

THE IMPACT OF DROUGHTS ON THE ECONOMICS OF
 TRADITIONAL ANIMAL PRODUCTION SYSTEMS

by

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Problem setting and objective

Although important changes have taken place in the last decades, animal keeping in the Butana continues to be the most important source of income for the majority of the population that live there; according to Ibrahim (1991), animal keeping has a share of 21% in the gross domestic product of Sudan (1988/89) while Winrock (1992) states that animal keeping constitutes a share of 51% in the contribution of agriculture to the GDP. This applies mainly to the rural areas of the Butana, where other possibilities of earning an income are limited. Thus, in the survey region, there are very different forms of animal keeping characterized by animal species and the animal keeping systems and the availability of other sources of income. It is only in a few exceptional cases that animal keepers practise livestock keeping exclusively. Very often, agriculture is practised in addition, trade is earned out and/or services are offered. The various combinations of different economic activities (multiple employment, on which see also Badiel 1992) are appropriate for representing typical farming systems, including animal keeping (regarding Research on Farming Systems, see also Manig 1993).

The survey presented here is concentrated on extensive animal keeping which is practised in connection with agriculture. It thereby represents the traditional form of animal keeping, even if its organization has changed considerably, however, in the case of animal keepers who lived further north, the economic conditions in times of crisis were sometimes far less favourable than in the groups presented here.

Table 1 - Farming systems including animal keeping surveyed in Um Sarha and Shawat

Farming system	Village		Camp		Camp	
	Barat	HH	Um Sarha	HH	Shawat	HH
Extensive animal keeping	26	100	39	100	20	49
Of these with:						
- wadi-cultivation	18	69	34	87	7	17
- mechanized rainfed agriculture	1	4				
- irrigated agriculture	7	27	3	8	10	24
- other			2	5	3	7
Mechanized rainfed agriculture with animal keeping					18	44
Animal trade					3	7
Total farming systems	26	100	39	100	41	100

Note: HH = households

Source: The author's own survey

A camp and a village of the Shukriya tribe in Um Sarha and a camp of the Rashaida tribe in Shawat were selected as survey localities for the study on animal keeping systems in the Butana/Sudan. Geographically, these groups, live in regions where, according to Pflaumbaum's surveys (see Pflaumbaum, "Rangeland Carrying Capacity in the Butana", in this volume), natural pasture conditions are relatively favourable since they are situated relatively far to the south. In the two survey groups from Um Sarha, extensive animal keeping and wadi cultivation predominate, while in the Rashaida camp in Shawat extensive animal keeping and mechanized rainfed agriculture predominate (Table 1).

Animal keeping is usually practised not by individual households but by so-called "herding collectives", which should be understood as "extended families" as described by Kuhnen (1989) and Sörbø (1985). Several households (very often closely related) organize jointly their economic activities: they keep their animals in common herds, cultivate their fields in common, buy in common and support each other as far as possible in all concerns of life. These herding collectives have been selected as survey units. Of the total of 106 households surveyed (according to their residence) in 1991/92, 35 such communities were formed. It should however be noted that these organizational units have a very flexible structure and can reorganize themselves according to requirements or dissolve (for example, in times of crisis, households form herding collectives and separate again when conditions have improved).

The objective of the survey was to ascertain the economic parameters of income generation and utilization for characteristic years of production. It should be noted that a production year begins with the rainy season. Although this starts at different points of time every year, the beginning of July was taken as the beginning of the production year for the calculations. The four years of production from 1988/89 to 1991/92 were characterized by very different amounts of rainfall. 1988/89 had abundant rains and — according to the animal keepers interviewed — the conditions of production were very good for animal keeping. In 1989/90, the conditions were relatively normal and were considered to be good to satisfactory. 1990/91, in contrast, was an extremely dry year in which the conditions were most unfavourable for animal keeping. In 1991/92, as well, the amount of rainfall was below average; however, the conditions for animal keeping were far better than in the previous year. These four years of production show the range of variable conditions for production in animal keeping when the amounts of rainfall vary, as is typical in the Sahel. The main question was how animal holders reacted to the different conditions for production within the framework of their animal keeping, and especially what animal keeping could contribute to the income in the different years. To answer this, not only the three survey groups, but also the markets that were important for them were analysed.

Income generation

To be able to understand the income generation of the animal keepers surveyed, it is necessary to know their resource endowment. Resources comprise labour force equipment, rights to land and water, and the available capital, very often in the form of animals but also of human capital (information and knowledge) (Table 2).

The resources are not equally distributed among the various herding collectives. This is particularly evident as far as the number of animals per family worker is concerned (it is possible to compare the herding collectives consisting of a different number of people at the level of family labour). Animal keepers have access to the resources as a result of membership to a tribe of lineage, inheritance, donations, their wives' dowry, wage-earning labour and even thefts. According to their resource endowment, animal keepers try to earn their livelihood under extreme living conditions and, above all, variable conditions of production. Nowadays, the resource endowment suffices, only under relatively good to satisfactory conditions of production, to earn an adequate income on the farm. In times of crisis, as during droughts, however, it is obvious that animals, precisely because they are the most important resource, offer no secure basis of subsistence, as will be shown in the following section.

Table 2 — Average resource endowment of the herding collectives surveyed before and after the extremely dry year 1990/91

Resources	Vil. Banat		C. Um Sarha		C. Shawat		Total	
	90/91	91/92	90/91	91/92	90/91	91/92	90/91	91/92
L Persons	157	157	212	212	208	208	577	577
A HC	10	10	13	13	12	12	35	35
B Persons/HC	15.7	15.7	16.3	16.3	17.3	17.3	16.5	16.5
O FL/HC	6.7	6.7	7.4	7.4	8.2	8.2	7.4	7.4
U % FL for AK	19	35	27	40	15	25	20	30
R FL for AK	1.3	2.3	2.0	2.9	1.2	2.1	1.6	2.4
WL for AK	0.7	0.2	0.7	0.1	0.3	0.3	0.6	0.2
L for AK	2.0	2.5	2.7	3.0	1.5	2.4	2.2	2.5
C Camels	467	419	918	751	562	546	1947	1716
A Cattle	206	139	217	66	-	-	423	205
P Sheep	1260	400	3220	630	1870	590	6350	1620
I Goats	510	190	1140	630	360	240	2010	1060
T Total TLU	788	575	1506	923	785	629	3079	2127
A TLU/Person	5.0	3.7	7.1	4.4	3.8	3.0	5.3	3.7
L TLU/HC	80	58	116	71	65	52	88	61
TLU/worker	40	23	43	24	43	22	40	23
L Tribal area	yes	yes	yes	no	no	no	no	no
A % Wadi-cult.	100	100	100	0	0	0	0	0
N % Hawachas	40	40	8	8	0	0	0	0
D % Gerf-cult.	0	0	0	0	100	100	0	0
% rainf-cult.	10	10	0	0	75	75	0	0
Months water	8	4	8	4	12	12	0	0

Notes: Figures at the beginning of the year; fixed number of persons for the two years; rights to land are permanent even if the fields are not (self-)cultivated every year.

HC = herding collectives; AK = animal keeping; FL = family labour; WL = wage labour; TLU = Tropical Livestock Unit (= 250 kg); camel = 1; cattle = 0.7; sheep/goat = 0.1; FC = field cultivation; Cult. = cultivation

Source: The author's own survey

Income from animal keeping

Income from animal keeping is earned from meat production and used milk. The animal keepers' most important concern within the framework of animal keeping is to expand their livestock since it alone promises a certain security, prosperity and prestige. Although milk is considered by them more or less a by-product, it takes an important place in the daily diet. The value of the milk consumed becomes evident, for example, if, when calculating the marginal income on the side of performance, it is valued at loco farm price (Fig. 1).

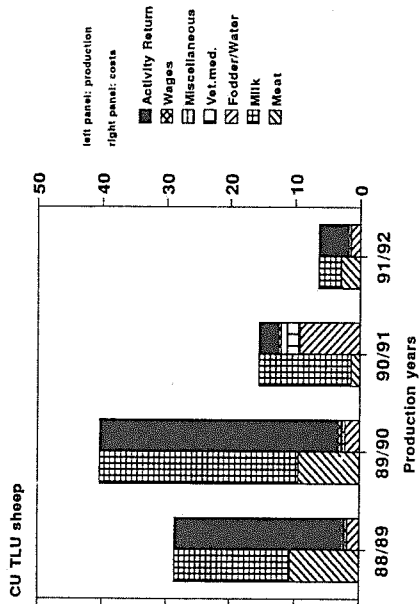


Fig. 1 - Average marginal income from animal keeping from 1988/89 to 1991/92 (CU TLU sheep). Source: The author's own survey.

The price which is acknowledged as loco farm price is the one claimed on the markets which the animal keepers usually visit exclusive of transport costs. In the case of milk, this is an imaginary value since the animal keepers cannot sell the milk they consume at the markets. To be able to record the inflation rate in the rural areas, a calculating unit based on sheep (CU TLU sheep) was used in the calculations. It reflects the development of animal prices on the markets and, moreover, it represents the most important source of cash income for animal keepers. The CU TLU sheep can be converted into monetary terms or other units. Thus in 1988/89, one CU TLU sheep was equivalent to £3,600, in 1989/90 to £56,000, in 1990/91 to £7,060 and in 1991/92 to £8,10,740.

Despite its predominance in the calculations presented here, milk should not be overestimated since it is a by-product of the meat production. Security and wealth are only assured by large herds of animals that represent not only a stock of capital because of their reproduction potential but also allow interest yield. Even if milk is very valuable, it can only be consumed and conserved to a limited extent. In the rural areas where the surveyed animals' keepers keep their animals, milk cannot be sold since there is no market for it. This is why non-consumed milk has no economic significance.

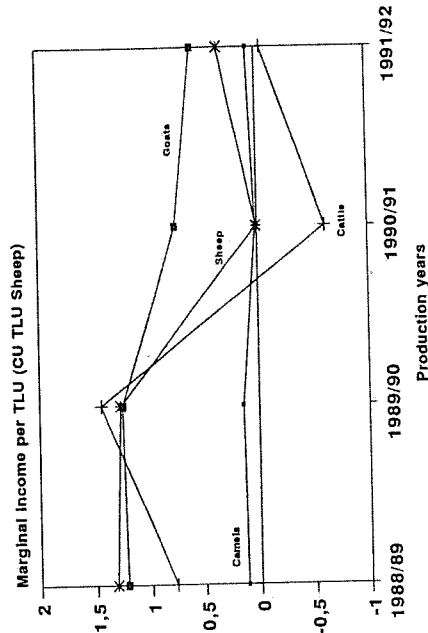


Fig. 2 - Average marginal income per TLU according to animal species from 1988/89 to 1991/92 (in CU TLU Sheep). Source: The author's own survey.

Costs arise in animal keeping. According to the year and the season, medicines, water, crop residues and salaries must be paid. Since natural pastures and one's own water are free of charge, a positive total marginal income is achieved even in extremely dry years. Here, however, there are differences between the individual animal species due to the varying demands on husbandry and production possibilities (Fig. 2).

However, even the positive total marginal income in the extremely dry year and in the following year should not delude us as to the fact that economic difficulties may occur. The marginal income from animal keeping does not suffice, by far, to guarantee the maintenance of the herding collective. To be able to meet all the expenses (that are important for survival), more and more animals must be sold. Thus, for example, in the extremely dry year of 1990/91, the livestock was reduced by one-third on the average, due primarily to sales and not to the death of animals as is often assumed (Table 3).

Animal markets

Markets are of great importance to animal keepers. There, they sell their animals and buy consumer goods. This is why the animal keepers' economy is

Table 3 - Gross income from animal keeping and changes in the livestock from 1988/89 to 1991/92 (CU TLU sheep and percentage of TLU)

	88/89	89/90	90/91	91/92
Gross income	27.1	38.4	5.8	6.2
Changes in livestock	+ 2 %	+ 2 %	- 33 %	- 13 %

Source: The author's own survey

largely orientated towards the market. Usually, animal owners sell their animals on the regional markets which - according to the geographical situation of their camp/village - lie at a distance of 40 to 100 km. Altogether, the survey covered seven market locations which have a more or less great significance for the animal owners concerned (Table 4). (Sobaq, El Helco and the refugee camp Shagarak can, according to Oesterdiekhoff (1991:383), be defined as first level markets since they are of local importance only. Kassala, New Halfa, Gedaref and Showak are of regional importance and therefore count among the second level markets. There are no third level markets of supraregional or international significance in the Butana. For example, Omdurman and Port Sudan belong to those.)

Lorries are the most important transportation means for reaching the markets. Since a lorry is not available in every camp/village, much less to all animal owners, transportation facilities constitute the most serious limitation when selling animals. The few lorries which are available travel very irregularly. The reasons for this are either impracticable tracks after rainfall, wrecked vehicles or the fact that the owner uses them for other purposes.

Table 4 - Animal supply on selected markets at the end of 1991 per market day (in number of animals)

	New Halfa	Gedaref	Showak	El Helco	Kassala
Sheep	100	1000	500	400	500
Goats	60	500	100	100	500
Camels	2	300	1,000	400	100
Cattle	40	300	0	100	100
Donkeys	5	100	0	10	30
Marker days /week	6	6	2	2	7
Main season (Months)	Sept.- Feb.	Oct.- April	Oct.- March	Jan.- April	Jan.- March

Source: The author's own survey

According to the distance, up to 10 % of the value of the transported animals must be paid as transportation costs. Additional transportation costs arise as fare for the person who travels to the market and eventually for purchases he brings back (e.g., a sack of sorghum). Altogether, travelling costs may add up to 40 % of a sheep's value. The sale can take two days generally. The night is spent either at relatives' in the market localities or in the open.

The market structure must be considered as being unfavourable for animal keepers who practise extensive animal keeping since:

- the markets are "demand markets",
- numerous suppliers (polypolists) are confronted with few buyers (oligopson) and
- both sides stand out because of different price elasticities.

When the animal owners go to the markets, they often want to buy foodstuffs. To that end, animals are sold (according to the requirements, a sheep or a goat, and sometimes even a head of cattle or a camel) in order to obtain the necessary cash.

Moreover, since they had to meet relatively high transportation costs, many animal sellers are more or less forced to sell their animals when they go to the market. They are confronted with animal buyers, very often wholesalers and butchers, who are aware of their awkward situation. Since the supply of animals is very often greater than the demand, they have an advantage over animal keepers in trade and can choose from the most favourable offers. This is obvious especially in the different price elasticities of buyers and sellers. The price elasticity of supply is much greater than that of demand.

Usually, animal keepers accept market conditions which are unfavourable for them for the only reason that they do not know anything else and participate only partially in the market with a degree of subsistence of up to 90 % in good and satisfactory production years (Doppler 1991); the degree of subsistence fluctuates between 20 and 100 % according to the year and the season. In order not to be exposed to surprises when they go to the market, animal keepers make inquiries beforehand about the prices they can get. These prices are then considered together with the urgency of selling the animals.

In times of crisis, as during the extremely dry year of 1990/91, the disadvantage of animal keepers on the market is very considerable and even threatening. The unfavourable marketing effects worsen considerably for them. Here, the terms of trade are especially significant: as a result of the sharply decreasing demand and very abundant supply (maintenance difficulties in animal keeping), animals are very cheap; in contrast, basic foodstuffs such as sorghum are very expensive (Fig. 3).

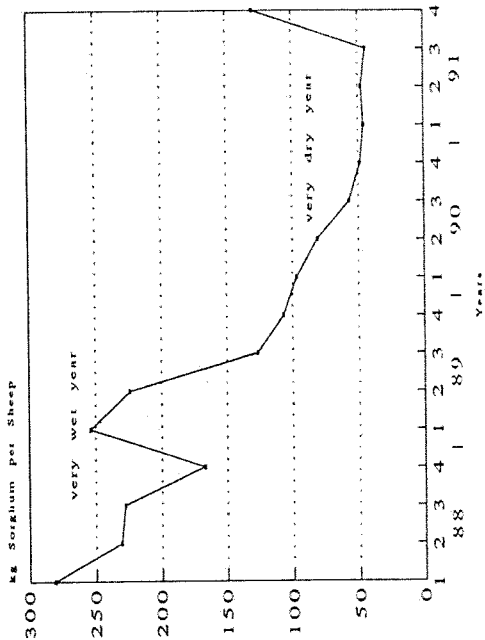


Fig. 3—Price relations of sorghum as compared to sheep from 1988 to 1991 (sorghum at retail prices).
Source: The author's own survey.

Precisely in such years the animal owners' subsistence is at its lowest level (less than 40%). Above all, there is a lack of self-cultivated sorghum and of milk (either there are no lactating animals or they are so far away from the households that they cannot supply any milk). These basic foodstuffs or their substitutes must be bought at the markets. In addition to the low degree of subsistence, the costs of animal keeping increase considerably since the animals, instead of grazing on natural pastures, must be given harvest residues, and water, being scarce, is expensive. Many animals must be sold to meet the costs.

Agriculture

Agriculture is generally practised besides animal keeping. There are various possibilities of practising agriculture. The traditional form is wadi cultivation. Further, there is extensive mechanized rainfed agriculture, which requires a relatively large amount of initial capital for machines and farm inputs, irrigated

agriculture, either in irrigated areas or on river banks, and flood agriculture, also on river banks. The Rashaïda from the Shawat camp mainly practise mechanized rainfed and flood agriculture; the Shukriya from Um Sarha, wadi cultivation and irrigated agriculture on leased plots in the New Halfa irrigated area (Table 5).

In the case of wadi cultivation, small fields (5-10 Feddan) are planted with sorghum for self-supply (cultivation period: June-December). Very often, the yields (50-150 kg/Feddan) of 20 Feddan which are cultivated on the average do not suffice to supply sorghum to the herding collective over the whole year (Bascom 1990b). A larger area cannot be cultivated since land and family labour are lacking even if, nowadays, some of the tillage can be done by machines (seed bed preparation, threshing). For these animal keepers, animal keeping is the predominant farm activity.

Extensive mechanized rainfed agriculture on areas of 1000 Feddan or more is practised by a few rich herding collectives, especially among the Rashaïda. This form of cultivation is largely mechanized or is practised with wage labour. The yields amounting to 100 to 300 kg/Feddan are higher than those of wadi cultivation (Bascom 1990a) but the costs are also higher. However, on the whole, returns to scale can be expected as a result of the extensive cultivation. As farm activity, it very often predominates over animal keeping.

A serious problem in wadi cultivation and in mechanized rainfed agriculture is the dependence on local and seasonal rainfalls (in irrigated cultivation, this does not play a very important role since water from the river is used for irrigation). This is important especially for animal keepers' households in which the cultivated sorghum is used for their own supply. Yield failures in the years of drought can only be compensated by the additional purchase of sorghum or its substitute, wheat, for which animals usually have to be sold. Since the harvest is poor everywhere and there is an additional demand, these

Table 5—Share of herding collectives with agricultural activities according to survey groups from 1988/89 to 1991/92 (multiple statements allowed)

Agricultural activities:	Village Banat			Camp Um Sarha		Camp Shawat	
	80 %	40 %	8 %	92 %	8 %	75 %	67 %
Wadi cultivation (Butana)	80 %	40 %	8 %	92 %	8 %	75 %	67 %
Leased plot (irrigated areas)	40 %	10 %	10 %	8 %	8 %	5 %	5 %
Mech. rainfed agric. (Butana)	10 %						
Flood agriculture (Atbara)							
No agriculture							

Notes: Butana = Central Butana; Irrigated area = New-Halfa Irrigated Area.

Source: The author's own survey.

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basic foodstuffs are just then extremely expensive, above all in relation to animals (terms of trade effect).

Irrigated and flood agriculture is relatively independent of the local and seasonal rainfall. In the irrigated areas, cultivation is done according to the administration's plan (significant in the sequence: cotton, groundnuts, wheat and sorghum); in flood agriculture, there is no stipulation, and cucumbers, melons and pumpkins are grown for the market. On the whole, these forms of agriculture are relatively constant in their yields, even in extremely dry years, and therefore represent a relative secure source of income. In irrigated areas, however, animal keeping is allowed to a limited extent only. This is why many tenants leave their animals with relatives in the Central Butana. The cultivation method does not correspond to the expectations of many animal keepers so that such leased plots or cultivation forms are utilized more intensively only during times of crisis. Many of the poor animal keepers would very readily make use of this secure source of income but do not have any right of access because no plots are available or can be leased in the irrigated areas.

Income utilization

The animal keepers' commodity basket is relatively unbalanced, and there are only insignificant differences between the individual herding collectives. However, according to the year and the season, great variations can be ascertained in the composition of this commodity basket: in good to satisfactory production years – seen in terms of value – a large amount of milk is consumed; in dry years, in contrast, a considerably larger amount of sorghum (and substitutes) and ingredients for sauces as well as meat (Fig. 4).

The various consumer goods, especially foodstuffs, determine the animal owners' degree of subsistence (Fig. 5). Depending on the livestock (TLU/Family L(about)), animal keeping contributes 47 to 82% of the animal owners' supply of consumer goods. In the case of herding collectives which have a relatively large number of animals, the share is much higher than in collectives which have a few animals. Most of the commodities bought additionally are financed by the sale of animals (as long as there are no other sources of income) which also make the largest contribution to subsistence supply. Here, however, great differences may result between the various seasons and years (Table 6).

In extremely dry years, casual work is also taken up to be able to reduce the sale of animals. However, its possibilities of contributing to the maintenance of the herding collective are limited since, in such years, the demand for wage labour is insignificant (because of harvest failures), the competition for available jobs is great, and, as a result, the wages are low. This is why the young

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Fig. 4 – Share of the most important foodstuffs in the animal holders' total consumption from 1988 to 1991 (average value). Source: Classified according to the survey made by Rabmann, Bremm.

Fig. 5 – Average degrees of subsistence from 1988 to 1991, according to survey groups. Source: Drawn up according to the author's and Bremm's surveys.

Table 6 - Share of animal keeping in the total consumption costs from 1988/89 to 1991/92

Share in Consumption:	88/89	89/90	90/91	91/92
Purchased additionally	60 %	40 %	58 %	38 %
Total	77 %	82 %	73 %	47 %

Source: The author's own survey

men in many herding collectives have gone abroad as far as the Arabian Peninsula to look for work (especially in Saudi Arabia). Thus, they try to earn more money than "at home" to support their families or to be able to afford a "better life" for themselves.

With such experiences and expectations, many young men are not greatly interested in following in their father's footsteps and in becoming animal keepers in the Central Butana. They find that this form of life (or of survival) is very arduous and only implies a limitation of the quality of life (according to their standards). Therefore, there is today a large gap between the generations concerning the question of the future economic structures of herding collectives. Without improved prospects for extensive animal keeping and when there are alternative possibilities of earning an income, few sons are prepared to take on animal keeping from their fathers and to remain in the Central Butana.

Possibilities of changed forms of management

Many herding collectives from the camp of the Rasha'ida in Shawat show that there can be a future for extensive animal keeping. They became more and more involved in agriculture at an early stage so that, as a result of this second economic support, they are now able to practise extensive animal keeping - even if it has changed - without having to decimate the livestock too strongly by removing animals for consumption, especially in the extremely dry years. In contrast, since the extremely dry year of 1990/91, the animal keepers from the camp Um Sarha have been experiencing great difficulties, although they have far more livestock than the two other survey groups. However, they practise wadi cultivation on a small scale only. This has little significance as an additional source of income and assures only a share of supply for subsistence by providing sorghum. As animal keepers practising traditional animal keeping and wadi cultivation, they do not see any future prospects for themselves, nor can they imagine a "better life" on that basis. Since it is almost impossible for them to start irrigated agriculture and mechanized rainfed agriculture (high capital requirements, rights of access), these forms of cultivation represent for

them only a restricted way out of economic difficulties: men earn their living as wage-earners in the fields of other proprietors. What applies to the animal holders in Um Sarha also applies to the majority of the 25,000 people living in the Central Butana. For them, there will never be sufficient alternative places of work in that region since there is hardly any other alternative than extensive animal keeping. They must therefore migrate to cities or to irrigated areas where only few places of work are available and competition is very great.

Animal Research and Development

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