(Chris Richter)

Chemical bush control (South Africa)

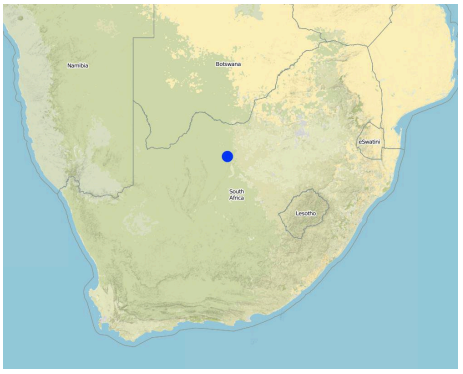
Chemical bush control with special reference to thinning and clearing

DESCRIPTION

To either clear or thin bush (trees) in encroached areas by chemical means.

In some areas, the bushes are so dense (more than 2000 plants/ha) that access to the area is not possible and therefore the aerial application of chemicals is the only solution. All the plants in this area get treated this way, but no selective treatment is possible (this is still a problem to overcome). This aerial application can be selective to some extent because some bushes survive the treatment. If that is the case, selected thinning with chemical bush control can be done on bushes (but not on palatable/usable species).
The purpose was to characterise and control bush encroachment; to define and quantify grass-bush interactions in mixed savannahs, by chemical bush control; to be able to make recommendations for larger application chemical bush control like by aerial application.
There was a lack of a technique for economic comparison between the potential loss of income due to bush encroachment and the cost of controlling bush.
Aftercare is very important and is an on-going process. After the first application of the chemicals, it is possible to let in goats. Browsers are better than game, because they browse the small bushes and prevent the area from further bush encroachment. The application of fire is also possible. In this area it should only be done every 7th -10th year (depending on the rainfall and grass production). There is very little communal land in this large area (5 million ha).

LOCATION



Location: Vryburg, Griekwastad, Mafekeng, North West Province & Northern Cape, South Africa

No. of Technology sites analysed:

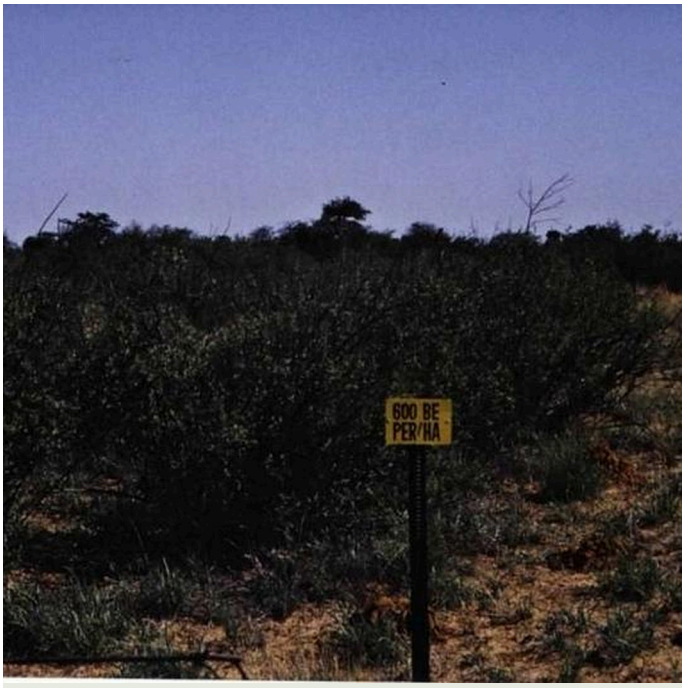
Geo-reference of selected sites
- 24.5456, -27.1992

Spread of the Technology: evenly spread over an area (approx. 100-1,000 km2)

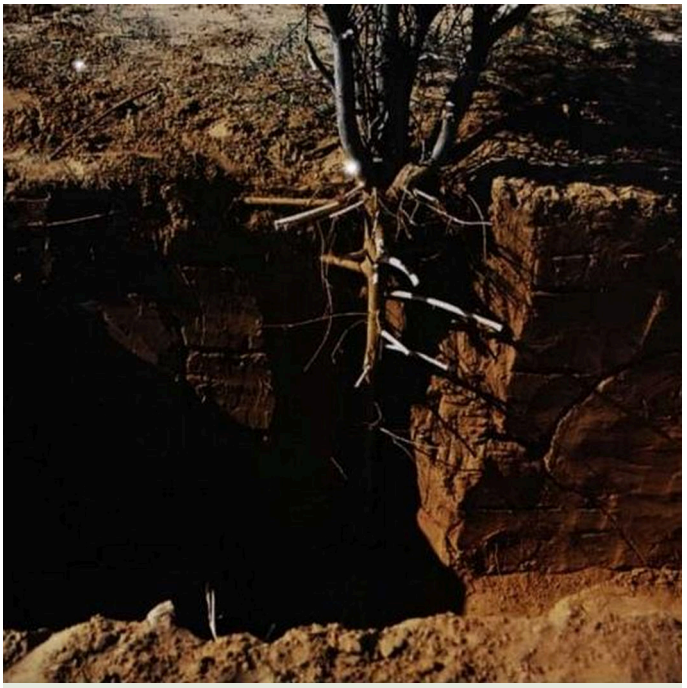
In a permanently protected area?:

Date of implementation: less than 10 years ago (recently)

Type of introduction
- ☐ through land users' innovation
- ☐ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☑ through projects/ external interventions



(Chris Richter)



(Chris Richter)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [ ] improve production
- [ ] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [ ] create beneficial economic impact
- [ ] create beneficial social impact
- [x] Improve access to land

Land use

Grazing land

- Ranching

Animal type: sheep, cattle

Water supply

- [ ] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [ ] prevent land degradation
- [x] reduce land degradation
- [x] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion

water degradation - Ha: aridification

SLM group

- Tap/deploy land

SLM measures

vegetative measures - V3: Clearing of vegetation

TECHNICAL DRAWING

Technical specifications

Technical knowledge required for field staff / advisors: moderate

Technical knowledge required for land users: moderate

Main technical functions: improvement of ground cover

Secondary technical functions: control of dispersed runoff: retain / trap, increase / maintain water stored in soil

Author: Chris Richter

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **Rand**
- Exchange rate (to USD): 1 USD = 6.0 Rand
- Average wage cost of hired labour per day: 7.00

Most important factors affecting the costs

For all 4 plots. They were working on each plot for 3 months. Travel and subsistence costs.

Establishment activities

1. Soil applied chemicals (tebuthiuron) (Timing/ frequency: Not important, better close to rainy season)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Rand)	Total costs per input (Rand)	% of costs borne by land users
Labour					
Apply chemicals	ha	1.0	40000.0	40000.0	
Equipment					
Tools	ha	1.0	6000.0	6000.0	
Construction material					
chemicals, subsistence allowan	ha	1.0	20000.0	20000.0	
Total costs for establishment of the Technology				**66'000.0**	
Total costs for establishment of the Technology in USD				*11'000.0*	

Maintenance activities

1. Burning the veld (Timing/ frequency: / 7-10 years)
2. Browsing the veld by goats (Timing/ frequency: None)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Rand)	Total costs per input (Rand)	% of costs borne by land users
Labour					
Burning and browsing the veld	ha	1.0	10000.0	10000.0	
Equipment					
Tools	ha	1.0	1500.0	1500.0	
Fertilizers and biocides					
Chemicals, subsistence allowan	ha	1.0	5000.0	5000.0	
Total costs for maintenance of the Technology				**16'500.0**	
Total costs for maintenance of the Technology in USD				*2'750.0*	

NATURAL ENVIRONMENT

Average annual rainfall

- ☐ < 250 mm
- ☑ 251-500 mm
- ☐ 501-750 mm
- ☐ 751-1,000 mm
- ☐ 1,001-1,500 mm
- ☐ 1,501-2,000 mm
- ☐ 2,001-3,000 mm
- ☐ 3,001-4,000 mm
- ☐ > 4,000 mm

Agro-climatic zone

- ☐ humid
- ☐ sub-humid
- ☑ semi-arid
- ☐ arid

Specifications on climate

The average is +-340mm

Slope
- [x] flat (0-2%)
- [ ] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [x] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms
- [x] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude
- [ ] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [x] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in
- [ ] convex situations
- [ ] concave situations
- [ ] not relevant

Soil depth
- [x] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [x] very deep (> 120 cm)

Soil texture (topsoil)
- [x] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [ ] medium (1-3%)
- [x] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [ ] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [ ] for agricultural use only (irrigation)
- [ ] unusable

Is salinity a problem?
- [ ] Ja
- [ ] Nee

Occurrence of flooding
- [ ] Ja
- [ ] Nee

Species diversity
- [ ] high
- [ ] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [x] commercial/ market

Off-farm income
- [ ] less than 10% of all income
- [x] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [ ] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [ ] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [ ] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [ ] men

Age
- [ ] children
- [ ] youth
- [ ] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [x] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [ ] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [x] communal/ village
- [ ] group
- [x] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

fodder production	decreased	increased	Primary production grasses, all seasons, composition changes
fodder quality	decreased	increased	
animal production	decreased	increased	With regard to woody component (game farming)
product diversity	decreased	increased	Higher grazing capacity
land management	hindered	simplified	Creating an open Savannah

farm income — decreased ... increased (✓)
Initial cost — high (✓) ... low

Socio-cultural impacts

Ecological impacts

soil moisture — decreased ... increased (✓)

soil cover — reduced ... improved (✓)

habitat diversity — decreased ... increased (✓)

Decrease in encroachers

Grass density, all seasons

Change of habitat

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns — very negative (✓) ... very positive
Long-term returns — very negative ... very positive (✓)

Benefits compared with maintenance costs

Short-term returns — very negative ... very positive (✓)
Long-term returns — very negative ... very positive (✓)

CLIMATE CHANGE

-

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- [ ] single cases/ experimental
- [ ] 1-10%
- [ ] 11-50%
- [x] > 50%

Number of households and/ or area covered

90 percent of the area

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- [x] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [ ] 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- [ ] Ja
- [ ] Nee

To which changing conditions?

- [ ] climatic change/ extremes
- [ ] changing markets
- [ ] labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Improvement in grazing capacity
- Improvement of veld condition and production
- Accessibility

Strengths: compiler's or other key resource person's view

- Improvement of veld condition and production
- Accessibility (because it was to dense)

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- Very expensive

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Under aero-application utilisable plants can be irradiated, if not adhered to directive Hand application
- Very expensive

REFERENCES

Compiler
Unknown User

Editors

Reviewer
David Streiff
Alexandra Gavilano

Date of documentation: Jan. 19, 2011

Last update: Junie 21, 2019

Resource persons
Chris Richter - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1375/

Linked SLM data
n.a.

Documentation was faciliated by

Institution
- Department of Agriculture of Zambia (Department of Agriculture) - Zambia

Project
- n.a.

Key references
- Msc of C. Richter, Gras-bosinteraksie in die bosveldgebiede van Noord-Kaap. 1991.: C. Richter