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**EVALUATING THE IMPACT OF BUSH ENCROACHMENT ON
HERBACEOUS VEGETATION, WOODY PLANTS COMPOSITION AND
PRODUCTION IN SHESHEGU COMMUNAL RANGELAND**

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INTRODUCTION

- Rangelands are used as the main source of feed for livestock in communal areas (Solomon *et al.*, 2007).
- Bush encroachment (BE) is an environmental and socio-economic problem that affects livestock production (Oba *et al.*, 2000).
- Few studies conducted to assessed the impact of BE in communal rangelands of the Eastern Cape.



OBJECTIVES

- To determine the impact of bush encroachment on botanical composition, basal cover and dry matter production.
- H_0 : Bush encroachment has no impact on the biomass production, basal cover, herbaceous species composition and soil nutrient content at Sheshegu communal rangelands.



MATERIALS AND METHODS

Study site



- Sheshegu communal rangeland near Alice.
- Mean annual rainfall 580 mm.
- Min. temperatures 5 °C -11 °C,
- Max. 26 °C - 41 °C
- False Thornveld of EC, Bisho Thornveld.
- Soils are derived from shale and mudstone.

DEMARCATIION OF VEGETATION UNITS



Experimental layout and sampling

- Four HVUs were identified, namely: Scattered, Moderate, and Mixed bush and Dense bushland.
- In each HVU, four 100m x 50m were demarcated.
- Four parallel 100m x 2m transects were laid
- Botanical composition, basal cover and biomass production were determined



DATA COLLECTION

- The step point technique was employed to determine herbaceous species (Evans and Love, 2006).
- Woody species composition was determined within five 2m x 100m transects per HVU
- Basal cover was determined by estimating point-to-tuft distance
- Biomass production was determined by harvesting herbaceous vegetation from 0.5m x 0.5m quadrats



STATISTICAL ANALYSS

- Data analyzed using General Linear Model (GLM) PROC of (SAS, 2010).
- Descriptive statistics
- Common/dominant species between HVUs

Model: $Y_{ij}(k) = \mu + a_{i(K)} + \varepsilon_{ij}(K)$

$Y_{ij}(k)$ = (species composition, biomass and basal cover).

μ = overall mean

$a_{i(K)}$ = effect of the i^{th} HVU

$\varepsilon_{ij}(K)$ = effect of a Random error.



RESULTS & DISCUSSION

- 19 grass species: 68.4% Increaser II species, 5.3% Increaser I species and 26.3% Decreaser species.
- Seven grass species were abundant in all HVUs

Table 1: Classification and relative abundances of herbaceous species

Species	Ecological status	Grazing value	Life form	%Abundance
<i>Aristida congesta</i>	Increaser II	Low	Perennial	6.7
<i>Cynodon dactylon</i>	Increaser II	High	Perennial	2.2
<i>Cymbopogon plurinodis</i>	Increaser II	Low	Perennial	0.5
<i>Digitaria eriantha</i>	Decreaser	High	Perennial	39.5
<i>Eragrostis obtuse</i>	Increaser II	Low	Perennial	13.5
<i>Eragrostis capensis</i>	Increaser II	Moderate	Perennial	0.6
<i>Eragrostis chloromelas</i>	Increaser II	Low	Perennial	5.2
<i>Eustachys paspaloides</i>	Decreaser	High	Perennial	0.5
<i>Forbs</i>	Increaser II	Low	Unknown	2.4
<i>Karoo</i>	Increaser II	Low	Unknown	3.5
<i>Karoochloa curva</i>	Increaser I	Low	Annual	1.2
<i>Microchloa cafra</i>	Increaser II	Low	Perennial	0.9
<i>Panicum maximum</i>	Decreaser	High	Perennial	1.5
<i>Panicum stapfianum</i>	Decreaser	High	Perennial	1.3
<i>Sporobolus africanus</i>	Increaser II	Low	Perennial	2.4
<i>Sporobolus fimbriatus</i>	Increaser II	High	Perennial	10
<i>Sedge</i>	Increaser II	Low	Unknown	1.4
<i>Setaria neglecta</i>	Increaser II	Low	Perennial	1.4
<i>Themeda triandra</i>	Decreaser	High	Perennial	5.3



Figure 2: Mean (\pm S. E) % abundances of common grass species in HVU's

Species	Season	Scattered bushland	Moderate bushland	Dense bushland	Mixed bushland	\pm SE
<i>Stylosanthes congesta</i>	Winter	(1.5) ^c	(20.3) ^a	(4.5) ^c	(8.0) ^b	2.2
	Summer	(1.5) ^c	(0.5) ^d	(3.5) ^b	(13.5) ^a	1.0
<i>Stylosanthes eriantha</i>	Winter	(36.0) ^a	(29.0) ^a	(47.8) ^a	(17.0) ^a	9.2
	Summer	(47.0) ^b	(48.3) ^b	(60.3) ^b	(30.3) ^b	4.1
<i>Stylosanthes chloromelas</i>	Winter	(3.5) ^b	(6.0) ^c	(1.8) ^c	(23.8) ^a	2.5
	Summer	(3.5) ^a	(2.3) ^b	(0.3) ^b	(0.3) ^b	1.0
<i>Stylosanthes obtuse</i>	Winter	(12.5) ^a	(6.8) ^a	(12.3) ^a	(15.3) ^a	3.0
	Summer	(18.0) ^a	(18.0) ^a	(6.3) ^a	(18.5) ^a	4.9
<i>Stylosanthes sp.</i>	Winter	(1.3) ^a	(3.5) ^a	(0.8) ^a	(4.5) ^a	1.8
	Summer	(1.0) ^a	(2.5) ^b	(1.8) ^b	(3.3) ^b	1.0
<i>Stylosanthes robustus africanus</i>	Winter	(2.0) ^a	(4.3) ^a	(3.0) ^a	(2.3) ^a	1.2
	Summer	(0.0) ^a	(4.5) ^a	(2.5) ^a	(0.5) ^a	1.2
<i>Stylosanthes robustus fimbriatus</i>	Winter	(6.8) ^a	(10.3) ^a	(14.5) ^a	(21.5) ^a	4.2
	Summer	(4.3) ^b	(4.0) ^b	(4.3) ^b	(14.3) ^a	1.8
<i>Stylosanthes meda triandra</i>	Winter	(19.5) ^a	(1.3) ^b	(0.5) ^{bc}	(1.0) ^{dc}	2.4
	Summer	(14.5) ^a	(6.5) ^b	(1.8) ^{bc}	(0.0) ^{dc}	2.3

^{ab}Different superscripts in a column denote significant differences at ($p < 0.05$) between season.



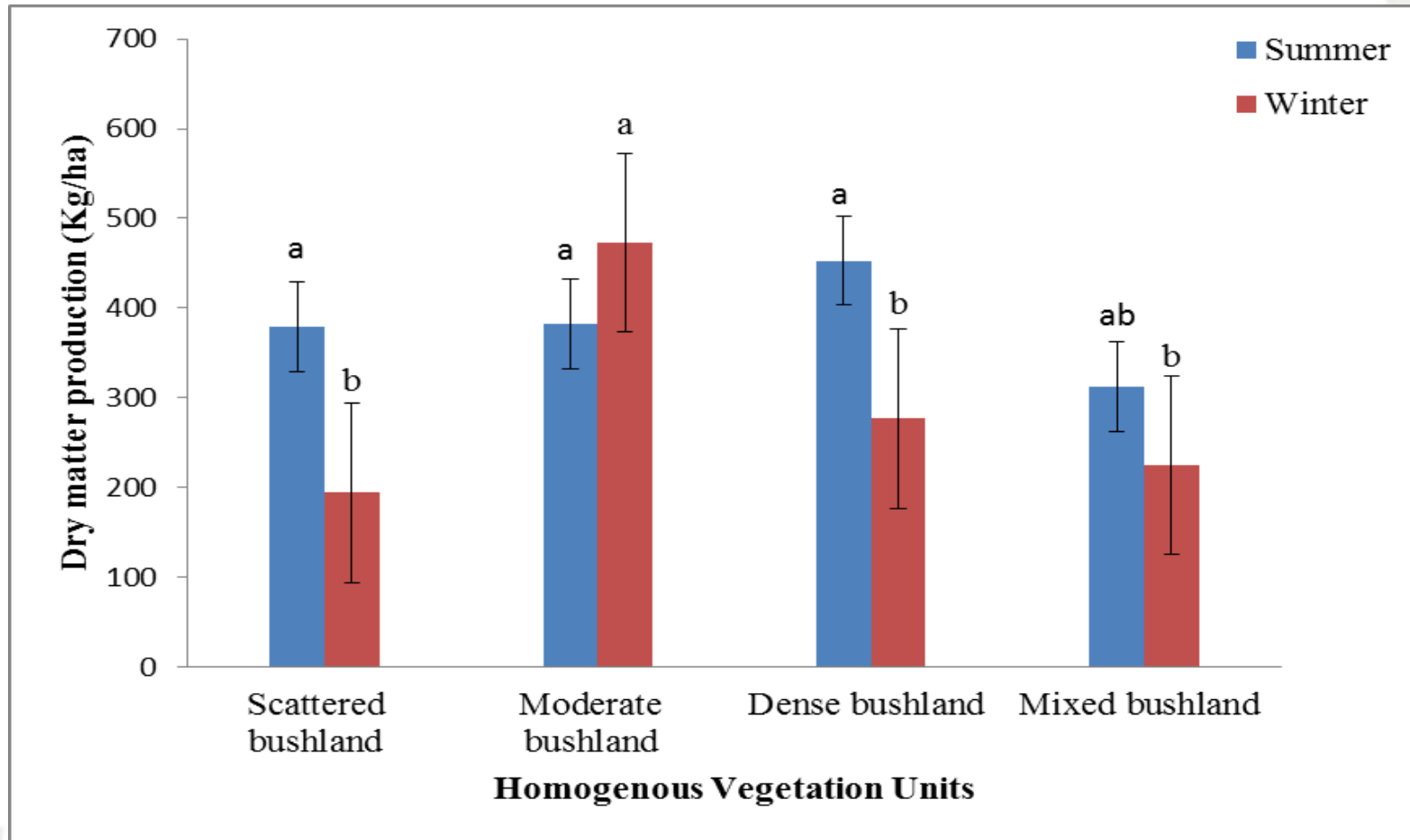


Figure 1: Seasonal dry matter production (kg ha^{-1}) in homogenous vegetation units of Sheshegu communal rangeland



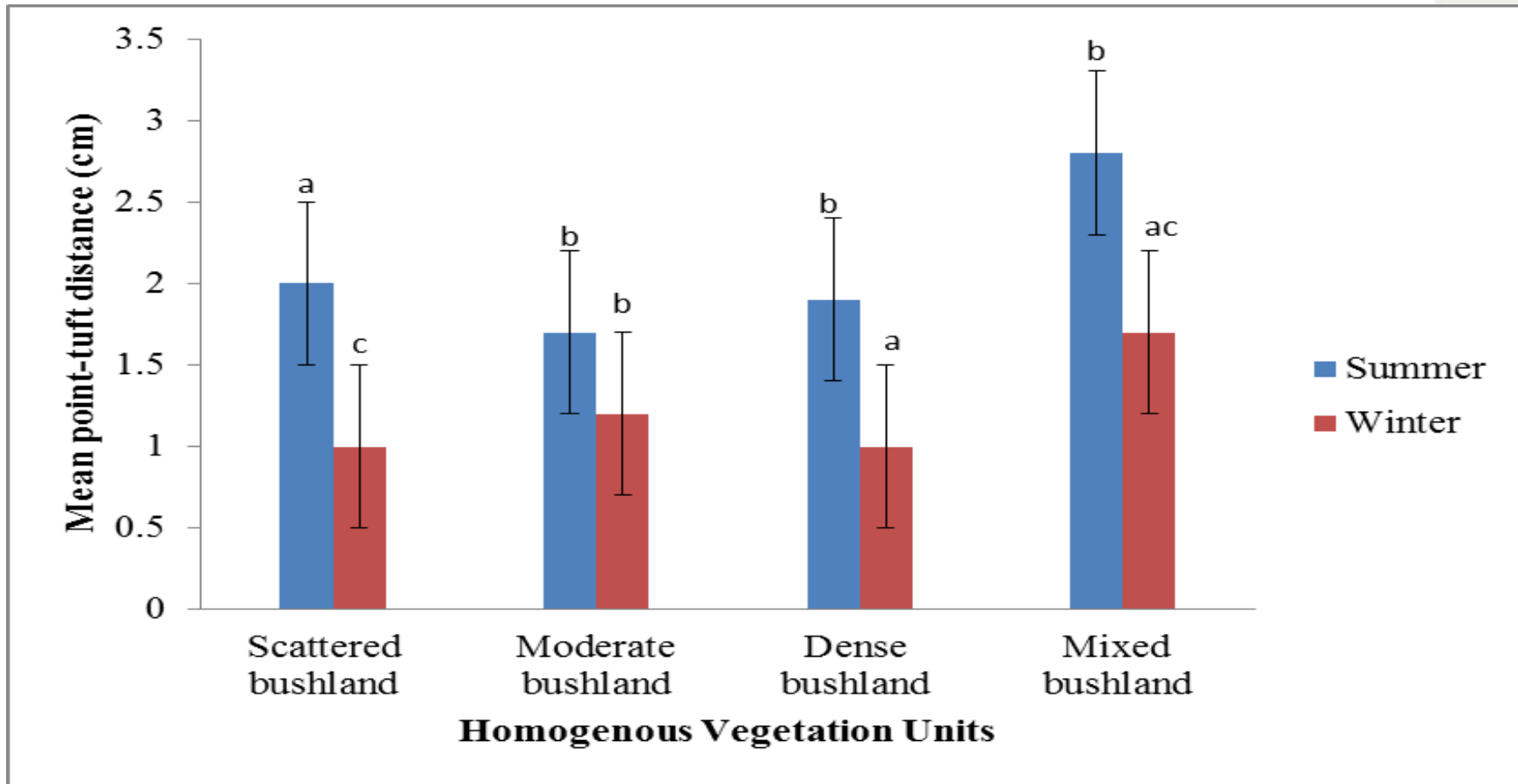


Figure2: Mean basal cover (cm) in Sheshegu communal rangeland.



: Overall mean abundances (%) of woody species composition in Sheshegu communal rangeland. .

Species	Acceptability	Thorns/spines	%Abundance
<i>Acacia karoo</i>	+	+	43.2
<i>Azima tetracantha</i>	-	+	3.4
<i>Aloe ferox</i>	-	+	3.7
<i>Brachylaena elliptica</i>	-	-	1.3
<i>Carissa haematocarpa</i>	-	-	2.5
<i>Coddia rudis</i>	-	-	7
<i>Diospyrosis lycioides</i>	-	-	1.1
<i>Erehia rigida</i>	+	-	3.5
<i>Grewia occidentalis</i>	+	-	2.1
<i>Lucas capensis</i>	-	-	7.2
<i>Lycium ferocissimum</i>	-	+	1.4
<i>Maytenus heterophylla</i>	+	+	5.4
<i>Maytenus capitata</i>	+	+	2.3
<i>Maytenus polycantha</i>	+	+	5.6
<i>Opantia ficus- indica</i>	-	+	1.2
<i>Pappea capansis</i>	-	-	1.3
<i>Phyllanthus verrucosus</i>	+	-	1.7
<i>Rhus longispina</i>	+	-	2.0
<i>Rhus refracta</i>	+	-	2.1
<i>Schotia Afra</i>	-	-	0.9
<i>Scutia Myrtina</i>	+	+	1.1

Table 5: Mean (\pm S.E) abundances of 6 common woody species in homogenous vegetation units

Species	Season	Scattered bushland	Moderate bushland	Dense bushland	Mixed bushland
<i>Acacia karoo</i>	Winter	63.8(3.3) ^a	62.2(3.3) ^a	46.0(3.3) ^b	5.5(3.3) ^c
	Summer	87.8(5.1) ^a	78.0(5.1) ^b	95(5.1) ^a	7.5(5.1) ^c
<i>Aloe ferox</i>	Winter	6.0(1.4) ^b	1.5(1.4) ^d	3.3(1.4) ^c	13.5(1.4) ^a
	Summer	0.0(2.1) ^a	4.0(2.4) ^a	0.0(2.1) ^a	5.5(2.1) ^a
<i>Coddia.rudis</i>	Winter	4.3(1.4) ^b	2.0(1.4) ^d	4.5(1.4) ^c	13.5(1.4) ^a
	Summer	6.5(2.2) ^b	6.3(2.6) ^b	1.0(2.2) ^c	15.5(2.2) ^a
<i>Lucas capensis</i>	Winter	4.5(1.0) ^b	2.7(1.0) ^c	2.5(1.0) ^d	14.2(1.0) ^a
	Summer	1.5(1.1) ^b	0.7(1.3) ^d	1.0(2.2) ^c	5.5(2.2) ^a
<i>Erehia rigida</i>	Winter	3.3(1.3) ^c	1.0(1.3) ^d	4.0(1.3) ^b	4.2(1.3) ^a
	Summer	2.8(1.6) ^c	3.0(1.8) ^b	0.0(1.6) ^d	12.8(1.6) ^a
<i>Maytenus polycantha</i>	Winter	2.2(2.4) ^b	3.0(2.4) ^a	2.0(2.4) ^b	8.0(2.4) ^c
	Summer	0.0(1.3) ^d	3.0(1.5) ^b	0.5(1.3) ^c	14.3(1.3) ^a

Different superscripts for each species in a column denote significant differences at ($p < 0.05$) between seasons.



Conclusions and recommendations

- Sheshegu communal rangeland was increasingly being encroached.
- Change in herbaceous species composition.
- The shift of Decreaser species to Increaser species with increase in the bush density.
- Biomass production and cover increases with increase in bush density (Scattered bush had lower biomass production)
- Therefore, Sheshegu communal rangeland is needs intervention to prevent further decline.



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