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AVAILABILITY AND SEASONALITY OF FEED SUPPLY  
IN BOTSWANA\*

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BY

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A B S T R A C T

Feed deficits in Botswana are caused by overstocking, lack of use of alternative feed resources and uncontrolled exports of some scarce feeds.

Livestock production has been customarily based on natural rangeland which meets up to 97% of feed requirements during normal years. During both short-term and long-term drought livestock mortality is high (20%) and any attempt to correct this deficiency has not been successful.

Crude protein and phosphorus have been identified as factors limiting livestock productivity. Crude protein content in the range rises from 5.7% in the dry season to 9.4% in the wet season.

Ruminant feed supplies during the dry season show a deficit of 900,000t. Harvesting of some range in the country is possible on some areas which are not utilized by livestock. Cereal crop residues have not received much attention in terms of utilization and efficient use. Some agro-industrial by-products though produced locally, are exported which further exacerbates the feed shortage. Likewise, animal by-products produced locally are not used efficiently and some are exported.

Forage and pasture development need a boost both by on-station research and farmer involvement. Research priorities are outlined and recommendations made for optimal utilization of feed resources in Botswana.

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## INTRODUCTION.

Botswana's livestock population is estimated at about 2.7 million cattle, 0.9 million goats and 0.2 million sheep (BOT AGRIC. STATS, 1984). 85% of the national herd is kept in the communal areas of which the majority are small livestock producers (10-40 head/household). The rest of the livestock (15%) is kept under commercial ranching.

Livestock in Botswana is customarily kept on range which provide 97% of their feed requirements. Despite this, there is considerable evidence that the productivity of the range is declining rather than matching the steadily increasing livestock population. The fact that only 5% of the country is suitable for arable agriculture means that availability of crop residues and agro-industrial by-products will remain very limited.

APRU (1975) reported that forage from natural rangeland in Botswana is of very low nutritive value being characterised by high crude fibre, low crude protein, low dry matter digestibility and low calcium and phosphorus contents at all times except for the immature herbage produced after the rains.

Causes of feed deficit in Botswana can be summarised as:

- (a) Lack of feed (Quality and quantity) during the dry season and early part of the rainy season.
- (b) Overstocking due to traditional right of keeping livestock as a reserve bank and for prestigious purposes.
- (c) Communal use of grazing land and stubble fields with no defined communal right of grazing.
- (d) Free access by freehold commercial farmers to graze in the communal areas.
- (e) Insufficient availability of crop residues and other stovers.
- (f) Lack of emphasis on fodder production and conservation.
- (g) Lack of supplementary feeding e.g. phosphate licks.

In addition to the problems outlined above, there is lack of information on seasonal and regional availability of feed resources. The purpose of this paper is to address the issue of feed availability and seasonality of supply in Botswana and pinpoint constraints in their utilization.

## RANGE RESOURCES.

Profiles of monthly availability, range productivity and cattle weights complemented by nutrient analysis of herbage and of the extrusa of fistulated steers commenced in 1972 by the Animal Production Research Unit (APRU, 1977). The aim was to collect data from all over the country on pasture productivity and liveweight changes and endeavour to pinpoint factors limiting productivity.

The results showed that phosphorus on dry matter basis was always below 0.03%. It was therefore the most limiting nutrient both to the range and livestock productivity. Crude protein content of ingested forage for the year averaged 8.5%, rising from 5.7% in the dry season to 9.4% in the wet season. It was concluded that crude protein was the second limiting factor after phosphorus than DM digestibility which accounted for more variance in the wet season than the dry season. In good years, the potential carrying capacities for the different areas were summarized and ranged from 10ha/Livestock unit in the hardveld to 20ha/Livestock unit in the sandveld (Field, 1978).

In normal (optimal rainfall) years, a high percentage of grazing in the communal areas is utilized. Assuming a linear relationship between range DM production and rainfall, reductions of 20-50%, 10-40% and 10-50% could be expected in the eastern hardveld for the years 1982, 1983 and 1984-85 respectively. (McGowan and Associates, 1979). However, the hardveld has poor range cover with consequent lower herbage availability from grasses. There may also be some buffer effect from browse.

In the sandveld, there is normally some unutilized grazing especially of less palatable species. It is likely that the Total Digestible Nutrients (TDN) deficit in these areas are less indicated by rainfall figures but may still show a reduction of 10-20% in the 1982-84 years.

## RUMINANT FEED SUPPLY.

Ruminant feed supplies in a normal year are shown in Table 1.

Table 1. Ruminant Feed Supply Normal Years

<u>Source</u>	<u>Percentage (%)</u>
1. Cereal residue and other stovers	2.50
2. Improved pasture and forage crop, Improved Hay	0.04
3. By-products-Agro-industrial(Brewer's grains)	0.01
4. *Concentrates(Manufactured feed and Homminy chop)	0.04
5. Range	<u>97.40</u>
	<u>100.00</u>

\*Hominy chop (10,000t) mainly from imported maize. Most of it is exported.

Assuming daily DM intake in cattle of 2.15% liveweight.(350kg liveweight animal) under communal grazing conditions, the annual requirement per head is 1.07t (Communal) and 1.23t (commercial). The national TDN requirement will be 3,464,000t per year (MOA, FAO Mission Reports, 1984). The 1981/82, 1982 - 1985 shortfall has been estimated at about 30% and 20% respectively.

#### DROUGHT YEARS.

In 1983 the government initiated a drought relief operation aimed at the purchase and distribution of feed for ruminant livestock. Imports of feed blocks (Rumevite, winterlick) were increased to about 0.1% of normal TDN supply. The 1984/85 imports of feed stuffs is summarized in Table 2.

Table 2. Drought Relief Sales of Roughage, 1984 and 1985.

<u>Feed Type</u>	<u>Quantity (Tonnes)</u>	<u>Price/Ton(Pula)</u>
1. Pandamatenga Grass-Okavango Area	586.6	114
2. Nyle Grass	1,180.6	135
3. Lucerne	367.5	200
4. Eragrostis Teff	877.1	150
5. Wheat straw (locally produced)	18.0	100
6. Millet stover	136.2	150
7. Peanut stover	148.2	175
8. Maize stover	1,649.5	150
9. Sorghum stover	1,601.2	150
	<u>TOTAL</u>	
	6,564.9	

Source : L.A.C. : Gaborone

The prices of the imported roughages when landed were approximately 80% of yellow maize. These were sold to farmers at a subsidised price of approximately P110/t. Despite these imports a deficit of 900,000t was still experienced. Pandamatenga grass was baled in the Okavango area which is not stocked except for Wildlife. The estimated area is 50-60,000ha. At a DM yield of 3t/ha, potential exists for production of 150,000t per season. A fodder bank could be established to level out variation in feed supply.

Livestock mortality were also high (20%). But this could be accounted for lack of awareness of the value of these roughages or by the fact that livestock are generally range grazed and not directly fed by their owners. Thus the importation of roughages and the subsidy applied fail to normalise the seasonal fluctuations in liveweight losses and livestock mortality.

**CEREAL CROP RESIDUES.**

Cereal crop residues are mainly from maize, sorghum and millet, while legume residues comprise of groundnuts and cowpeas. Table 3 shows the 1984 estimated yield of three cereal crop residues and area planted.

Table 3. Estimated Cereal Crop Residues and Area Planted, 1984.

Type of Residue

<u>Type of Residue</u>	<u>Area Planted('000ha)</u>	<u>Total Production('000 tons)</u>
Sorghum		
Traditional	107.6	591.8
Commercial	6.8	37.4
Maize		
Traditional	43.9	163.8
Commercial	4.0	14.9
Millet		
Traditional	16.6	50.6
Commercial	0.1	0.3
<b>TOTAL</b>		<b>858.8</b>

Source : BOT AGRIC STATS (1984)

Under traditional custom, the head is removed and transported to a homestead where threshing is done. The chaff and glumes are often burnt and not stored for livestock feeding. Standing stover in the field is left to be trampled and grazed by uncontrolled livestock since there is little individual ownership of fields.

The yield and nutritive value of the cereal crop residues were estimated in 1982 (Table 4).

Table 4. Dry Matter Yields and Dry Matter Digestibility (DMD) of Cereal Crop Residues.

Type Residue	DM Yield Range Ton/Ha	Average DM Yield(Ton/Ha)	DMD%
Sorghum	0.60 - 10.40	3.50	60.93
Millet	1.15 - 4.95	3.05	55.65
Maize	1.66 - 5.81	3.73	63.60

Source : Mosienyane B.P. (1983) Botswana Bulletin of Agric. Research.

It was concluded that DM yield decreased by 28.34% units and DMD by 11.17% units from April to May. This means that when harvested early, cereal crop residues could yield stover of high quality and quantity. It was also calculated that a 6 ha area could maintain a herd of 50 mature oxen for a period of over 2 months in the dry season. As stated earlier if estimates of crop residues were included in the Ministry of Agriculture situation report, this can serve as an indicator of the potential quantity and location of an otherwise neglected feed resource.

#### LEGUMINOUS RESIDUES.

Production of legumes (beans, groundnuts, sunflower etc) is currently undertaken by commercial farmers. Yields of these legumes have not been established and they do not play a significant role in livestock nutrition. There is interest in ploughing these legumes in pure stand and therefore, until the market of oil seeds is established there is very little interest in these products.

#### MILLING BY-PRODUCTS.

Botswana hosts a number of milling factories. A recent inventory revealed the existence of one large milling factory in the south (10,000t of hominy chop, mostly exported), one medium factory in central, and about ten other small units along the eastern part. There is a heavy reliance on imported grain (Maize and sorghum). For the past 2 years, the country imported sorghum grain amounting to 19,000t. Assuming a 20% sorghum bran (Moroko) content, this represents about 3,800t of additional moroko that can be potentially used as feed.

Sorghum is the staple food in Botswana. Every household produces some kind of sorghum bran and this is fed to either chicken or donkeys but rarely to cattle.

Table 5 summarises the types of milling by-products available.

Table 5. Estimated Milling By-products - 1985

<u>Type of By-Products</u>	<u>Estimated Production (Ton/Yr)</u>
Sorghum bran (Moroko)	
Local	11,000
Import	3,800
Wheat bran Import	6,000
Hominy chop Import	<u>10,00</u>
	<u>30,800</u>
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Wheat bran is produced in the south from imported wheat. There is also some rice bran produced in the north west. Not much use is made of Hominy chop locally, but with the setting up of some dairies, this product will be useful in the country.

Brewer's grain is produced from three breweries situated in eastern Botswana. The total production is about 15,000t DM. Most of it is bought by farmers who produce pigs and a few dairies. Production levels fall during winter when traditional beer brewing is high and this confounds the already existing feed deficits.

#### **ANIMAL BY-PRODUCTS.**

Research findings have established the need to look into recycling of animal waste for livestock feed. Except for one feedlot, hardly anyone uses poultry litter as animal feed. Botswana has an estimated 770,000 mature birds (broilers and layers) producing about 6183.1t of litter per year. (Poultry Section, MOA, 1985).

The Botswana Meat Commission (BMC) currently produces bonemeal, carcass meal and blood meal. (Table 6). Most of the products except bonemeal are exported. Bonemeal is subsidized up to 75% by the livestock industry. Despite this the quantity of bonemeal produced can supply less than 2.5% of the national herd. It is recommended that export of all animal by-products be stopped and local utilization be promoted.

Table 6. BMC Animal -Products-1984

<u>Type of By-Product</u>	<u>Production (Ton)</u>
Bonemeal	2,528
Carcass Meal	4,361
Blood Meal	531
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TOTAL	<u>7,420</u>

Source : BMC Report 1984

#### CONCENTRATE FEED

There are about three large producers of compounded feeds. These are for calf starter, poultry feed, dairy meal etc. Most of these by-products are for pig and are derived from imported grains. The other sources are feed blocks which are also imported and sold by the government to farmers without charging transport. Feed block imports are around 300t, molasses 25t and drought cubes (10% CP) of about 2,000t per year.(L.A.C.)

#### FORAGE AND PASTURE DEVELOPMENT.

There are investigations for a forage and pasture establishment programme. APRU has a goal to establish large fields of Cenchrus in its network of ranches. The small scale dairy project in APRU (funded by IDRC) also has as its aim the establishment of at least 1 ha of Lablab purpureus (Dolichos lablab) for the Small Scale Dairy Project participating farmers. Leucaena was tried but problems were encountered with termites and Wildlife. There is also a seed production project (funded by UNDP) whose objective is to establish a seed multiplication unit for fodder crops.

## RESEARCH PRIORITIES

Feed shortage are going to prevail since productive land is a fixed entity. Consequently, unless alternative strategies are sought, Botswana will face declining livestock and range productivity. It is suggested that the following be considered in setting research priorities.

- an inventory should be made of all available feed resources in each region in Botswana.
- possible beneficiaries be identified and the use of by-products and crop residues and the associated technology developed locally.
- assessment of nutritive value be done on all available by-products, and other feed resources and the results disseminated so that information is available to producers and extension personnel.
- establish improved pastures (adaptable grasses and annual legumes) for the communal areas.
- assist communal farmers in appropriate methods of forage (by-products and planted fodders) conservation and feeding; particularly during the dry season.
- increase the level of mineral nutrition through supplemented feeding in the range.

#### REFERENCES

1. **Animal Production Research Unit, 1975.** A Five Year Programme of Integrated Beef Cattle and Range Research in Botswana 1970-75 Part 1. Technical Results. Ministry of Agriculture, Private Bag 0033, Gaborone. Botswana.
2. **Animal Production Research Unit, 1977.** An Integrated Programme of Beef Cattle and Range Research in Botswana 1970-75, Ministry of Agriculture, Private Bag 003, Gaborone. Botswana.
3. **Botswana Agricultural Statistics, 1984.** Livestock and Crop Survey. Division of Planning and Statistics, Ministry of Agriculture, Private Bag Bag 003, Gaborone. Botswana.
4. **Botswana Meat Commission, 1984.** Annual Report. Private Bag 4, Lobatse, 16p.
5. **Field, D.I. 1978.** Handbook of Basic Ecology for Range Management in Botswana. Ministry of Agriculture, Gaborone, Botswana. 93p.
6. **Kiflewahid, B., 1983.** Overview of research methods employed in the evaluation of by-products for use in animal feed. In Kiflewahid, B, Potts, G.R., Drysdale R.M. eds. By product utilization for Animal Production, IDRC 206e, 93 - 115.
7. **Livestock Advisory Centre.** Private Bag 0034, Gaborone. Botswana.
8. **McGowan and Associates, 1979.** A study of Draught and Contingency Measures Relating to the Livestock Sector of Botswana. Consultancy Report for Government of Botswana.
9. **Ministry of Agriculture and F.A.O. Mission Reports, 1984.**
10. **Ministry of Agriculture, Poultry Section, 1985.** Ministry of Agriculture, Private Bag 003, Gaborone, Botswana.
11. **Mosienyane, B.P., 1983.** Crop Residues for Animal Feeding Bulletin of Agricultural Research in Botswana. Ministry of Agriculture. Botswana.

APPENDIX A  
BOTSWANA BASIC DATA

Location 18° S to 27° S and 20° E to 29° E.

Human Population 935,000 (1983) of which 80% in the agricultural sector. Annual increase 3.0%.

Altitude 600 - 1400m (mainly 900 - 1200m)

Area: Traditional farming and communal grazing areas	370,000km <sup>2</sup>
Freehold farming	28,000km <sup>2</sup>
National Parks, Wildlife and forest reserve	187,000km <sup>2</sup>
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	585,000km <sup>2</sup>
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Ecological zones: Eastern Harveld  
Kalahari  
Okavango  
Makgadikgadi basin

Numbers cattle ('000) 1984	2,685
Numbers of Smallstock ('000) 1984 (sheep and goats)	1,057