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Spotlight on Agriculture

Ministry of Agriculture, Water and Forestry, Directorate of Agricultural Research and Training, Private Bag 13184, Windhoek

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USING REMOTE SENSING IN SEARCH OF GRAZING CAPACITY

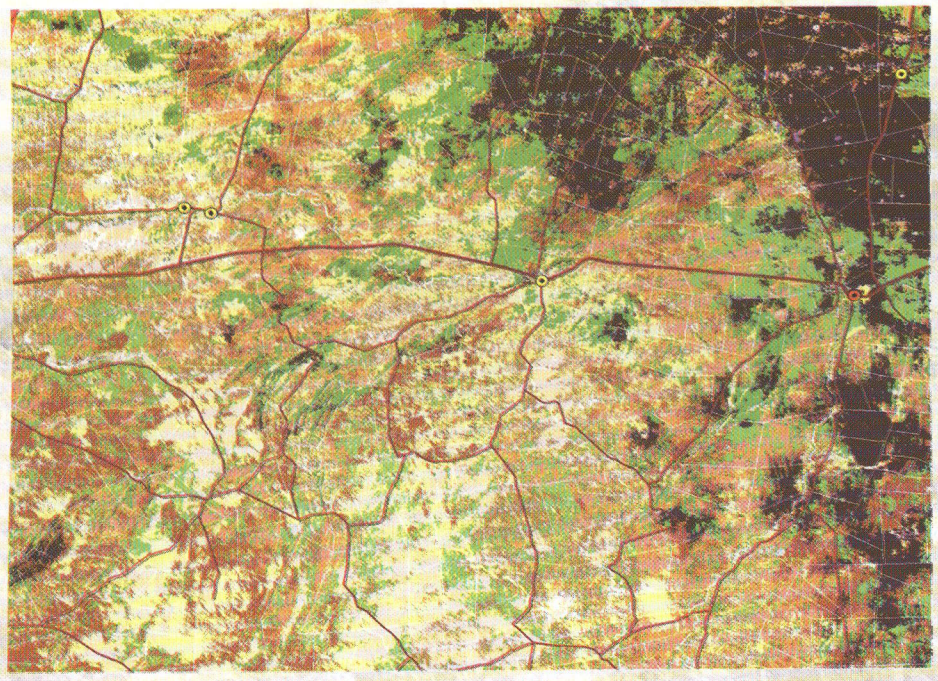
INTRODUCTION

The Ministry of Agriculture, Water and Forestry is currently in the process of fine-tuning remote sensing methodologies in an effort to ultimately determine grazing capacities on a national level. The approach involves the use of satellite-derived total seasonal Biomass Production Estimates (BPE), corrected for Woodiness, Accessibility and Palatability (WAP), and Land Cover (LC) mapping. Both BPE and LC mapping require ground truthing in terms of vegetation biomass production, which forms the basis of grazing-capacity.

Ground truthing is bringing into line, with satellite-generated data, the reality of what is going on in the field. It is the intention of researchers in this ministry to produce an updated grazing-capacity map, backed by scientific methodology, that can be used for fair land evaluation and be applied to ensure long-term sustainable use of the grazing resource.

METHODOLOGY

A land cover map was generated during January of 2005, using percentage canopy cover and height of vegetation as classification parameters. The map is complimentary to the now well-known seasonal BPE image, in the sense that it indicates additional vegetation structure features. The land cover map, which was generated for an 11 000 km² pilot area east of Windhoek, consists of ten vegetation cover units, of which only six were eventually ground truthed in terms of plant biomass. The remaining four consist of severely encroached areas, or where a vegetation cover unit contributed less than 1 % to the total area.



Land cover map of pilot area: Lat. 22–23° : Long. 17–19°

The ground truthing mechanism chosen to determine grazeable plant biomass was the clipping of quadrats. Thirty sites were chosen in the pilot area, varying from three to six sites per vegetation cover unit, and clippings were carried out during April of 2006, as well as April of 2007. Materials so collected were dried and weighed, and the grazing capacity per vegetation cover unit calculated.

Clipped quadrat

Forest		Low shrub – closed		Urban	
Woodland – open		Low shrub – open		Wetlands	
Woodland – sparse		Low shrub – sparse		Cultivation	
Tall shrub – closed		Grassland		Sand	
Tall shrub – open		Water – man-made		Pans	
Tall shrub – sparse		Water – natural		Bare/degraded	

RESULTS

The results of the past two years of clippings are presented in the following table.

GC – Grazing Capaxity
AB – Animal Biomass
– Huge negative differences in GC between years
– notable positive differences in GC between years
– Virtually no differences in GC between years

Pilot Area: Grazing Capacity per land cover unit for the growing periods of 2005/6 and 2006/7

Land cover unit	Grass & bag	Bag	GC (Kg AB/Ha) 2007	GC (Kg AB/Ha) 2006	GC (Ha/LSU) 2007	GC (Ha/LSU) 2006
Grassland - Alt Hartbeesvlei	201.2	126.6	0.85	86.86	528.42	5.18
Grassland - Kanabis	2593.1	138.9	28.02	48.85	16.06	9.21
Grassland - Orumbe Nord	916.8	118.3	9.12	43.23	49.37	10.41
Grassland - Otjiwarunmendu	892.1	127.7	8.73	25.83	51.57	17.42
Grassland - Smalhoek	7760.3	728.4	80.27	110.69	5.61	4.07
Grassland - Volmoed	365.5	125	2.75	77.06	163.91	5.84
Grassland - Wiesesrus	6985.3	245.3	76.94	55.81	5.85	8.06
Woodland Sparse - Grunenthal	2404.2	169.5	25.51	42.51	17.64	10.59
Woodland Sparse - Merino	not clipped	–	–	39.35	–	11.44
Woodland Sparse - Owiniekiro	4902.1	130	54.48	65.81	8.26	6.84
Woodland Sparse - Spandau	2361	128.2	25.49	44.30	17.65	10.16
Low shrub Sparse - Grt Okapanje	120.4	105.6	0.17	87.18	2663.51	5.16
Low shrub Sparse - Saaleck	7009.3	290.3	76.70	86.08	5.87	5.23
Low Shrub Sparse - Olive	1762.4	178.7	18.08	94.78	24.89	4.75
Low Shrub Sparse - Orumbo	394.6	127.3	3.05	54.49	147.47	8.26
Tall Shrub Sparse - Golden Aue	1421.2	117.2	14.89	69.17	30.23	6.51
Tall shrub Sparse - Helene	655.1	159.3	5.66	50.68	79.51	8.88
Tall shrub Sparse - Kaukurus Ost	2814.4	119.8	30.76	23.24	14.63	19.36
Tall Shrub Sparse - Nuwe Orde	2780.6	170.6	29.79	55.10	15.10	8.17
Tall shrub Sparse - Orumbo Nord	3900	242.4	41.75	20.44	10.78	22.01
Tall Shrub Sparse - Sandkraal	3819.9	261	40.63	41.29	11.08	10.90
Tall Shrub Sparse - Scheidthof	340	113.9	2.58	24.24	174.35	18.57
Tall Shrub Open - Autabib	2976	231.8	31.33	61.94	14.36	7.27
Tall Shrub Open - Duvenhage	3503.1	279.4	36.80	50.17	12.23	8.97
Tall Shrub Open - Eliza	5874.3	343.4	63.14	87.32	7.13	5.15
Tall Shrub Open - Gross Osombahe	1571.2	81.6	17.00	62.26	26.46	7.23
Tall Shrub Open - Kameelboom	393.6	88.4	3.48	49.90	129.16	9.02
Woodland Open - Herzwalde	5397.3	240.7	58.87	70.70	7.64	6.37
Woodland Open - Mountain View	1182.1	106.4	12.28	92.86	36.65	4.85
Woodland Open - Wendelstein	4821.6	255.8	52.12	36.07	8.63	12.47

DISCUSSION

Substantial differences between the grazing capacities of the 2005/6 and 2006/7 growing seasons can be observed in the table. These differences are easily explained in terms of rainfall.

CONCLUSION

Grazing capacity varies tremendously over years. Although this variation is influenced by a number of factors, rainfall remains a major contributing factor. In the search for the ever-elusive assessment of the grazing capacity of Namibia's extensive rangelands, remote sensing is not as quick a solution as many may think. There are still some issues to be addressed in the use and application of this methodology. Nonetheless, it provides an exciting and worthwhile tool to apply in the search for the sustainable use of land. It must also be stressed that, in order to generate credible grazing capacity figures that will be to the satisfaction of all involved and concerned, ground truthing should continue for a number of years.

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