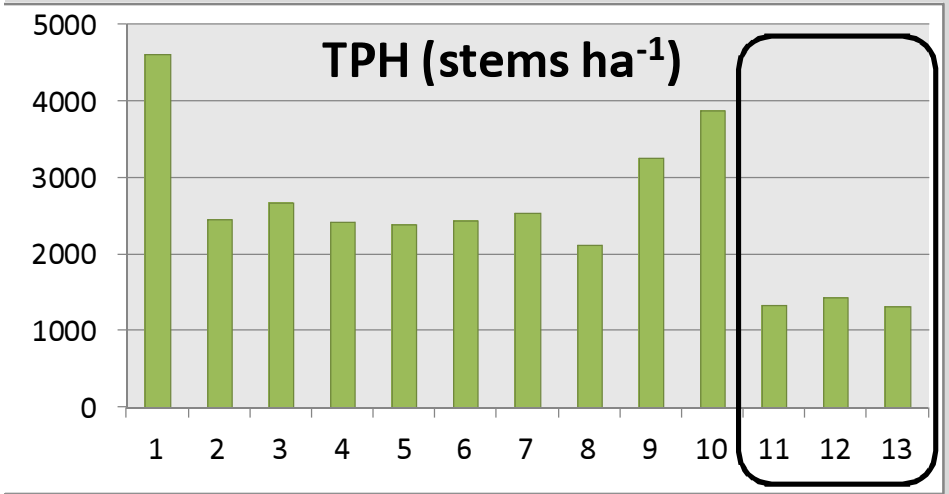

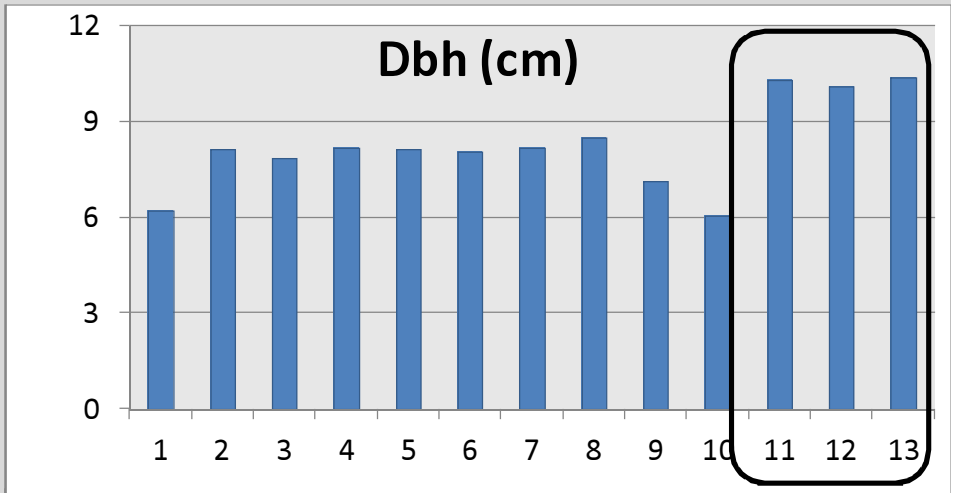

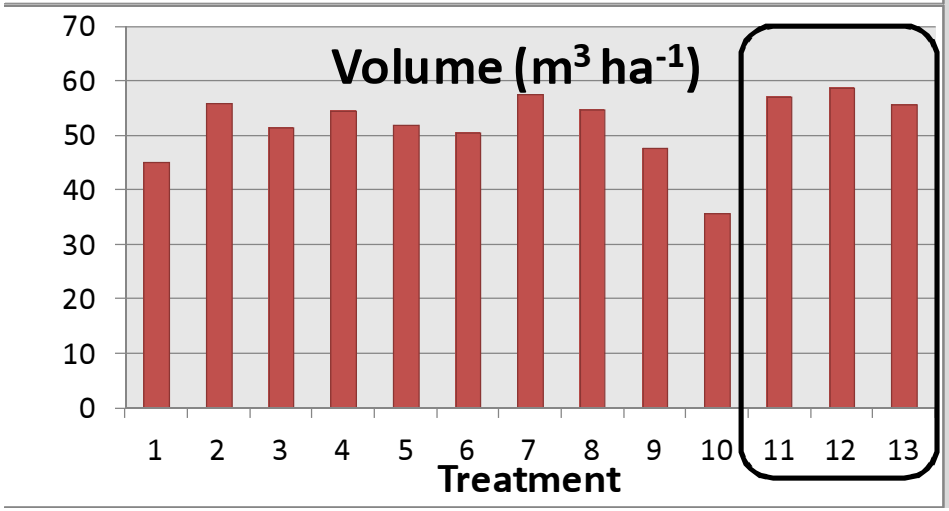

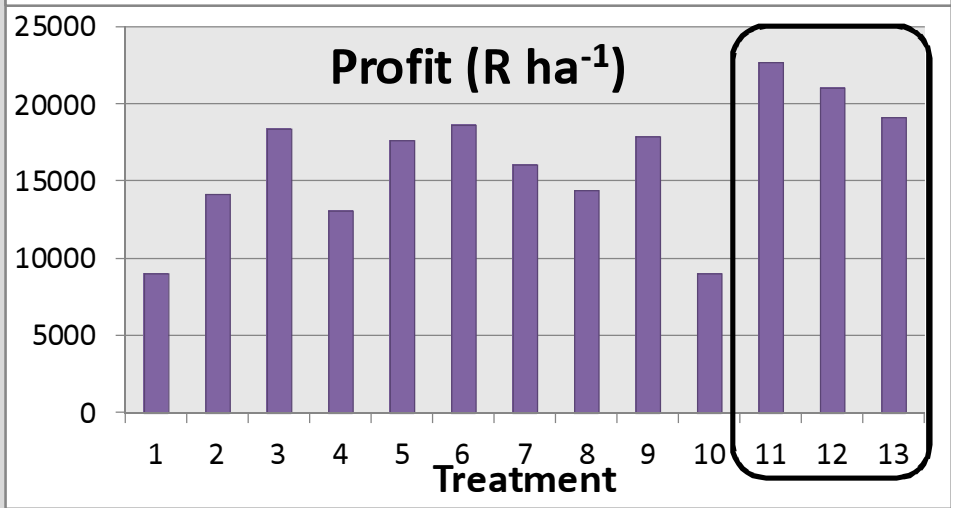

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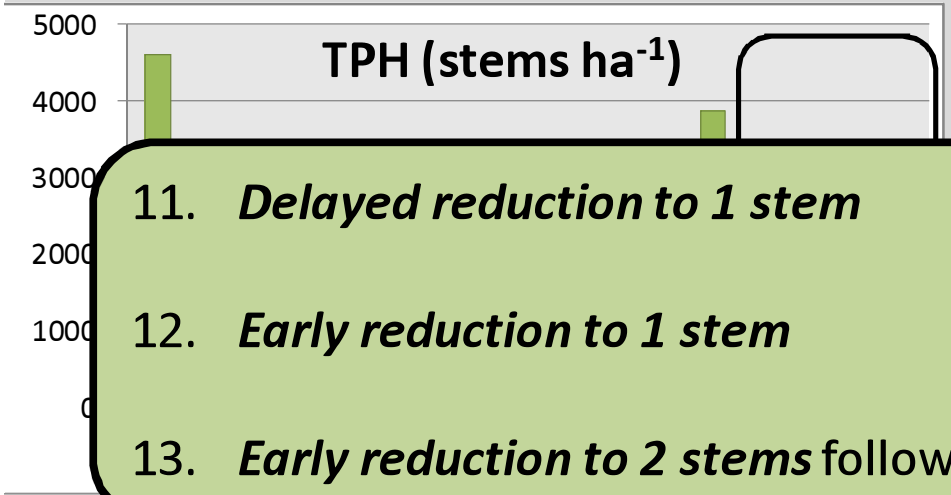
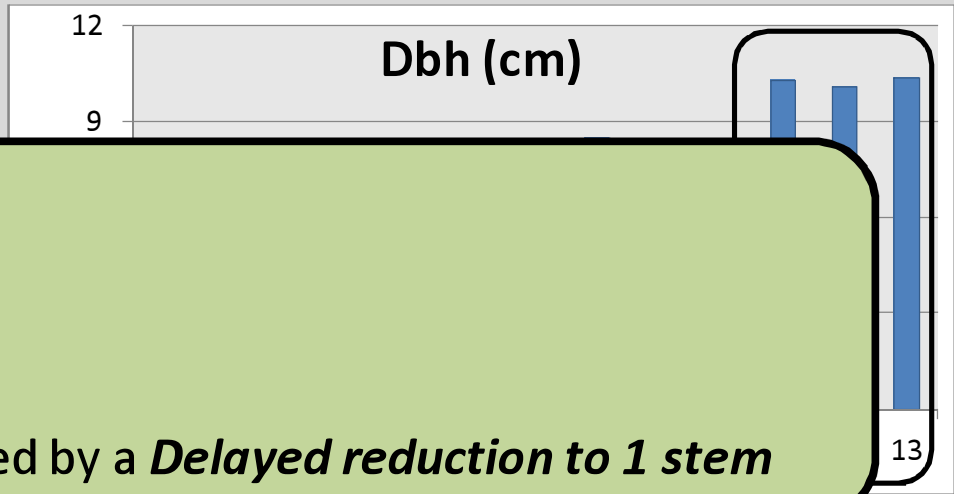
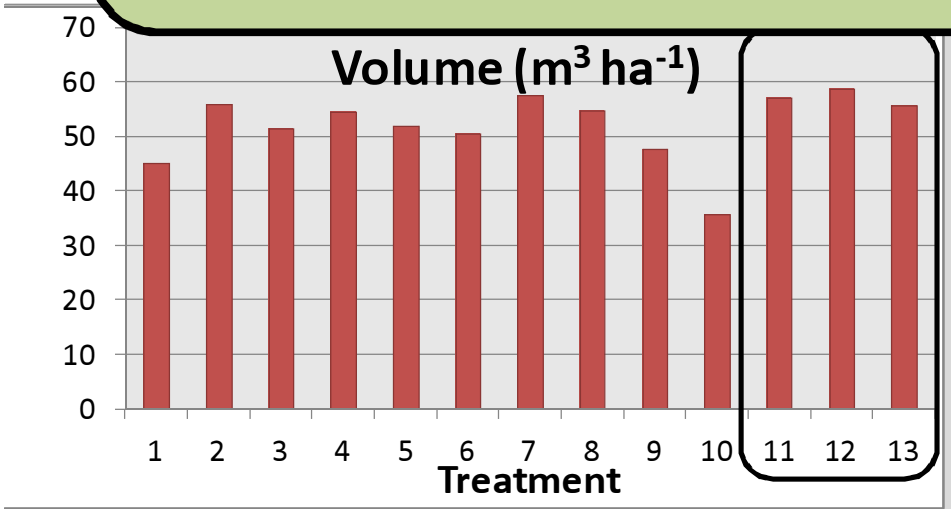


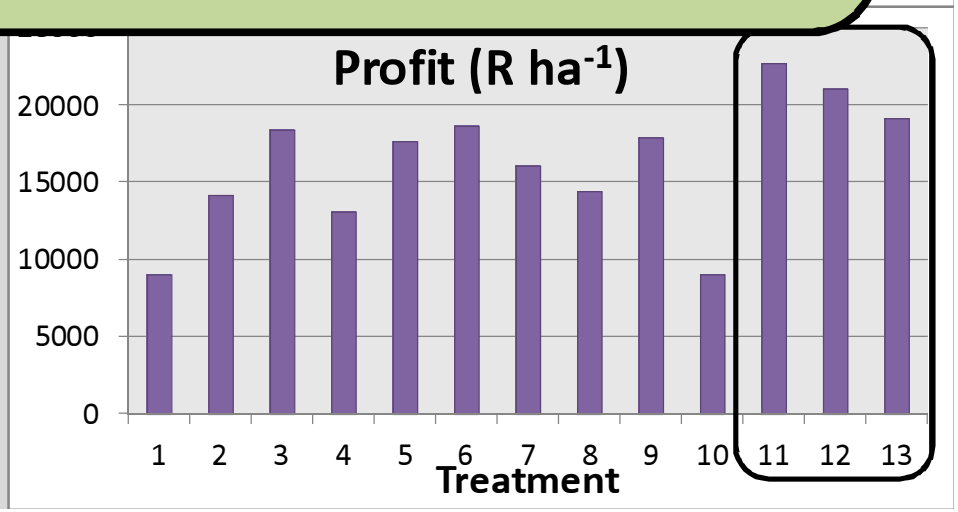


11. ***Delayed reduction to 1 stem***

12. ***Early reduction to 1 stem***

13. ***Early reduction to 2 stems*** followed by a ***Delayed reduction to 1 stem***





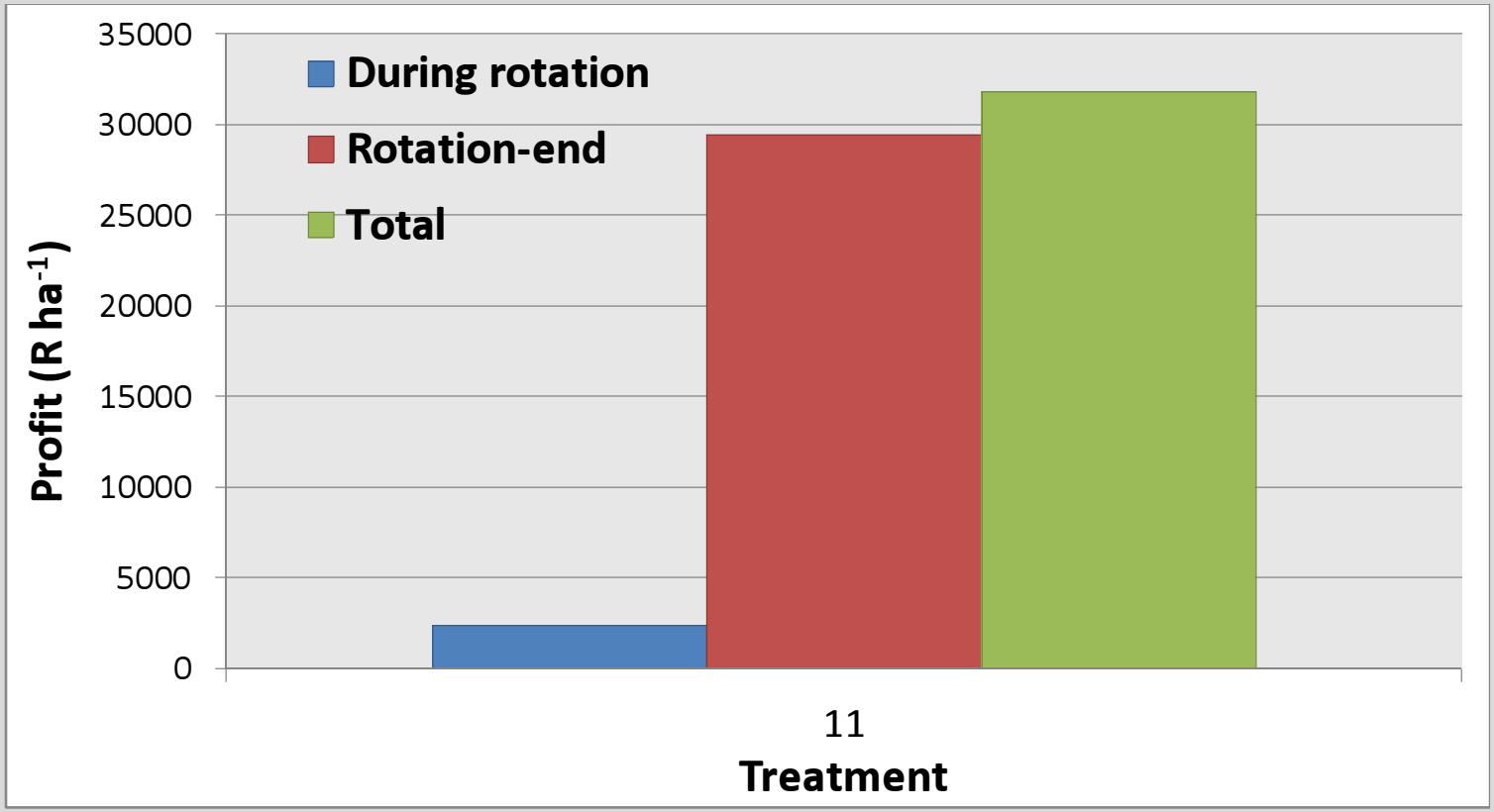
Scenario 3: Medium-sized Commercial company

- **Need for products/income during rotation** and at rotation-end
- Maximum pulpwood and profit at rotation-end (lowest input costs)

- As for Scenario 4 (Commercial Companies)

But with

- **Reduction operation timed to profit from sale of product without compromising rotation-end volume**



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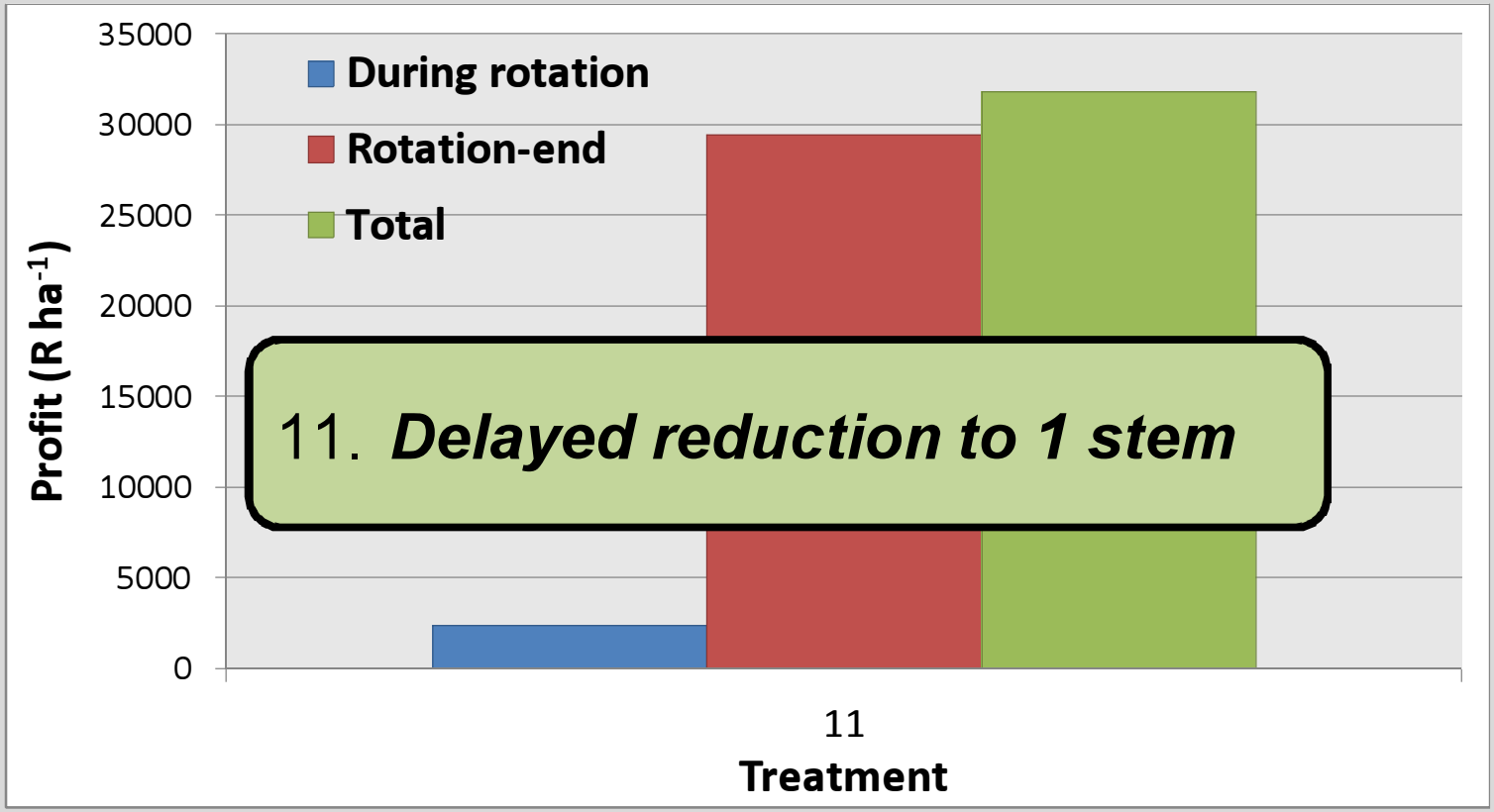

Conclusions

- From an emerging growers perspective the results are promising in that certain management regimes are not only:
  - product-specific;
  - but also allow for flexibility in terms of number of times product can be removed (and hence income through the rotation)

- From a “corporate perspective”, the growing of trees specifically for pulpwood production is compromised if managed to include other products (poles/laths/droppers)

Acknowledgements

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- Institute for Commercial Forestry Research (ICFR) technical staff
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- National Research Foundation of South Africa