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Characterization of Butana Cattle Production Systems in the River Nile State, Sudan

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Summary:
The objectives of this study were to characterize the dairy production systems, adopted management practices, identify Butana cattle breeding goals and constraints to dairy production in the River Nile State of the Sudan during November to December 2018. Butana cattle are kept by semi-nomadic tribes in a mixed crop-livestock production system and are the dominant livestock species. Information for this study was collected from 250 Butana cattle owners in 10 villages in the River Nile State using a semi-structured questionnaire, group discussions, and personal observation. The majority of respondents in this study (83.2%) owned farms while 13.6% had leased farms and 3.4% were on communal land. Most of Butana cattle owners (93.6%) indicated livestock to be their main activity. Butana cattle have multi-functional roles in the production system and milk production is important for obtaining regular cash income and home-consumption needs. The ranking of breeding objectives on a scale of 0 to 1 was 0.37, 0.31and 0.2 for milk, meat and the social role of cattle. Water was obtained from traditional wells by 55.6% of owners while 5.6% obtained water from water points equipped with tank and pump and 38.8% got their water from both sources. The distance to watering point was about 1-5 km for 8% of owners while 57.4% of owners had to move their animals more than 5km to the water source and 34.6% of owners avail water on the farm. Most herds (62.0%) grazed for 12 hours daily while 29.2% grazed for 15 hours and 8.8% grazed for 18 hours. Reasons for low milk production in summer were said to be limited water availability (88.4%), limited feed (9.2%) and high temperatures (2.4%). Migration distance ranged between 100 and 300 km for all owners. It was concluded that the cause of the rather low milk yield of Butana cows in the field compared with their higher performance

reported under research station conditions was the unfavorable production conditions. The provision of extension services, veterinary care, water harvesting, and establishing farmers cooperatives are prerequisites for future improvement.

key words: Butana, Production systems

Introduction:

The objectives of this research were to produce baseline data and knowledge of the phenotypic characteristics of Butana cattle and to shed light on cattle smallholder farmer's conditions, explore the challenges and constraints they are facing. It also aimed at identifying necessary interventions for enhanced contribution to food security for rural populations. Butana together with Kenana cattle are considered to have the best dairy potential and are thus candidates for improvement as dairy cattle. They are well adapted to the local environmental stresses such as high temperatures, long periods of feed and water shortage. However, their performance under field conditions is poor. They suffer from poor juvenile growth rate, late age at first calving, low milk yield and long calving intervals. Butana cattle are a promising indigenous dairy breed, which under improved feeding and management in research stations yield more than 1500 and up to 4500kg milk per lactation (El-Habeeb, 1991 and Musa *et al.,* 2005). In some major production traits, the Sudanese Butana and Kenana cattle compare favorably under average station management with some of the best breeds in tropical countries, and their performance does not fall far behind that of 50% Freislan crossbred cattle in the Sudan. The productivity of Butana is higher than that of the Boran of Ethiopea (Demeke*et al.*, 2004) and comparable to that of Sahiwal (Bhatnagar*et al.*, 1983) and Hariana (Duce and Taneja, 1984) in India.Kenana and Butana could be used particularly in medium-intensive production systems. The local environment (high temperature, low feed quality and quantity, disease and parasitic challenge) can sustain only composite genotypes of a moderate level of *Bostaurus* blood. Their relative economic efficiency is yet to be considered (Musa *et al*., 2006).

Materials and Methods

A set of detailed structured questionnaires were prepared and used to collect information from smallholders. The questionnaires were pretested to check clarity and appropriateness of the questions. The questions covered household information and the dairy production management practices. Stratified random sampling was used to collect information from 250

owners in the River Nile State. The study covered 10 villages selected on the basis of cattle population density. The selection of herds within villages was random. The herds sampled in this study were located on the banks of the Atbara River in the River Nile State, Sudan. This area is inhabited by different tribes of Butana and Gallia who raise this breed and their main economic activity is a mixed crop- livestock production. Most of the cattle were owned by Butana tribes. The questions covered household information and the dairy production management practices. The study period was conducted during November to December 2018.

Data analysis

The SPSS statistical computer software (SPSS for windows, release 13.0, 2007) was used to analyze the data. Results are presented mainly in the form of descriptive tabular summaries. Chi square (χ^2) or t tests were carried out as appropriate to assess the statistical significance or otherwise of particular comparisons. An index was calculated to provide overall ranking of the reasons of keeping cattle according to the formula:

Index = Σ of (8 for rank 1 + 7 for rank 2 + 6 for rank 3 + 5 for rank 4 + 4 for rank 5 + 3 for rank6 + 2 for rank 7+ 1 for rank 8) given for an individual reason divided by the sum of (8 for rank 1 + 7 for rank 2 + 6 for rank 3 + 5 for rank 4 + 4 for rank 5 + 3 for rank6 + 2 for rank 7+ 1 for rank 8) summed over all reasons (Snedecor and Cochran, 1967).

Results and Discussion

The general household characteristics in the studied area are shown in table 1. The family size for the majority of surveyed households ranged from 6 to 10 persons. For education level, more than one third of the total farmers (36.4%) were secondary, over one fifth were illiterate and 41.6% were primary school (table 1).El Zubeir and Fadlelmoula,(2014) showed that the education level of farms in Eastern Nile, Khartoum state was (16.67, 6.67, 30, 16.67, 21.67 and 8.33 %) of illiteracy, khalwa, primary, secondary, graduate and post graduate, respectively. El Zubeir and Mahala (2011) and Ahmed and El Zubeir (2013) reported that the illiteracy among the dairy farms owners was 36% and 26.67%, respectively. Most of interviewed Butana cattle owners had training courses in legumes, forage and crop production particularly wheat cultivation. Some of them had training in water basins construction.

Table 1. General household information.

Item	%
Family size	
3-6 persons	29.1
6-10 persons	70.9
Education level	
Illiterate	22
Primary	41.6
Secondary	36.4.
Training	
Yes	70.4
No	29.6
Type of Training (198respondents)	
Legumes cultivation	29
forage cultivation (Sorghum)	26.4
Water harvesting	40.3
crop cultivation	4.3

Major activity and ranking of livestock species showed that almost allof owners practiced livestock rearing as their main business activity while a few practiced livestock rearing as a secondary activity. Owners would like to keep dairy cattle as first choice followed by sheep, goats, poultry and camels. The phenomena of raising goats beside dairy cattle could be attributed to the reason that goats need least level of management, low feeds cost, short life cycle as well having good demand and high marketing chances. They used goats return to meet the feeding cost of their dairy cows. In accordance with this study Musa (2006) found similar results and stated that cattle received a higher ranking when both sheep and goats were kept alongside cattle and where just one of them was kept. Hamza *et al.* (2015) noticed that the main types of animal reared in crossbreed dairy farms in Mossay district were cattle and goats (55%) beside, some other types. Elzubier and Fadlelmoula,(2014) found that diversified farms as a type of farming were found to represent 36.67% of farms in Khartoum State. Furthermore, goats, sheep and camels as additional dairy animals were found to be reared. This might be done for economic reasons or farmers try to optimize and diversifying the use of existing resources.

Butana cattle production system in Sudan

As shown in table 2. Butana cattle are kept in a mixed crop-livestock production system. Farmers in villages close to the banks of the river grow different crops and vegetables. Deep in the Butana the area is semi-desert with low rainfall and limited cultivation is practiced to meet all or part of the household grain requirements. The majority of farmers in the studied villages had on average 5 – 10 feddans grazing area (table 2). Moreover, the semi intensive system was predominant in the study area. The majority of respondents owned farms while few had leased farms and the rest were on communal land (Table 2). For farm type, more than 50%are small scale farms. The crops grown were mostly wheat, sorghum, groundnut and vegetables.

Table2. Farm type and size, production system, land ownership and crops grown.

Item	%	Item	%
System of production		Land ownership	
Intensive	24.8	Own	83.2
Semi-intensive	53.2	Lease	13.6
Extensive	13.2	Communal	3.2
Backyard	8.8	Grazing area (Feddans)	
Crops		1-5 Feddans	14
Wheat	88.4	5-10 Feddans	86
ground nut	46.8	Farm Size	
Onion	0.6	20-25 Feddans	25.2
Alfalfa	0.5	31-50Feddans	50.4
White beans	21.2	26-30Feddans	24.4
Sorghum	69.2	Farm type	
Watermelon	0.96	Small scale (commercial)	30
		Small scale (subsistence)	30
		Large scale	40

Water supply during the dry season was indicated as a major constraint to the cattle herders in the Butana area away from the river banks. From table 3,able cattle owners tend to transport water by trucks to where pasture is abundant or use large plastic containers for storing water. Poor livestock

owners tend to prolong the watering intervals and move their animals to the water points. More than of the owners (57.4%) had to move their animals on hoof for a distance of more than 5 km. Water was obtained from wells by55.6% of owners while 5.6% obtained water from water points equipped with tank and pump (locally known as donkeys) and 38.8%got their water from both. The distance to watering point was about 1-5 km for 8% of owners while 57.4% of owners had to move their animals more than 5km to the water source and 34.6% of owners said they offer water on the farm. Hamza *et al*. (2015) reported that the common source of drinking water in South Darfur, (Mossay) was wells (60%), some had water pipes (25%) and the other producers obtained drinking water from both pipes and wells (10%). Most herds (62.0%) grazed for 12 hours daily while 29.2% grazed for 15 hours and 8.8% grazed for 18 hours.

Table 3. Watering and grazing

Watering		Distance to Grazing	
% of respondents	Method	% of respondents	Distance
55.6	moved to water point	3.6	1-3km
5.6	Water is fetched	77.2	2-3km
38.8	Both	19.2	Over 3 km
Distance to water		Grazing time	
% of respondents	Distance	% of respondents	Hours
34.6	On farm	62	12
8	1-5km	29.2	15
57.4	Over 5km	8.8	18

Most of owners were semi nomadic migrating annually over long distances to find feed and water in the Butana area. As shown in table 4 about 42.8% of respondents said they migrated a distance between 300 and 350 km. The season of migration for the majority (80.8%) was the rainy season when herders move south to take advantage of the rainy season pastures.

Table 4. Distance and season of migration.

Annual migration distance (N=235) %	
32.6	100-200km
24.6	200-300km
42.8	300-350km
Migration season (N=250)	
9.2	Dry summer
10	Winter
80.8	Rainy season

The cows of most respondents were said to produce 12 -13 liter/ day while higher daily yields (14-17 liters)were reported by 23.2% cows. Furthermore lower milk yields (8- 11 liters) were reported by 19.2 % cows (Table 5).Table 5.revealed that the majority of owners had to present the calf to the cow to stimulate milk let down. However, lower daily milk yields were reported by Hassabo (2009) for Kenana and Butana as 7 and 6 kg respectively. Tibin *et al*. (1990) studied the average milk yield of Sudanese crossbred cows with 50%-75% Friesian blood and reported 10.1 kg at Kuku project. The variations in milk yields reported in different studies may be attributed to effect of environmental conditions combined with heat stress and humidity, types of breed and farm management level.

Table 5. Milk yield and milk let down method(N=25).

Milk yield		Let down stimulation method	
Average yield (liters)	% of respondents	Method	% of respondents
8-11 liter	19.2	Moving pails	9.2
12-13 liter	57.6	Introducing	90.8
14-17 liter	23.2	calf to cow	

Summer milk production is summarized in table 6. More than 80% of the respondents revealed that the level of milk production fluctuated from low to average in summer season. So far some respondents had to purchase additional milk for home consumption. The main constraints to milk production in summer were limited availability of water and to a less extent low fodder production and high temperatures.

Table 6. Summer milk production(N=25).

Level of production	% of respondents
High	12.8
Average	50
Low	37.2
Need to purchase additional milk (N=250)	
Answer	% of respondents
Yes	37.4
No	62.6
Reason for low production in summer	
Reason	% of respondents
High temperature	2.4
Decreased feed	9.2
Limited water availability	88.4

Animals must be given veterinary care to reduce their susceptibility to disease and decrease mortality. Since 1900, when for the first time veterinary services efforts were made for disease control, disease prevention programs passed through certain development changes (Baasher, 1969).The liberalization of the economy and the privatization of the veterinary services occurred in the mid- eighties. Since then livestock owners have to pay for veterinary care at market prices and that is beyond the means of most cattle owners in the area. As a result, the high cost of veterinary services and drugs put the service beyond the reach of poor herders and rural inhabitants. Prevalent diseases recorded by the respondents are presented in table 7. The most incident diseases in Butana area were mineral deficiency, mastitis and bloat. While other diseases of foot and Mouth disease, abortion and diarrhea were not common. In line with the results of this study Saeed *et al*. (2015) reported that the percentage of the infectious diseases such as Mastitis, Foot and Mouth disease, Contagious Bovine Pox and Pleuro–pneumonia; that frequently occurred in the milk herd in both small and large scale livestock keepers; were 99%, 51%, 13% and 11%, respectively). However, Mustafa (2008) conducting surveys on some livestock keeping practices in urban and peri-urban parts of Khartoum North Province, found that infectious diseases such as Foot and Mouth diseases, Contagious Bovine Pleuro–pneumonia had frequently occurred in the herd with a percentage of 60%. He also found

Mastitis with a percentage of 35.6% and Diarrheas and Bloats with a percentage of 24.4%.

Table 7. Prevalent diseases.

Diseases (N=199)	%
Mastitis	25.43
Mineral deficiency	36.13
Foot and mouth disease	11.18
Abortion	13.38
Diarrhea	13.99
Bloat	25.32

The ranking of the different breeding objectives for Butana cattle herders are listed in table 8. It was clear that the main purposes of keeping Butana cattle were milk and meat production. Also Butana herders stated that social reasons were important objectives. In line with our study Rahamtalla*et al*. (2014) found that 52% of Butana breeders questioned considered that the primary reason of keeping cattle was to generate income from the sale of milk.

Table 8. The ranking index of breeding objectives of keeping Butana cattle.

Breeding objectives	Rank index
Milk	0.370
Meat	0.310
Manure	0.050
Skin	0.050
Insurance	0.012
Finance	0.001
Risk management	0.007
Social role	0.200

As shown in Table 4 Except for concentrates, significant association was found between average milk production and other type of feeds offered to Butana cattle .

Table 9. The association between quantity of milk production and production factors.

Item	chi square value	P value
Distance to grazing area	15.797	N.S
Feeding hay	21.198	***
Green fodder	24.824	***
Concentrates	0.589	N.S
Concentrates with fodder	7.898	*
Distance to watering point	8.439	N.S
Times of milking	12.348	*
Cattle rank	71.009	*
Diseases	49.480	***
Migration distance	115.673	***
Education level	4.873	*
Training	226	N.S

Conclusions and recommendations

The yield of Butana cattle under improved feeding and management conditions in research stations amounts to1500 kg milk and up to 4500 kg per lactation.The large difference between performance under research station conditions and field conditions indicates the amount of improvement in production that can be achieved by better feeding and management. This breed ranks among the best tropical dairy breeds and as a valuable genetic resource should be conserved and improved.

However this breed is faced by serious threats from extensive crossbreeding and changes in the economic environment. There is a total lack of extension services in the Butana area. Such a service can help in forming farmer cooperatives and establishing a simple recording system that covers a few important traits. Both of these are prerequisites for a group improvement program

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