

LIVESTOCK RESOURCES

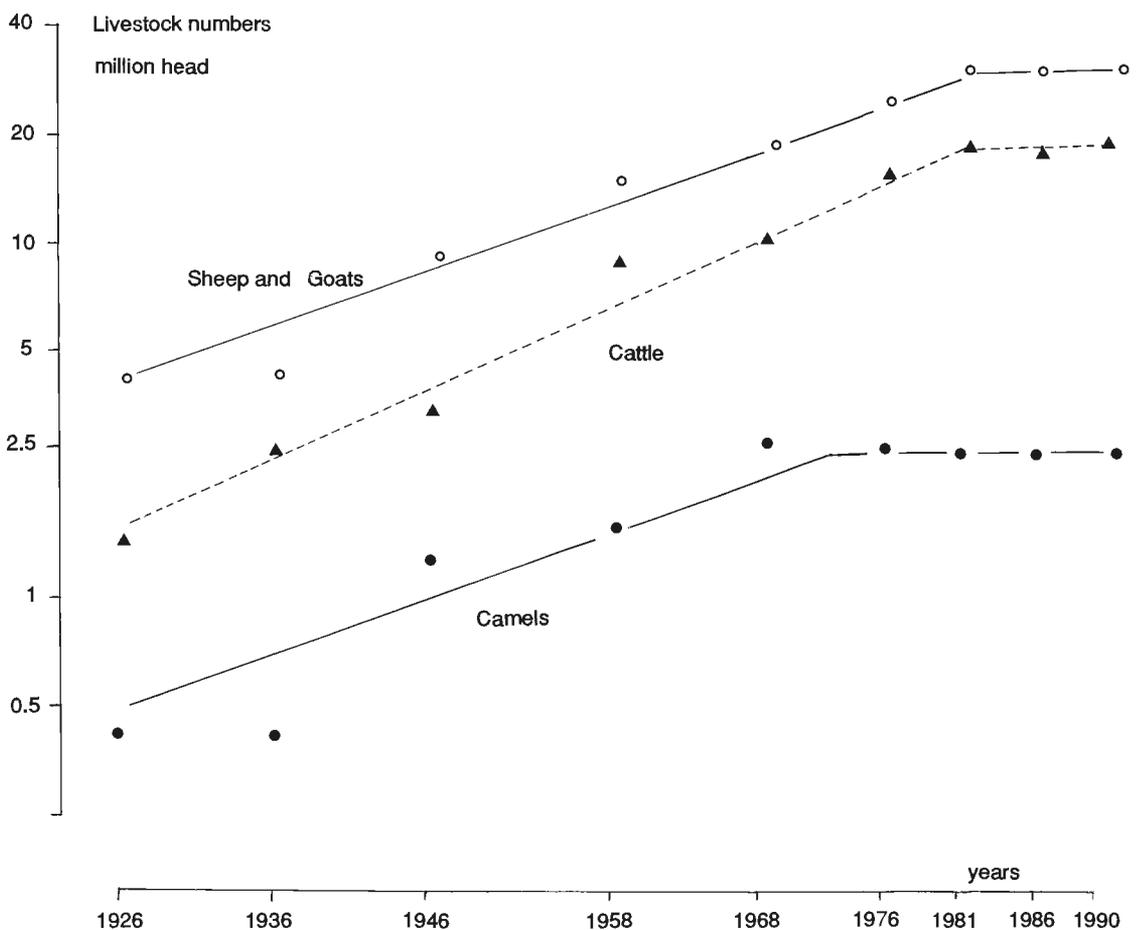
H.I. KHATAB

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Several attempts have been made to carry out "censuses" of livestock in the Sudan. The earliest one dates back to 1926. Such estimates are often complemented by data from other sources including, but not exclusive to, those from vaccination campaigns, livestock taxes and the production of hides and skins. The most intensive efforts were made in 1975-1976 when a series of aerial surveys was undertaken : the apparently precise figures resulting from these, in view of the difficulties of counting nomadic livestock, must be treated with the usual reserve. Complications also arise in any census attempt as a result of the climatic variations characterized by a series of good years that are succeeded by drought. It is generally held, based on several sources, that there was a steady increase in animal numbers over the half century preceding 1980 (**Figure 1**) followed by a much slower rate of growth in the last 10-12 years as a result of the persistent series of dry years and the consequent heavy losses.

What is also evident from **Figure 1** is the uncertainty of the successive estimates for all species. Annual rates of increase for cattle, sheep, goats and camels in 1976 were estimated at 6.1, 2.8, 4.1 and 3.4% but the slopes of the lines in **Figure 1** represent 4.0% for cattle, 3.8% for small ruminants and 3.8% for camels: these figures themselves would have result in the doubling of livestock numbers, depending on the species, each 17-20 years in the period 1926-1980. A further complication is that the figures for the period after 1976 refer only to samples from the north of the country. These are possibly not relevant to the whole, as it is likely that the effects of drought have been less marked in the south than in the north (see also the section on stocking rates).

Fig 1 - Livestock population in the Sudan



As a result, figures that purport to provide total numbers (**Table 1**) may be more useful as an indication of relative distribution, rather than as actual totals. With this in mind it can be seen that the grazing areas between the 12th and 18th parallels carry two-thirds of the small ruminants, almost all the camels and some 40% of the cattle of the country. This distribution is an adequate indication of the ability of the various species to survive and produce in these dry areas. Sheep are always slightly more numerous than goats, especially in proximity to the major towns where they find a ready market. More than 27% of all small ruminants are concentrated in the Central Province while cattle are concentrated in the higher potential areas or in the south of the country.

Livestock owners do not usually specialize in one species: 80% of people owning sheep also own camels and 40% own cattle, while almost all of goats as well. Each domestic animal species is considered to have a particular role in the production strategy and each has advantages and disadvantages.

Table 1 - Numbers ('000) and regional distribution of livestock in the Sudan in 1989

Region	Species			
	Cattle	Sheep	Goat	Camel
Northern Province	39	553	504	191
Eastern Province	873	2 102	1 690	760
Khartoum and Central Provinces	3 884	5 545	3 486	316
Northern Kordofan	1 204	2 864	2 077	976
Northern Darfur	1 165	1 634	1 473	259
Southern Darfur + Southern Kordofan	5 399	2 410	2 238	165
Southern Region	7 140	3 698	2 474	38
Sudan	19 704	18 806	13 942	2 705

Livestock breeds

The majority of livestock breeds in the Sudan are found only within a tribal group. They usually derive from crosses between two or three major types, however, and often bear the name of the tribe. Modern cattle are generally descendants of the zebu which arrived in Africa from India, via the Arabian Peninsula or Egypt, and were crossed with the ancient longhorn stock. Over the centuries these "Sanga" types have been progressively absorbed, at least in Sudan, by further crossing with zebu animals. The last great influx was relatively recent, following the great rinderpest pandemic at the end of the 19th century. In a similar manner, modern sheep and goats are mixtures of early Arab and Nilotic stock.

Cattle

The Northern Sudan Shorthorned Zebu have a long head, narrow face, flat forehead and convex profile. Naturally polled animals occur occasionally. Ears are large and usually pendulous. The hump varies somewhat in size, as it does in shape, but is usually cervico-thoracic in position with only slight variation: it is large and well-muscled in the male, smaller in the female. The dewlap, navel fold and sheath are usually medium to large. The chest is narrow and the ribs not well sprung; the back slopes steeply upward, the rump downward and the tail head is set low. The thighs are poorly muscled and the legs relatively long. The skin is loose and the coat short and of varied coloration.

Sudan cattle are late maturing and age at first calving in traditional herds is usually in excess of four years.

The majority of cattle are owned by nomadic or semi-nomadic Arab tribes and are kept primarily for milk: they are used by some tribes, however, as riding and pack animals. In general Sudanese cattle are well adapted to the prevailing conditions.

Sudanese cattle derive from four sources. The *Baggara* type is the closest to the true zebu. The Kenana and Butana have been crossed to some extent with the Hamitic longhorn, as already mentioned, but now show little evidence of the classic Sanga type. The Um Bororo cattle belong to the so-called Fellata tribes, who are still mainly limited to the west of the country and are of western origin, including Niger, Nigeria and Chad. Some original indigenous cattle are still found in the eastern hill areas and in the south of the country.

Species	Advantages	Disadvantages
Camels	Robust and hardy Large grazing radius of 40-60 km Browsers Can be watered at long intervals especially on "gizu" when can go up to 4 months without free water Resistant to drought (10% losses in 1984) Easy to manage Provides milk Used for all types of transport (including commercial hire) and as a primary source of power High sale value Conveys prestige on its owner	Liable to be stolen, more so recently (Kababish, Kawahla, Hawawir, Meidob, Zeiyadiya, Zaghawa)
Goats	Survive on almost any vegetation Requires little care Provides milk Milk is churned to a special butter for children by the Haedendowa Provides hair Easily saleable for petty cash Provides meat and often slaughtered for prestigious visitors Useful in maintaining family ties when ceded as gifts	Accused of accelerating degradation because it grazes on almost any vegetation Susceptible to disease Vulnerable to drought suffering 25% losses in 1984-1985
Sheep	Less hardy than camel and manageable only under good grazing conditions Grazes over a large radius to 40 km Drinking interval 4 days Short generation cycle Easily marketable and cash sales mean camels do not need to be sold (sheep are the coat of camels, Kababish proverb). Good investment with quick returns in good years	Susceptible to disease Vulnerable to drought with estimated loss in 1984 of 25%
Cattle	Thrives well under semi-arid conditions if good grazing available Best milk breeds are owned by Abbala (Butana and Kenana, of all rural nomadic groups), as compared to the zebu type raised by <i>Baqqara</i> Supplies milk for sedentary part of nomadic family Butter and ghee processed from milk for home consumption or sale Productive and young readily saleable Good internal and external market	Grazes a limited radius of 8-12 km and devastates pasture around settlements and permanent water Needs intensive management

Baggara cattle

An overwhelming proportion of the cattle of Kordofan and Darfur regions are of the western *Baggara type*. They occur in many colours including white, grey, black, brown, fawn, grey and white, and black and white. Different pastoral groups have distinct preferences for particular types of cattle. These preferences are reflected in the composition of their herds which tend to be dominated by a single breed or colour type. The dominant colour of animals owned by the Habbaniya, Ta'aisha and Bani Halba tribes, for example, is white; that of the Rizayqat in eastern-southern darfur is red. Various other coat colours occur, including black, yellow, grey, orange and dun. Broken patterns are also exhibited, often of three and sometimes of four colours on one animal. Flecks, blotches and spots of black or brown on white or grey ground are common, as is the reverse pattern. Darker points on light backgrounds also occur. Hair is short and fine, the skin thin and pigmented. The dewlap is well developed and often extensively pleated. The umbilical fold in females is comparatively small. The sheath in males is triangular in shape.

Horns are ovoid or circular in cross-section, curve upward and outward from the poll, before turning in at the tip. They are heavier on males than on females and in the former often lack the inward curve. In mature females they range in length from 16 to 45 cm with an average of 29 cm. Average length of horn in males is 31 cm. True polled animals are uncommon but loose hanging horns and scurs occur in a number of animals. Ears are long and drooping. Facial profile tends to be straight.

The hump in females is generally small and cervico-thoracic in position. It is larger in males but still small by the standard of many zebus. The back is straight or slopes down from the sacrum, hindquarters development is poor, the rump sloping steeply to the tail, which is long. Average height at withers in mature males is 143 cm and in females 132 cm. Live weight of mature males averages 367 kg in the range of 298 to 493 kg. Females average 286 kg within the range of 200 to 365 kg.

Western *Baggara* cattle are used principally for milk production; males are also used as pack animals and as riding animals for herding. *Baggara* cattle are the main source of meat production, whether for local use or export.

Kenana

The characteristic colour of the Kenana is light blue-grey, with gradations from nearly white to steel-grey, shading to nearly black on head, neck, hump, hindquarters and legs. The points (muzzle, horns, tail tip and hooves) are black. The individual coat hairs are black at the base and white, or occasionally (and usually in the young) red at the tip. The darker colours and darker areas are due to the hairs having a broader black band.

The horns are usually short, 15-20 cm in length, with a maximum of 30-35 cm and measure 5 x 6 cm at the base in females and 6 x 7 cm in males. Loose horns are common. The face is thin with a convex, but occasionally straight, profile. The hump is cervico-thoracic in position, large in the male with a tendency to hang to one side, smaller in the female and castrates. The dewlap is large, as is the sheath in males. The sacrum is higher than the withers. The udder is well-shaped and of good size with large well-placed teats. Mature cows can reach 130 cm and weigh as much as 450 kg. Bulls reach 141 cm and weigh up to 550 kg.

The Kenana is found east of the confluence of the Blue and White Niles at Khartoum and south and east to the Ethiopian border. It is most common in the Blue Nile (Fung), White Nile and Gezira provinces in a triangular area roughly bounded by Sennar, Singa, Roseires and Kosti and lying approximately between latitudes 10° and 13° N and latitudes 32° and 34° E. The total population of Kenana cattle has been estimated at two million head: they are owned mainly by nomadic and semi-nomadic tribes including the Kenana, the Rufa'a el Hoy and the Beni Meharib. Traditionally they are used as dairy, beef and draught animals.

White Nile cattle are said to have the same production characteristics as the Kenana and to trace back to them. Similar characteristics are exhibited by the Kababish, or Dar er Reih, cattle.

Kenana

The region to the east and north of Khartoum is called the Butana. Its northern section is the home of two important tribes, the Batahin and the Shukriya. Butana cattle, considered as one of the best dairy cattle in the country with yields of 1, 900 kg per lactation, form the majority of these tribes' holdings.

The Butana resemble the Kenana in physical characteristics except for the dominant colour, which is red.

Red Bororo (Um Bororo)

These cattle are of the long lyre-horned West African zebu type. Introduced by Bororo (a clan of the Fulani group) immigrants from West Africa in the 19th century, they are commonest in the western provinces but now extend into Kassala province. The majority

of animals are of an even deep cherry-red colour. The skin is loose and supple and the dewlap and sheath or navel fold well developed, allowing a large area for evaporative cooling. They are of relatively large size, females being 130-135 cm at the withers and weighing 250-300 kg and males 140-150 cm and 450 kg or more. They are well adapted to arid conditions which they are able to overcome by their ability to move long distances rapidly in search of feed and water.

Bororo cattle are considered to be intelligent and obedient of their owners but are nervous and flighty in the presence of strangers. A few animals are castrated for pack purposes and bulls are occasionally ridden but, in the Sudan, the breed is considered temperamentally unfit for work. Also in the Sudan it is considered that the Um Bororo produces only small quantities of milk in a short lactation and its beef is of poor quality. In its native areas in Nigeria and Chad it is considered a productive multi-purpose animal, providing milk, meat and power for drawing water, as well as being used in a variety of ceremonial roles.

Minor breeds

Several minor breeds can be identified in different areas of the country. A few have small populations in the current study area.

Gash or Erashi. This type is said to represent 47% of the cattle population of the Eastern Region. They are an early indigenous Beja type kept mainly by the Hadendowa and Beni Amer tribes in the Gash and Tokar Deltas. The colour is white with black extremities. They are considered to be good milk producers.

Karoor. Representing 5% of the cattle population of the Eastern region and originally from Eritrea this type is now found in many Beja herds, particularly in the Gash Delta. It is a shorthorned zebu type which varies in colour but usually shows mixtures of red, white and black. It is not a good milk animal.

Nuba Mountain or Kalib. The original cattle of the Nuba were small, black, humpless animals. Indiscriminate cross-breeding, especially with the *Baggara* type, has produced an intermediate type known as the Nuba Mountain breed. These are small animals with a short head, broad muzzle and short horns that occasionally hang loose. There are many colour varieties. They are said to be somewhat tolerant of trypanosomosis, having inherited the trait from their humpless ancestors. Their main function is ceremonial, as many as 50 head being slaughtered at major wrestling ceremonies.

Sheep

The majority of sheep belong to a general type classed as Sudan Desert. There are, however, many variations and some groups show more or less influence of western and Nilotic blood.

Sudan Desert

The Sudan Desert sheep in its purest state is found from Darfur in the west to Blue Nile in the east. It is a large animal with useful meat and carcass characteristics: in the Sudan it is considered to be a good animal for export purposes. Weights of 65-70 kg can be achieved but 40-50 kg is more normal. Some strains are good milk producers.

There are several tribal types. In Kordofan these are the Kabashi and the Hamari. The Hamari is mainly from the En Nahud area and is tall and thin-tailed with large horns: the colour is red or brown. The Kabashi, commonest around Soderi, Bara and El Mazrub, is white, heavier than the Hamari and is a good milk producer.

The main tribal breeds in the Gezira are the black and white Dubasi, the sandy-red Shugor (or Ashgar in the plural), and the cream and more heavily built Watish. The Gezira types tend to have similar production characteristics although the Shugor produces significantly larger litters than the other two and the Watish has a smaller mature size.

In Blue Nile province the Sudan desert type is known as the Baladi (= local). Sheep in the Eastern Region are of two principal subtypes: the Beja raised by the tribes of the same name in Red Sea Hills and the coastal plain while the Butana is raised by the Shukriya and is a pale sandy colour. The Beja is relatively small in size while the Butana is a very large sheep with a strong flock instinct.

Other types

Nubi or *Garaq*. This is a small sheep and produces little milk. Although mainly confined to the Nuba Mountains it is owned by Arab tribes.

Western Baggara. These sheep are smaller than the Sudan Desert and seem to be intermediate between Sudan Desert and Sudan Desert x Sudan Nilotic. They are of good mutton type, generally shorter in the leg than the Sudan Desert and having a thinner tail. The rib cage is well sprung and they have quite well-developed hindquarters, although there is some tendency for the rump to slope off. Under local management conditions, carcass finish is poor, with little or no fat and a dressed carcass percentage of 33-56% with an average of about 41%. The predominant colour is red, varying in shade from sand to almost black; white occurs fairly frequently and various combinations of red and white are also common. Black and black and white are also present and it is possible that these colours may have been introduced as a result of infusions of Arid Upland or Zhagawa and of Um Bororo blood. The coat consists of coarse hair. Males are mainly horned, these being ribbed, growing out from the head in a regular spiral: they may be as long as 60 cm measured on the curve. Some males are only lightly horned or carry loose scurs. Lighter, slimmer horns are carried by about 5% the females. Ears are long and pendulous in the range 12-18 cm. The neck and legs are long. The mean shoulder height in females is 76 cm.

Um Bororo or **Fulani.** These sheep are fairly numerous in Southern Darfur. Large flocks of migrant sheep from Chad and the Central African Republic swell the numbers in the dry season. They are a large, long-legged type, characteristically with black forequarters and white hindquarters.

Zhaqawa or **Arid Upland.** These black sheep (except for a white tail tip) have rather long hair, are tall and leggy and are owned by the tribe of the same name that inhabits north-west Darfur. They are very similar to the Black Maure sheep of the western Sahel in Mauritania and Mali.

Goats

The three main type of goats in the Sudan can be described as the Nubian, Sudan Desert and Nilotic. Some exotic goats have been imported, including the Swiss (by missionaries in the early 1900s) which is considered to be a good milk producer, and the Anglo-Nubian (with British assistance in the mid 1970s).

Nubian

This is a large, relatively long-legged goat with extremely long and pendulous ears. The hair is also usually long, black in colour except for the ears which are grey. The Nubian is essentially an urban goat, living well by scavenging on human waste. It is commonest in the central areas of the country, particularly along the Nile valleys. Milk yield is often in the region of 2.5-3.0 litres a day, much of which is taken for human use, the kid or kids being deprived of it by the simple expedient of putting a bag on the udder and allowing only limited access.

Sudan Desert

A large long-legged goat, considered to be relatively prolific and a good meat goat, if somewhat lacking as a dairy goat. Its essential characteristic is its ability to survive the harsh climatic and limited nutritional environment of the northern Sudan desert areas.

Baggara

The goats of the *Baggara* tribes of Southern Darfur approximate closely to the Sudan desert type. They are highly prolific and are good producers of meat and milk. Coat colour is variable, ranging from white, through light shades of grey and silver to fawn, brown, red and black. The coat consists of fine short hair but occasionally some animals with long hair are seen. The long hair may be general over the body but more commonly it is confined to the hindquarters and legs. Beards are present in many older females and begin to sprout in males from about four months of age. Manes, either to the shoulder or down the length of the back, occur but are not common. Horns are present in about 95% of all goats, being much larger and flatter in males than in females in which normal growth is upward and backward. Average shoulder height of mature females is 65.5 cm and weight 32.7 kg.

Minor types

The Habashi or Abyssinian goat is found in the Central region and is thought to have been introduced during the First World War by troops from Eritrea: it is a small hairy goat with dark markings on the shoulders and flanks. The Hadalat and Baladi types of the Red Sea and Gash areas are smaller than the Nubian.

Camels

The two major types of the one-humped camel are the riding and baggage or pack types. There has been much interest in the riding type in recent years and some attempts to select for speed have been made as a market has developed for racing camels for export at very high prices to the Arabian Peninsula and Gulf area.

Pack camels

The main distinction is between the so-called Arab and the Rashaidi. The former, a native of Northern Kordofan and Darfur, is bred by the Kababish, Hamar, Kawahla, Zhagawa, Meidob, Shenabla and Zeyadiya: it is a large, heavily-built animal, grey to red in colour, weighing 400-500 kg when mature and capable of carrying almost 300 kg for up to 30 km in a day.

The typical Rashaidi is the rufous coloured animal bred by the tribe from which it takes its name. They are large and are renowned as meat animals as well as producing fair quantities of milk. They are less hardy than the majority of pack animals and do not thrive on less than good grazing. They are less numerous than the Arab type and are bred, in addition to the Rashaidi themselves, by the Shukriya, Lahawin and Batahin.

Riding camels

The most famous types are bred east of the Nile.

The Anafi is bred by the Rashaidi and has been selected for speed rather than for stamina but over distances of up to 40 km they are unequalled as personal transport animals. It is a leggy animal and light in build. The colour is white to pale cream.

The Bishari camel of the Beja tribes of the Red Sea area, which also extends to Eritrea, is the other major riding type. It is also reputed to be a good milk animal. Many sub-types are recognized by the tribes that own them but they differ little the one from the other.

Equines

The 1975-1976 aerial survey estimated almost 100,000 horse in the Sudan, most in Southern Darfur and Southern Kordofan and 789,000 donkeys.

Horses

Two major types of native horse are usually recognized. The Baladi is the western Sudan type and is owned mainly by the *Baggara* tribes: it is rather small with a withers height of about 12-13 hands (120 cm). The Baladi has been the subject of long years of attempted improvement, firstly for military purposes and more recently for racing: English and French thoroughbreds were first imported and then bloodstock from Kenya. The resulting Sudan Countrybred is not widespread and limited to a small coterie of wealthy traders and civil servants.

The Dongolawi takes its name from the town of the same name in Northern Province. It is believed to have been introduced from Egypt in the late 18th century. It is bigger than the Baladi, has a pronounced Roman nose, and is reputed to be a fast runner.

Donkeys

The commonest donkey, sometimes known as the Makadi or Darawi type, is the small grey pack animal which is the ubiquitous beast of burden in northern Sudan rural areas. This grossly mistreated beast, rarely reaching 105 cm at the withers and almost never weighing 120 kg is expected to carry as much as or more than its own weight in miscellaneous goods for 20 or 30 km to market and then carry its owner on the way back, day in and day out, on the little nutrition it can glean when it is not staggering along under these mundane burdens.

A totally different type is the much more statuesque, usually white, Syrian or Rifawi donkey, growing to 120 cm at the withers and weighing up to 160 kg or more. This is essentially an urban animal and a personnel carrier, the person in question usually being a merchant of no little consequence. Its habitual gait is a tripping trot which carries it along at 6-8 km/hr but its contribution to the national economy is in no way comparable to that of its supposedly humbler, much smaller and often disdainfully disregarded grey brother.

Crosses between the two principal donkey types are dubbed the Sudanese Riding Donkey whose attributes are nearer to those of the Rifawi than the common grey. The *Equus asinus* x *Equus caballus* hybrid, commonly known as the mule, was once fairly common in the Sudan, especially as a military transport animal but is now very seldom seen.

Livestock productivity

Sudanese livestock are well adapted to the harsh environment in which they are expected to survive, produce and multiply. They travel long distances in search of their daily feed, survive on a watering regime which allows them access to liquid only at irregular intervals of several days, are resistant to many diseases, and adjust their reproductive rate to the prevailing but usually unfavourable environmental conditions.

Under favourable conditions, however, priority is given to the multiplication of the species and conception and birth rates increase to take advantage of the improved feed availability. Weight losses are recovered by the phenomenon of compensatory gain as soon as rain produces grass. For long, the accepted wisdom has been that traditional owners are backward and ignorant, but in reality they have adopted sophisticated management techniques that are well-suited to the prevailing conditions. This does not mean that they get what might be considered high productivity from their animals. Indeed they may not be attempting to do this, as survival is a delicate balance between the science of the totally improbable and the art of the equally unlikely possible. Some results obtained under experimental conditions hint at the real potential of Sudan's indigenous livestock but there is much to do before these capabilities become economically and ecologically feasible.

Herd structures

The sex and age composition of a herd or flock, far from being something which happens by chance, is a tightly controlled factor that provides a good indication of the production objectives of the owners and the capabilities of the animals.

There are few detailed and really quantitative studies of cattle herd structure in the Sudan, especially for the more nomadic tribes. Those that have been done, however, always show a high proportion of females, in line with the principal production objective which is milk for home consumption and for conversion to ghee. Cows of breeding age are usually

equivalent to about 35-40% of the herd (**Table 2**) and younger females and calves form about the same percentage. Mature males comprise about 6-8%, even in those groups for which they are used as transport and pack animals. Breeding and pack males are selected early in life and the others sold at ages of about two years: in some tribes, when environmental circumstances prove extremely difficult, males are sold at even younger ages.

There are few differences in herd structure related to breed type but there are clear differences due to the environment. In Southern Darfur the female proportion of the herd is about 70% but in the drier northern parts of the Butana this proportion can be higher than 90%. An intermediate situation is found in irrigated areas. In herds in very dry areas, males are sold very young, while growing females are relatively numerous, in part due to good fertility rates and in part to low early mortality.

Table 2 - Cattle herd structures (%)

Breed type or area and sex												
Age (years)	Baqqara		Butana		Kenana		Southern Darfur		Gezira and Managil		Eastern Region	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<2	15.5	20.8	5.8	22.1	15.5	21.3	17.1	20.8	14.0	16.9	3.9	31.6
2-4	6.2	14.8	5.8	15.6	5.3	15.2	10.2	16.8	3.3	17.2	2.5	20.2
4 - 8a)	5.7	26.0	7.6	28.1	8.0	24.3	3.8	31.3	1.6	47.0	1.7	40.1
	-	11.0	-	6.8	-	10.4	-	-	-	-	-	-
Overall	27.4	72.6	19.2	72.6	28.8	71.2	31.1	68.9	18.9	81.1	8.1	91.9

Note: a) Over 4 years in regions

Sources: Wilson and Clarke 1975, AOAD 1983, Oxfam 1989

In small ruminant flocks (**Table 3**) there are always more than 75% of females, with regional differences showing the same trend as for cattle. Adult males often comprise only 2% of the flock in goats and 3-4% in sheep. The example of flock structures for both sheep and goats from the Gezira, which show very few females in the age class 7-15 months, is somewhat anomalous and can be considered to be due to the effects of drought just before the survey was made.

The proportion of males is higher in most camel herds than for the ruminant species. This is mainly because of the transport function but also because camels for meat are often sold to Egypt, where the market and the long trek across the desert involve in getting animals to that market, require that animals be larger and stronger. Breeding females in camel herds are rarely more than 33% of the total.

There is a clear dichotomy of structure in donkey herds. In rural areas, where herds serve for both transport and as a breeding reserve the structure may be of approximately equal proportions of male and female or slightly in favour of the latter. In urban areas the work demand is such that males are best suited to the system and they often account for 80% or more of the total numbers in these areas.

Table 3 - Regional small ruminant flock structures (%)

Species and age (months)	Region and sex					
	Darfur		Gezira and Managil		Eastern region	
	Male	Female	Male	Female	Male	Female
Sheep						
<7	8.8	13.4	14.4	20.7	6.1	17.3
7-19	9.2	15.3	1.9	7.6	5.6	31.8
>19	4.2	49.1	1.7	53.7	3.5	35.7
Overall	22.2	77.8	18.0	82.0	15.2	84.8
Goat						
<7	14.8	18.5	10.8	20.2	5.2	18.4
&-15	7.2	16.0	1.9	9.2	3.8	37.4
>15	1.6	41.8	1.0	56.9	1.7	33.0
Overall	23.6	76.3	13.7	86.3	10.7	88.8

Productivity

Cattle reproduction in years of average rainfall and feed availability hardly differs from one area to another (**Table 4**). Kenana and Butana females appear to be slightly younger at first calving, at 3.5-4.0 years, than do the *Baggara* animals, in which first calving may be delayed to 5.0 years. Subsequent intervals between calvings may also be slightly shorter in Butana than in the other breeds. Total lifetime production of young is therefore less in *Baggara* cattle than in the other major groups, at least in the traditional systems. On research stations no real differences in reproductive performance of the three major types have been noted.

Table 4 - Reproductive performance of cattle in traditional and modern systems

Parameter	Breeds in traditional system			Research stations
	Baqqara	Butana	Kenana	
Female fertility rate (%)	50-60	55-60	55-60	85
Age at first calving (months)	59	47	43	38
Productive life (years)	7-8	7-8	7-8	9
(number of calves)	4-5	4-6	4-6	7
Calving interval	20	18	20	15.4

Both reproductive performance and mortality rates are subject to climatic variations. According to the normal statistical sources (Ministry of Animal Resources, 1989), the period 1983-1985 was one in which low reproductive and high mortality rates prevailed (**Table 5**). It seems that calving rates were some 20% less than in "normal" years and mortality rates much higher, with losses of 40% adults and 50% young being recorded. Climatic conditions continued to be unfavourable up to 1988 and the forced sale of animals had further consequences on herd structure and productivity. Deaths in young are often in excess of 10% in the first year, however. Adult mortality is usually lower and often about the same as the off-take rate.

Baggara cattle tend to be smaller than the Kenana and the Butana as well as having slower relative growth rates (**Table 6**). Weight gains in all breeds are less than optimal, however, and often negative in the dry season: even during the favourable period much of the energy is used in compensatory gain and in the long treks to good grazing areas and to find water. The Butana are considered to be the best milking animals while *the Baggara*, once again, have lower performance with shorter lactation periods and a smaller daily output. In general the productivity of Sudanese cattle is low, as in many other African countries, and for much the same reasons. These reasons are the harsh natural environment, limited feed resources which are often of very poor quality in the dry season, and inadequate health care and services.

LIVESTOCK RESOURCES (CONTINUED)

Table 5 - Cattle herd dynamics in the period 1981-1982-1988-1989

Year	Parameter (%)			
	Fertility rate	Calf mortality	Off take rate	Herd mortality
1981/1982	62	10.3	7.1	7.0
1982/1983	60	11.0	8.1	8.1
1983/1984	54	11.6	9.0	9.0
1984/1985	49	14.5	10.0	10.5
1985/1986	52	11.5	6.0	9.1
1986/1987	56	10.7	7.5	8.9
1987/1988	Note data missing for this year			
1988/1989	61	10.5	7.8	8.6

Table 6 - Cattle weight gains and milk production in the major systems

Parameter	Traditional sector and breed			
	Baggara	Butana	Kenana	Research stations
Weight at birth (kg)	18	24	23	24
Weight at 1 yr (kg)	103	180	160	n.a.
Male age at sale (yr)	5	4	4	2
Weight at sale (kg)	330	380	360	450
Daily gain (g)	170	244	230	580
Lactation period (d)	230	280	230	300
Lactation yield (kg)	350	1400	1100	1550

Source: FAO 1986

Small ruminants are comparatively better at transforming the natural resources to economic products. Fertility rates, with non-seasonal breeding are usually in excess of 100% and twin births in sheep overall may be 4-6% of all parturitions, while in goats they are 8-12%: multiple births in Southern Darfur may be more than double these generalized Sudan data. There is very early offtake of males in both goats and sheep (Table 7), animals often being slaughtered or sold at under 12 months and very few males older than two years remain in the flocks. Mortality rates in young animals may be as high as 20% but offtake rates (as home consumption, for social reasons and as sales) are often as high as or in excess of 30%.

Table 7 - Basic productivity parameters of small ruminants

Parameter	Sheep				Goats
	Traditional	Improved	Gezira	Red Sea	Traditional
Fertility (%)	77	90	87	64	75
Age at first birth (months)	19	12	18	19	16
Productive life (years)	5-6	6			5-6
(parturitions)	4	8	5	4	8
Weight at birth (kg)	2.7	3.5	3.0	2.6	2.5
Male age at sale (months)	24	18	20	24	18
Weight at sale (kg)	35	45	40	32	23
Weight gain (g/d)	45	77	50	40	40
Lactation length (days)	210	200	200	180	210
Lactation yield (kg)	140	250	-	-	155
Mortality, young (%)	13.9	-	-	-	14.0
herd (%)	10.5	-	-	-	10.6
Off take (%)	24-28	-	-	-	26-28

Offtake from camel herds, as might be expected with reproductive rates of less than 50% and retention of males to advanced ages, is low. Female camels are, however, relatively good milk animals, not the least advantageous aspect of which is a very long lactation period. Low annual rates of reproduction are also compensated by a long life, often approaching 20 years and during which birth will be given to 6-7 young (Table 8).

More accurate data on the camel farming systems and their productivity were obtained from a survey conducted in 1987 on 836 Butana's herds (Table 9)

Table 8 - Herd and productivity parameters of camels

Parameter		Parameter	
Males in herd < 4 yr (%)	13-23	Fertility (%)	40-55
> 4 yr (%)	5-17	Age at first birth (years)	5-6
Females in herd < 4 yr (%)	32-42	Productive life (years)	12-14
> 4 yr (%)	30-42	Birth interval (months)	24-30
Weight at birth (kg)	35	Lactation length (days)	450-500
Adult male weight (kg)	475	Lactation yield (kg)	1200-1800
Weight gain (g/d)	150-200	Mortality, young (%)	11.9
Off take (%)	6-7	herd (%)	9.0

Table 9 - Reproduction and production performance of Butana camel herds (from 1987's enquiry) (Saint-Martin et al., 1990 - Maillard, 1982)

Age class (year)	3-4	4-5	5-6	6-7	7-8	8-9	>9
Annual calving rate (p.100)	1	12	28	42	36	38	34

(n = 2 083 breeding females)

Average age at first parturition : 6 years 6 months (n = 8 847 females)

Average interval between births : 2 years 4 months (n = 2 307)

Age class (years)	0-1	1-2	2-3	3-4	4-5	>5
Mortality rate (p.100)	12.2	4.1	3.0	2.3	2.5	4.0
. males	13.4	4.3	3.4	3.1	3.3	4.9
. females	10.9	4.0	2.5	1.5	1.8	3.3
Offtake rate (p.100)	0.4	0.8	2.6	4.7	7.4	15.4
. males	0.7	1.2	4.0	7.4	13.2	29.2
. females	0.2	0.4	1.5	2.1	2.3	3.1

Wildlife

Although much reduced in numbers, wild animals still comprise an important resource in the Sudan. This is for both good, as a potential source of tourist and hunting revenue and a traditional source of protein, and for evil, where they compete with man as crop robbers and with his animals for feed resources. The potential economic and aesthetic value of wildlife is only now being recognized and encouraged.

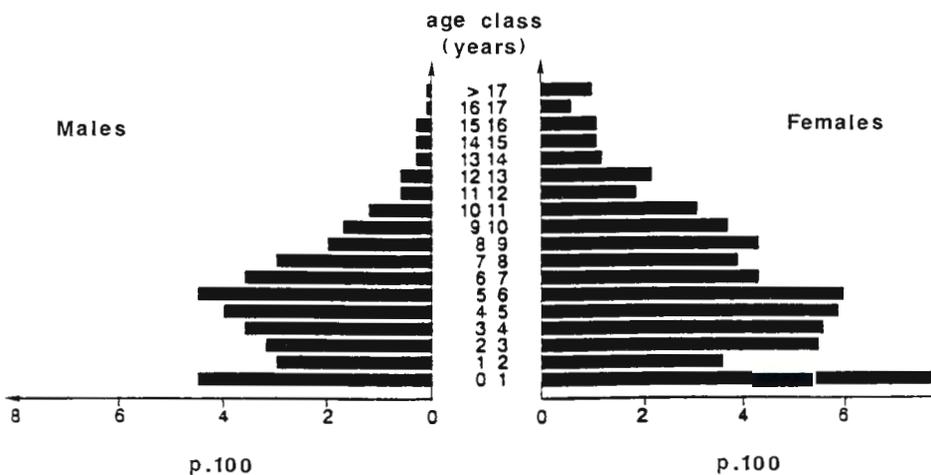
The wide range of habitat types in the Sudan is reflected in the wild fauna. Between 60 and 70 species of larger mammals have been recorded and more than 100 smaller mammals in the orders *Lagomorpha*, *Chiroptera*, *Insectivora*, *Rodentia*, *Carnivora*, *Hyracoidea* and *Primata* (Wilson 1981, 1982). There are more than 900 bird species. Reptiles, fishes and insects add to the rich variety. As for domestic livestock the best estimates of distribution and numbers are from the aerial surveys of the mid-1970s although there are some general indications of the areas where the major species of mammals are found (Table 10). There have, however, been rapid changes in the status of wildlife over the last 15-20 years due to inadvertent reduction and modification of habitat by the expansion of agriculture but also due to inadequate control of hunting and poaching. Several species once relatively common in Northern Sudan have been absent for very many years. Others found only in the north, such as addax, oryx, addra, Soemmerings gazelle, Nubian ibex, Barbary sheep, lion, leopard and cheetah are now either extinct or extremely rare.

Table 10 - Status and distribution of some larger wild animals in arid and semi-arid Sudan

Scientific name	Common name	Distribution
Endangered species		
<i>Acinonyx jubatus</i>	Cheetah	Darfur, Blue Nile
<i>Addax nasomaculatus</i>	Addax	Northern Darfur
<i>Ammotragus lervia</i>	Barbary sheep	Northern Darfur
<i>Capra ibex</i>	Nubian ibex	Red Sea Hills
<i>Fennecus zerda</i>	Fennec fox	Desert and very arid zone
<i>Gazella dama</i>	Addra, Dama gazelle	Northern Darfur and Kordofan
<i>G. soemmeringi</i>	Soemmering's gazelle	Kassala, Butana
<i>G. leptoceros</i>	Rhim gazelle	Northern Darfur and Kordofan, Kassala
<i>Loxodonta africana</i>	Elephant	Southern Darfur, Blue Nile
<i>Oreotragus oreotragus</i>	Klipspringer	Red sea Hills
<i>Oryx dammah</i>	Scimitar-horned oryx	Northern Darfur
<i>Madoqua saltiana</i>	Dik-dik	Southern Darfur, Blue Nile
<i>Panthera pardus</i>	Leopard	Widespread
<i>Redunca fulvorufula</i>	Mountain reedbuck	Red Sea Hills
<i>Struthio camelus</i>	Ostrich	Widespread
<i>Tragelaphus imberbis</i>	Lesser kudu	Southern Darfur
<i>T. strepsiceros</i>	Greater kudu	Jebel Marra, Blue Nile
<i>Vulpes spp.</i> , "	"fox"	Kassala, Southern Kordofan and Darfur

Others		
<i>Alcelaphus buselaphus</i>	Lelwel hartebeest	Southern Darfur
<i>Canis spp.</i>	Jackal	Kassala, Blue Nile, Darfur
<i>Cercopithecus aethiops</i>	Vervet monkey	Widespread
<i>Colobus guereza</i>	Colubus	Southern Darfur
<i>Crocodylus niloticus</i>	Crocodile	Nile and tributaries
<i>Crocuta crocuta</i>	Spotted hyaena	Widespread
<i>Damaliscus tiang</i>	Korrigum, Tiang	Blue Nile, Southern Darfur
<i>Equus burchelli</i>	Zebra	Blue Nile
<i>Erythrocebus patas</i>	Red hussar, Patas	Widespread
<i>Felis spp.</i>	"cats", serval	Widespread
<i>Gazella granti</i>	Grant's gazelle	South Kordofan
<i>G. dorcas</i>	Dorcas gazelle	Northern Darfur and Kordofan Kassala
<i>G. rufrifrons</i>	Red-fronted gazelle	Widespread
<i>G. thomsoni</i>	Thomson's gazelle	Blue Nile
<i>Giraffa camelopardalis</i>	Giraffe	Southern Darfur and Kordofan
<i>Hyaena hyaena</i>	Striped hyaena	Blue Nile
<i>Hystrix cristatus</i>	Porcupine	Widespread
<i>Hippotragus equinus</i>	Roan antelope	Southern Darfur and Kordofan
<i>Kobus defassa</i>	Defassa waterbuck	Blue Nile, Southern Darfur
<i>Lycaon pictus</i>	African hunting dog	Southern Darfur and Kordofan
<i>Manis temmincki</i>	Pangolin	Southern Darfur
<i>Mellivora capensis</i>	Ratel, honey badger	Widespread
<i>Orycteropus afer</i>	Aardvaark	Southern Darfur
<i>Panthera leo</i>	Lion	Widespread
<i>Papio anubis</i>	Baboon	Southern Darfur and Kordofan
<i>Phacochoerus aethiopicus</i>	Warthog	Widespread
<i>Taurotragus derbianus</i>	Giant eland	Southern Darfur
<i>Tragelaphus scriptus</i>	Bushbuck	Southern Darfur and Kordofan
<i>Silvicapra grimmia</i>	Grimm's duiker	Blue Nile
<i>Syncerus caffer</i>	Buffalo	Widespread
<i>Viverra civetta</i>	Civet	Widespread

Camel population distribution (Butana)



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