For hundreds of years, the nomadic herds of the Sudan made use of a minute proportion of the available feed resources. The majority of grazers were able to forage and provide a diet for themselves in subsequent years. In the south of the area, the herders produced large quantities of droppings, which nourished the vegetation. Grazing pressure eventually became so heavy that it reduced the availability of feed resources, and the livestock owners resorted to burning the vegetation to reduce the problem. Fires were often not controlled, leading to the destruction of crops and causing conflict between livestock owners and crop farmers. The bare soil left by the fires was also susceptible to erosion, especially if the early rains were very heavy.

To the north, fires were less frequent, mainly because the growth was (other than in exceptional years) inadequate to provide sufficient fuel for a good fire. Instead, the herders allowed the graziers to use the scarce feed resources. During migration, the major herds were preceded by scouts who sought out the best grazing and watering areas. Movements were more frequent where grazing or water was scarce.

Stocking rates

The basis of an assessment of rangeland use is the number of animals that can be carried or are present per unit area in each ecological zone. A standard livestock unit (TLU or Tropical Livestock Unit) is generally assumed in order to calculate stocking rates, this being equivalent to an “average” cow of 1.0 TLU, a sheep or a goat being put at 0.1, and a camel at 1.2. This method has the merit of allowing stocking rates and carrying capacities to be expressed as a single figure but the unitary values assigned to the different species are not very realistic.

Unfortunately, there is little real information on the distribution of livestock and the various “estimates” show enormous differences, depending on the source and the method used. Recent attempts to calculate animal populations as we have done above and to then compare these with the official data, will provide figures of 75% of cattle and 80-85% of sheep and goats; during the drought of the mid-1980s the official data have likely been underestimates; by contrast, the aerial census estimates are still below the official figures. Further estimates are needed to this effect.

Two examples will suffice to illustrate the nature of the problem. The first relates to a 1986 aerial census of the Gezira and the surrounding areas (Resource Inventory and Management 1987). A total of 50,570 km² was included in the census, being virtually the whole of Gezira Province plus small areas of adjacent ones (Figure 1). Censuses were repeated at 2-month intervals and the numbers of animals counted were adjusted upwards by 25% for cattle and 120% for goats to take account of the numbers under various type of cover at the time of the census. The results, even then, provide lower estimates. For example, cattle estimates were less than half the official figures and camels only one-eighth of them; irrigated areas, where densities are in any case much higher but more animals are in the open, the aerial census estimates were still well below the official figures.
Figure 1 - The zone covered by the aerial livestock survey in 1986

Table 1 - Livestock numbers and grazing pressure in Gezira Province

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goat</th>
<th>Camel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official figures ('000)</td>
<td>647</td>
<td>945</td>
<td>544</td>
<td>97</td>
</tr>
<tr>
<td>Dens it y (N°/km²)</td>
<td>25</td>
<td>55</td>
<td>55</td>
<td>8.5</td>
</tr>
<tr>
<td>February density (N°/km²)</td>
<td>9.6</td>
<td>15.8</td>
<td>25.1</td>
<td>0.7</td>
</tr>
<tr>
<td>April density (N°/km²)</td>
<td>11.9</td>
<td>40.9</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Irrigated areas (12,500 km²)</td>
<td>20.4</td>
<td>75.9</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

A second example is provided by a survey carried out by OXFAM in Red Sea Province in March and September 1989. The figures for the period at the end of the rains in March, compared to those for September, are higher for sheep and goats (13-19% being in sedentary holdings), similar for cattle (both ords that fall short of the peak season but very much lower for camels. Compared to the official figures the OXFAM estimates are much less, 50% for cattle and camels and 80-90% for small ruminants (Table 2).

Table 2 - Livestock numbers and grazing pressure in Red Sea Province

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goat</th>
<th>Camel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official figures ('000)</td>
<td>47</td>
<td>260</td>
<td>549</td>
<td>110</td>
</tr>
<tr>
<td>OXFAM count ('000)</td>
<td>21-22</td>
<td>143-212</td>
<td>332-482</td>
<td>40-58</td>
</tr>
<tr>
<td>Average density (N°/km²)</td>
<td>0.47</td>
<td>0.80</td>
<td>0.88</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Official figures are now derived from the base established in 1976 (Watts et al.; Resources Management and Research 1976) and have been increased annually on assumed reproduction and mortality rates, except during the two worst drought years. Others sources assume even greater and totally unrealistic animal densities.

The next example is given in Table 3. Official figures are usually given for administrative regions or provinces, of which some are only partially or even non-existent represented in the present survey area. In this last case the numbers have been recalculated on the basis of the proportional area. The stocking rates are provided for 1976 (the base year) and for 1986 (the latest year for which official figures are available). The very large and
RANGLAND UTILIZATION AND DEGRADATION

Scale: 1 / 5,000,000

Degraded areas
Endangered areas
Slightly overgrazed rangelands
Intact rangelands

Intact rangelands
Apparently inexplicable differences are obvious, as for example a general increase of 20-30% but an increase of 50% for the Gezira and 115% for Northern Darfur. Both these last areas are totally included in the mapped area and proportional calculation errors can thus be excluded. In spite of statements that regular quotas are applied across the board this is obviously not the case.

A second method of calculating the pressure on the feed resources is one that takes account of the amount available (see section on Primary Production). Domestic herbivores are assumed to eat, by weight equivalent to 2.5% of their live weight every day, or just 6 kg per TLU. The entre of primary production is not however, available to animals, in part because some of it is little or not at all because some is inaccessible. In addition, total consumption of plant material would lead to the death of perennial grasses and loss of the seed bank in annuals. Most recommendations of beast use are that actual consumption should be one-third to one-half of the feed on offer: this then allows, at the same time, the plants to survive and regenerate and the animals to select the best of what is available.

Table 3 - Livestock numbers and grazing pressures in the Sudan

<table>
<thead>
<tr>
<th>Province</th>
<th>Official livestock number ('000)</th>
<th>Census ('000)</th>
<th>Mapped area TLU ('000)</th>
<th>RIM 1986</th>
<th>RMR 1976</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Sea</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>13</td>
<td>6.65</td>
</tr>
<tr>
<td>Nile</td>
<td>98</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>Kaduna</td>
<td>50</td>
<td>23.4</td>
<td>13.4</td>
<td>100</td>
<td>1.03</td>
</tr>
<tr>
<td>Equatoria/Kordofan</td>
<td>700</td>
<td>325</td>
<td>286</td>
<td>100</td>
<td>2.86</td>
</tr>
<tr>
<td>Northern Kordofan</td>
<td>1,115</td>
<td>389</td>
<td>722</td>
<td>100</td>
<td>2.47</td>
</tr>
<tr>
<td>Southern Kordofan</td>
<td>870</td>
<td>275</td>
<td>382</td>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>Sennar</td>
<td>150</td>
<td>45</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Blue Nile</td>
<td>635</td>
<td>113</td>
<td>545</td>
<td>100</td>
<td>2.86</td>
</tr>
<tr>
<td>White Nile</td>
<td>2,008</td>
<td>50</td>
<td>200</td>
<td>100</td>
<td>2.47</td>
</tr>
<tr>
<td>Southern Darfur</td>
<td>3,696</td>
<td>1,833</td>
<td>1,833</td>
<td>100</td>
<td>2.47</td>
</tr>
<tr>
<td>Northern Darfur</td>
<td>1,786</td>
<td>1,000</td>
<td>1,000</td>
<td>100</td>
<td>1.03</td>
</tr>
<tr>
<td>Southern Kordofan</td>
<td>997</td>
<td>313</td>
<td>313</td>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>Central Region</td>
<td>652</td>
<td>221</td>
<td>221</td>
<td>100</td>
<td>1.65</td>
</tr>
<tr>
<td>Southern Kordofan</td>
<td>283</td>
<td>88</td>
<td>88</td>
<td>100</td>
<td>1.65</td>
</tr>
</tbody>
</table>

On the basis of a feed availability of 10 to 12 kg per TLU per day it is possible to arrive at an hypothetic carrying capacity for the area studied, and compare this to current stocking rates (Table 4). The figures for carrying capacity for the Northern and Eastern regions are obviously national as almost all the animals are concentrated on the Nile in the first area and are very unevenly distributed in the second case, matching to Red Sea Province. The figures here generally remain for the other areas and show that stocking rates are not too high in Gezira, somewhat high in White Nile and excessively high in the Central Region. In this last area, animals do not adapt to the range alone and receive some form of supplementation. It might also be indicated (Table 4) that actual figures for livestock are probably about 30% higher than in officially recorded.
Table 4 - Actual and potential range stocking rates (TLU/km²) in major regions of the Sudan

<table>
<thead>
<tr>
<th>Region</th>
<th>Official figures</th>
<th>Aerial census</th>
<th>Calculated carrying capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>1.89</td>
<td>1.50</td>
<td>1.1-1.3</td>
</tr>
<tr>
<td>Eastern</td>
<td>13.33</td>
<td>7.42</td>
<td>9.0-11.5</td>
</tr>
<tr>
<td>Central and Khartoum</td>
<td>35.70</td>
<td>27.02</td>
<td>11.6-14.8</td>
</tr>
<tr>
<td>Kordofan</td>
<td>13.47</td>
<td>10.22</td>
<td>8.7-11.0</td>
</tr>
<tr>
<td>Darfur</td>
<td>12.88</td>
<td>7.60</td>
<td>9.5-12.1</td>
</tr>
</tbody>
</table>

Source: ??

The feed situation

The use of feed resources is related to the type of animals which feed on them and to their movements. Livestock distribution patterns show that camels and small ruminants use the dominant species in the north, while cattle are concentrated in the south. The division is not, however, totally rigid, and many areas are used alternately by cattle and camels, each of which is able to occupy a particular niche at different times of the year. In addition, some areas in a particular zone may be reserved for one species, for example cattle in those areas with a good field layer, or have access to water, while the more difficult areas are grazed by the other species.

The mobility of the herds, that is to say, the transhumant and nomadic practices, helps greatly in overcoming the loss in feed value of the natural resources during the dry season. The mobility, however, is sometimes limited by the seasonal floods, for example, in the analysis of the availability of feed and water resources for the provision of children's education, and the “take-off”. The mobility reduces the risk of diseases and the loss of production, and the animals can take advantage of the different resources available, each of which has its own characteristics. The flexibility of the system allows animals to find a diet of at least fair nutritional value throughout much of the year. The freedom of choice is, however, being increasingly restricted by legislation on rights and times of access to resources which have been subject to traditional but more flexible arrangements.

From the foregoing it is evident that each major ecoclimatic zone needs to be examined individually in relation to feed supply and animal nutritional status.

The desert zone

In the desert, feed resources are both widely scattered and not always available when most required. The “gizti,” for example, is expected to occur in one out of five years but there were apparently none at all between 1965 and 1974 and in 1975 it was limited to very restricted areas. In the 15 years following, there were four “gizti” years but the areas where it occurred were such that only camels and small ruminants were able to take advantage of it. While the “gizti” is an essential feed resource, its impact at national level does remain somewhat limited.
Administrators as well as livestock owners appreciate the "gizu," however, as tribal quarrels are fewer in "gizu" years. The Kababish are the people who traditionally make most use of the "gizu" and are prepared to travel as much as 1,000 km in search of it. Because camels, in particular, do not require free water when on "gizu" grazing these long distances are not as taxing as might first appear. Absences from the home base and its water supply of as long as eight months are possible in exceptional years. The herders get their liquid requirements from camel milk but they are also at risk of their own health, in that their bodies can benefit the well-being of the desert while succumbing to pneumonia and bronchitis.

The fossil valleys of the Nile are a more reliable source of feed in the desert, in particular they provide a few bases from which forays into the desert offer advantage of ephemeral fresh supplies can be made, or as an staging areas on the routes to the free desert, in some years. Infrequent occurs of 60 mm of rain or more can lead to a sprouting of vegetation at the lower of hills or small in areas. Camel herds then sail 100-250 km in search of these fresh forage, in the flood soils and the rock areas in which they occur when the fresh is exhausted. These essentially one-week cycles are exploited every year in the tags of each temporary supplies of feed, in their absence, are themselves becoming more and more degraded.

The hyper-arid zone

The hyper-arid zone can only be used in the rains. The area is almost unwatered by rain, in which the vegetation has a short growing period mainly confined to August but at this time they provide a feed of excellent nutritional value. Basaltic basins are unusual during the short rainy period and little of the deep zones contain water as late as November and December. The effective grazing continues to provide feed and are grazed in the growing season only when water is available. Much of the 3000 km, however, varying between low to the ground and is eaten by seals or decomposed by bacteria and fungi, the mineral cutter away at the advent of the next year. Much of the seed stock is dispersed over a wide area, leading to a certain homogeneity of vegetation types in the zone. The primary production from this seed bank in a particular year is greatly dependent on the amount and distribution of rainfall.
The eastern slopes of the Red Sea Hills are a better grazing area than most of the remainder of the hyper-arid zone because the steep valleys into which rainfall is channelled provide a good feed source. The pattern of use is generally similar to that of the rest of the zone and there is considerable use of browsing. Some use by cattle is possible, however, particularly in the Ethiopian frontier areas which are accessible from bases that are only a short distance away.

In contrast, the very dry areas closer to the Nile and Atbara Rivers are less useful as pasture areas as the outlying clay areas do not constitute a feed reserve and may venture far to the north. The feed potential of many vegetation is greatly reduced as the dense system of cultivation impedes free access.

The arid zone on sands

The Sahel zone is an important grazing area for both cattle and camels. The former use it during the wet season and feed mainly on the field layer. This is supplemented by camels which are present mainly during the dry season and make use of the browse layer. The installation of many permanent water sources in this zone has encouraged a semi-sedentary production. These can be utilised, however, that some of these wells have been installed where their sound economy and ecological reasons. This has allowed permanent use of large areas, which it may be said only temporarily, with little fear of degraded areas being the result.

A single large capacity water source allows an area within a radius of 20-30 km to be permanently grazed. By the end of the dry season there is absolutely no vegetation cover left and the cattle look and there is only to seek food for the next season. The small plots that remain are often clips if the seeds germinate in response to an early rain which is followed again by a long dry spell. The sparse and poor quality vegetation that sheets establish itself forms discontinuous patches and even if there is any hope that it can be eaten by the cattle and the grass is used up the following dry season, further aggravating the effects of wind and providing little biomass to small-diameter woody. Attempts to establish "green belts" around the major villages and towns have never been successful and in addition are extremely costly.

The arid zone is one in which there once existed a complex equilibrium between plants and animals. Too light a use could result in there being insufficient dry matter to maintain the fire, destroying the dry season potential. Too heavy use, paradoxically, might be the same effect. A series of bad years could result in an apparent decline in the feed value of an area but a run of good years served to restore the balance. Heavy settlement and increased numbers of animals have destroyed this natural system of checks and balances.

The sand dunes of the arid zone are also an important producer of gum from the spiny acacia. Most gnat is produced if these are allowed to remain in full growth and human livestock are kept only during the dry season and the old wood then pruned to encourage new
growth. Increased population pressure, ignorance of the tree's ecological requirements, the loss of traditional ownership rights to trees, the high price of gum on the world market and the lack of other sources of cash have had serious negative effects on the long-term productivity of this resource. Regeneration is reduced (and attempts to encourage it have not been very successful) and the areas laid bare are now largely covered by Calotropis procera, always a sign of degradation and a plant of practically no feed value.

Present trends in national policies and the world market for gum arabic may yet provide a reprieve for Acacia senegal. Prices have dropped on export and the numerous artificial substitutes now available have led to lower returns. In addition there is now an efficient market for the product and the owners are trying to capture the profit. The "gum arabic industry" is essentially one of opportunistic gathering; it is badly organized, returns are at best not very good and additional costs of transport and taxes are a disincentive to its production. This is all to the good of the range and to livestock production.

The carrying capacity of the Sahel zone has been variously estimated at 11-15 TLU/ha and 50 TLU/ha (Hunting Technical Services 1974). It would appear that even the lower of these figures, if the area were to be grazed for six months equivalent to a primary production of 1500 kg/ha, is far too high for the zone as a whole but would apply only to the most productive areas. If the zone is in fact grazed throughout the year and even the current stocking rate of 11-12 TLU/ha is leading to more and more degradation.

Dry zone on clay

The Butana has for long been considered to be a vast grass plain but the marked contrast that existed between this and the more wooded areas to the west is now less obvious. As a consequence of the loss of woody cover on the sands the principal difference between these and the clays is the distribution of the shrub layer. In Kordofan the shrub layer is somewhat more evenly spread over the whole area while in the Butana it is more or less confined to the drainage lines and some run on areas. Instead of the clay plains allow commonwood reedbeds by the appearance of these runs in the Butana. Water collects along these sandy small hedgerows for plants at the dryer stages, while as the rains come the water tends centripetal lines deposited above. Plant that receive less water begin to disappear, and the area come up the barely perceptible slopes to occupy the empty space.

It is evident here also that over use destroys the delicate balance that exists in these fragile ecosystems. The progressive loss of these vegetation bands results in poorer water infiltration and subsequent flooding and later on in overgrazing of the sand margins (resulting in the sand margins and lateral spreading dryness in the dry season) and the decrease in water infiltration with consequent greater run off. On the resulting increased areas the seed returns to surface away by the first rains and has no chance to germinate. Cattle and sheep, the primary grazing animals, are mainly responsible for this type of degradation. This was recognized many years ago when it was proposed (Harrison and Jackson 1958) that the clay plains be reserved for use by camels, especially in case of the fact that, needing watering only at intervals of 14 days they are much more efficient users of the whole area.
In Hes, Marriott and Jackson (1958) suggested a carrying capacity of 31 TLU/km² for the clay plains as only about 40% of that suggested for sand in the same climatic belt, thus attempting in some measure to acknowledge the extreme fragility of the clay plain environment. This area was also at risk, at least until the 1960s, from the frequent dry season fires. A carrying capacity of 31 TLU/km² implies a primary production of 740 kg of dry matter eaten over a five-month period but this recommended rate is certainly exceeded at the current time over much of the area. The Butana is a desolate sight these days with a few scattered dead and moribund stumps remaining in a sea of bare earth.

Semi-arid zone and sand

This is an area that is permanently occupied by livestock and at the same time the one which has suffered more than any other from the spread of cultivation. Between 1960 and 1987 it was estimated that more than a third of the national grazing resources had been lost, some from overgrazing in the east but most from encroaching cultivation in the south. The annual increase in cultivated area is of the order of 200,000 ha. The pastoral response to this has been a systematic annual transhumance to the Bahr el Ghazal whereas in earlier times such a move was only made in very exceptional years.

The short lime which animals can now spend in the northern areas means, of necessity, that the southern pastures are grazed much earlier than they used to be. Early grazing means that there is insufficient time for recovery of pasture or for encouraging new growth. In addition, the traditional method of a group moving on and numbers of stock grazing, has been lost and the situation is now often chaotic. Not only rights, but also the resource itself, are being eroded and it is clear that the composition of the vegetation now differs greatly from that described in the 1950s and 1960s. These negative effects are a further reason for attempting to re-establish some rational form of control.

Conflicts between herders and crop farmers are more frequent and often more violent than heretofore. Part of the reason lies in the greater area under cultivation but the political problems in the south of the country can also be considered to be a contributory factor. Animals are driven more and more by their owners on to cropped areas, often by night. This means the problem is assuming a more fundamental aspect, it being not only over grazing and access but over ownership of the land itself. The traditional pastoral tribes consider they have historical rights to much of the area but the settled farmers consider the pastoralists as intruders, coming from afar but coming earlier and staying later than was the situation a few years ago.

Government response, faced with this conflict and with the lack of feed resources, has been to attempt to establish ranches or grazing blocks and to limit mobility to short distance transhumance to well-defined areas. Results do not seem to have been very good as on an area of 400,000 ha in Darfur and have been even less encouraging. Some even say encouraging in their failure, in Kordofan. In spite of this the same line is still being pursued by Government.
Another factor is the tendency of pastoralists to settle. This is in particular the case for those who have lost a major part of their holdings and who no longer see the advantage of making long treks when they can be more comfortably settled near a permanent source of water. Other advantages arising from all or part of the household settling in one place include education for the children, medical services and the proximity of market facilities. The sedentary part of the family often cultivates a small plot, but usually with little enthusiasm as cultivation is viewed as being much harder work than herding, to complement the products of the flocks and herds.

Semi-arid zone on clay

If there are problems on the sandy areas of the semi-arid zone, it seems they are even more pronounced on clay. Access to water along the rivers is almost impossible in view of the intense cultivation, even though in theory livestock corridors have been delineated through these areas. In reality these corridors are left too narrow to allow of substantial flocks on either side of the river to poly the land for the year. The herders accuse the cultivators, who indeed tacitly admit to it in order to try and limit damage to their crops, of moving the boundary markers, thus making an already inadequate provision even more restrictive. Farmers who themselves now own livestock believe the cultivators at fault and accuse the nomadic livestock of bringing in disease and weed seeds. A few farmers believe this to such an extent that they remove dung from their fields to prevent weed growth even though they see no advantage in the fertilizing effect of it. Conflicts are now sometimes so violent that the army has had to intervene.

Attempts to redress the situation and provide some rational solutions seem to have had less success on the clay plains than on sands in Darfur and Kordofan. As an example, one area of 250,000 ha designated as a grazing reserve was quickly turned into a mechanized farming scheme when it proved impossible to manage livestock there. On the other hand, farmers have little respect for the people who graze their livestock in the Dinder National Park. They consider the area, just as they do the areas recently occupied for cultivation, as their traditional grazing fief and accuse the authorities of neocolonialism in attempting to deprive them of these ancient rights.

Even though the number of nomadic herds is being reduced there has been no reduction in livestock numbers and new production systems are evolving. Herd and flock output shows increases in line with improved management. In particular, in sheep and goats, the numbers are at their highest levels since the 1960s. On clay, pastoralists have found new opportunities for both animal husbandry and crop cultivation. In reality, the traditional livestock economy has been transformed, with the establishment of cooperative farming units and the introduction of new crops and livestock species. This has led to an increase in crop residues and weedy growth on channel banks. However, the availability of these resources is highly variable, depending on the climate and the area.

In the Gezira, there is more of this latter kind of feed available, particularly between July and October. From November to February, weedy growth and grundnut haulms provide the main feed. During this period, pastoralists may move their livestock to areas where crop residues are more abundant, or to areas where the land is more suitable for cultivation. In the dry season, between March and June, when crop residues are scarce, pastoralists may move their livestock to areas where there are more opportunities for grazing. This may involve moving livestock to areas where there is more water or to areas where there are more opportunities for crop residues. However, this movement is highly variable, depending on the climate and the area.

A further development is investment, in the economic sense of the word, in large-scale livestock production. The wealthier farmers have built up herds of 200 head or more, and even larger herds of 500 head or more. The major feed resource is the crop residues and the weedy growth on channel banks. However, the availability of these resources is highly variable, depending on the climate and the area. In the dry season, between March and June, when crop residues are scarce, pastoralists may move their livestock to areas where there are more opportunities for grazing. This may involve moving livestock to areas where there is more water or to areas where there are more opportunities for crop residues. However, this movement is highly variable, depending on the climate and the area.
The Darfur mountainous area

This is not a homogeneous area in terms of climate and resources. It is, however, a clearly differentiated area in terms of climate and resources. Livestock owners here are relatively well off, though the north of the area is somewhat at the equator of 20°C for an average household of seven people, and those to the south may have double this number. These holdings are 20-40% greater than the national average for the same latitude band. Agriculture has not expanded to the same extent as cattle to the east and traditional grazing areas have not suffered the same degree of aridization, except along the new highway from Nyala to El Geneina.

The political frontier with Chad is just that. There is no physical or natural barrier to free passage and Darfur has always been influenced by events in Chad, the Fulani herders with their Livestock cattle being a case in point. The dry season transhumance is not necessarily directly south to the Bahre el Araba and many herds have traditionally moved in a south-western direction into Chad and the Central African Republic. In security in Chad in recent years has proved an impetus to this latter system and, indeed, Darfur now finds itself an immigration zone for herds attempting to avoid the conflict there.

The remainder of Southern Darfur is also relatively better off than most of the northern pastoral areas in terms of cattle and livestock reproduction. As a result, dry season movements, even here, are not occurring in distance or time as they are in many other areas.

Southern Darfur, whether it be Jebel Marra or the area to the south, is far from totally exempt from the effects of climate. The drought of recent years has affected the area, but the climatic factors and the overall situation there is far less serious than elsewhere. It could also be possible here to restore the field layer within a reasonable period of time.

Map summary

An attempt has been made on the pastoral map to include data relating to current stocking rates and to the conditions of the range itself. The result has been the identification of 15 zones which largely represent four major conditions, all presenting a somewhat varied prognosis for the future. These can be described in increasing order of threat to the problems they are facing.

Very degraded areas

This is the type of land found in the heart of the central area, from El Obeid to Kassala. The situation here remains critical, not only because of range recovery, but also because the number of animals is still very high. Recovery of the area is not possible in the foreseeable future.

Type A areas can be defined

Type 1A comprises those three discontinuous areas, one in the east and two in the south. The latter areas are a result of climate and the other is as a result of land degradation. On these areas the degradation is non-made either being a result of climatic change, soil erosion is unlikely to improve while stocking rates are too high.

Type 1B comprises the plans close to the Red, allowed by the major irrigation schemes which, in fact, are also the principle food reserves. Decreasing rates are thus far in excess of the capability of the rainfall ranges to prevent degrading areas will only do maintained it adequate crop rotation of some form of permanent feed can be made available.

Areas at risk

These areas include almost all the areas of the semi-arid areas. Their original production levels have been reduced mainly as a result of overgrazing, which, in itself has caused a rapid increase in the number of animals, and the already reduced areas just absorbed. It is again possible to identify these areas.
Areas

- **3A** is the semi-arid sandy zone which has had an influx of animals that in the past grazed farther to the north and which have added further impetus to a zone already at internal risk from drought. The major stock routes also cross this area and many livestock owners are turning to cultivation to provide an additional source of income and compensate for reduced animal productivity. The need to conserve natural vegetation requires urgent measures to conserve it if it is ever to be rendered productive again.

- The areas of 3B in Darfur and on the clay plains are still not too heavily stocked to be fmally affected by excessive degradation. The current trend, however, is of more and more cultivation and a concentration of animals on areas of poor quality grazing.

- **North Darfur** and **Kordofan** designated 3A.

- The arid zones of **Northern Darfur** just to the south of those in 3A, as well as the **Red Sea Hills** in the east, both being noted as 3A.

- The semi-arid areas in Darfur have mainly suffered as a direct result of climatic change. They are now, nonetheless, having to support livestock numbers well in excess of their carrying capacity. Again there are two areas:

  1. North Darfur and western Kordofan designated 3A.

  2. The arid zones of Northern Darfur just to the south of those in 3A, as well as the Red Sea Hills in the east, both being noted as 3A.

- The mountainous areas (4A) have been less affected by climatic change than elsewhere and have been spared to some extent because they are relatively difficult of access. There is still risk of devastating fires in these areas. Some parts of this unit are partly protected (Chinder National Park) and others are of relatively little value as pastures (Nuba Mountains).

**BIBLIOGRAPHY**

1. **LIVESTOCK POPULATION**
   - Government of Kordofan Region. Inventory of animals at El Obeid Town and surrounding villages. Department of Planning and Economy and the Administration for Natural Resources. 1985. (in Arabic).

2. **RANGELAND UTILIZATION**
RANGE USE (CONTINUED)


