Restoration versus wood utilization - a potential conflict of interest in dealing with bush thickened areas in the Northern Cape

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INTRODUCTION

Many farms in the savanna areas of the Northern Cape suffer from bush thickening

At the same time there is a growing interest in the utilization of wood from indigenous trees as a source of firewood and biofuel

A proposal was subsequently formulated by a group of farmers and a mining company to utilize wood from problem woody species (mainly *Acacia mellifera*), harvested on farms within a 20 km radius of the mine

STUDY AREA

Study conducted at Ulco, near Delportshoop, Northern Cape

Two vegetation units represented: SVk6 Schmidsdrift Thornveld (largest area) & SVk7 Ghaap Plateau Vaalbosveld (Mucina & Rutherford 2006)

Mean seasonal rainfall - 400 mm

Surface limestone common and soils are generally shallow and well drained

Dominant tree species: *Acacia mellifera* (SVk6) and *Tarchonanthus camphoratus* (SVk7)

RATIONALE

The Ulco cement mine

RATIONALE

Interest of the mine

Operational cost: Reliant on coal from Mpumalange transported by road - want to replace 20% of their coal with wood chips

Carbon credits: wood chips represent a biofuel that may reduce carbon emissions during combustion compared to coal

RATIONALE

The surrounding commercial farms (cattle & game)

RATIONALE

Interest of commercial farmers

Resolve bush thickening on their farms: Bush thickening reduces the grazing capacity of the natural veld and threaten the viability of the farms as economic units

Cover costs and enhance cash flow: An income from the wood can cover costs of the bush control measures and can also enhance the short-term cash flow of the farms

OBJECTIVES

(i) Quantify the wood resource on several farms within a 20 km radius of the mine,

(ii) Provide guidelines for the most appropriate approach to the wood harvesting / restoration of thickened areas

PROCEDURE

Twenty sites on five farms surrounding the Ulco mine selected for the study

At each site a belt transect of 100x2.5m (250m^2) was laid out in such a way as to best represent the woody vegetation of that site

The dimensions of all rooted, live woody plants were measured

Dry mass estimates of the leaves and wood were calculated using the newly developed BECVOL 3-model

PROCEDURE

Summary of values calculated with the new BECVOL 3-model:

- Tree density (plants per hectare)
- Evapotranspiration Tree Equivalents (ETTE) per ha
- Leaf dry DM/ha (total, up to 1.5 m, up to 2.0 m, up to 5.0 m)
- Shoots <5.0 mm DM/ha (total, up to 1.5 m, up to 2.0 m, up to 5.0 m)
- Stems >5.0 - 20.0 mm DM/ha
- Wood >20.0 mm DM/ha

RESULTS

Plant Variable	*Acacia mellifera*	*Searsia lancea*	*Grewia flava*	Total
• Tree density (plants/ha)	400	80	160	640
• Evapotranspiration tree equivalents per ha (ETTE/ha)	6 982	2 964	393	10 339
• Leaf dry mass (kg/ha)	1 655	657	77	2 390
• Shoot dry mass - shoots <0.5 cm (kg/ha)	2 632	1 252	115	4 000
• Stem dry mass - stems >0.5-20 cm in diameter (kg/ha)	6 690	3 408	222	10 319
• Wood dry mass - wood >20 cm in diameter (kg/ha)	29 262	20 761	168	50 191
• Total wood dry mass (all fractions) (kg/ha)	38 584	25 421	505	64 510
• Total tree dry mass - leaves and wood combined (kg/ha)	40 239	24 764	582	66 900

RESULTS

The total wood dry mass (all fractions) of the 20 plots varied from a low 3 562 kg ha^{-1} to a high of 438 884 kg ha^{-1} with an average of 67 450 kg ha^{-1}

RESULTS

On average the wood >20 cm in diameter made up 79.8 % of the total wood mass, while the stems >0.5-20 cm and shoots <0.5 cm made up 13.4 and 6.8 % of the total wood mass, respectively

Should the trees be harvested during the summer months when the trees have their full leaf carriage, the leaves would add another 2.7 % to the total tree dry mass

From the data it is clear that a high wood mass per hectare is without exception related to the presence of very large trees

Wood mass per hectare increased exponentially with an increase in the number of very large trees, while plots with a predominance of small to medium sized trees - even at very high densities - yielded a much lower wood mass

DISCUSSION

Restoration vs. Wood harvesting

Restoration	Maximum wood harvest
- Selective thinning	- Total harvest of all plants
- Retain the large trees	- Harvest the large trees (large trees yield the highest mass)
- Treat harvested trees with an arboricide - prevent coppice	- Allow coppice growth (plants can be harvested again in time)

DISCUSSION

DISCUSSION

DISCUSSION

DISCUSSION

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Recommendation

Best solution a compromise during which as many as possible trees are harvested, while still retaining the benefits of some remaining trees

Trees should be selectively harvested, starting with the smallest plants and progressively moving to larger plants until a set target has been reached

Apply the general rule of thumb to retain a maximum tree leaf biomass equal to 10x the average annual rainfall = 4 000 ETTE/ha

The stumps of harvested trees must be treated with an ecologically safe arboricide to prevent regrowth without risk to the remaining trees

DISCUSSION

Example

DISCUSSION

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DISCUSSION

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The site is relatively open with *A. mellifera* the dominant species and a few distinctive large *Searsia lancea* trees. Total tree DM is 66 400 kg - trees of the designated group up to 3.8 m can be harvested to achieve the targeted 4 000 ETTE/ha. This will render a total wood harvest of 15 100 kg dry wood per hectare

DISCUSSION

Mean equivalent ETTE-values of woody plants in 6 height classes

Height class (m)	Mean ETTE-value - All plants	Mean ETTE-value - *A. mellifera*
0 - 1.0	0.73	0.90
>1.0 – 2.0	1.94	2.56
>2.0 – 3.0	5.94	6.64
>3.0 – 4.0	14.07	15.69
>4.0 – 5.0	28.83	31.34
>5.0	48.80	49.92

CONCLUSIONS

The fact that the highest wood yields reside in large trees, presents a potential conflict of interest

It is thus a matter of weighing short-term benefits (cash flow and income generation) up against long-term benefits (ecological stability and rangeland restoration)

It is thus important that priorities are clearly identified prior to the harvesting operation

The best solution is probably a compromise between wood harvesting and retaining some trees (preferably the larger trees)