

Simplified technique for assessing the condition of the grass sward in the *Cymbopogon Themed* veld in the southern Free State and north Eastern Cape provinces of South Africa

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Introduction

A simplified technique based on key grass species has been developed to assess the condition of the grass sward for livestock production in the *Cymbopogon-Themed* Veld type see Table 1 (Goqwana, 2004). This research product greatly simplifies the assessment of veld condition in this veld type as it obviates the necessity to be able to identify all the different grass species occurring in this veld type. The results of the technique are used to describe the condition of the veld in terms of its potential to produce forage for livestock and to resist accelerated soil erosion. This information is then used to formulate veld management practices like controlled burning based on the condition of the grass sward.

Procedure

The procedure followed for using this technique is that the different homogeneous vegetation units (HVU's) occurring on a farming unit are identified and demarcated on a map of the farm. This involves separating out all the different types of veld as influenced by soil type, aspect and altitude on the property. Sample sites are then located



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in representative areas in each of the HVU's at a sampling intensity of one survey per 100 hectares, thereby varying the sampling intensity according to the size of the different HVU's.

Grass surveys are then conducted at each sample site using a nearest plant-point method. This involves recording the nearest rooted herbaceous plant to a point quadrat located at two metre intervals along two transects 100 metres long, parallel to one another and 25 metres apart i.e. 100 points per survey. The basal cover of the grass sward is indexed by recording the distance from the point quadrat to the edge of the nearest rooted herbaceous plant.

In addition to the grass surveys the standing crop of grass is estimated with a Disc Pasture Meter by recording the disc height at two metre intervals along the same two transects used for recording the different grass species. The data from the grass and Disc Pasture Meter surveys are then used to describe the condition of the veld, using table 1 as a template. The three parameters used are the botanical composition of the species expressed as a percentage, the mean point to tuft distance in centimetres and the standing crop of the sward in kilogrammes per hectare. This value is calculated using the calibration developed by Trollope (1983) for estimating the standing crop of grass under veld conditions in the Eastern Cape Province viz.

$$y = 340 + 388.3x$$

where: y = mean fuel load - kg/ha;
 x = mean disc height - cm.

Table 1: Simplified technique for assessing the condition of the grass sward in the *Cymbopogon Themeda* Veld in the southern Free State & north Eastern Cape Province.

ASSESSMENT VELD CONDITION - GRASS SWARD
Cymbopogon Themeda Veld

Sample Site:.....
Soil Type:.....

Date:.....
GPS:.....

CATEGORY	SPECIES	FREQUENCY %	FORAGE FACTOR	FORAGE SCORE
DECREASER SPECIES	<i>Themeda triandra</i>		8	
DECREASER TOTAL				
INCREASER I SPECIES	<i>Cymbopogon plurinodis</i>		3	
	<i>Elionurus muticus</i>		-2	
INCREASER I TOTAL				
INCREASER II SPECIES	<i>Heteropogon contortus</i>		5	
	<i>Eragrostis spp.</i>		1	
	Karoo		-5	
	Forbs		-6	
	Bare Ground		-4	
				242
INCREASER II TOTAL			FORAGE SCORE	
Other species				
TOTAL				

CONCLUSIONS

FORAGE/ FUEL POTENTIAL

POTENTIAL	SCORE	FORAGE
		Tick
VERY HIGH	> 500	
HIGH	401 - 500	
MEDIUM	301 - 400	
LOW	200 - 300	
VERY LOW	< 200	

SOIL EROSION

FACTOR	POTENTIAL FOR EROSION		
	LOW	MOD	HIGH
TUFT DISTANCE	<3 cm	3-5 cm	>5cm
Distance = cm			
GRASS STD CROP	> 1500 kg/ha	<1500 kg/ha	
kg/ha =			
OVERALL SOIL EROSION POTENTIAL	LOW	HIGH	

TREND

CATEGORY	%	GRAZING	Tick
DECREASER SPP.		MODERATE	
INCREASER I SPP		UNDER	
INCREASER I SPP		SELECTIVE	
INCREASER II SPP		OVER	

CONTROLLED BURNING

BOTANICAL COMPOSITION	%	BURN	
		YES	NO
DECREASER SPECIES			
INCREASER I SPECIES			
INCREASER II SPECIES			
FUEL LOAD - kg/ha >4000			
OVERALL DECISION TO BURN			

The conclusions that can be drawn from the results of the key grass species technique are based on the following assumptions that have been developed through field experience gained with the use of this procedure of assessing range condition in the Eastern Cape Province.

Forage Potential

The range in the forage scores from very high (>500) to very low (<200) reflect the potential of the grass sward to produce forage for grazing domestic livestock. These categories have proven to be ecologically meaningful with highly applicable practical management implications.

Trend

This refers to whether the veld is being moderately grazed, under grazed, selectively grazed or over grazed. The criteria used for deciding the intensity of grazing is that if the veld is dominated by Decreaser grass species then it is correctly stocked and is being moderately grazed. If it is dominated by Increaser I grass species then it is understocked and is being under grazed. If it is dominated by Increaser II grass species then it is overstocked and is being over grazed. Finally if it is dominated by both Increaser I and Increaser II grass species it is being selectively grazed.

Soil Erosion

The effect of the herbaceous vegetation on accelerated soil erosion depends upon the basal and canopy cover of the grass sward. If the basal and canopy covers are high then the potential for soil erosion is low and *vice versa*. Simple indices have been identified for these two parameters. Basal cover is satisfactorily described by recording the distance from a measuring point to the edge of the nearest grass tuft and is easily measured in the field. The different categories of point to tuft distance reflecting low (<3 cm), moderate (3-5 cm) and high (>5 cm) potentials for soil erosion were derived from field research and experience. The standing crop of grass is an excellent index of

the canopy cover of the grass sward and is readily measured in the field with a disc pasture meter. The different values that have been assigned to this parameter have been subjectively determined based on field experience in the Eastern Cape Province.

Controlled Burning

The necessity for veld to be burnt or not depends upon its ecological status and physical condition. In order to maintain the potential of the grass sward to produce forage, burning should not be applied if the grass sward is in a pioneer condition dominated by Increaser II grass species caused by overgrazing. Burning should be avoided if the veld is in this condition in order to allow it to develop to a more productive stage dominated by Decreaser grass species. Conversely when the grass sward is in an under grazed condition dominated by Increaser I species, it needs to be burnt to increase the better fire adapted and more productive Decreaser grass species. Finally controlled burning is also necessary when the grass sward has become overgrown and moribund as a result of excessive self-shading. When in this condition it is necessary to remove this old unpalatable grass material to restore the vigour of the grass sward and allow new nutritious regrowth to develop. Field experience gained all over southern and east Africa indicates that when the standing crop of grass >4000 kg/ha then the grass sward has become moribund and needs to be defoliated by burning or any other means of removal.

Examples of veld in different conditions assessed with the key grass species technique for the *Cymbopogon Themeda* veld

Examples of veld that is correctly stocked, understocked, overstocked and selectively grazed as determined with the key grass species technique are presented in Tables 2, 3, 4 and 5 together with conclusions as to whether the veld needs to be burnt or not.

Table 2: Example of veld that is correctly stocked and dominated by *Themeda triandra*.

ASSESSMENT VELD CONDITION - GRASS SWARD
Cymbopogon Themeda Veld

Sample Site: *Themeda triandra* dominant veld
Soil Type:

Date:

GPS:

CATEGORY	SPECIES	FREQUENCY %	FORAGE FACTOR	FORAGE SCORE
DECREASER SPECIES	<i>Themeda triandra</i>	65	8	520
DECREASER TOTAL		65		
INCREASER I SPECIES	<i>Cymbopogon plurinodis</i>	10	3	30
	<i>Elionurus muticus</i>	7	-2	-14
INCREASER I TOTAL		17		
INCREASER II SPECIES	<i>Heteropogon contortus</i>	10	5	50
	<i>Eragrostis spp.</i>		1	
	Karoo	3	-5	-15
	Forbs	5	-6	-30
	Bare Ground	0	-4	
				242
INCREASER II TOTAL		18	FORAGE SCORE	783
Other species		-		
TOTAL		100		

CONCLUSIONS

FORAGE/ FUEL POTENTIAL

POTENTIAL	SCORE	FORAGE
		Tick
VERY HIGH	> 500	✓
HIGH	401 - 500	
MEDIUM	301 - 400	
LOW	200 - 300	
VERY LOW	< 200	

TREND

CATEGORY	%	GRAZING	Tick
DECREASER SPP.	65	MODERATE	✓
INCREASER I SPP	17	UNDER	
INCREASER I SPP	17	SELECTIVE	
INCREASER II SPP	18	OVER	

CONTROLLED BURNING

BOTANICAL COMPOSITION	%	BURN	
		YES	NO
DECREASER SPECIES	65	✓	
INCREASER I SPECIES	17		
INCREASER II SPECIES	18		
FUEL LOAD - kg/ha >4000			✓
OVERALL DECISION TO BURN			✓

SOIL EROSION

FACTOR	POTENTIAL FOR EROSION		
	LOW	MOD	HIGH
TUFT DISTANCE	<3 cm	3-5 cm	>5cm
Distance = cm	✓		
GRASS STD CROP	> 1500 kg/ha	<1500 kg/ha	
kg/ha =	✓		
OVERALL SOIL EROSION POTENTIAL	LOW	HIGH	

Table 3: Example of veld that is understocked and dominated by *Cymbopogon plurinodis* and *Elionurus muticus*

ASSESSMENT VELD CONDITION - GRASS SWARD
Cymbopogon Themeda Veld

Sample Site: *Cymbopogon/ Elionurus* dominant veld
Soil Type:.....

Date: 11th May 2004.

GPS:.....

CATEGORY	SPECIES	FREQUENCY %	FORAGE FACTOR	FORAGE SCORE
DECREASER SPECIES	<i>Themeda triandra</i>	2	8	16
DECREASER TOTAL		2		
INCREASER I SPECIES	<i>Cymbopogon plurinodis</i>	35	3	105
	<i>Elionurus muticus</i>	40	-2	-80
INCREASER I TOTAL		75		
INCREASER II SPECIES	<i>Heteropogon contortus</i>	2	5	10
	<i>Eragrostis spp.</i>	10	1	10
	Karoo		-5	
	Forbs	7	-6	-42
	Bare Ground		-4	
				242
INCREASER II TOTAL		19	FORAGE SCORE	261
Other species		4		
TOTAL		100		

CONCLUSIONS

FORAGE/ FUEL POTENTIAL

POTENTIAL	SCORE	FORAGE Tick
VERY HIGH	> 500	
HIGH	401 - 500	
MEDIUM	301 - 400	
LOW	200 - 300	✓
VERY LOW	< 200	

TREND

CATEGORY	%	GRAZING	Tick
DECREASER SPP.	2	MODERATE	
INCREASER I SPP	75	UNDER	✓
INCREASER I SPP	75	SELECTIVE	
INCREASER II SPP	19	OVER	

CONTROLLED BURNING

BOTANICAL COMPOSITION	%	BURN	
		YES	NO
DECREASER SPECIES	2		
INCREASER I SPECIES	75	✓	
INCREASER II SPECIES	19		
FUEL LOAD - kg/ha >4000		✓	
OVERALL DECISION TO BURN		✓	

SOIL EROSION

FACTOR	POTENTIAL FOR EROSION		
TUFT DISTANCE	LOW	MOD	HIGH
	<3 cm	3-5 cm	>5cm
Distance = cm		✓	
GRASS STD CROP	> 1500 kg/ha	<1500 kg/ha	
kg/ha =			
OVERALL SOIL EROSION POTENTIAL	LOW	HIGH	
	✓		

Table 4: Example of veld that is overstocked and dominated by *Eragrostis* species.

ASSESSMENT VELD CONDITION - GRASS SWARD
Cymbopogon Themeda Veld

Sample Site: *Eragrostis* species dominant veld.

Date: 11th May 2004

Soil Type:.....

GPS:.....

CATEGORY	SPECIES	FREQUENCY %	FORAGE FACTOR	FORAGE SCORE
DECREASER SPECIES	<i>Themeda triandra</i>		8	
DECREASER TOTAL		0		
INCREASER I SPECIES	<i>Cymbopogon plurinodis</i>	5	3	15
	<i>Elionurus muticus</i>	1	-2	-2
INCREASER I TOTAL		6		
INCREASER II SPECIES	<i>Heteropogon contortus</i>		5	
	<i>Eragrostis spp.</i>	64	1	64
	Karoo	15	-5	-75
	Forbs	5	-6	-30
	Bare Ground	10	-4	-40
		94		242
INCREASER II TOTAL			FORAGE SCORE	174
Other species				
TOTAL		100		

CONCLUSIONS

FORAGE/ FUEL POTENTIAL

POTENTIAL	SCORE	FORAGE Tick
VERY HIGH	> 500	
HIGH	401 - 500	
MEDIUM	301 - 400	
LOW	200 - 300	✓
VERY LOW	< 200	

SOIL EROSION

FACTOR	POTENTIAL FOR EROSION		
TUFT DISTANCE	LOW	MOD	HIGH
	<3 cm	3-5 cm	>5cm
Distance = cm			✓
GRASS STD CROP	> 1500 kg/ha	<1500 kg/ha	
kg/ha =			✓
OVERALL SOIL EROSION POTENTIAL	LOW	HIGH	
			✓

TREND

CATEGORY	%	GRAZING	Tick
DECREASER SPP.	0	MODERATE	
INCREASER I SPP	6	UNDER	
INCREASER I SPP	6	SELECTIVE	
INCREASER II SPP	94	OVER	✓

CONTROLLED BURNING

BOTANICAL COMPOSITION	%	BURN	
		YES	NO
DECREASER SPECIES	0		
INCREASER I SPECIES	6		
INCREASER II SPECIES	94		✓
FUEL LOAD - kg/ha >4000			✓
OVERALL DECISION TO BURN			✓

Table 5: Example of selectively grazed veld dominated by *Cymbopogon plurinodis* and *Eragrostis* species.

ASSESSMENT VELD CONDITION - GRASS SWARD
Cymbopogon Themeda Veld

Sample Site: *Cymbopogon/Eragrostis* dominant veld.... Date: 11th May 2004

Soil Type:..... GPS:.....

CATEGORY	SPECIES	FREQUENCY %	FORAGE FACTOR	FORAGE SCORE
DECREASER SPECIES	<i>Themeda triandra</i>	2	8	16
DECREASER TOTAL		20		
INCREASER I SPECIES	<i>Cymbopogon plurinodis</i>	45	3	135
	<i>Elionurus muticus</i>	6	-2	-12
INCREASER I TOTAL		51		
INCREASER II SPECIES	<i>Heteropogon contortus</i>		5	
	<i>Eragrostis spp.</i>	40	1	40
	Karoo	2	-5	-10
	Forbs	5	-6	-30
	Bare Ground		-4	
				242
INCREASER II TOTAL		47	FORAGE SCORE	381
Other species				
TOTAL		100		

CONCLUSIONS

FORAGE/ FUEL POTENTIAL

POTENTIAL	SCORE	FORAGE Tick
VERY HIGH	> 500	
HIGH	401 - 500	
MEDIUM	301 - 400	✓
LOW	200 - 300	
VERY LOW	< 200	

TREND

CATEGORY	%	GRAZING	Tick
DECREASER SPP.	2	MODERATE	
INCREASER I SPP	51	UNDER	
INCREASER I SPP	51	SELECTIVE	✓
INCREASER II SPP	47	OVER	

SOIL EROSION

FACTOR	POTENTIAL FOR EROSION		
TUFT DISTANCE	LOW	MOD	HIGH
	<3 cm	3-5 cm	>5cm
Distance = cm		✓	
GRASS STD CROP	> 1500 kg/ha	<1500 kg/ha	
kg/ha =	✓		
OVERALL SOIL EROSION POTENTIAL	LOW	HIGH	
	✓		

CONTROLLED BURNING

BOTANICAL COMPOSITION	%	BURN	
		YES	NO
DECREASER SPECIES	2		
INCREASER I SPECIES	51	✓	
INCREASER II SPECIES	47		
FUEL LOAD - kg/ha >4000		✓	
OVERALL DECISION TO BURN		✓	

References

- Goqwana, WM 2004. The development of a method of assessing veld condition in the communal grazing areas of the north Eastern Cape province of South Africa. MSc Agric. Thesis, University Fort Hare, Alice.
- Trollope WSW 1983. Control of bush encroachment with fire in the arid savannas of southeastern Africa. PhD thesis, University of Natal, Pietermaritzburg.