Title: Local knowledge of grasses in semi-arid South Africa: Comparison of forage traits, status and trends, and similarities with field studies

Solomon Tefera

University of Fort Hare, Faculty of Science and Agriculture, Department of Livestock and Pasture Science, Alice Campus, P Bag X1314, Alice, 5700, South Africa, email: teferabeyenesolomon@yahoo.com.

1. Introduction

Many African communal Rangeland areas

- ✓ Climate Change, poverty, rangeland degradation and underutilization, Unemployment, food insecurity.
- ✓ Vast rangeland resources that need to be sustainably utilized and managed in order to address some of the challenges

This requires to identify pathways for sustainable management and use/or development

- Local knowledge (LK) and social institutions are being increasingly recognized as vital gears to identify pathways
- A growing interest of integrating LK and scientific knowledge.

- SA communal farmer (Livestock owners??) use their LK and perceptions for generations to make decisions.
- On grass species.
  - LK have not been adequately recorded and examined

Why is this significant?

- part of a large research project focusing on the integration of local and scientific knowledge in rangeland resource management and utilization for sustainable small scale livestock production in semi-arid Eastern Cape Province of South Africa.

- for recognizing farmers' familiarity and needs to outline fundamental working out necessities
  - advance their knowledge of the grass species,
  - their values and management needs
- a package of sustainable communal based rangeland management and local resource use system.

Research Questions

1) Do the farmers (or livestock owners) have thorough knowledge of grasses, their values, habitats and status?
2) How do communal farmers rank grasses based on the respective forage traits? Are there differences between villages, age or sex ?
3) Does LK of grasses correspond with scientific knowledge?
4) Does the grasses, identified by the respondent, reflect the grass species identified in the field survey (or what is the similarity)?
5) implications for communal based rangeland development program and interventions?

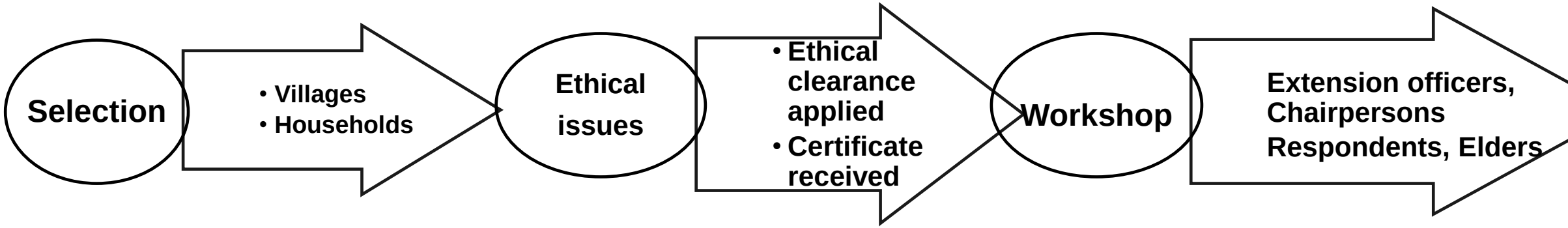
2. Materials and Methods

- Location: Eastern Cape: Fort Beafort to King Williams (≥80 Kkm X 40 Km)
  Six villages

Table 1. Proportion (%) of communal respondents according to sex and age groups

	Sex		Villages				
	Female	Male	>20-30	>30-40	>40-50	>50-60	>60
Sakhi	33.3	66.7	13.3	20	10	23.3	33.3
Chwarhu	33.3	66.7	43.3	10	20	16.7	10
Ngwenya	33.7	66.7	16.7	20	13.3	16.7	10
Esigingqini	30	70	30	20	13.3	20	16.7
Phumlani	50	50	36.7	10	10	10	33.7
Madubela	33.3	66.7	33.3	6.7	20	23.3	16.7

Sampling procedure



Data Collection:

- close- and open ended questions to capture

Demography	Grass species	Describe forage characteristics
• **Sex groups** • **Age groups**	• **List species** • **Vernacular names**	• **Production** • **Grazing value** • **Ecological value (benefit)** • **Adaptability** • **Habitat preference** • **Current status and trends**

SPSS

Table 2. Summary of grass plant traits and indicators of each trait

Trait	Explaining variable	score
1. Forage production	-forage biomass	1-3
	-plant regrowth after grazing	1-3
	Total score	**2-6**
2. Forage grazing values	-palatability	1-5
	-grazeable portion	1-4
	-period of forage provision	1-3
	-age at which the plant is most palatable	1-3
	-animal performance	1-3
	Total score	**5-18**
3. Adaptability	-adaptation to stress (dry/drought, shallow or poor soil conditions)	1-4
	-resistance to frequent grazing	1-4
	-resistance to fire	1-4
	-resistance to trampling	1-4
	-resistance to heat stress	1-3
	-competition against weeds and bushes	1-2
	Total score	**6-21**

Table 2 cont'd

4. Ecological values	-root condition	1-4
	-ground cover	1-3
	-litter production and decomposition	1-3
	-ability of the plant to protect the soil	1-4
	Total score	**4-14**
5. Plant status and habitat preference	-life and growth forms	1-4
	-current status	1-5
	-current trends	1-5
	-soil preference	1-4
	-landscape preference	1-5
	-environment preference	1-8
	Total score	**6-27**

3. Results and Discussion

- ***Grass species identified***

Table 3. Vernacular and scientific names of herbaceous species (mainly grasses identified by the communal farmers. and proportion (%) of respondents

Vernacular name	Scientific name	Sakhi	Chwarhu	Ngwenya	Esigingqini	Phumlani	Madubela
Bosisi	*Chrysocoma tenifolia*	0	3.3	33.3	3.3	6.7	3.3
Buffalo grass	*Panicum maximum*	3.3	0	0	0	0	0
Hlotshazana/Nokawsana	*Aristida conjesta*	10	26.7	20	0	0	0
Idobo	*cluster*	23.3	30	20	3.3	0	26.7
Injica/Umsingizana/Umsuka	*Sporobolus africanus*	33.3	40	40	43.3	10	23.3
Iqunde	*Themeda triandra*	6.7	13.3	0	33.3	0	6.7
Isandla	*Digitaria eriantha*	0	13.3	0	0	0	0
Isilevu	*Elionurus muticus*	0	0	0	0	0	13.3
Isiqungu	*Hyparrhenia hirta*	3.3	0	0	10	0	0
Kikuyu	*Pennisetum clandestenum*	0	0	0	13.3	3.3	10
Madolwana	*Eragrostis obtusa*	23.3	13.3	16.7	3.3	0	50
Qaqaqa	*Cynodon dactylon*	86.7	93.3	76.7	86.7	96.7	76.7
Padi	*Panicum dilatatum*	0	6.7	0	0	0	0

Knowledge and perceptions of the forage traits

Table 4. Proportion (%) of communal livestock farmers in the six villages (range) who do not have knowledge of the forage traits on the identified herbaceous plants.

Plant species	Plant status and habitat	Forage production	Grazing values	Adaptability	Ecological value
Aristida congesta	41	71	35	29	29
Chrysocoma tenifolia	33	67	60	33	40
Cynodon dactylon	35	66	15	47	24
Digitaria eriantha	50	50	50	50	50
Elionurus muticus	50	50	50	50	50
Eragrostis obtusa	41	78	41	19	28
Hyparrenia hirta	100	100	100	100	100
Pennisetum clandestenum	100	50	13	38	0
Sporobolus africanus	30	68	49	54	27
Themeda triandra	28	50	50	17	17

Relative importance of grasses for the respective traits

Table 5. Relative importance of grasses based on the selected traits (sum of the mean score of the variables in each trait) in the six studied villages.

Species	Plant status and habitat preference	Forage production	Grazing values	Adaptability	Ecological values
Aristida congesta	22.8^{c}	3.8^{c}	11.6^{d}	13.6^{a}	10.4^{bc}
Chrysocoma tenifolia	21.8^{d}	4.6^{b}	12.4^{c}	14.3^{a}	13.7^{a}
Cynodon dactylon	24.4^{b}	3.9^{c}	13.9^{b}	14.2^{a}	10.8^{bc}
Digitaria eriantha	18.4^{f}	-	15.0^{a}	8.00^{e}	9.8 ^{d}
Elionurus muticus	19.1^{e}	5^{a}	10.3^{e}	12.3^{b}	10.8^{bc}
Eragrostis obtusa	19.5^{e}	5^{a}	12.9^{c}	12.9^{b}	8.1^{e}
Hyparrenia hirta	-	-	-	-	-
Pennisetum clandestenum	-	5.3^{a}	15.8^{a}	10.2^{d}	10.3^{bc}
Sporobolus africanus	21.5^{c}	4.1^{bc}	12.9^{c}	12.7^{b}	11.1^{b}
Themeda triandra	26.0^{a}	4.0^{bc}	12.5^{c}	14.0^{a}	11.1^{b}
P-value	.008	0.01	0.03	.004	0.01
Chi-square	26.8	24.3	26.6	31.8	32.5

Figure 1. Hierarchy

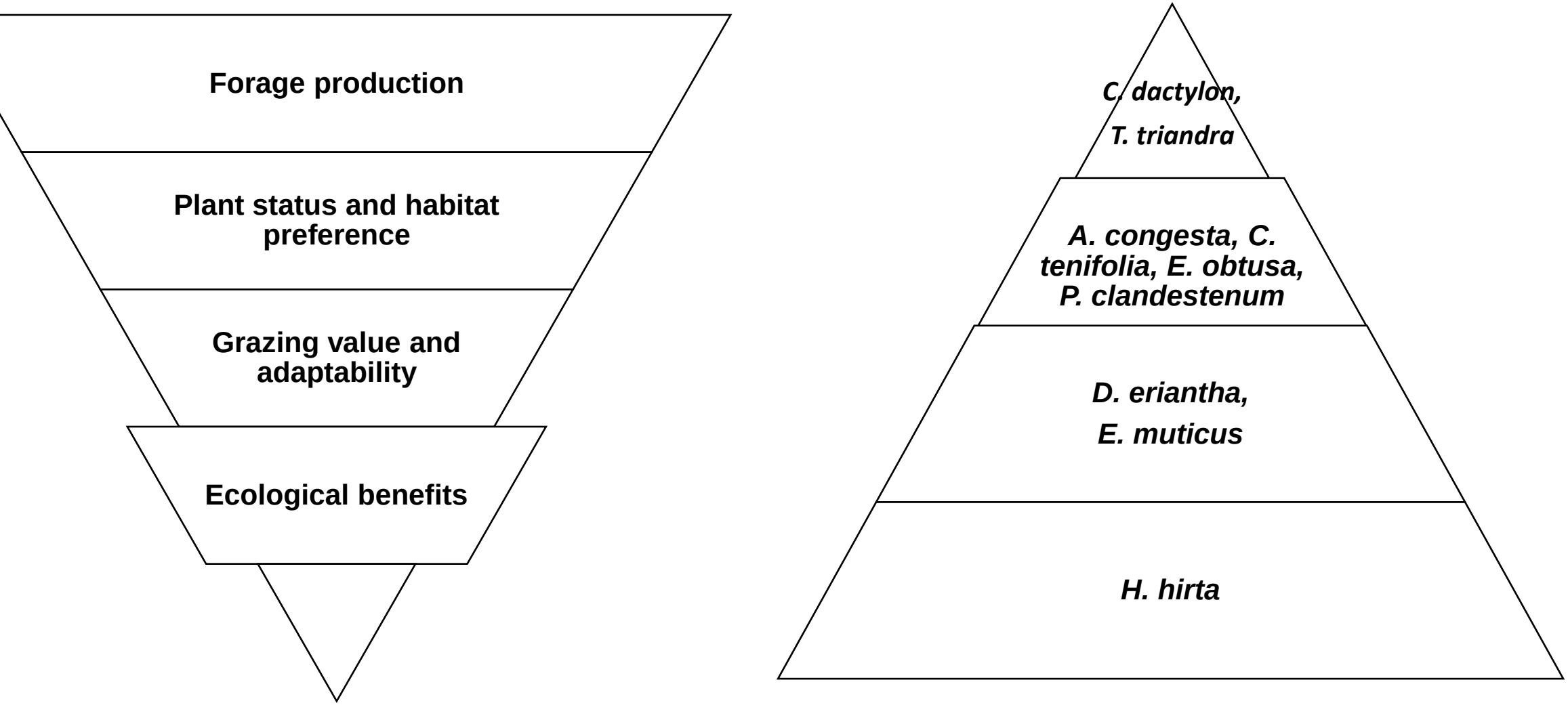


Table 6. Relations between forage traits

	PSH	FP	GV	Adap	EV
PSH		**+**	**+**	_	**+**
FP			**+ (weak)**	_	**+ (weak)**
GV				_	**Not clear**
Adap					**+**

Table 7. Analysis of the variations between sites (villages) on the scoring of selected indicators within forage traits for each grass species

Species	specific variable	P	Chi-square
Aristida congesta	***Grazing value***	0.03	6.8
	-grazeable portion		
Chrysocoma tenifolia	***Plant description***	0.05	4.0
	-landscape preference		
Cynodon dactylon	***Grazing value***		
	-palatability	0.003	17.9
	-age at which the plant is most palatable	0.04	12.0
	Ecological values		
	-root system		
	-ground cover	0.014	14.3
		0.02	13.9
	Plant status		
	-current status		
		0.01	14.7
Sporobolus africanus	***Adaptability***		
	- Resistance to trampling,	0.001	20.1
	- to prolonged heat stress	0.009	15.4
Themeda triandra	***Plant habitat***		
	-landscape preference	0.02	10.0

Table 8. Analysis of the variations between sex groups for the scoring of selected variables in the traits for each grass species

Species	Attributes and specific variable	P	Z-value
Aristida congesta	***Adaptability***		
	-adaptation to stress (dry/drought, shallow or poor soil conditions	0.05	-1.94
	Ecological values		
	-ground cover	0.03	-2.20
Chrysocoma tenifolia	***Adaptability***		
	-adaptation to stress (dry/drought, shallow or poor soil conditions	0.03	-2.20
	-Response to prolonged heat stress	0.05	-1.91
	Ecological values		
	-ground cover	0.01	-2.50
Cynodon dactylon	***Forage production***	0.05	-1.98
	Ecological values		
	-ground cover	0.05	-1.90
Eragrostis obtusa	***Adaptability***		
	-resistance to frequent grazing	0.04	-2.01
	-response to prolonged heat stress	0.06	-1.89

Table 9. Analysis of the variations between age groups for the scoring of selected variables in the traits for each grass species (data is presented only for grasses and variables that showed significant differences).

Species	Attributes and specific variable	P	Z-value
Aristida congesta	***Grazing value***		
	-palatability	0.6	-1.9
	Plant status		
	-trend	0.03	-2.2
Chrysocoma tenifolia	***Adaptability***		
	-resistance to grazing	0.04	-2.1
Cynodon dactylon	***Adaptability***		
	-adaptation to stress (dry/drought, shallow or poor soil conditions	0.02	-2.1
	Plant status		
	-life forms	0.009	-2.6
Eragrostis obtusa	***Ecological benefit***		
	-litter cover	0.02	-2.3
	Plant status	0.05	-1.9
Sporobolus africanus	***Forage production***		
	-biomass	0.06	-1.9
	-regrowth after grazing	0.03	-2.2

4. Conclusion

- Do communal farmers know grasses?
- Communal farmers don’t have strong knowledge of identifying grasses/their values, but suggest may have reasonable IK that can complement scientific knowledge and improve our understanding of grasses.

- Some interesting Hierarchy and relationships between forage traits were established:

- The study hinted the Ik could be useful and can be integrated with scientific knowledge in rangeland resource management and utilization for sustainable small scale livestock production.

- recognized farmers’ familiarity as well as their needs
  - fundamental training-grass species,
  - their values and management needs

- Extended studies to be conducted at large landscape level.

5. Challenges

- No herdsmen
- Grass is grass
- Ask the cattle, goats, and sheep
- Less interest

“Look after the pastures & the animal will look after themselves”