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REPORT ON ANIMAL HUSBANDRY
AMONG THE NGOK DINKA OF THE SUDAN

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Chapter One: Introduction

The Abyei Integrated Rural Development Project (ADP) began in 1978 with an emphasis on agricultural crop cultivation and human health. Even though a concern for livestock was a part of the original ADP design, it was not stressed initially because of the feedback from the local people, who saw agricultural crop production and human health as their major problems. However, the experience of the ADP during the first year highlighted the importance of livestock production as a link between the traditional commercial aspects of the local economy, and it was decided that the development of the area must be designed to address both livestock and crop production.

As a result, funding was requested in 1979 for a livestock survey to study the Ngok Dinka livestock production system and to establish its role in the Ngok Dinka social and economic system. Once the production system was understood then recommendations could be given if necessary, that would contribute to improvement of production for all Ngok producers. Concurrently, a similar study of the Missiriya Humr livestock production system was to be conducted.

The Abyei Study Area, and its relation to the region as well as the nation is shown graphically in the map of Sudan, and Figure 1.1. The survey was designed and implemented to provide initial guidelines for a livestock improvement program, that would be a part of the overall ADP set-up. The premature termination of the project leaves some doubts as to the eventual usefulness of such a survey. It is hoped that the Sudanese Government and donor agencies, will once again commit themselves to a Rural Development Project in Abyei, and that this report will then become the basis for involvement in the Ngok Dinka livestock sector.

The following report provides the results of the Livestock Survey carried out from April 1980 to April 1981 among the Ngok Dinka. Unfortunately, political events of that year did not allow a similar survey to be carried out with the Missiriya.

The Livestock Survey was designed by Dr. W.J.A. Payne based on experience with a survey among the Bor Dinka in the Jonglei Area in Sudan. The survey was

then modified by the Livestock Researcher during the course of the survey period. Appendix A provides the details of the survey methodology, a final version of the main herder questionnaire, and a copy of the livestock trader questionnaire.

The survey was carried out by a team composed of the expatriot researcher, Mr. Aguek Ngor Kuol, a Ngok Dinka Veterinary Assistant who was the ADP Livestock Officer, and various other support personnel. The ADP anthropologist, Dr. R. Huntington as well as Dr. Payne, visited the field team on numerous occasions and provided valuable advice.

The report of the survey results begins with a summary of the major conclusions and recommendations in Chapter 2. Chapter 3 provides an introduction to the study area, as well as background information on the Human Population. Chapter 4 introduces the livestock population, and provides estimates of total population and herbivore biomass. The range resources available for use by this biomass, as well as a first approximation of the carrying capacity, are presented in Chapter 5. Chapter 6 provides a fairly detailed look at the livestock management practices, both on an individual herd level, as well as on a societal level. Chapter 7 discusses the disease situation faced by the Ngok Livestock. All of these factors: population, range resources, management and disease, affect the productivity of the livestock, which is discussed in Chapter 8. Finally, Chapter 9 covers the marketing of livestock.

Monetary values in this report are written in Sudanese Pounds. The official exchange rate in 1980 was $2.00 to SL1.00, but a rate of $1.25 to SL1.00 is more realistic.

Finally, a survey as extensive as this could not have been conducted without the support of many people. The advice of Dr. W.J.A. Payne, Dr. David Cole, Dr. Richard Huntington were greatly appreciated. The continual support at the field level by the HIID Team, especially the team leader, Mr. Richard Fuller, allowed smooth transition through logistical problems, and moral support during frustrating times. Among the ADP staff many thanks go to Mr. Aguek Ngor Kuol for assisting in the survey, Mr. Seddig Abdallah, project co-director Mr. Fathi

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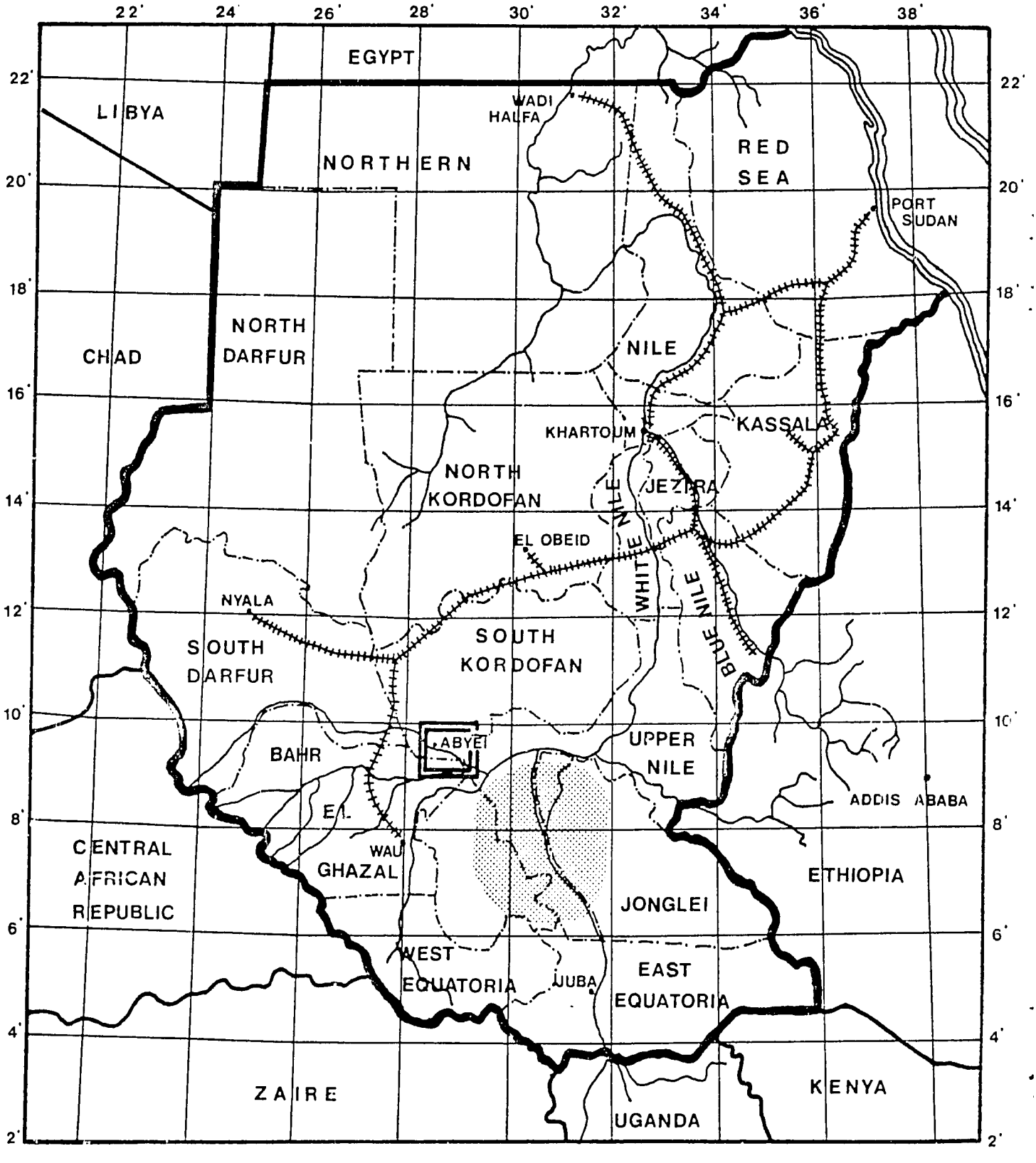
SUDAN



CENTRAL SWAMPLAND (APPROXIMATED)

ABYEI STUDY AREA

RIVER

0 50 100 200 500
KILOMETER

NATIONAL BORDER

PROVINCIAL BORDER

RAILROAD

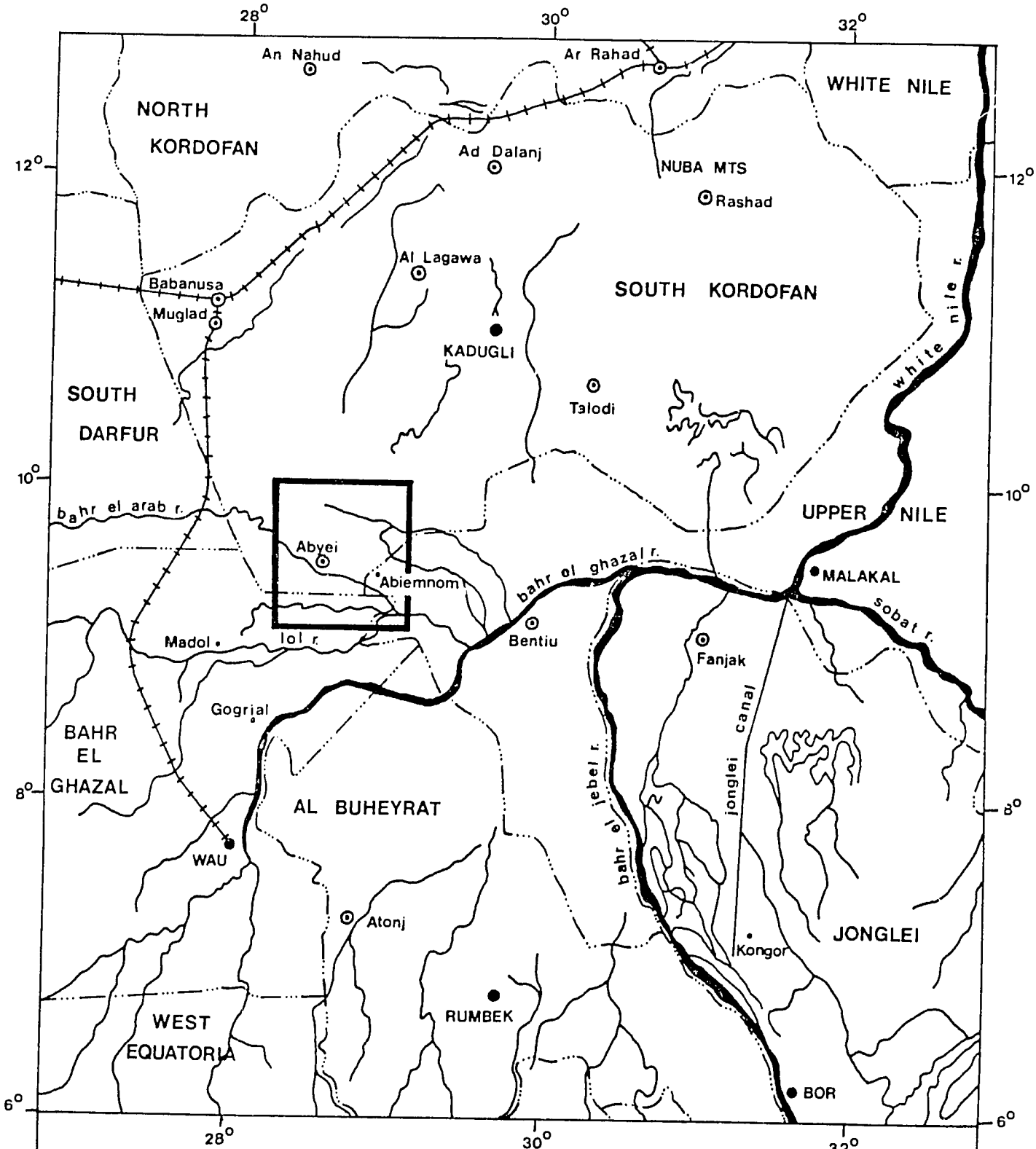


Fig 1.1
REGIONAL MAP

Detail of Sudan Survey Dep't
National Map 1978....
Drawn by Maryam Niamir

0 50 100 200
kilometer

Provincial boundary
Drainage systems
Railroad
Province Headquarter
Council HQ
Other Towns

Chapter Two: Summary of Conclusions and Recommendations

The livestock survey estimates that the Ngok Dinka have a population of roughly 31,000 people currently living in the Abyei Study Area, a lower figure than was previously assumed. Correspondingly, they have a total of 27,000 head of cattle and 42,400 small stock. These later figures are much higher than what was previously understood. Thus the initial perception of a moderately populated area with limited livestock resources must be modified.

The Ngok Dinka engage in a mixed economy of livestock and crop production. The population is divided accordingly. The sedentary people occupy the "Ngok Settled Area" (NSA) and engage in cultivation, while keeping a few milking cows in their byres for sustenance. The migratory people continuously move through the "Ngok Use Area" (NUA), with the majority of the livestock owned by a household, in search of water and pastures.

Livestock perform various social and economic roles for the Ngok. Economically, they perform two vital roles in Dinka society. The first is the important, and sometimes only, contribution to the diet of the people through milk productivity. Cattle are primarily seen as milk producers rather than beef producers. The second role is a complex system of wealth generation that manifests itself in various forms. Livestock are similar to a savings bank. Mature animals are an asset that either directly increase the herd (cows) or provide cash whenever it is needed (bulls). Immature animals are an asset whose returns are seen in the future, therefore investment in these is similar to investment in any bond or stock.

In the Dinka society, the direction of investment is nearly always toward cattle. A poor man will engage in crop cultivation, selling the surplus until he gradually builds up a good smallstock flock. Smallstock are gradually sold off so that a cattle herd can be built up. Thereafter the major part of his investment will be in cattle, although some goes toward purchase of commodities, education or medicine.

These economic factors serve to maintain the fact that cattle are a very important and valuable item in Dinka society. Because of their great value, they perform various socio-cultural roles. The most importnat is that cattle are the means of forging ties and resolving conflicts among the Ngok Dinka, and with their neighbors. On the other hand, cattle can be a means of creating conflict through theft. For example, theft is the main cause of conflict between the Ngok and other southern tribes, such as the Nuer. On the other hand, the Missiriya-Dinka conflict is slightly different. It appears to be a dispute over rangeland, but it is not a dispute over the use of the range, rather it is over the control of the rangeland.

Initial estimations of the carrying capacity of the rangeland in the NUA show that it is in general underutilized, even though there are pockets of heavy concentration and grazing. These occur in the peak of the wet season, when the muddy conditions limit the number of suitable campsites, and in the peak of the dry season, when the herds congregate near a few remaining water sources. Nevertheless, this selective heavy grazing does not appear to cause permanent damage to the range. The condition of the NUA is unclear, although it is safer to assume that it is approaching a critical situation.

The use of the rangeland by the Ngok Dinka is based on a rational management system that ensures adequate resources for all cattle. One regulatory mechanism is an informal system of land demarcation, enforced by the traditional judiciary which separates the pastures used by the sedentary herd, from that used by the migratory herd. The other system, also informally acknowledged, is that for most of the year, camps do not completely graze any specific area, but move on, thus ensuring enough pasture for other camps and for later in the season. A third system is linked to the subtribal affiliation of camps. Although very fluid, camps can generally be divided into 2 major groups, each using separate migration routes and campsites.

It is these regulatory mechanisms that mitigate a deterioration of the rangeland, and must be safeguarded against changes that may destroy them. Similarly, any new change in rangeland management that is introduced in the area, must be accompanied by its own set of regulatory mechanisms.

The rangeland most probably cannot support a very high level of use such as a totally sedenterized population. Migration has certain benefits that serve to ensure adequate nutrition of cattle, adequate pastures for the whole year, and high levels of milk production. One of the constraints facing the sedenterized byre cattle in the dry season is a relatively limited supply of grazing resources and more importantly inadequate water sources.

On the other hand, a migratory existence increases the chances of cattle coming into contact with and spreading diseases. Even though mortality rates for 1980 are lower than rates reported among other Nilotic herds, morbidity of Ngok livestock is fairly high. Wet season conditions encourage high morbidity rates among all livestock. The Ngok Dinka have a store of traditional cures and methods of diagnosis. Unfortunately, the advent of modern medicine has ironically created a contradictory and dangerous situation. The efficiency of modern medicine in curing diseases has shown the inadequacy of most traditional methods, so that they are no longer used. On the other hand, not everyone has access to the modern medicine. Therefore the cattle are receiving much less medical attention than they previously were.

The productivity of livestock can be measured in several ways. First, is their ability to regenerate. Among the Ngok herds, cattle had a very high rate of growth in 1980, although it is not known what the situation was in earlier years. This high rate was mainly due to very high calving rates. Conversely negative growth rates were found among small stock, leading to the conclusion that small stock flocks have more extreme fluctuations of boom-and-bust than cattle, since they are the main source of meat, and are more easily converted into cash than cattle.

Since milk is a major part of the Ngok diet, its output is the most important measure of livestock productivity. The main source of milk for human consumption is from cattle, although goats are also milked. Milk production is sufficient according to daily adult requirements, except in dry season byres when yield per cow drops dramatically due to inadequate grazing and water intake. The quality of milk is moderately low, with low levels of protein especially in the dry season.

A third measure of productivity is the quantity and variety of by-products. Except for the occasional production of clarified butter from surplus milk, there are no other forms of dairy products. A low incidence of slaughtering of livestock implies that the storage of meat, or a more efficient processing of hides and skins is not worthwhile. Manure production is lower among Ngok cattle than most other places, and almost all of it is burnt to ward off insects from the cattle. Some is hoof-trampled into the garden plots, but manure is not manually spread over fields because the returns to such labor are not seen as worthwhile.

Finally, a fourth measure of productivity, as it affects the regional and national economics, is the rate of commercial sale of livestock. Since the 1972 Peace Accords between the Northern and Southern regions, Abyei Town has become one of the major collection centers of southern livestock for export to northern and national markets. In 1980, almost 10 percent of the cattle sold in Omdurman came from the Abyei market. The sales rate of Ngok cattle is almost 9% of all cattle, a high figure compared to the usual rates reported in the literature on African nomadic societies. Even the recent crisis in the Missiriya-Dinka conflicts did not affect the volume or nature of transactions in the Abyei livestock market. No matter what the local, regional and national political situations are, the economic under-current continues to flow. Abyei market benefits the producers by providing high prices for their cattle, even during the main selling season. On the other hand, Arab traders are still able to make very sizeable profits by trekking cattle to the north, and returning with foods and manufactured commodities to the Abyei market. This livestock market is expected to continue to be a very important center for supplying urban markets with beef, and for servicing the region around Abyei Town.

Livestock insure the survival and well being of a household by functioning as insurance against disaster in crop production or in drought conditions and a bank reserve in good years. Therefore the rate of offtake from a herd is sensitive to expectations of future conditions, and as such is necessarily conservative. If the livestock population is increased, there is no guarantee

that offtake will also increase. For that to happen, the importance of livestock as both a hedge against disaster and a bank reserve will have to be reduced. One way is to increase the production from each animal, especially cows, to minimize the effects of unreliable climatic conditions and boom-and-bust periods. The other way is to diversify investment opportunities into education (by providing better services), animal health and nutrition, tools and resources for crop production, and possibley rural industries such as carpentry. At present, for the majority of herdowners, diversification of investment into areas that eventually lead to higher cattle production, is much more acceptable.

Assessments of the carrying capacity of the Ngok Use Area were derived from crude estimations of vegetative cover and herbivore biomass in the wet season. These results indicate that in the wet season the area is under-utlized, but the limit to which the livestock population can be increased can only be determined by further rangeland studies, especially in the dry season.

Therefore it is more appropriate to be cauticus and to recommend a two-pronged approach to livestock development among the Ngok Dinka. The major emphasis should be on testing ways to increase the productivity of existing cattle. Since an important part of the diet of the people is made up of milk products, increasing milk productivity should be given first priority. The two major constraints to increasing such productivity are the lack of adequate water resources in the dry season, and livestock ill-health. Rangeland improvements and supplementary feeds will also help to increase productivity.

The second approach is to increase livestock populations. Initially this will be partially and gradually achieved as part of the efforts to increase productivity of existing livestock. For example, reduction of mortality through better health practicies may increase the herd sizes. Only when an adequate study of the rangeland potential has been carried out could we consider direct strategies for increasing the livestock population.

The lack of water sources in the dry season can be ameliorated by the provision of small hand-pumped wells, similar to those tested by the ADP. The experience of the ADP in the construction of these wells provided one important lesson, that logistical problems of importing the material, of hiring a specialist, and of working in the Abyei conditions, etc., all add up to considerable delays in the provision of these wells. The slow start-up of hand-pump construction may have some benefit in the long run because it allows the people to set up rules and regulatory mechanisms for the wells without haste and with considerable forethought.

One other way of providing water sources is through earth dams constructed across seasonal water courses. The Abyei people have had experience in the construction of such dams, but could do with better advice on the design, construction and maintenance of such dams.

On the question of livestock health, the greatest impact could be achieved by a two-pronged approach. One is to increase the supply of drugs available in the area, through the creation of a pharmacy. Its exact organizational form is still unclear, but it would probably cover both human and animal health care. The other approach is to increase the use of drugs, by establishing an Animal Health Training Program that would train herders in better diagnostic skills, the use of modern drugs, and disease prevention techniques, including tick control. The list of traditional cures collected in this report, include a few methods that are probably quite effective. It is suggested that the cures be pharmaceutically tested, and those that prove to be efficient should be included in the Animal Health Training Program, as a way of encouraging the preservation of effective, local cures. The Animal Health Training Program would be part of a larger training package that would include range management issues.

The veterinary clinic of Abyei must be encouraged to widen its scope. The vaccination services offered by the clinic are very important indeed, and must be expanded to run efficiently and cover the whole livestock population. The veterinary clinic would greatly benefit from more support from the provincial headquarters.

Apart from the reduction of these two major constraints, other strategies can be recommended. One way of increasing livestock productivity, is through the improvement of the rangeland. Broadcasting of leguminous forage species in the byre-pasture area, a concerted effort to provide more trees, as shade and regeneration of a resource currently consumed in large quantities by people and goats, and testing ways of controlling bush fires that are sensitive to local managerial conditions, are three important ways of improving the rangeland. It is recommended that these activities be carried out as pilot experiments, concurrently with a more detailed rangeland survey.

A second way of increasing livestock productivity, especially of byre cattle, is through the provision of supplementary feed, such as sorghum and grain legume fodder, and minerals. These would provide a greater opportunity to increase the interaction between livestock and crop cultivation, and to strengthen the mixed economy nature of Ngok society.

Even though more marketing research in Abyei is helpful in answering some specific questions, there are various ways that we now know will help to improve marketing of livestock and its products in the area. Assistance given to Ngok livestock traders is one way of providing alternative avenues of investment for the Ngok, and possibly of increasing prices of cattle in the southern markets frequented by the Ngok. Physical improvement of the Abyei market site (livestock and women's markets) as well as the Dumbeloya site will create healthier condicions and added incentive for participants. More recent data comparing cattle prices in Abyei with those in Bentiu and Malakal would help to assess whether Abyei prices are reasonable or subject to monopsomistic distortion. Finally, the Abyei Rural Council must be encouraged to maintain good records of the livestock market and to link it with the LMMC's (Livestock Meat and Marketing Corporation) efforts.

It is important to note that the discussions so far are based on a realization that most developmental efforts in Abyei have to be accompanied by an extension program that reaches the majority of herdowners, and is a true conduit of information, both "forwards" and "backwards." Technical solutions are of no use if the managerial and organizational aspects of their implementation are not commensurate with local conditions.

Chapter Three: Human Population

1. Introduction

The socio-economic survey carried out in 1978 by the Development Studies and Research Center, University of Khartoum, covered a wide range of topics, including the social and cultural aspects of the Ngok Dinka people.

This chapter is meant to be a brief report on the human population of the area in order to provide a background for the rest of the report, and also to stress the fact that a livestock survey cannot be divorced from a look at the people who are managing the system. For further socio-anthropological detail, the reader is referred to the 1978 socio-economic survey.

By 1980, the ADP was able to carry out more detailed surveys on the economic system of the people, in the form of a livestock survey, and a village level agricultural survey (Ackroyd, 1981). In addition two attempts were made to estimate the total population of the Ngok Dinka, through the livestock survey and the geographical survey (Hayes, 1980). Earlier estimates of the population had ranged from 16,000 to 80,000. The two ADP surveys, using different and independent survey procedures, placed the population at around 30,000. The procedure used by the livestock survey is detailed in section 2 of this chapter, "Estimates of Human Population".

The Ngok Dinka are a tribal confederation of nine territorially organized subtribes. They trace their origins to the greater Dinka People ("Monjang"). The Ngok migrated some eight generations ago from the Upper Nile province of eastern Sudan to the present area. The third section of this chapter describes those aspects of local organization that are pertinent to livestock management.

The Ngok engage in a mixed economy where part of the household is responsible for cultivation and another part for livestock production. Thus they are characteristically semi-nomadic or transhumant, with a "sedentary" and a "migratory" population. In reality, such categorization

is too rigid since there is a continuous process of labor and cattle exchange between the two. The "spatial" distribution of the population is further described in section 4.

Figure 3.1 shows the territorial distribution of the nine subtribes, as well as the area actually settled by the Ngok Dinka (total of 1450 square kilometers) termed Ngok settled area (NSA). This and the area used by the Ngok migratory population (4500 square kilometers) is termed the Ngok Use Area (NUA) or Abyei Study Area. These lands are not totally exclusive to the Ngok and are used by other people. The interaction of the Ngok people with the surrounding region is outlined in the fifth and final section of this chapter.

2. Estimates of Human Population

The human population living in the Ngok Settled Area (NSA) include a majority of Ngok Dinka and a comparatively small minority of Arab descent living in Abyei Town. The estimates of the total population of the area range from 29,600 derived from the geographical survey and 31,066 people derived from the livestock survey. The former has been reported elsewhere (Hayes, 1980) and the latter is described in detail in this section.

During dry season 1980-81 a "road survey" was carried out in which the number of houses and byres ("structures") were counted from a moving vehicle every five kilometers. Visibility from the top of a landrover is assumed to be a total of 3/4 km on both sides of the road. Only sandy ridges were passable by vehicle, although small one to two kilometer patches of woodland were also in the path of the road. Given that from all accounts the majority of the population lives on sandy ridges, this logistical problem of random sampling is not thought to create too much bias in the sample.

A total of 1683 houses and 462 byres, or 2145 structures, were counted on approximately 100 square kilometers of land area. A follow-up "intensive survey" of 39 households was then carried out. Since this survey was designed to count both livestock and human population, every fifth byre in a five kilometer stretch of the road survey was chosen for intensive counts. The

Fig 3.1

APPROXIMATE TRIBAL TERRITORIES

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT: Dinka name — Noong

Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

NGOK SUB-TRIBAL TERRITORY

TRIBAL TERRITORY

0 1 2 3 4 5 10 20

Kilometer

Names and boundary representations are not necessarily authoritative.

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March–May 1980 by Jane Hayes.

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir.

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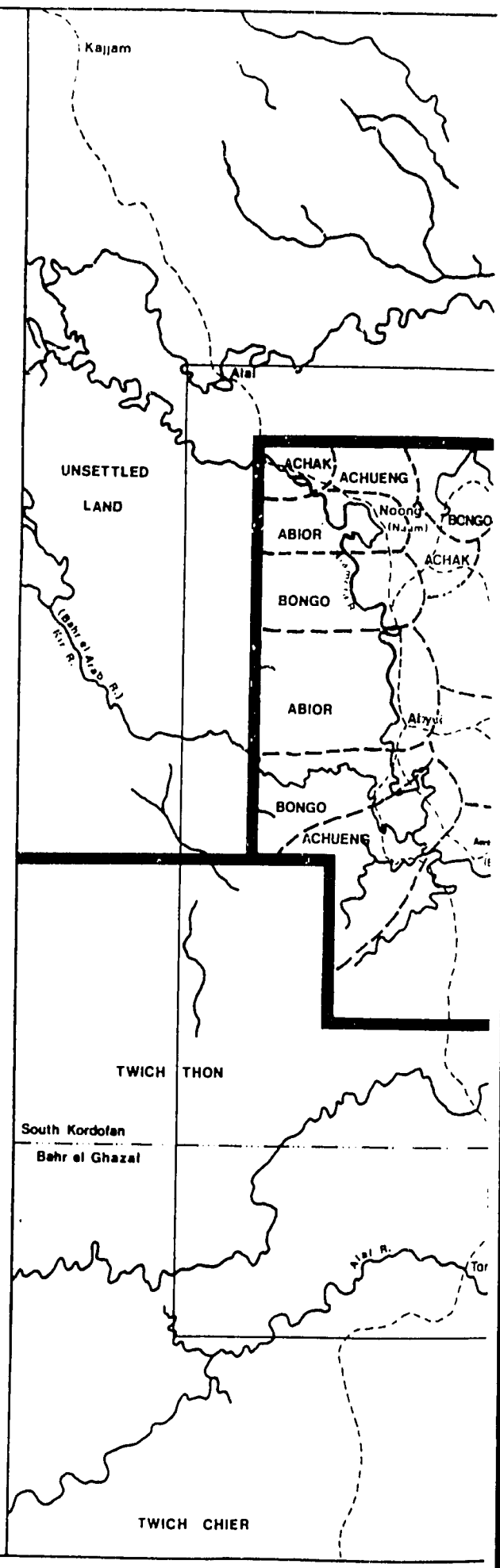
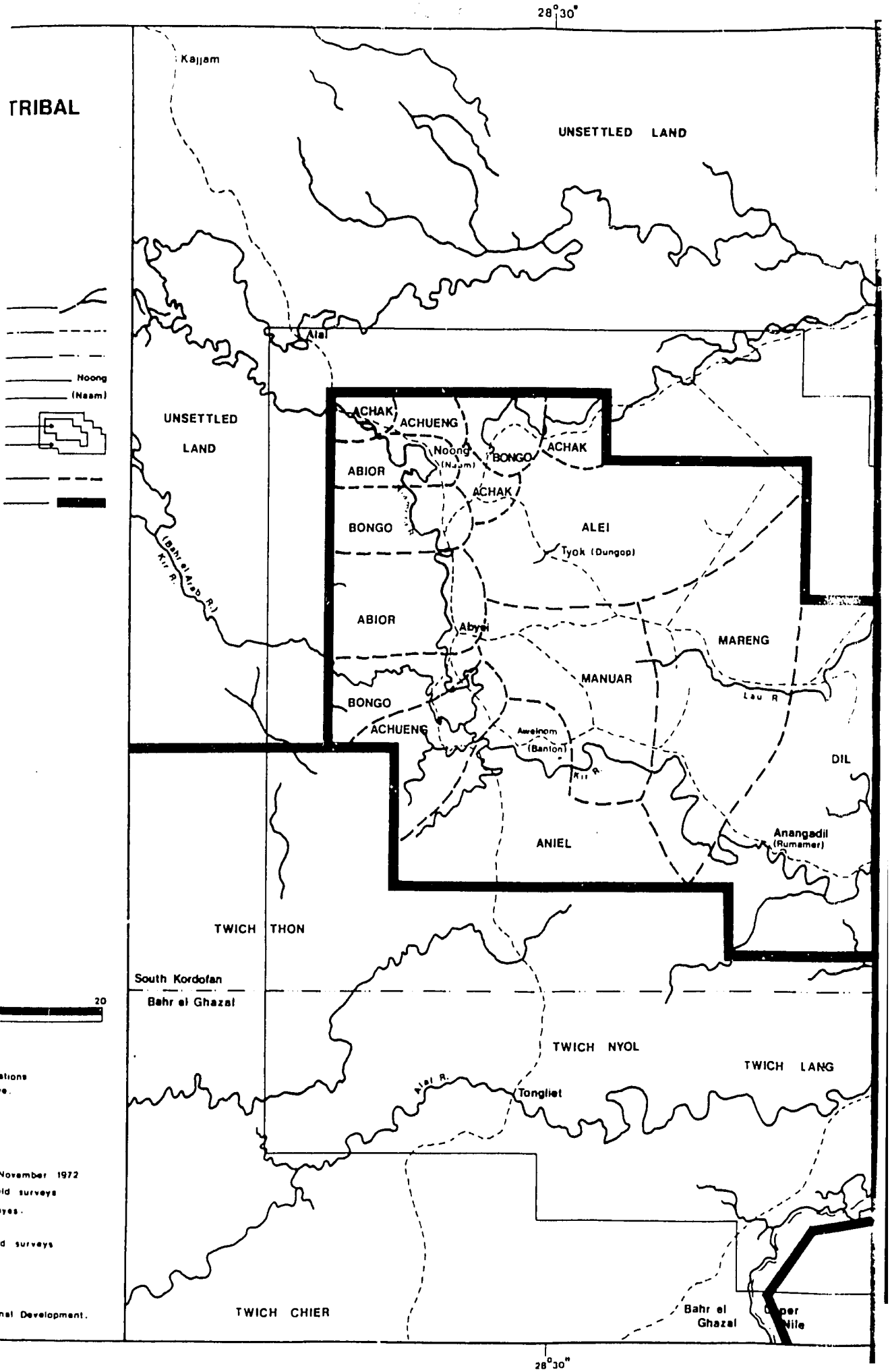


TRIBAL



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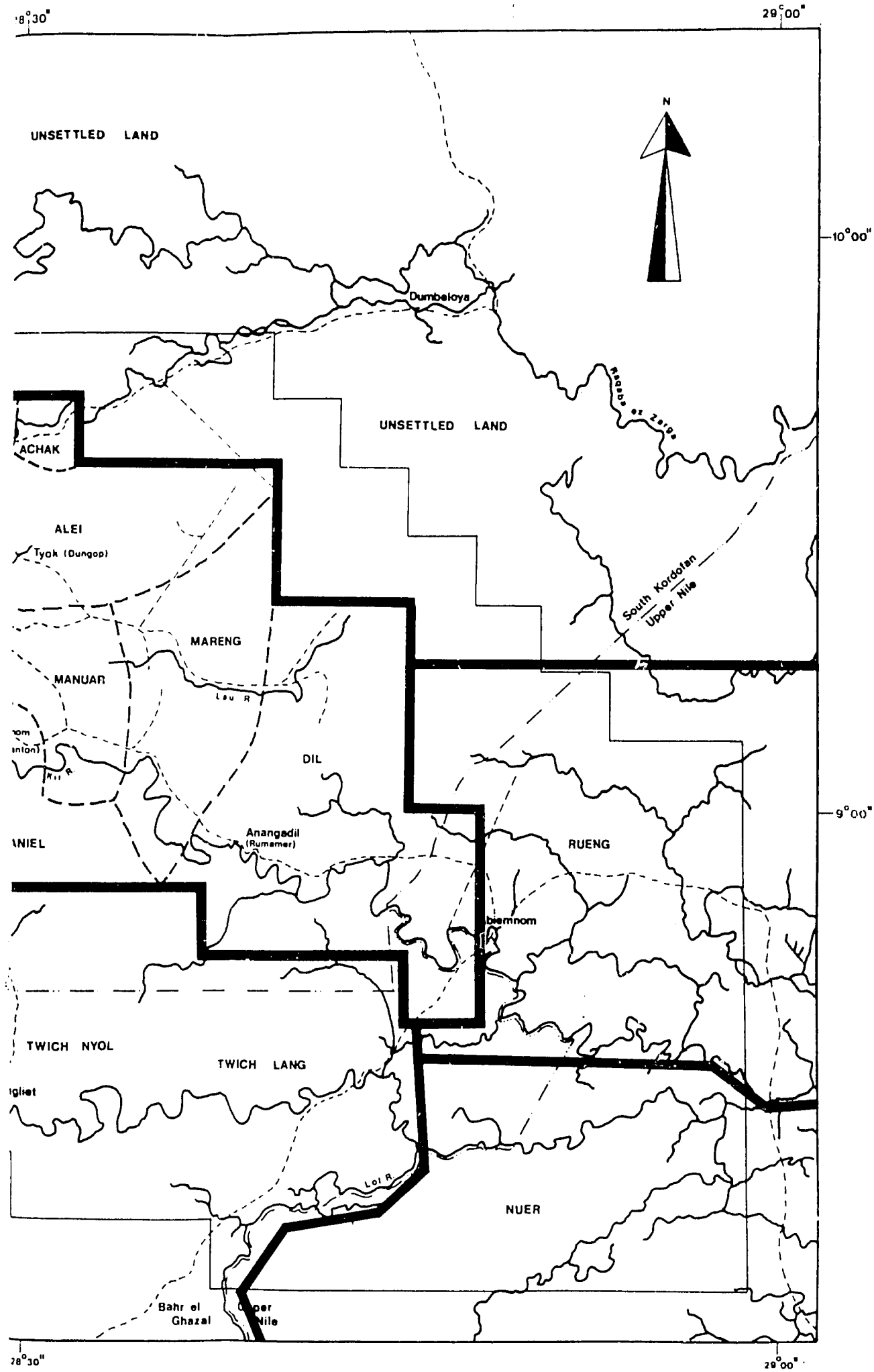
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N
UNSETTLED LAND
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MARENG
MANUAR
Lau R.
DIL
Anangadil
(Rumamer)
RUENG
biemnom
TWICH NYOL
TWICH LANG
Lol R.
NUER
Bahr el
Ghazal
Upper
Nile
28°30"
29°00"

The geographical survey population estimates of 29,600, based on voting registration and sample surveys, is fairly close to the livestock survey estimate, based on a totally different procedure. Thus it seems that the total human population is roughly around 30,000 people and certainly not as high as the initial figures suggested by the residents of the area.

The overall human density of the Ngok Settled Area (NSA), based on a total 1450 square kilometers of land, is 20.7 people per square kilometer. Since not a of this land area is settled, and since the greater majority of the population live on sandy ridges, it is useful to discuss the density distribution obtained from the road survey (See Figure 3.2).

Density distribution is based on the density of each 3.78 square kilometer segment counted. (5km X .75km) 75% of the estimated number of people surveyed live in densities of 126 people per square kilometer or less. The highest density recorded was in the Banton-Mading Achuing area at 189 people per square kilometer.

The Ngok Dinka settlements are mostly small hamlets of five to ten households. In more populated areas the hamlets approach the size of villages. Abyei Town is the most densely populated center in the Abyei Study Area. Although the town's total land area was not measured, it is estimated to be not more than eight hectares. Therefore, the town density is 215 people per hectare. Density figures for other African nomadic societies are based on the total land area used by the people and livestock. For societies with mixed livestock and crop economies, where crop cultivation is emphasized, population densities are very high. In Teso District of Uganda it is 85 people per square kilometer (Allan, 1965, 189). For mixed economies where livestock production is emphasized, densities range from 0.96 to 5.2 people per square kilometer (Allan, 1965, 309). The overall population density of the Ngok, based on 4500 square kilometers of land, is 6.7 people per square kilometer, slightly higher than similar mixed economies. On the other hand, Ngok population are congregated on limited sandy ridges, and the densities are expected to be very high. The road survey gave an average of 77.5 people per square kilometer living on 100 square kilometers of surveyed sandy ridges.

Fig 3.2

POPULATION DENSITY NGOK DINKA SETTLEMENTS

10°00"

9°00"

28°

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT Dinka name Noong
Arabic name (Naam)

NGOK SETTLED AREA

NGOK USE AREA

POPULATION DENSITY: people/km²

LOW, 17 – 54 p/k²

MEDIUM LOW, 55 – 90 p/k²

MEDIUM 91 – 126 p/k²

MEDIUM HIGH, 127 – 163 p/k²

HIGH, 164 – 191 p/k²

0 1 2 3 4 5 10 20
Kilometer

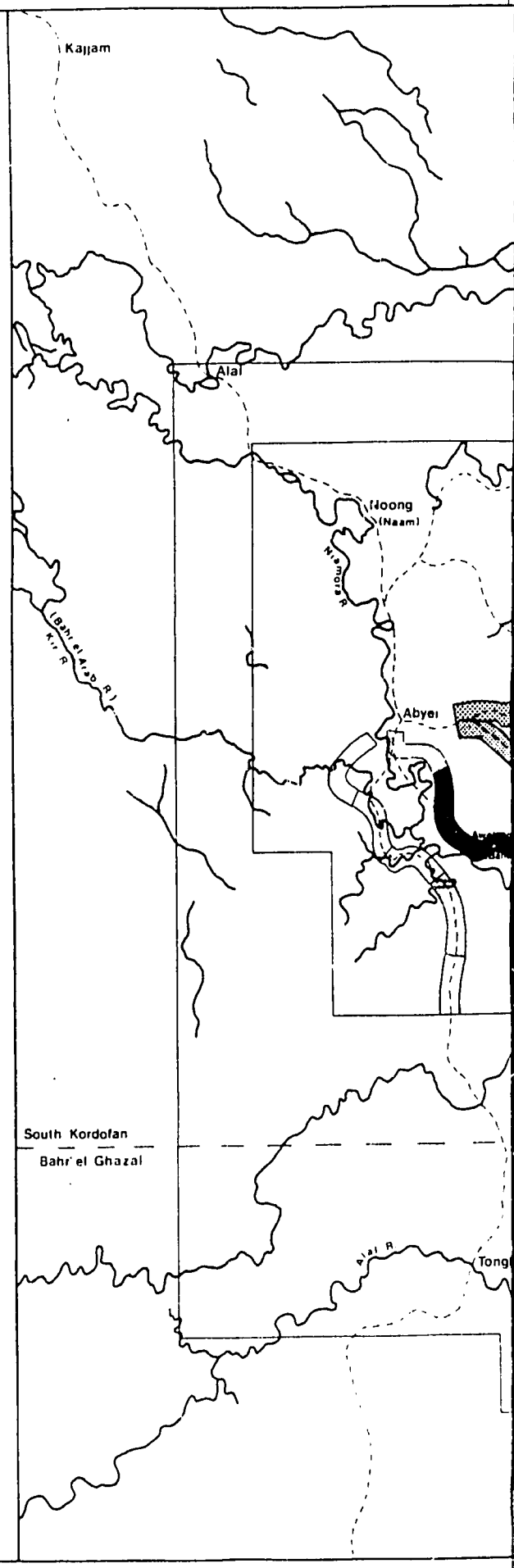
Names and boundary representations are not necessarily authoritative

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March – May 1980 by Jane Hayes

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir

for Harvard Institute for International Development



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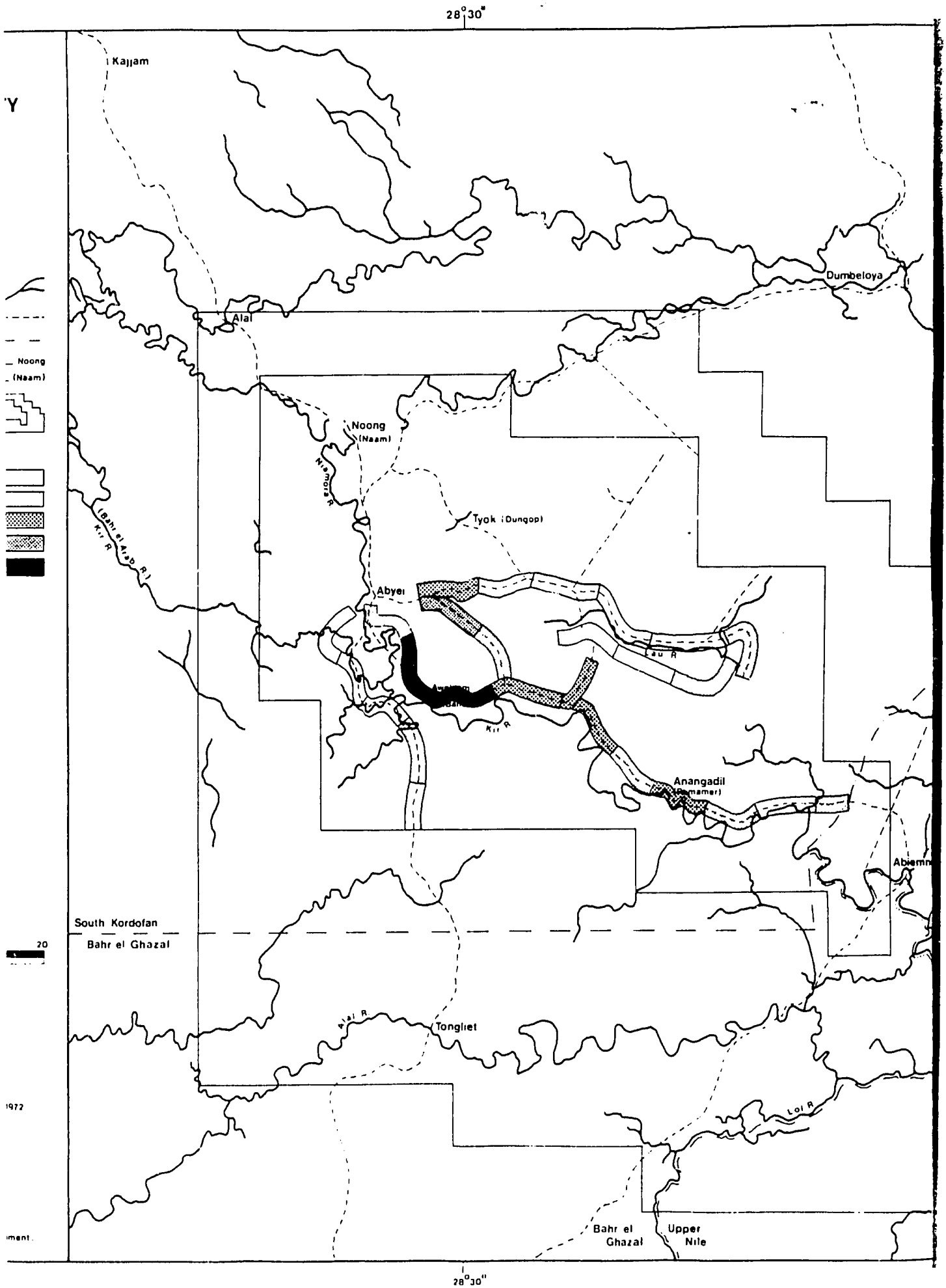
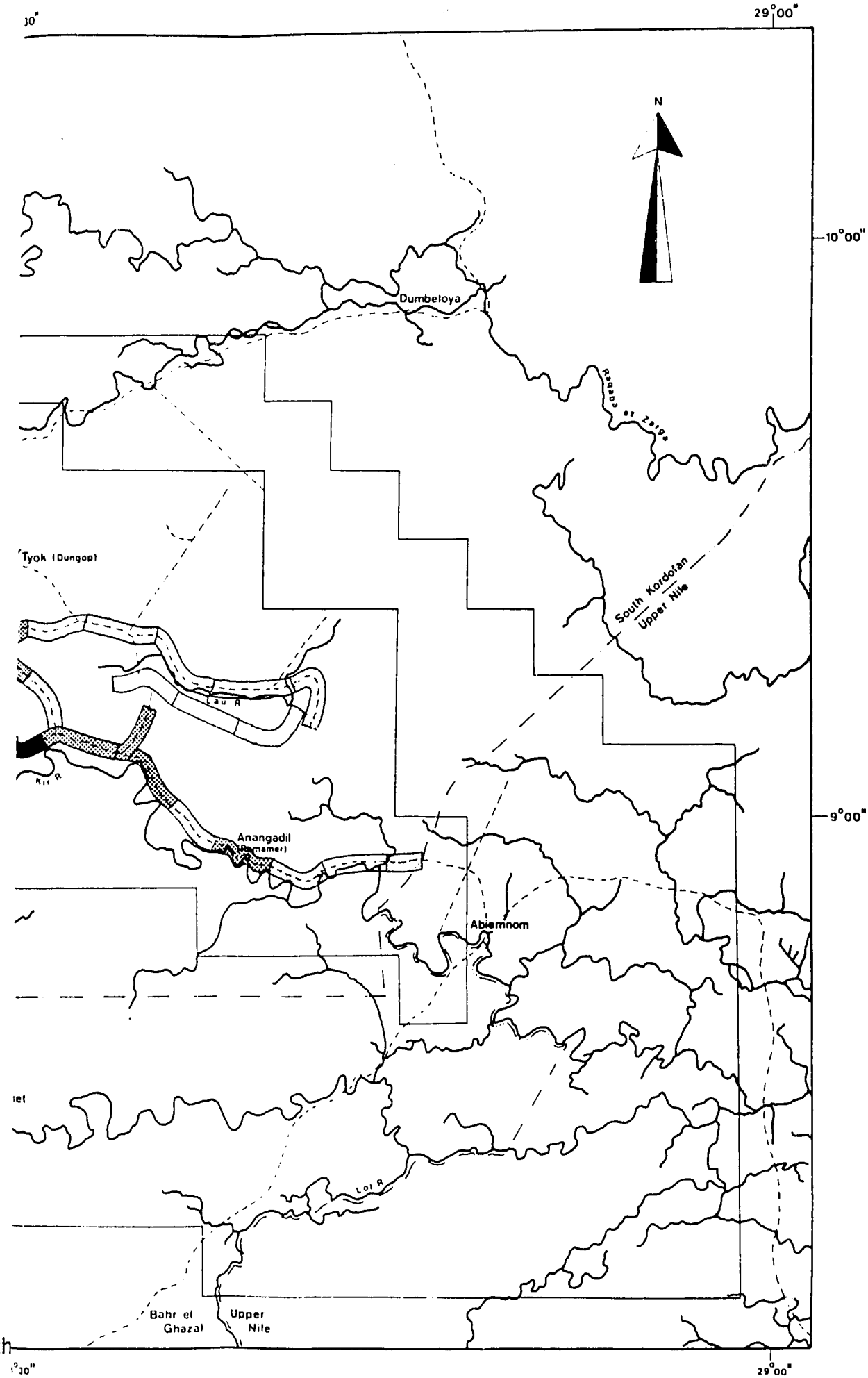

28°30"
Kajjam
Dumbeloya
Alal
Noong
(Naam)
Noong R.
Tyok (Dungop)
(Bahr el Arab R.)
Kir R.
Abyei
Lau R.
Kir R.
Anangadil
(Bamamer)
Abiemn
South Kordofan
Bahr el Ghazal
Wai R.
Tongliet
Loi R.
Bahr el
Ghazal
Upper
Nile
28°30"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Upper Nile
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Ghazal
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Nile
29°00"

From th

3. Local Organization

The Ngok Dinka's socio-political organization is based on two systems of identification. One is the clan, which is based on kinship and blood ties. The clans trace their decendence from the original clans that migrated to the present area. The other system of identification is the subtribe, based on geographical territories. The two principles interact to form the complex Ngok socio-political structure. Within each subtribe there is a dominant lineage belonging to the two main chiefly clans of Fajok (or Pajok) and Diendior (Deng, 1971, 17). Nevertheless, these two chiefly clans are identified mainly with the Abior and Manuar subtribes respectively. Figure 3.1 shows the rought boundaries of the subtribal territories. The livestock survey used the subtribal territorial principle as the main delineator of social organization within the Ngok community.

The hierarchy of political leaders is based on the subtribal territories. The "sheikh", the lowest of the hierarchy, is a leader elected by a territorial village. He has two main functions. One, now defunct, is the collection of taxes. The other is the arbitrator in disputes between villagers. Disputes that cannot be resolved by the sheikh are referred to the next higher political leader, the chief or "umda". There are nine chiefs, corresponding to nine subtribes. The office of the chief is passed down from father to son, and they usually come from the more powerful clans. The traditional position of the paramount chief, was formally established by the British Colonial Administration, but recently has been abolished by the central Sudanese Government, although among the Ngok the paramount chief still exerts considerable influence.

Local politics among the Ngok has had two basic currents. One is the local political competition between the current paramount chief (led by Fajok-Abior) and the "opposition group" (led by Diendior-Manuar). The other current is linked to the national problem of north versus south. Both of these currents have intermingled, leading to serious conflicts that sometimes have resulted in assasinations and skirmishes. The role of the northern national government and its administrative responsibility for the Abyei area

has not always been clear. For a detailed description of the political scene, the reader is referred to Huntington, 1981.

One result of these political currents has been the abolition by the central government of the traditional unitary court in Abyei Town which was to be replaced by two courts. In the reshuffle the "opposition group" was given political supremacy. In reality by 1981 only one court was functioning, that of Abyei Town, and it was using the nationally reorganized penal code based on the Muslim Sharia. It is suspected that the influence of this court does not reach the day to day life of the Ngok since most of their disputes are settled by the Sheikh or umdas. But the Abyei Town court does symbolize the political currents in the area.

As described later in this report the traditional judiciary system has an important role in the safeguarding of social regulatory mechanisms that oreserve the common resources. Therefore, it is important to consider the political currents as they may affect daily management issues.

4. Spatial Distribution of the Population

The Ngok Dinka population can be divided into three spatial categories: the people living in Abyei Town; the people living in villages described as "sedentary"; the "migratory" people who are in charge of the bulk of the livestock population. Each of these is described in this section.

a. Towns

Abyei Town is the only large congregation of people in the Abyei region. Other smaller centers exist in Noong (due to the Muglad-Abyei road and to a borewell), Awelnom (due to the ferry), Mabok and Anangadil (military station). (See Figure 5.4 in Chapter 5) In all of these smaller centers one finds small Ngok merchants who bring wares such as sugar, salt, pepper, fish and some manufactured goods from the Abyei Market, and also act as local collec-

tion - distribution centers for locally surplus sorghum. The price of the former goods in these smaller centers increases as the distance to Abyei increases (i.e. positive correlation) and the price of sorghum decreases as the distance to Abyei increases (inverse correlation).

From the diagram of Abyei Town (see Figure 3.3) sketched in July - August 1980 with the aid of a compass, a total of 633 huts or 207 compounds belonging to the Dinka were distinguished. If we assume a compound is equivalent to a household, then this gives a ratio of 3.06 huts per household. In addition there are a total of 262 huts or 94 compounds belonging to the Arabs, giving a ratio of 2.79 huts per household. A survey of areas and Dinka residents of Abyei Town (Larson, 1980) involving 17 Arab and 41 Dinka households shows an average of 6.35 people in an Arab compound and 5.44 people in a Dinka compound. These figures indicate that the Arab population live in slightly more crowded conditions than Dinka residents (2.28 people per Arab hut; 1.78 people per Dinka hut). It is estimated that there are 1126 Dinka and 597 Arabs, or a total of 1723 people living in Abyei Town. This figure excludes the army and police personnel and their families since permission was not given to survey them.

During the wet season the Dinka residents engage in cultivating garden plots with sorghum, maize and vegetables such as okra and cucumbers. The Arab population consists mainly of merchants and their families. They also cultivate vegetables, although on a smaller scale than the Dinka.

There are 37 byres in Abyei Town belonging to Dinka and 11 byres belonging to Arabs. In other words one byre to every six Dinka compounds and one to every nine Arab compounds. A survey of 15 Dinka byres showed on the average 20.18 cattle and 20.75 small stock in each byre, giving a total estimate of 768 small stock and 747 cattle owned by the Dinka in Abyei Town. Unfortunately the surveyor was not given permission by the Arab population to count their livestock.

The social and economic services available in Abyei Town determine its regional importance. These services and businesses are managed by a combined system of private enterprise and government activity. The hospital is

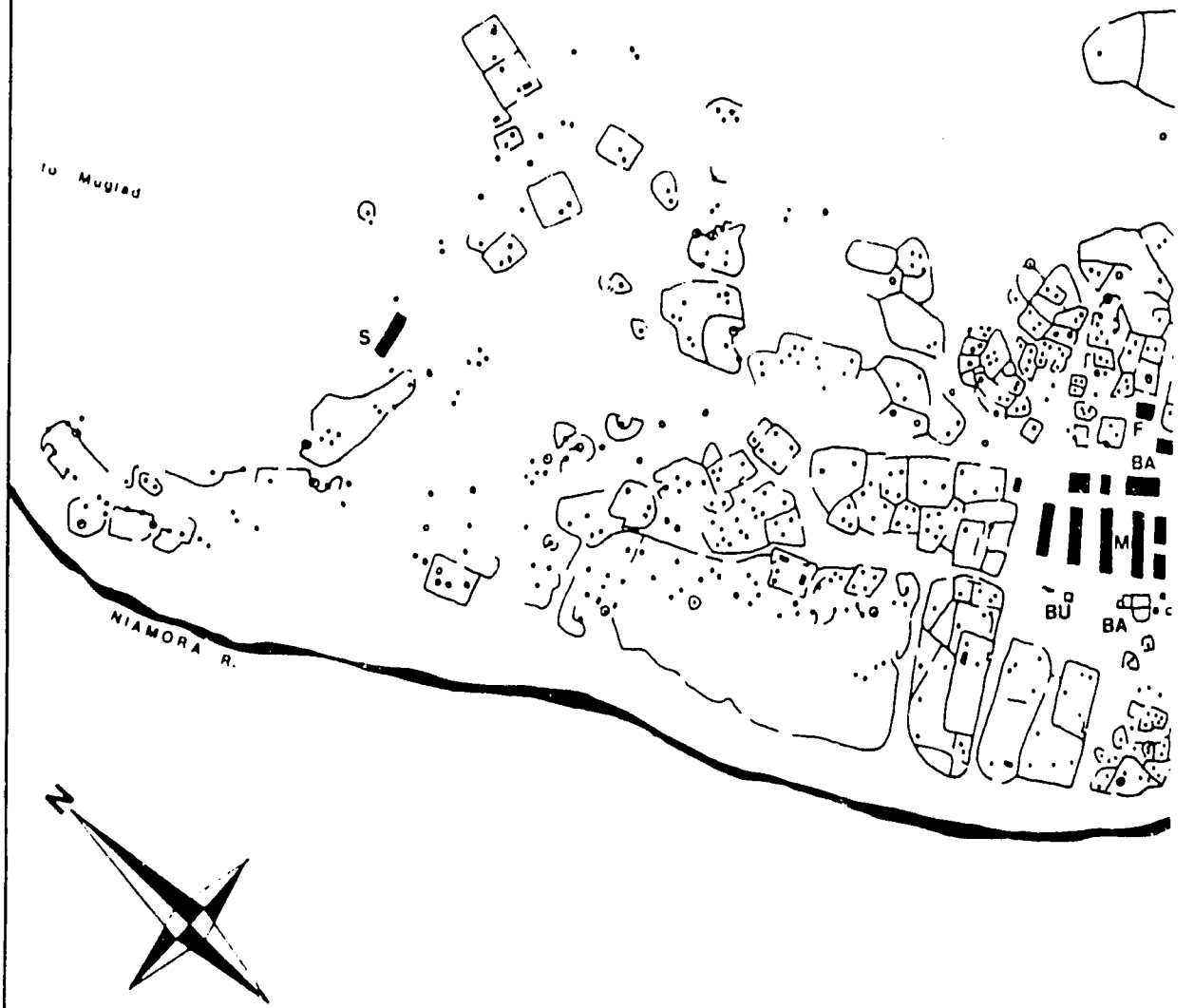
probably the best functioning government responsibility. It is a cement block and mortar compound with a large garden plot which has not been planted in the past two years. Every six months a new doctor is sent from the provincial headquarters and relatively regular supplies of drugs are available. By contrast the veterinary clinic, headed by a veterinarian assistant, rarely has even a minimal supply of drugs. A low budget, lack of independent transportation and lack of political clout are among its major problems. There are two brick elementary schools in Abyei Town for boys and for girls. The medium of instruction is in Arabic. For the past few years the provincial government has appointed teachers, but they have not reported to work. Thus ad hoc groups of local educated Dinka have volunteered for this responsibility. A secondary school has also been built in Abyei Town but has never seen a student or teacher. In 1980 an adult education class was set up by local residents to teach English, but soon became tangled in local politics and was shut down.

The army, police and rural council (RC) stations are housed in brick and mortar structures. The rural council (RC) is an elected body with a president, but whose chairman is an appointee from the provincial government with the formal title of inspector of local governments. In dry season 1979/80 the RC was dissolved by order of the provincial commissioner. With the appointment of a new provincial commissioner in May 1980, the RC was reconvened but most of its members spent the rainy season in Khartoum or Juba, and the RC did not formally meet until November 1980. During all this time the appointed chairman had de facto control over the RC. Even though a northerner, the RC chairman was well liked by the Dinka. He was replaced by a new inspector of local governments in February 1981.

The RC receives a yearly budget from the provincial government for administrative and developmental activities. There are no taxes on either humans or animals in Abyei. The RC receives additional petty funds from fines, market-stall licenses, livestock sales registration fees, vaccination fees and water charges from the deep borewells. With its limited budget it pays salaries of government employees, provides diesel fuel for the borewells and tries to maintain its physical structures. For major operations such as repairing washed-out bridges or constructing earth bunds,

Fig 3.3
SKETCH OF ABYEI TOWN

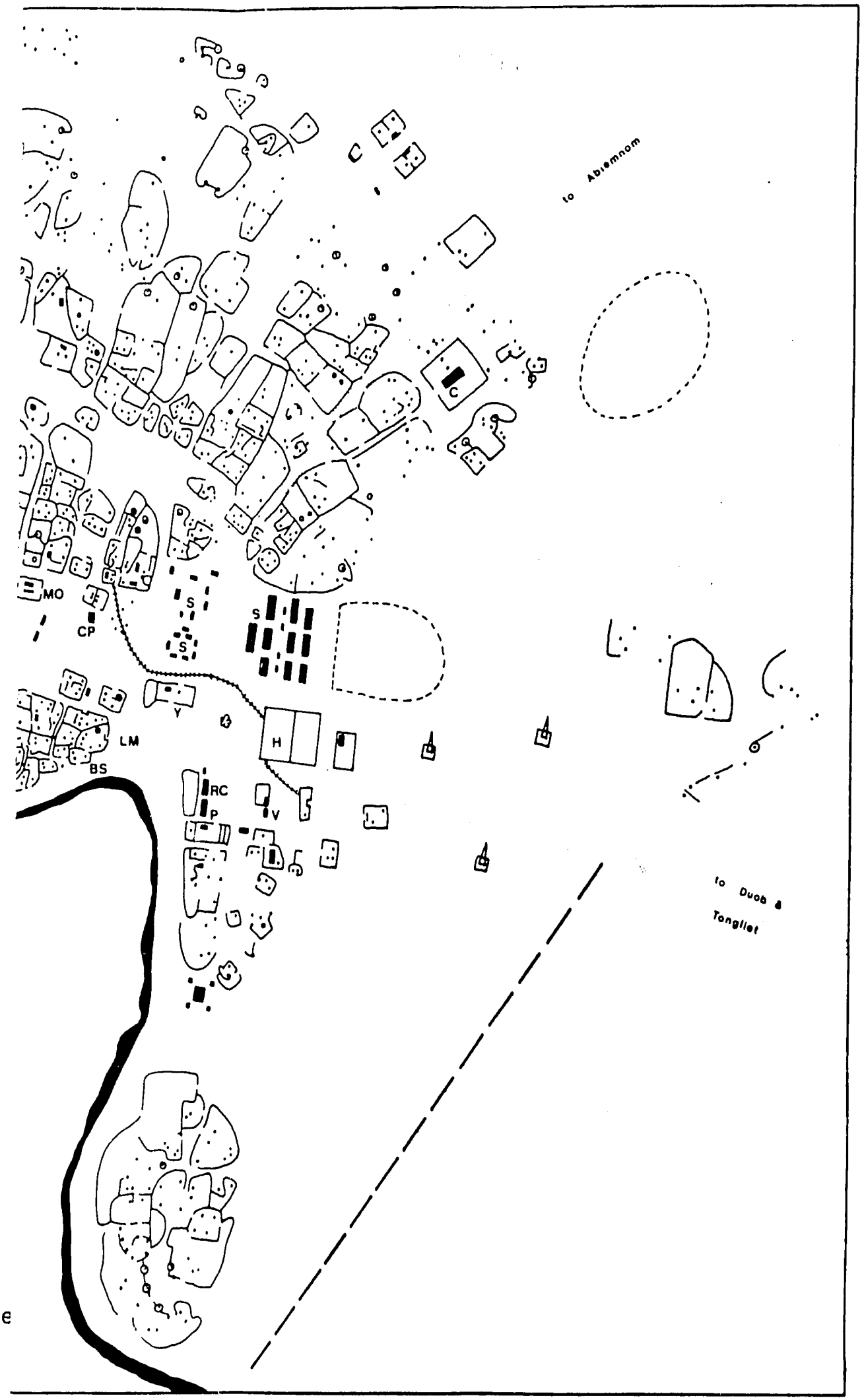
NO SCALE, FOR REFERENCE ONLY



Thatch & Mud House	•	Blacksmith	BS
Animal Byre	⊙	Catholic Church	C
Brick Structure	▬	Cooperative & Post Office	CP
Fence	———	Flour Mill	F
Military Compound	·····	Hospital	H
Local Court	✧	Livestock Market	LM
River	~~~	Market	M
Landing Strip	— — —	Mosque	MO
Vehicular Track		Police HQ	P
Electrical Wire	·····	Rural Council HQ	RC
Deep Borewell	✧	School	S
Butcher	BU	Veterinary Clinic	V
Baker	BA	Youth Club	Y

Sketch based on compass & crude yardstick during field surveys July – August 1980 by Maryam Niamir.

From



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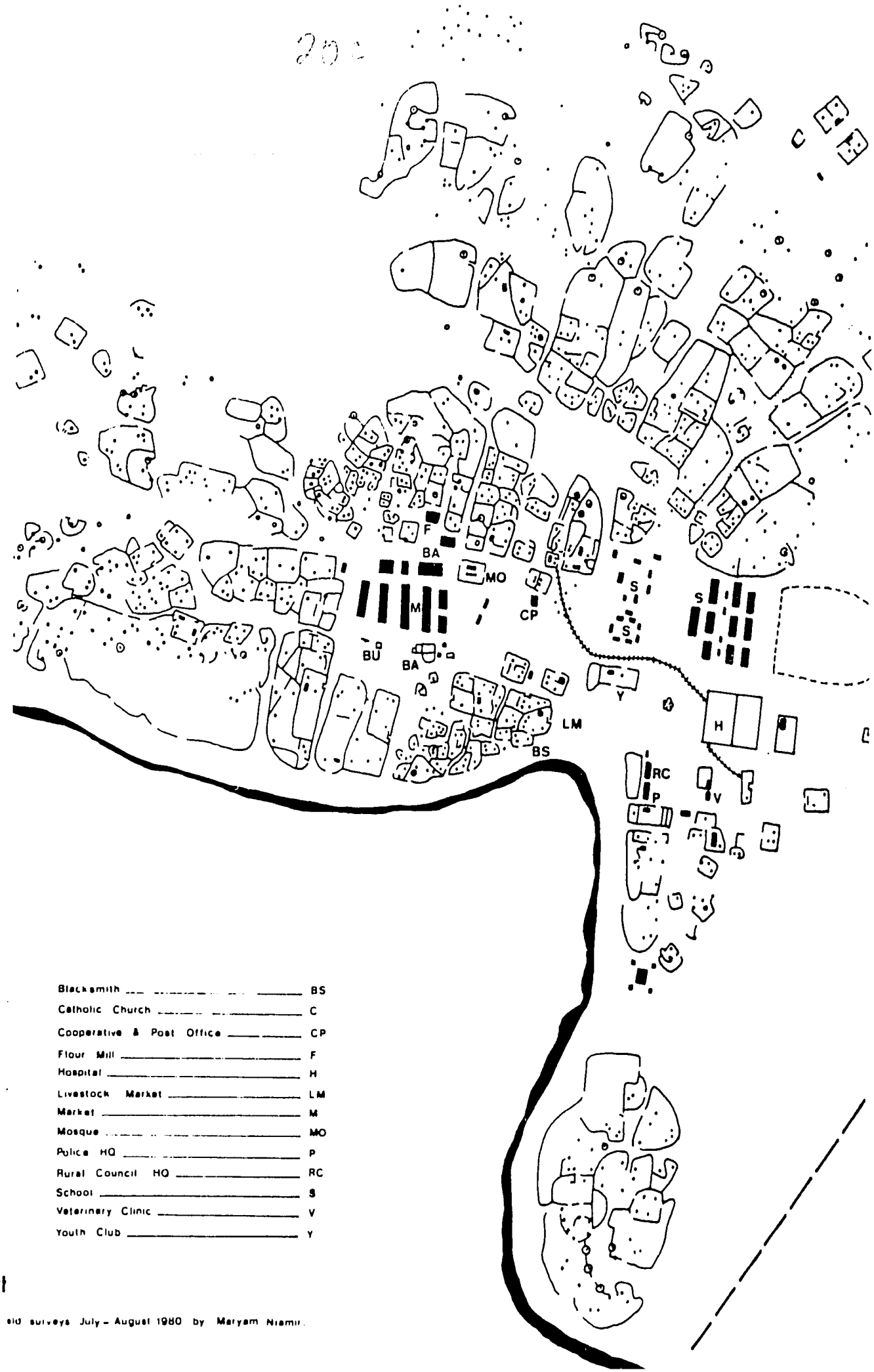


Blacksmith	BS
Catholic Church	C
Cooperative & Post Office	CP
Flour Mill	F
Hospital	H
Livestock Market	LM
Market	M
Mosque	MO
Police HQ	P
Rural Council HQ	RC
School	S
Veterinary Clinic	V
Youth Club	Y

From tl

eld surveys July – August 1980 by Maryam Niamir.

the RC is effective in mobilizing local (Arab merchants and Dinka) labor.

The other services available in the town are managed by private enterprise. There are two bakeries fueled by firewood. An engine powered general grinding mill is owned by a Khartoum merchant. The retail stores are effectively controlled by Arab merchants. These merchants invariably have links in El Obeid or Khartoum and are part of the "jellaba" merchant system. They own most of the stall space which they rent out to Arab or Dinka petty merchants. The majority of these stalls are made from tin plates nailed together and resting on wooden frames. There is a bicycle repair store controlled by an Arab merchant. There are three butcher stalls owned by Arabs and catering entirely to Abyei residents. The butchers take turns in buying and selling meat. The slaughtering is done under very unhealthy conditions by the river in a heavily populated section of the town. An attempt by the ADP in October 1980 to convince the butchers to relocate the slaughtering place to an unpopulated area was emphatically rejected because of the greatly increased distance to the market even though the projects' offer of building butchering slabs and hooks was greatly appreciated. Accumulated waste from the market place is left scattered over the area and is not disposed of properly.

A women's daily market is held under some trees and exposed to heat, rain and dust storms. Farm surpluses such as sour milk, ghee, vegetables and poultry are available regularly in the women's market.

The merchants and the various Dinka sheikhs and umda's residing in the town are an active social and political force. Funds and labor have been raised to repair the local mosque, to assist the RC in its activities, and recently, to build a mud and thatch social clubhouse. Another active force is the Youth Club, an association set up by the local SSU (Sudan Socialist Union), which engages in cultural activities and is a political forum.

There are four to five Dinka and Arab blacksmiths in Abyei who mainly produce spears and hoes.

The town is located on a sandy ridge, on a bend of the Niamora River,

which in the wet season floods the livestock market, the blacksmith stalls and major pedestrian and vehicular pathways. Its vehicular roads enter the town through the market place and leave for the south amid a jumble of narrow residential roads. In the dry season these and the pedestrian pathways are replete with wheel ruts, cattle hoof marks and deep holes. In the rainy season the mud and puddles make transportation difficult and are breeding grounds for mosquitoes and other insects.

The only source of electricity is the hospital generator which runs every night for a few hours and powers the hospital, the medical assistant's residence, the official government residences and the residence of an influential Arab merchant. Theoretically it is available to anyone who can afford to erect power transmission lines.

The deep borewell constructed about ten years ago is located on the outskirts of town and operates a total of six hours per day. Unlike the other borewells in the Abyei area, the one in Abyei Town remains functioning throughout the year. The users are charged £S 0.02 per four gallons. The users, not all of whom are town residents, are willing to pay the fee for the clean water even when abundant surface water is available in the rainy season. There are numerous boys who distribute water to the town residents with leather sacks slung over donkeys. Apparently the number of these small enterprises has been increasing rapidly in the past five years. They were originally exclusively owned by Arab merchants, but recently a few Dinka merchants have been getting involved.

On the southern outskirts of the town there is an airstrip running east to west, which has been recently improved and enlarged to 1100 meters by the ADP.

Night soil is either located in individual pit latrines, or like the hospital and school refuse, is dumped in an open area about 500 meters across the airstrip from the borewell. It is a dangerous breeding area for disease vectors.

There is no historical data on the growth of the Abyei Town. Nevertheless, popular history indicates a fairly rapid increase in population and

spatial layout. There are no formal zoning laws, but there are informal, tacit rules that are enforced through popular opinion. There is as yet no segregation by income, although there is a tendency to locate near relatives. The only visible segregation is between Arabs and Dinka households.

b. Sedentary Villages and Hamlets

The majority of the sedentary population inhabit the top or the slopes of sandy ridges. Here they will build a cattle byre, a few huts and cultivate a garden plot. In general homesteads are widely dispersed with only two to four homesteads making up a hamlet.

A survey of household population was carried out in conjunction with the livestock survey. A total of 44 households were chosen from various representative areas. A slight bias exists in that only those households who owned livestock were included, thus the sample may be skewed toward larger households than the true population. On the average there were 7.68 people per household (s = 4.03)* Furthermore, there is a tendency to congregate into certain areas in the dry season, while in the wet season there is a homogeneous dispersal of people among homesteads. In normal dry seasons (that is, when political instability is not an issue) many of the northern homesteads are temporarily abandoned because of lack of water. People will migrate to homesteads of relatives or friends that are near permanent sources of water, such as the deep borewells or the major rivers.

On average 50.59% of people counted were women. A high proportion of the people are children between 0 to 4 years with a tendency toward more male children. There are proportionately more women above the age of 20 than men. (See Table 3.2). The majority of the people in a household (73.7%) are related directly to the head of the household (wife, sons, daughters and wife's relatives). The next frequent relationship is the brother of the head of the household and his family (13.84%). (See Table 3.3).

The sedentary Ngok population in general cultivate various varieties of dura (sorghum bicolor) as a main crop on the domdit or large field,

* s is standard diviation.

Table 3.2

Sex-Age Distribution of Members of 44 Byre-Owning Households

	Number	Percent		Number	Percent
Male 0 to 4	41	12.13	Female 0 to 4	32	9.47
Male 5 to 19	64	18.94	Female 5 to 19	65	19.23
Male 20+	62	18.34	Female 20+	74	21.89
Total Male	167	49.41	Total female	171	50.59

(The above includes dry season 1980/81 and the wet season 1980.)

Table 3.3

Relationships of Members of Household to Head of Household (hhh)

Related to head of household (hhh)	73.70%
Related to brother of hhh	13.84%
Related to father of hhh	5.88%
Related to sister of hhh	3.81%
Related to mother of hhh	1.73%
Related to friend of hhh	1.04%
	100%

(The above includes dry season 1980/81 and wet season 1980.)

that averages 1.5 hectares per household (Ackroyd, 1981). This crop is often interspersed with small amounts of sesame which the people believe reduces the incidence of Striga hermonthica, a parasitic weed on sorghum. In general, the longer a household has stayed in one place, the farther away is their domdit. This is due to the loss of fertility of the land associated with continuous cultivation. Immediately adjacent to the huts is the ngai or garden plot which is cultivated with a variety of vegetables much like those cultivated in Abyei Town. The size of these plots averages 0.5 hectares (Ackroyd, 1981). A common practice is to rotate the cattle byre within the ngai to take advantage of manure fertilization. Crop cultivation is the main responsibility of women, and it is common to find all the wives of one man having separate but contiguous ngai. But the most common pattern for a man with many wives is to locate his wives in separate villages.

The cropping activity, though, is carried out by both men and women (see Ackroyd, 1981). The land clearing and sowing season generally starts in May/June when the young girls return from the toich cattle camps to assist in the operation. During the rainy season there are at least two weeding periods. Harvesting starts in August with short growing sorghum, maize and some vegetable crops. The main sorghum crop is harvested in September/October and ratooned. The second sorghum crop is harvested in December/January. During this time there is much movement of people between the cattle camps and the homestead.

A number of cattle consisting mostly of milking cows and sheep, goats and poultry are kept at the homestead all year around. (See Chapter Six on herd structure). Milking cows that approach the end of their lactating cycle are sent back to the camp, and new milkers are brought back into the homestead. In most cases the milk yield on a homestead is consumed by the family. Some may be given to relatives or neighbors. A further part of the surplus may be sold in the Abyei market (see Chapter Nine on milk marketing).

c. Migratory Population

The Ngok Dinka cattle camps are continuously on the move year round. These movements vary from short trips to relatively long hauls, depending on the time of the year (see Chapter Six on migration). Each camp is made up of a number of hearths, the number fluctuating with the season. A survey of 31 hearths during 1980-81 showed that there are on average 4.65 people per hearth (s = 2.09). In the wet season camps are larger and closer to the homesteads, and there is much mobility of people among camps and between camps and homesteads.

The people in the camps lead a more leisurely and relaxed life than the sedentary population. Consequently, the average number of people per hearth is higher than three people per 100 head of cattle, which the Dinka claim to be a sufficient ratio.

The majority of people in a hearth are male (73.61%) with most of these

being above 20 years of age. There are very few children in the hearths and very few females above 20 years (see Table 3.4).

Table 3.4

Sex-Age Distribution of Members of 31 Hearths

	Number	Percent		Number	Percent
Male 0 to 4	7	4.86	Female 0 to 4	2	1.39
Male 5 to 19	33	22.92	Female 5 to 19	33	22.92
Male 20+	66	45.83	Female 20+	3	2.08
Total	106	73.61	Total	38	26.39

From the age/sex distribution the following scenario develops. Young children remain in the homestead until they are five to six years old. Thereafter they are sent to the cattle camps depending on the balance of labor needed. Young girls are preferably kept at the homestead to care for the children, while young boys are sent to the camps to herd the cattle. But this is by no means a rigorous distinction. If there are not enough young boys to herd the cattle in the camps, young girls will take their place. Young girls also perform cooking and milking responsibilities in the camp. In general Dinka will return to the homestead upon marrying age and stay there more or less permanently: girls at the ages of 15 to 20 and men at the ages of 35 to 40. A man may continue to herd the camp cattle after marriage until his sons grow old enough to become head of hearths (usually when they are over 20).

Such a scenario is simplistic since it focuses on a nuclear family unit as an independent entity. Such is not the case in nomadic societies where survival of the individual unit depends on cooperation with other units. As we saw, the composition of a household is more or less directly centered around the head of the household. The membership in a hearth is more variegated. Only 15.32% of members are directly related to the head of the hearth (N = 31 hearths). Most of the members are related to the father of the head of the hearth. Table 3.5 shows the breakdown of relationships of members to the head of the hearth.

Table 3.5

Relationship of Members of Hearth to Head of Hearth (hh)

	Number	Percent
Related to father of hh	41	37
Related to brother of hh	18	16
Related to hh	17	15
Related to sister of hh	16	14
Related to mother of hh	10	10
Related to friend of hh	9	8
Total	111	100

Such a breakdown coincides with informant observations that each hearth is affiliated with at least ten households by way of either kinship and/or taking charge of their cattle. Unlike the Missiriya tribes to the north, camp and even hearth affiliations among the Ngok Dinka are very fluid. Camps may be formed with Rueng, Rek, Twich (all Dinka tribes) and even Nuer hearths. There is no consistency in camp composition from year to year, although pairs of hearths may remain together for a few years. Thus camp composition depends on both friendship relations as well as the availability of grazing resources in each particular area.

The dynamics of a sedentary/migratory system is a rational response to the availability of resources and the environmental constraints. In the wet season the cattle camps return to the vicinity of the homestead, during which time the labor pool for cultivation is increased. During the dry season the camps travel further south in search of pastures, while the sedentary population engage in activities such as land clearing, housing construction and wood gathering for sale in the market.

5. Interaction of Study Area with the Region

The Abyei area is under the jurisdiction of the south Kordofan province, even though it is occupied by people who see themselves as southerners. The Abyei Rural Council (RC) is administratively part of south Kordofan province with its provincial headquarters in Kadugli (see map of Sudan and regional

map, Figure 1.1). The elected rural councils from the base of a hierarchy of district, and then province, people's councils. The Abyei area has had a long history of intentional or unintentional discrimination by the provincial administration. This has been an important factor in the factional split within Abyei, between those who favor being part of the southern region and those who favor the north.

Immediately north of the Abyei area is a vast "no-man's" land stretching 80 kilometers northward and about 150 kilometers from east to west. Except for a few settlements near the borewells, there is no other settlement in this area. It is part of the migration route of the Missiriya Humr tribal confederation, whose homeland is to the north of this no-man's land.* The Missiriya Humr are a largely nomadic tribe who spend the wet season in the area around Babanusa where they may cultivate millet. As the dry season progresses the Missiriya form cattle camps and move south with the water. In recent years there has been a trend toward spontaneous sedentarization. Some households may remain all year round near the bigger towns of the north. Others may migrate short distances with their families and cattle to Dumbeloya and Fawal. It is only the richer households with considerable number of cattle who can afford, and simultaneously need, a long trek to better pastures in the south (Huntings, soon to be published).

To the west of these people reside the Missiriya Rizeigat. The Rizeigat and Humr tribes traditionally migrated south of the 10 degree parallel in the dry season. The Rizeigat use the western pastures in S. Darfur and parts of northwestern Bahr el Ghazal province. In the past the Humr would sweep down in a southeastern direction into the Abyei and sometimes beyond into the Upper Nile and Bahr el Ghazal provinces. Each subsection had a traditional route. Those that used the Abyei area were mostly Awlad Kamil (including the nazirate or paramount chief), Awlad Omran and Mazaghna.

In 1965 a wave of hostilities broke out between the Ngok Dinka and Missiriya Humr which has continued spradically ever since and again approached crisis proportions in 1981. There are many reasons for these conflicts. The harassment of the Dinka by the northern (predominantly Arab) army, ostensibly in search of Anyanya or southern rebels of the civil wars, exacerbated the

* See Cunnison, 1966.

situation and created a mistrust of the government. Accusations of theft of livestock provided sparks that flared up into violent clashes sometimes resulting in hundreds dead. The national army which is under provincial authority provides differential treatment to the two sides. For example, in the recent 1980-81 conflicts the army placed security guards only in the Missiriya camps, thus proving their "collusion" with the Missiriya in the eyes of the Dinka. The recent crisis has extended beyond Abyei to Rueng and Nuerland with reports of fifty Nuer killed.

Chronicle and analysis of the Missiriya Humr - Ngok Dinka interaction has been provided in Huntington (1981). Suffice it to say that the Missiriya are wary of the Abyei area joining the southern region for fear of losing control over these dry season pastures. Their other dry season pastures are already under the control of the southern region, although the Missiriya are still able to use them.

To the south of Abyei in the southern region are the Rek, Twich and Rueng tribes, all part of the larger Dinka people. To the east of these are the Nuer people (Figure 3.1). There is much harmonious interaction and marriage between the four Dinka tribes, although isolated disputes are inevitable. A long history of hostilities between the Dinka and the Nuer have been recorded by anthropologists to the point of being a cause celebre.* At the moment these hostilities are isolated and involve small thefts or disputes over pastures. The Dinka - Nuer conflicts are tame and localized when compared to the Dinka - Humr conflicts. The latter have strong national implications and are highly politicized.

More importantly these tribal contacts provide an opportunity for the spreading of ideas and assimilation of social traits. The Ngok Dinka are situated in between the northern and southern tribes and come into contact with the northerners more often than other southerners. Through the years the Ngok Dinka have adopted the dress of the north, and for those Dinka who have travelled north, even the religion.

The movements of these various tribes across the landscape in search of pastures is a marvelous choreographic piece of adaptation to environmental constraints. Each tribe occupies the area vacated by another tribe as the

* See Evans Pritchard, 19..

seasons progress. The southern livestock are able to tolerate wetter conditions than the Abyei livestock and similarly the Humr livestock can tolerate drier conditions.

The other type of interaction of the study area with the region is economic. Abyei Town is a major regional marketing center. It is supplied with merchandise and some foodstuff by the northern Arab merchants (jellaba) and serves not only the Abyei area population, but also the nearby southern people. It is also a major livestock trading center where southern cattle are exported to the north. The importance of Abyei in regional economics and as a conduit between north and south must not be ignored.

6. Conclusions

With a total population estimated at 31,000 the Ngok Dinka divide their lives between a sedentary and a migratory existence. In this way they are able to invest in two major agricultural activities, crop and livestock production.

Abyei Town is the main scene of congregation, of political activity and of economic links to the north and south. The present level of services in the town could be improved to provide greater outreach to the region. Only then can improvement of secondary centers such as Anangadil be contemplated.

The Ngok Use Area (NUA) is used by various northern and southern tribes in what appears to be a very efficient and coordinated way. Tribal conflicts are inevitable, but more importantly, tribal contact influences changes and assimilation.

Local politics has direct repercussions on the longstanding national issue of the boundary between the northern and southern regions. Many Ngok Dinka hope that formal affiliation with the southern region will stop the present discrimination by northern government bureaus and will allow Abyei to prosper with new and better services. Unfortunately, the southern government is lacking enough resources at the moment to even reach the western and central areas under its present jurisdiction. The political fate of the Abyei Area is still unclear, but its economic role is an important one and is expected to continue in the future.

Chapter Four: Livestock Population

1. Introduction

This chapter introduces the Ngok Dinka livestock and compares its breed to the other livestock that use the area. Furthermore, an attempt is made to estimate the total livestock population of the Ngok Dinka, and the total biomass in the Abyei Study Area. Such estimates are invariably shown to be wrong when more data is collected, but the amount of information available now, and the fairly high level of confidence placed on its collection, allows us to proceed and to present these as first approximations of reality.

2. Description of Types

Cattle: There are two major breeds of cattle in the Abyei Study Area. Those herded by the Dinka are the "Nilotic", also known as "Southern Sudanese Longhorn." They are of the Sanga type and are probably descendants from ancient crossbreeds between Hamitic Longhorn humpless cattle, and humped Zebu cattle (Williamson, 1978). They are similar to Nuer and Shilluk cattle. The second are the Northern Sudanese Shorthorned Zebu. Those owned by the Missiriya tribesmen are probably of the Baggara type which are of very mixed origin.

The Dinka cattle are generally considered to be very hardy and are tolerant to some extent to a variety of diseases and internal and external parasites. They are adapted to living in tropical and semi-tropical areas. The Zebu appear to be more tolerant of rinderpest than Sanga cattle, and also better suited to living in arid and semi-arid areas. (Williamson, 1978).

The cattle owned by the Ngok Dinka are primarily Nilotic or Sanga type, but have been crossbred extensively with the Northern Zebu (Baggara) type. As such, they are very adaptable to the transition zone climate that characterizes Abyei Area. There have been no records of attempts to breed Ngok cattle with exotic or foreign breeds in the Abyei Area. There probably exists a wide gene mixture in both major breeds of the area, with potentials for selective breeding.

Sheep: The Dinka sheep have hairy coats and are thin legged. They are generally classified as a separate type within the African hairy-coated category. Within the Ngok Dinka herds, there is considerable crossbreeding with West African Dwarfs, Fulani and Nilotic types of sheep. The Dinka sheep are similar to the Nuer and Shilluk sheep. Sheep in general are not well suited to swampy environments, so the present populations are probably descendants from the fittest individuals. As such, their numbers are comparatively few and they are hardy and tolerant of climatic, nutritional and disease stresses. However, they are not tolerant of water deprivation (Payne, 1977). They are poor milkers and are generally raised for their meat.

The Missiriya tribesmen own primarily Sudanese Desert sheep with fat tails and hairy coats. When the animal is in good condition, the tail carries considerable amount of fat. They are considered to be good milkers and are more tolerant of water deprivation than the Dinka sheep.

Goats: Dinka goats are of the Nilotic or Southern Sudan type. They are low milkers but have more milk than the Dinka sheep. They are hardy and tolerant of diseases and internal parasites. The Missiriya have comparatively few goats. They are probably crossbreeds between the high milk yielding Nuban and the Nilotic goats.

Donkeys, Horses and Camels: The number of donkeys and horses in the Abyei Area is almost negligible. They have been imported into the area very recently and are used as beasts of burden. The RM&R/Watson Aerial Survey in 1976 estimated that there were 212 donkeys in Strata 36. This strata corresponds but is also much larger than the study area defined by the ADP. The major constrainst to the survival of domesticated equines in the Abyei Area is their very low tolerance to diseases and internal/external parasites of a semi-tropical habitat. There are no camels in the Abyei Area. The Missiriya have considerably more equines and camels, but these are generally left behind at their northern settlements and not brought into the Ngok Use Area.

Fowl: Poultry have been introduced relatively recently in the Dinka livestock economy. They are of an indefinite and varied breed. They are small in body size and produce few eggs during the year. The eggs are small and have very thin shells. Recently, the ADP Health Program has introduced four breeding roosters (crosses of male Light Sussex and female Rhode Island Red), and 50 chicks from the Animal Research Laboratories, Khartoum. All roosters have survived and are at present distributed among various households as part of the Improved Nutrition Program. The chicks had a survival rate of 50% and are also distributed among households.

Other types of fowl in the area are guinea fowl, duck, geese, and ostrich. They are relatively few in number, although their population increases in the South. They are hunted for their meat, and small children gather their eggs. Some rare cases of domesticated guinea fowl and ostrich were seen in the Abyei Area.

Wildlife: The major wild ruminants are primarily Red-fronted gazelle, common Duiker, Oribi, Bushbuck, Warthog and a few hippopotami (Haltenorth, 1977). The major monkey species are Anubis Baboon, Patas or Red Monkey, and a variety of Green Monkeys, especially Vervets and Grivets (Dorst, 1970). Local information suggests that the number of game animals in the Abyei area has substantially decreased in recent years, probably due to two factors. One is that the drier climate has forced southwardly migration, where they are able to tolerate trypanosomiasis much better than domestic animals. Secondly, the incidence of hunting with automatic rifles has increased.

The results of the EMAR/Watson Aerial Census on wildlife of South Kordofan (Vol. 24) and Bahr el Ghazal (Vol. 20A) Provinces in Sept. 1976 have been collected (Table 4.1).

3. Livestock Numbers

There are many difficulties in estimating the total number of livestock owned by tribal populations. Livestock are the medium of exchange for social transactions such as bride-price, loans, debt repayment, fines, etc. A

Dinka will never be frank about the number of cattle he owns for fear of pushing up the price of such social transactions. For the same reason, he will distribute his cattle among relatives' and friends' byres or camps to "hide" his cattle. Thus a questionnaire-census approach to estimating the total number of cattle owned by Dinka is futile. An aerial survey approach like the one done by RM&R/Watson in 1976 is useful in estimating total numbers, but it is impossible to differentiate the total number into those owned by a certain tribe, or household. Furthermore, because of the migratory movements and daily grazing habits, it is easy to miss a substantial number of cattle. Given the lack of time and resources, no attempts were made by the ADP livestock survey to estimate the total livestock poulations of other neighboring tribes. The only concern was to estimate how many non-Ngok livestock used the Abyei Study Area.

Table 4.1 Results Compiled from RM&R Aerial Survey 1976

	Abyei Strata* (Strata 36)	All South Kordofan	North Eastern** Bahr el Ghazal	All Bahr el Ghazal
Wildlife (herbivore) biomass (Tons)	95.5	543	1273	182,005
Livestock units (LU=300 kg)	318	1811	4242	606,685
Biomass Density (kg/km^2)	12	4	79	1,412

* Includes an area extending eastward from the NUA - total of 7957 km^2
**Includes strata 13,14,16 & 27 - total of 16108 km^2

The method used by the present research to estimate the number of livestock owned by Ngok Dinka is based on the enumeration of a sample of byres and camps both in the wet season and dry season. The enumeration was done at a time of day when the livestock were actually pegged at the byre or camp, and is judged to be accurate. Table 4.2 shows the results of the sampling procedures for cattle populations.

Table 4.2: Results of Enumeration of Byre Cattle

	# byres sampled	% with cattle	Avg. # cattle/byre	# hearths sampled*	% with cattle	Avg. # cattle/hearth
Dry Season 1980	11	90	20.67	14	100	123.86
Dry Season 1981	39	36	18.93	41	100	75.69
Wet Season 1980	29	89	15.84	26	100	85.91

* Each camp is composed of a number of hearths.

The wet season sample is slightly biased toward households with byres. The Dry Season 1980 byre sample is very small and there was a definite selection bias toward byres that had cattle. The Dry Season 1981 byre sample is more representative since it is based on a survey of every fifth byre in a total area of 99 km^2. Partially constructed structures were not counted. The Population Density Survey (Dry Season 1981) counted a total of 2145 structures in that area. The sampling procedure (of 71 households) gave a figure of 2.21 structures/household; thus the density survey covered 971 households. Only 462 byres were counted, therefore only 48% of the households had byres (assuming no household has more than one byre). The 52% who do not have byres includes those who had partially built byres, households who are affiliated with byre-owning households, and households who do not have enough resources to build a byre. The number of these latter is probably very small since a newly married man will more often than not build a byre first and all the family will live in it until enough resources are gathered to build a house.

Cattle: The total number of cattle kept in byres is estimated by assuming there are a total number of 3893 Ngok Dinka households (see Chapter 3) and by using the figures of 48% of households with byres, % of byres with cattle, and average cattle/byre.

The Dry Season 1980 camp sample is very small, while the Dry Season 1981 and Wet Season 1980 camp samples are a fairly good sample. The total number of camps is estimated by a ground survey. In the dry seasons it is difficult to estimate the total because an unspecified number will have moved beyond

major rivers that have no means of crossing with vehicles. In the wet season, camps will converge in certain areas and will form a few very large camps; thus it is easier to estimate the total number of hearths.

Table 4.3 shows the cattle population estimations derived from the various sampling procedures:

Table 4.3: Estimated Cattle Population of Ngok Dinka

	Total estimated camp cattle	Total estimated byre cattle	Grand Total
Dry Season 1980	14,863	34,769	49,632
Dry Season 1981	9,159	12,737	21,896
Wet Season A	12,027	26,348	38,375
Wet Season B	12,027	14,802	26,829

Wet Season byre population has been estimated in two ways. The first (A) uses the sampling result that 89% of byres have cattle. The second (B) procedure assumes that such a figure is inflated. Since in the Wet Season, more cattle are taken to the byre from the camp, the % of byres that have cattle must be higher than the 36% in the Dry Season. Therefore, an estimated figure of 50% is used.

The Dry Season 1981 and Wet Season B results are assumed to have greater reliability because of better sampling conditions. Their difference arises from the fact that the Dry Season 1981 camp figure is probably an underestimation since many camps were inaccessible to the survey.

In conclusion, we can say with fair confidence that the total number of cattle owned by Ngok Dinka is a minimum of 27,000. Informants maintain that 50 years ago, there were many more cattle owned by the Ngok Dinka and that the drought of 1972 and especially the civil wars decimated a large number of them. It is fair to assume that the Ngok have been regenerating their cattle herds since then.

Sheep and Goats: Data on sheep and goat numbers were collected in Wet Season 1980 and Dry Season 1981. They were enumerated in the same way that cattle were. One distinguishing feature of Ngok Dinka small stock management is that small stock are always kept at the byre and are never taken to the camps. Table 4.4 shows the survey results for sheep and goats. The procedure used to estimate the total population is the same as that used for estimating total cattle populations in the byre.

Table 4.4: Results of Enumeration of Sheep and Goats

	# samples	% with small stock	avg. small stock per byre	total small stock
Wet Season Sheep	29	36	19.9	13390
Dry Season 1981 Sheep	39	36	22	14802
Wet Season Goats	29	79	19.59	28925
Dry Season 1981 Goats	39	62	29.79	34520

The difference in results between the two procedures is not very significant. Procedurally, there is more confidence in the Dry Season 1981 sample. But Dry Season 1981 is a time when refugees from the nothern areas of Abyei had settled with relatives in the south, inflating the number of small stock per household. Therefore the Wet Season sampling is assumed to be more reliable and those results will be used in the rest of the report.

Initial estimations of Ngok cattle populations by the ADP were based on the RM&R/Watson Aerial survey. Table 4.5 shows the discrepency between the Aerial Survey and the ADP 1980/81 livestock populations.

Table 4.5: Various Estimations of Ngok Livestock Population

	# cattle	# sheep	# goats
RM&R/Watson (1976)	4,823	8,387	8,807
ADP (1980)	27,000	13,400	29,000

The RM&R/Watson aerial survey stratum have been retabulated by Hunting Technical Services, to coincide more accurately with the NUA. Originally, they were based on random samples of transects, flown over at certain times of the day. Sources of bias and error were systematically accounted for, in the final analysis. Yet, given the peculiar geography of the area (see Chapter 5, Range Resources), it is possible that random transects crossing over sandy ridges, savannah land, forest land, etc., would actually underestimate the number of livestock in the area, because of the high concentration of human and livestock populations on the sandy ridges.

The only data available on the number of poultry owned by Ngok Dinka is based on a visual count of 20 mutually exclusive households in Dry Season 1980 and 1981. From this very small sample, 70% had poultry (adults and chicks) at an average of 5.8 per household. Assuming that the sampling procedure is representative, we can estimate that 2725 households own a total of 15,806 head of poultry.

4. Herbivore Biomass

It was not feasible for the ADP livestock survey to estimate the total number of cattle owned by other southern tribes or by northern tribes. Yet it is necessary to estimate the number that would use any portion of the Abyei Area, so that adequate biomass figures can be derived.*

Ngok Settled Area (NSA)

In the Dry Season, this area is used by the Ngok byre livestock, Mi siriya, Fellata, and Rek Dinka camps. In the Wet Season, is is used by Ngok byre livestock, Ngok camp cattle, and some Rek camps. Population estimates of these other tribes are based on visual observation and

* It is assumed that herbivore wildlife populations are minimal and will not be included in the computed figures.

hearsay of the number of camps and the number of livestock/camp.* This method is assumed to be accurate for northern tribes, since their presence in the Area is a matter of major concern to the local people. Yet it is probably an underestimation of the presence of southern tribes.

Kilograms of body weight of all livestock is based on two methods. The first is conversion of chest girth measurements of Ngok Dinka cattle to body weight by the use of a formula derived from the data of the Dinka of Bor Area (Payne, 1977):**

$$\log W = -8.17 + 2.74 \log G$$

$$t_G = 84.6612$$

$$r^2 = 0.9597$$

where W = weight in kg

G = chest girth in cm.

The second method is derived from actual weighing of 62 goats and 56 sheep of various ages among the Ngok Dinka herds in Wet Season 1980 and Dry Season 1981.

The weight of an average head of animal in a typical herd is based on multiplication of each age and sex category with its specific weight, all proportional to the age-sex structure of a typical herd. Because of the lack of data, the same figures are used for the livestock of the other tribes.

In Dry Season 1981, there were three Messeriya camps (20 ferigs) in the Ngok Settled Area, two Fellata camps and six Rek camps. This represents a total of 6100 heads of Messeriya cattle, approximately 500 Fellata cattle and 3,888 Rek cattle (four hearths/camp at 162 cattle/hearth). Along with 12,737 Ngok byre cattle, there were a total of 23,225 cattle

* Average cattle/camp in Messeriya herds is based on Hunting Technical Services Survey in 1980 (soon to be published). Average cattle/camp of Rek based on actual enumeration of those camps in Wet Season 1980 by ADP Livestock Survey.

** Formula derived by Lisa Feurzeig, student at Harvard University in September/October 1980.

in the Ngok Settled Area (NSA). In addition there were 13,400 sheep and 29,000 goats (using the more reliable Wet Season data). These represent a total biomass of 5,394 tons or 17,980 livestock units (one LU = 300 kg) in the Dry Season NSA. Table 4.6 presents the average livestock weights used in these calculations.

Table 4.6: Average Livestock Weights based On a Typical Ngok Herd or Flock Structure

Species	Weight in Kg.
camp cattle	225.53 *
byre cattle	182.69 *
sheep	17.77
goat	15.99

*Note: The difference indicates the different herd structures.

In Wet Season 1980, there were only two Rek camps in the Abyei Settled Area, representing 1944 cattle. There were 12,027 cattle in Ngok camps and 14,802 cattle in Ngok byres. Also in the byres, there were 13,400 sheep and 29,000 goats. All of these represent 6557 tons of biomass or 21,856 LU. Interesting to note is that even with liberal estimates of the dry season biomass, it still does not surpass the wet season biomass.

Ngok Use Area

It is much more difficult to estimate the livestock population of this larger area. Not only is there a wider mixture of tribal camps, but also it includes areas settled by other southern Tribes. Table 4.7 presents a list of all the tribes that use the Ngok Use Area.

Table 4.7: Utilization of Ngok Use Area Rangeland

Dry Season	Wet Season
Ngok byre and camp	Ngok byre and camp
Twich byre and camp	Twich byre and camp
Rueng byre	Rueng byre and camp
Rek camps	Rek camps
Messeriya camp	Nuer camps
Fellata camp	

More field research is required to estimate the biomass of the Ngok Use Area. Yet it is safer to assume at this point that given the large number of Tribal camps, and that only recently have the Missiriya been coming deeper into the area, that the range resources are being heavily utilized.

5. Conclusions

The Dinka cattle are generally well suited to the area they currently utilize, although they probably have a very wide range of gene mixtures. Other breeds from the north or the south, find the NUA either too wet or too dry, to occupy the area continuously. Yet among the Ngok herds there were cattle that were reported to have been brought from the north or the south to improve the herd.

Goats are well suited to the area as well, and do provide some milk although lower than other goat herds. Sheep are not suited to the area, and their numbers are comparatively fewer than goats. Poultry are an important element in Ngok diets, but their productivity is low because of their susceptibility to various diseases, especially Newcastle disease, and their low level of nutrition which results in smaller eggs and thinner shells.

Herbivore biomass in the NSA is higher in the wet season than in the dry season, due to the return of the Ngok cattle camps. Presumably in the years previous to the Missiriya-Dinka conflict, the NSA biomass in the dry season would have been more than at present because of the larger number of cattle the Missiriya are reported to have. These now are moving further east and bypassing the NSA. To what extent the whole NUA is being used is not known since it is difficult to estimate livestock numbers for the other Tribes. Yet it seems safer to assume that the NUA is being grazed heavily, although not necessarily overgrazed, and that it is wise to start mitigating actions as soon as possible.

Chapter Five: Range Resources

1. Introduction

The initial perception of range resources in the Abyei Study Area was that of deterioration due to encroaching desertification or overgrazing. The livestock survey has shown that the situation is much better, but that the possibility of deterioration must continually be kept in mind because of the sensitive nature of tropical grasslands, and developmental actions must be designed to mitigate deterioration in the future.

The survey of range resources is based on various sources of information:

1. A geographical survey conducted in Dry Season 1980 by Jane Hayes for HIID.
2. Collection of plant species for identification from all ecosystems.
3. Collection of one meter square forage samples and samples from mineral sources for nutritional analysis from all ecosystems.
4. Trails with alternative sources of feed.

The geographical survey provided valuable baseline data on ecosystems and water resources. The collection of plant species gave a first approximation of the types of forage available in the area, and allowed a more accurate ecosystem classification based on vegetation. Collection of forage samples provided information on the quantity of forage available in the Wet Season. Unfortunately only a few forage samples were collected for the Dry Season. The information available on the nutritional quality of forage has not yet been analyzed. Both the plant collections and forage samples are relatively small in number, therefore they can only provide a beginning look at the carrying capacity of the rangeland. The experience gained from trials of silage and fodder utilization, albeit limited, provide guidelines on the relative merits of each system.

Although this survey of range resources was not carried out by a range management specialist, it followed guidelines laid down by Dr. W.J.A. Payne, who travelled extensively through the area in April 1978, January and November 1980, thus giving him an opportunity to view the range conditions at three

stages in the dry season, and three different years. The results of the 1980-81 survey presented here, leave some questions unanswered, and in some cases are necessarily based on fairly crude generalizations. But they are a substantial advancement over the previous level of information.

2. Ecosystem Description

a. Soil/Typography Classification

Most of the soil in the Abyei Study Area is a fine textured, grayish brown, cracking clay soil, which is dominantly a montmorillonite clay. It appears that the only difference occurs on the sandy ridges where the texture shifts toward sandy soils. A more important geographic factor is topography.

Abyei Area is extremely flat, with gradually undulating sandy ridges which may rise one meter from valley to peak but which stretch out at least one kilometer from valley to valley. Even so, the effect on drainage patterns is enormous It is rainfall and the drainage lines and flows that determine both natural range species as well as potential for crop cultivation.

b. Vegetation Classification

Given the drainage patterns, soil variations and human land use, the geographical survey in March/April 1980 determined 3 land use systems. The first are the Raqaba landscapes: the repeating pattern of sandy ridges and shallow valleys, parts of which may be inundated with water in the rainy season. The second are the savannah-woodland landscapes: a mixture of grass, bush and trees on generally medium dark clay soils. The third are the swamplands which are mostly inundated all year around. (See Fig. 5.1)

In 1980, the new grass cover had started to emerge by the beginning of May. The livestock survey collected 76 species of grasses, broadleaves and trees during wet season 1980 from a wide geographical area in the Ngok settled area. The species were subsequently identified at various herbariums, including U. of Khartoum, U. of Gezira, in Sudan, and Royal Botannical Gardens in London.

According to these collections, the Ngok settled area, with a total of 1450 km^2 of land, has been broken down into 5 "ecosystems": (See fig. 5.2)

a. Sandy Ridge, including only the top and slopes of sandy ridges and some waterlogged patches estimated at 385 km^2 or 26.54% of total land area.

b. Open savannah, a transition zone between sandy ridge and forest savannah, and including light woodland, estimated at 645 km^2 or 44.48%.

c. Forest savannah, characterized by medium to dense woodland estimated at 339 km^2 or 23.38%.

d. Swampland including small seasonal marshes and swamps, and riverine vegetation, estimated at 72 km^2 or 5.0%.

e. Fresh and recent burn, indicating 1-2 year old brush fires, estimated at 9 km^2 or .6%.*

A full list of the plant species collected are presented in Appendix B. The following is a description of the more important and/or more abundant forage types.

i. Sandy Ridge Landscape:

These areas are characterized by 30-75 cm tall grasses. The more abundant grass species are Rottboelia exaltata, Setaria sphacelata, S. pallide-fusca, S. verticillata, Sporobulus festivus, S. microprotus, Chloris virgata, Panicum hygrocharis, Schoenfeldia gracilis, Aristida hordeacea and Hyparrhenia confinis.

R. exaltata or Itchgrass is a tufted annual grass which is highly palatable. It is suitable as fodder or ensilage, but when mature is avoided on natural stands because of its stiff, easily breaking hairs. It is used by the Ngok as fresh fodder for calves.

Among the Setaria spp., S. sphacelata or Golden Timothy is by far the best. It is a perennial, while the other two are annuals, It can tolerate temporary flooding and water-logging, and is resistant to bushfires. It has been cultivated successfully in Africa, in legume associations of Desmodium intortum, and

* Estimates are based on manual interpretation of lands at 1 imagery, Nov 1972 and are crude generalizations.

Fig 5.1

LAND USE SYSTEMS

ABYEI STUDY AREA

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT . Dinka name — Noong

Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

"RAQABA" or repeating flat sandy ridges

SAVANNAH–WOODLAND

"SUD" or Central Swampland

0 1 2 3 4 5 10 20

Kilometer

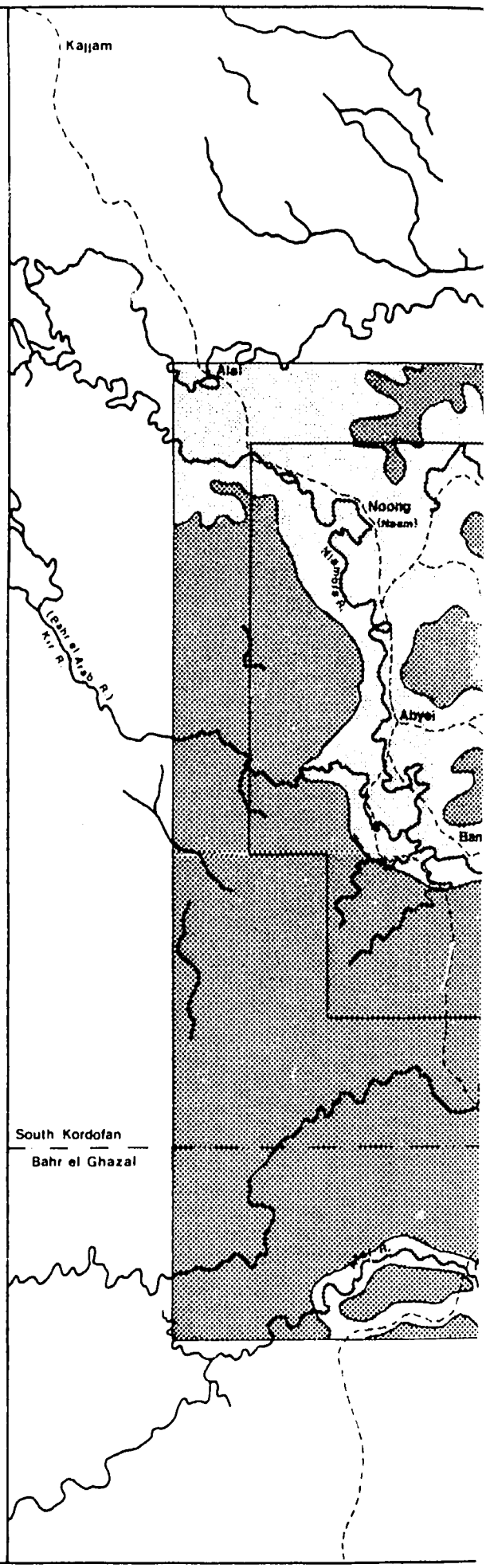
Names and boundary representations are not necessarily authoritative

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March–May 1980 by Jane Hayes

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir...

for Harvard Institute for International Development



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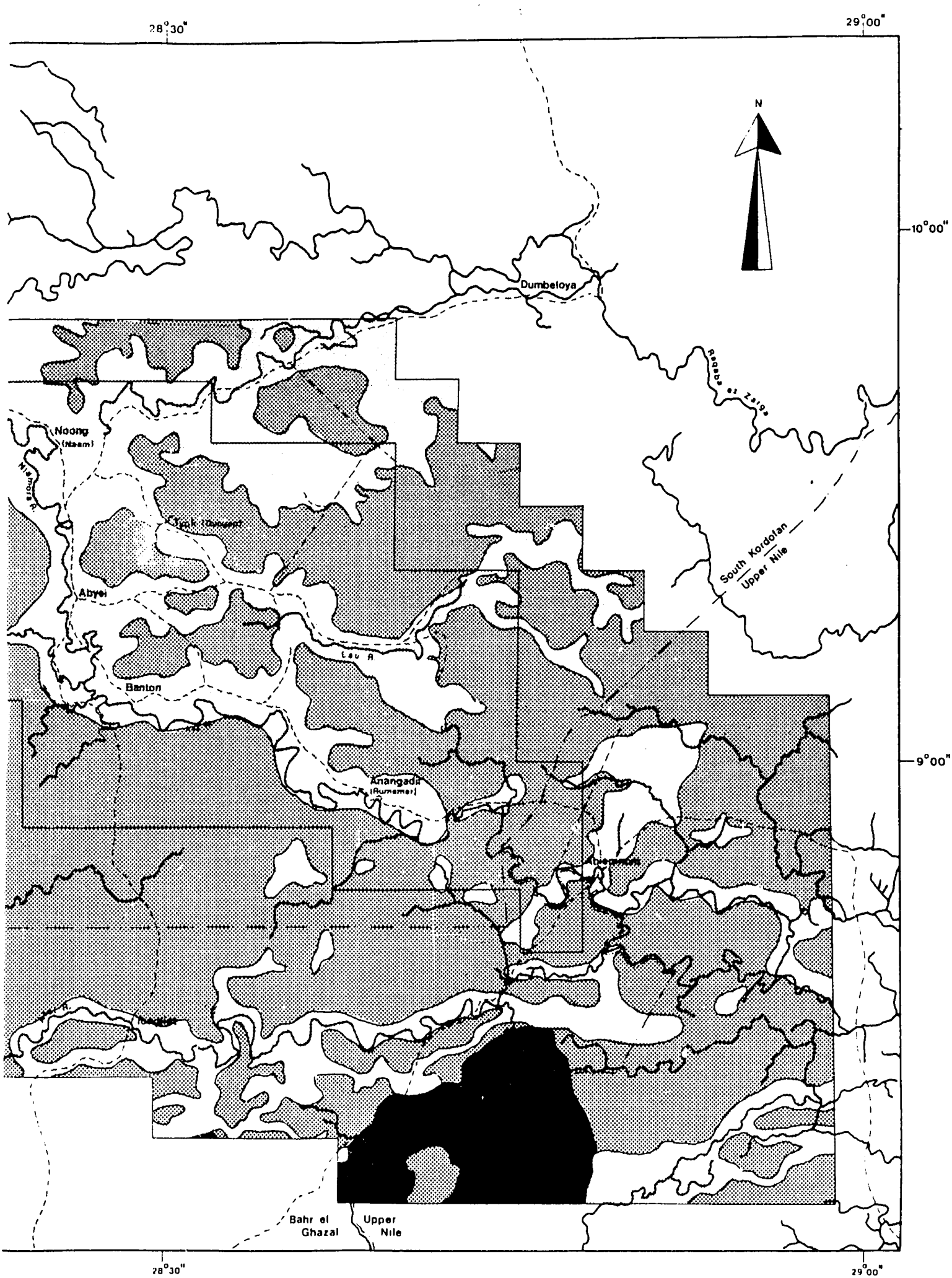

28°30"
29°00"
10°00"
9°00"
N
Dumbeloya
Noong
(Naam)
Abyei
Banton
Lau R.
Anangadi
(Rumamer)
South Kordofan
Upper Nile
Bahr el
Ghazal
Upper
Nile

Fig. 5.2

ECOTYPES OF NGOK SETTLED AREA

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT : Dinka name — Noong
: Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

SANDY RIDGE

OPEN SAVANNAH & LIGHT WOODLAND

MEDIUM & DENSE WOODLAND

RECENT BURN

RIVER & MARSHLAND

0 1 2 3 4 5 10 20

Kilometer

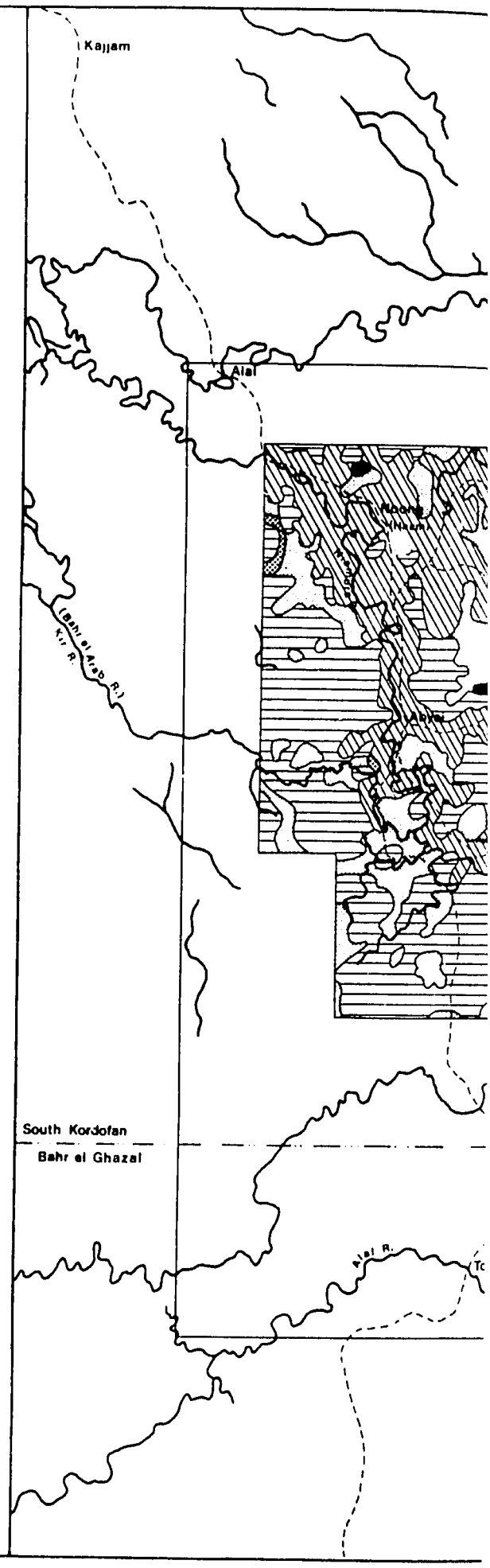
Names and boundary representations are not necessarily authoritative.

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March–May 1980 by Jane Hayes.

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir.

for Harvard Institute for International Development.



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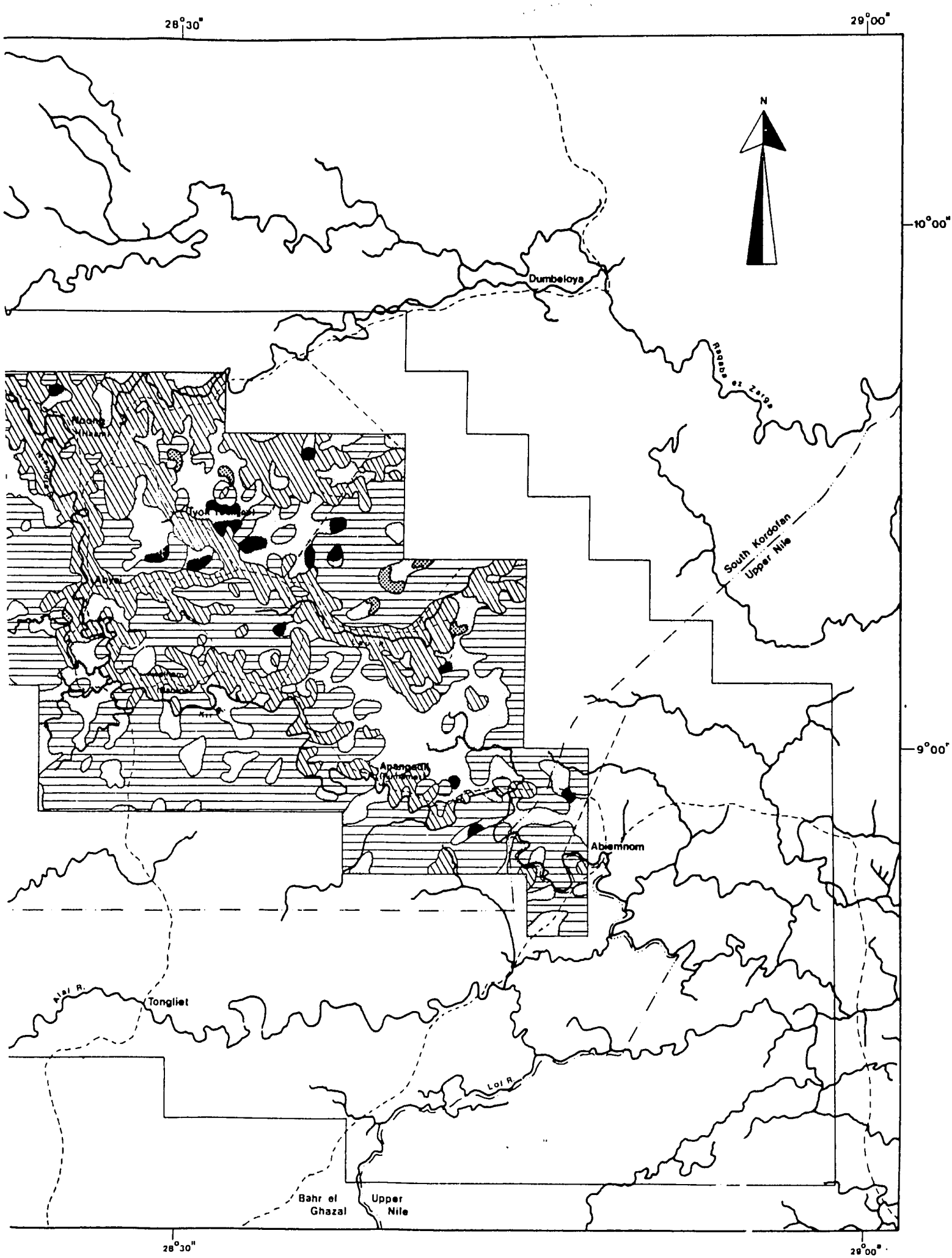

28°30"
29°00"
N
10°00"
9°00"
Dumbeloya
Bahr el Zeraf
South Kordofan
Upper Nile
Abyei
Aparengdit
Abiemnom
Tongliet
Nial R.
Lol R.
Bahr el Ghazal
Upper Nile
28°30"
29°00"

Trifolium repens. (Bogden, 1977, 259).

The Sporobolus spp. or drop seeds are generally perennials and of relatively poorer quality. They are considered to be increasers or dominating species, especially on heavily grazed ranges. They are quite palatable and S. festivus, an annual growing on sandy soils, is of high quality.

Chloris virgata or blackseed grass, is an annual that is of good nutritive value, especially when young. It makes good hay when cut at the flowering stage. It has been sucessfully used in reseeding denuded pastoral lands in Kenya at medium altitudes. (Bogdan, 1977, 87)

Some other grasses that are not very abundant in the Ngok settled area but are of high quality are worth mentioning: Cenchrus ciliaris or African foxtail, is a tufted perennial. Because of its deep root system it is drought resistent and can tolerate shallow flooding. It is easily established by broadcasting, but if used for reseeding denuded land, it must have seedbed preparation, which has been done successfully in Tanzania by cattle trampling. The best legume association is with Stylosanthes guianensis and S. humilis. (Bogdan, 1977, 70) Once established it can withstand heavy grazing and bush fires.

Ischaemum afium, a rhizomatous perennial, has excellent nutritive value when young. A study done in Sudan showed 8.7% CP content in 2-week old herbage (Bodgan, 1977, 160). Dactyloctenium aegyptium or Crowfoot grass is an annual plant that tolerates salinity although that is as yet not a problem in the Ngok settled area. It is one of the best annual grazing grasses in semi-arid areas. It withstands overgrazing fairly well, but dies soon with the onset of the dry season. A close ally, D. giganteum, has been used to improve natural pastures in Rhodesia (Bogdan, 1977, 104). Plants found in American grasslands, may contain a small amount of cyanogen glucosides at certain stages of its growth. At high concentrations these are poisonous to animals. (Ensminger, 1978, 1083)

Most broadleafs or dichotylons are found in the sandy ridge landscapes rather than the other ecotypes. The most common ones are Combretum aculeatum, Hibiscus trionum (wild okra), Cassia tora, Indigofera numularifolia, Alysicarpus glumaceus, Rhynchosia minima, Acanthospermum hispidum and Tribulus terrestris.

Alysicarpus glumaceus, an annual herb, is palatable to cattle, but it does not produce a large bulk of herbage. Its perennial form, A. rugosus, has been successfully grown in mixtures of perennial grasses. (Bogdan, 1977, 319)

Rhynchosia minima, is a perennial herb that tolerates moderate soil salinity, and small amounts of seasonal waterlogging. However, it is drought resistant. Palatability varies with its different varieties, but generally young plants are more palatable. In Kenya, it was shown to be more palatable to cattle than sheep. (Bogdan, 1977, 395)

Combretum aculeatum is a small bush that is locally considered to be a good source of browse, and the seeds are eaten by people. Nothing has been found in the literatures concerning this plant.

Acanthospermum hispidum is an annual herb that is not palatable, yet invades overgrazed or denuded pastures. Its burrs are transported by animals. The seeds germinate irregularly and can remain dormant for several years. It can be controlled by herbicides on arable land, but only a system of management to increase the vigor of natural pastures will control it in grasslands (Ivens, 1976, 103).

Plant associations have been determined from 32 one meter square samples of various ecosystems. 14 of these samples were from the Sandy Ridges. Of these, 70% were found on top of sandy ridges and were composed of shorter plants:

grasses: Sporobolus festivus
Chloris virgata
Panicum hygrocharis
Dactylactenium aegyptium
Eragrostis cilianensis
Schoenefeldia gracilis
Tetrapogon cencliriformis
Penicum coloratum

broadleaves: Indigofera numularifolia
Acanthospermum hispidum

The rest of the samples, found on the slopes of sandy ridges contained:

grasses: Pennisetum ramosum
Setaria pallide-fusca
Chloris virgata
Sporobolus festivus
Dactylactenium aegyptium

broadleaves: Combretum aculeatum
Sida alba
Cassia tora
Rhynchosia minima

In the Ngok settled area, most of the short growing species reach maturity in August and there normally is a second growth after that. This is especially true for such species as S. Festivus, T. cencliriformis, S. gracilis, Eriochloa fatmensis (nubica) and U. trichopus.

Among the few trees that occur on sandy ridges are those that grow on sandier soils, such as Balanites aegyptiaca and Tamarindus indica. Both are very useful trees in providing shade and edible leaves and seeds. However, the Ngok believe that B. aegyptiaca attracts flies. Ziziphus spina-christi, a thorny bush, is abundant and is used mostly to make fairly impermeable fences around arable fields or campsites. Moringa oleifera is not very common, but is valued for its seed pods that are used to clarify water. Only two Adansonia digitata (Baobab) have been seen in the Abyei Study Area.

.. Open Savannah Landscapes

These are fairly wide areas that mark the transition between sandy ridges and forest savannahs. They include areas of seasonal waterlogging and are characterized by heavier clay soils than sandy ridges.

The types of grasses found are generally 75-200 cm tall, although in severely waterlogged areas, shorter Graminae and Cyperaceae species are found. The most common grasses are Rottboelia exaltata (tall), Andropogon gayanus, Panicum coloratum, Sorghum sudanense, S. purpurea-sericeum, Eragrostis cilianensis, Eriochloa meyeriana and Hyparhhenia confinis.

Andropogon gayanus, or Gamba grass, is a tufted perennial that remains green long into the dry season and even produces some regrowth if situated near river banks. It is drought resistant and tolerates deep seasonal flooding. It is of excellent palatability and is preferred by Ngok herdsmen. In Africa, it is resistent to bush fires and develops new shoots a few days after burning. Successful legume associations include Centrosema pubescens, Stylosanthes guianensis and Clitoria ternata (Bogden, 1977, 37).

Panicum coloratum occurs mostly on open savannah, but also on sandy ridges. It is a tufted perennial growing mostly on heavy soils. It is not an aggressive grass, but forms well balanced mixtures with legumes such as Desmodium uncinatum and Glycine wightii in Kenya. (Bodgen, 1977, 185). In America, it has been known to cause photosensitization in lambs and some adult sheep, although it is suitable to cattle. (Ensminger, 1978, 1095).

The Sorghum species are annual and all contain cyanogenic glucosides, although S. sudanense (Sudan grass) and S. purpurea-sericeum are known to contain less than other species. They are easily established and provide high seed yields, yet they are susceptible to attack by smut. They perform better as a pure stand rather than with legumes. They are better utilized as fodder rather than silage. (Bogdan, 1977, 277). A high consumption of these plants is considered by the Ngok to be poisonous.

Eragrostis cilianensis, or Grey Love Grass, is an annual that is dominant or co-dominant in areas where perennials cannot survive. In higher rainfall areas it colonizes denuded land, and has been used in Kenya to reseed such lands. (Bogdan, 1977, 136). This plant as well as the perennial Eriochloa meyeriana are good sources of grazing.

Of the few broadleaves that occur on open savannah land, Tribulus terrestris and Acalypha crenata are the more common. T. terrestris or Puncturevine is an unpallatable annual herb. It is known to profilitate in poor grasslands (Ivens, 1976, 225) and is generally avoided by Ngok livestock.

The same plant associations are found on open savannahs as on sandy ridges, although there are less Schoenefeldia gracilis, Tetrapogon cenchriformis, Dactylactenium aegyptium and Eragrostis cilianensis. Most plant associations (from a sample of 8) were composed of tall species such as Sorghum purpurea-sericeum and Setaria spp., and short plants such as Sporobolus festivus and Chloris virgata. In some areas, there were pure stands of Andropogon gayanus, Setaria sphacelata, or Hyparhhenia confinis.

There are more trees in the open savannah than sandy ridges but the species are the same, with a few more types such as Acacia siebarana (paper-back thorn) Albizia seriocephala and Combretum hartmannianum. Neither provide much shade, but the former have edible pods and young shoots.

i. Forest Savannah

The grasses found in this ecosystem are very tall, ranging from 150 to 350 cm. The main species are Andropogon gayanus, and Setaria sphacelata (tall). As described earlier, both are tufted perennials and can withstand bush-fires.

There are virtually no short grasses or dichotyledons in the forest savannah, due to the lack of direct sunshine, bush fires and/or competition from perennial grasses. The tree cover is dense and can be divided into two assocations. In general, North of the Bahr el Arab is dominated by the following (in order of abundance)

Acacia seyal
Acacia sieberana
Acacia nilotica
Balanites aegyptiaca
Ziziphus spina-christi
Gardenia erubescens
Ficus Spp., especially F. polita
Combretum hartmannianum
Tamarin dus indica
Cassia sieberana

South of Bahr el Arab one finds (in order of abundance):

Acacia drepanolobium

Acacia nilotica

Combretum hartmannianum

Piliostigma reticulatum

Balanitas aegyptiaca

Albizia sericocephala

Butyrospermum parkii (v. niloticum)

Tamarindus indica

Khaya senegalensis (mahogony)

Borassus aethiopum

Both Acacia seyal and A. nilotica contain tannin in the bark. The latter is known to contain 25-34% tannin in its pods and 59% in its bark (Sahni, 1968). A. nilotica also contains gum, but not as much as A. arabica. C. hartmannianum is known to contain 21% tannin in its fruit and bark. At present these tannin resources are not used by the people of the Ngok Settled Area.

B. aethiopum and K. senegalensis are excellent construction woods, the former known to be termite proof (Weber, 1977, 114) but they are not found in abundance in the Abyei Study Area.

iv. Swampland and Riverine Landscapes

The main vegetation on the swamps are short Cyperaceae families, such as Fimbristylis miliaceae, Scleria foliosa, and Cyperus iria. No potential uses of such annual plants have been recorded in the literature. Two annual Gramineae species, Leersia drepanothrix and Oriza barthii are also available in swamps and tend to occur in pure stands. They are both types of wild rice and are harvested by the Ngok. There are very few broadleaves in the marshes, the most common being Ipomoea aquatica, a creeping plant that also occurs on water-logged soils and is a weed on arable land.

Riverine vegetation is composed of mostly Echinochloa spp. such as E. scabra (stagnina), E. colona and E. pyramidalis. Cyperus papyrus occurs abundantly on rivers south of the Bahr el Arab and is used by the local people to make mats.

E. Colona, is also known as Shama Millet, Swamp grass or Jungle rice (Hafliger, 1980, 54). It is a tufted annual grass whose seeds are harvested by the people, and is suitable for cattle. Attempts in southern Sudan were unsuccessful in bringing it under irrigation (Jonglei, 1954, 1069).

E. Scabra and E. pyramidalis (or Antelopegrass) are both highly palatable perennials and good as fodder. E. pyramidalis is suitable to growing in rows under irrigation and is established from tuft splits or rhizomes (Jonglei, 1954, 1069)(Bogdan, 1977, 130). It also withstands long periods of drought. E. scabra is difficult to maintain under irrigation because of its high water requirement (Jonglei, 1954, 1069) but is of higher nutritive value than the other Echinochloa spp. (Bogdan, 1977, 131). The Ngok Dinka use this species as fodder for the cattle. This practice is more widespread in Abyei Town.

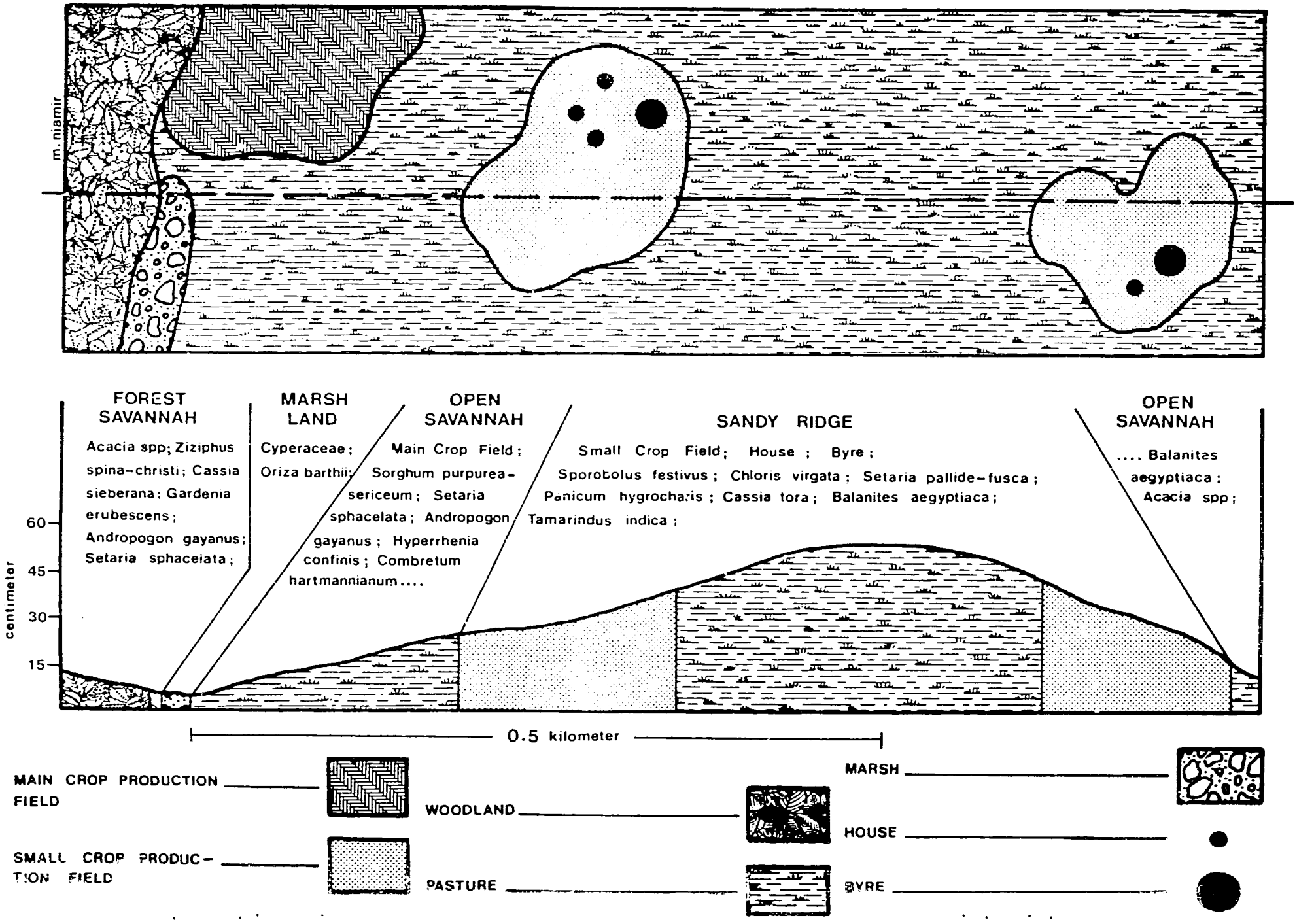
The trees most commonly found on riverine areas are Piliostigma reticulatum and to a lesser extent Euphorbia abyssinica.

The identification of plant species from the Abyei Area is certainly not an exhaustive collection and does not go beyond the Ngok Settled Area. Figure 5.3 provides a summary of the land classifications. Yet from this collection it is evident that there is a fairly good range of species of grasses on the sandy ridge and open savannah landscape. Such variety does not exist on forest savannah and swampland landscapes. Protein content of forage grasses* in this area is low, which could be redressed by an increase of leguminous species.

Some legumes have been successfully introduced into other areas of Africa, notably Trifolum repens, Desmodium intortum and Stylosanthes guianensis. It is not known what the fate of imported species in Abyei will be. Experience with imported domesticated crops into the area have not been very fruitful. (Fuller, 1981). It is suggested that some legumes and grass species suitable for broadcasting be tried out, to see whether there is any scope for improving forage species in the Abyei Area.

* 34 forage samples have been analyzed for their nutritive quality by the Animal Research Laboratory - Kuku, Khartoum, but the reslts are not yet complete. The samples were collected in Wet Season 1980 from areas that had not been grazed for at least 10 days prior to clipping.

Fig 5.3 SKETCH OF A SANDY RIDGE



v. Fresh and Recent Burn

The occurance of brush fires is very localized in the Ngok Use Area, while it often occurs very extensively in the northern "no-man's land", and the southern areas near the Central Swampland.

There are many reasons why the range is burnt. The major reason is to obtain green regrowth from perennial plants. This is normally done from early February until the end of the dry season and involves some open but mostly forest savannah landscapes. The other reasons are for hunting, gathering honey and gravel. From the point of view of livestock production, bush fires are beneficial on natural rangelands because they remove old and dry vegetation of low feeding value and stimulate protein-rich new growth. Fires control the encroachment of bush and forest onto grazing land. Furthermore, they serve to destroy ticks, insects and other disease vectors. Nevertheless, the major problem in bush fires is that they are hard to control and once started may cover many kilometers of varied vegetation.

The local herders realize the undesirability of uncontrolled fires, which may spreadto riverbanks and destroy the already abundant regrowth. Yet they complain that there is no way to control the fires, or to stop honey gatherers or hunters from starting the fires. To protect their herds, most campsites in the dry season are located on already burnt areas.

To date, only two means of control of bush fires exist in the Ngok Use Area. One is the very highly ineffective position within the Rural Council of "Bush Warden". This was established recently by order of the Provincial government. There is apparently one such warden for each subtribal territory (and none for the dry season pastures where the Provincial government has no authority). Their responsibility is to apprehend those who start bushfires and place them under arrest. In reality, no such culprits have been apprehended, and the wardens spend most of their time in Abyei Town.

The second means of control is slightly more effective and has resulted in less frequent and more localized fires in the Ngok Settled Area. Traditionally, culprits are liable to be brought before the local court if the fire spreads to

another homestead or its fields. Considering that only 7% of the Ngok Settled Area had been burnt in 1971/1972, bush fires do not seem to affect the rangeland here as much as they would elsewhere. A study of the larger region, extending from 9:30N to almost 11:00N, and 28:00E to almost 29:30E, showed that 19.7% of that area was fresh and recent burn. (Hayes, 1980) The problem is not acute in the Abyei Area, but in any case, methods to deal with the problem must be on the level of management training, rather than physical control of fires, since the latter presents too many logistical hurdles.

C. Carrying Capacity of Pastures

A crude determination of the carrying capacity of the Ngok Settled Area is based on total land areas of each ecosystem (from landsat imagery interpretation) and average gram of dry matter of grasses/meter square from these ecosystems. See Table 5.1.

Table 5.1 Results of Forage Sampling in Wet Season, 1980

Ecosystem	# of m^2 samples	gm ovendried matter/m^2	tons dry matter/ km^2
Sandy ridge	15	196.5	196.5/tons/km^2
Open Savannah	8	354.5	354.5
Forest Savannah	6	562.2	562.2
Marshland	2	264	264

Carrying capacity represents the amount of grass forage available in mid wet season. Except for recent and freshly burnt areas, it is assumed that there is no other denuded land in these ecosystems in the Wet Season.* Thus 12 Km^2 of burnt land is not counted in the total carrying capacity. Furthermore, the amount of arable land under cultivation in one year is subtracted. Each household has on average 1.5 hectares of open savannah and 0.5 hectares of sandy ridge

* Visual observation corroborates this assumption. The only other denuded lands are the camp sites, but these regain vegetation as early as a week after the site is evacuated in the Wet Season.

under actual cultivation (Ackroyd, 1981). About 3-4 times more land is also involved to support a ten year fallow rotation cycle, (Fuller 1981), but since they remain fallow, they revert back into natural rangeland almost immediately. With an estimated 3893 Ngok households, a total of 58.40 km^2 of open savannah and 19.50 km^2 of sandy ridge is under crop cultivation in any one year.

Table 5.2 Carrying Capacity (C.C.) of Rangeland in Ngok Settled Area in Wet Season

Ecosystem	Total Land area km^2	Total dry matter tons	C.C.I* LU/6mo.	C.C.II* LU/6mo.
Sandy Ridge	356	69954	32386	19432
Open Savannah	597	211637	97980	39192
Forest Savannah	348	195646	90577	9058
Marsh & Riverine	60	15840	7333	2933
Total	1361	493077	228,276	70,615

- Notes: *C.C.I. - assumes 50% of the dry matter is consumed in all ecosystems in order to reflect a proper use factor (PUF) that allows for the protection and maintenance of the plants for the following years' growth.
- C.C.II - in addition to the PUF above, it is also assumed that not all parts of the plants are palatable or eaten by the livestock. For example, forest vegetation is composed mainly of tall growing plants from which the livestock may only select the lower leaves. Therefore, the following figures are assumed to reflect both PUF and palatability and are expressed as % of dry matter consumed: sandy ridge 30%, open savannah 20%, forest savannah 5%, marsh and river 20%.

** Each Livestock Unit (LU) of 300 kg weight, will consume 2% of its body weight, or 6 kg/day (1.08 tons/6 months)of dry matter.

It seems that the rangeland is potentially able to support much more than the present Wet Season (or heaviest) biomass of 20,300 LU in the Ngok Settled Area (since goats are browsers, they are not included in this figure). (Table 5.2) At present, the rate of rangeland use in the Wet Season is 6.2 hectares/LU (although there are areas of higher concentration). The results show that there is a potential for increasing the rate of use to almost 2 hectares/LU in the Wet Season.

For the sake of argument, the present livestock population of the Ngok Dinka and its trends of growth can be projected into the future. Chapter 6 presents the herd structures and demographic indices from which the growth rate is estimated. Considering only cattle, the growth rate in a herd was 15% in

1980-81. A simple projection shows that if the current growth rate is maintained, the estimated carrying capacity potential of 70,600 LU will be filled by the year 1990. This does not include growth of livestock owned by other tribes who also use the area, or growth in small stock.

Considering that tropical rangelands have periods of boom and bust, it is highly unlikely that a growth rate of 15% can be maintained for Ngok livestock year after year. Yet this exercise serves to heighten the fact that caution must be exercised whenever development plans are expected to affect livestock population.

It appears that Wet Season range conditions are more than adequate at present, although there may be localized areas that see heavy grazing. These are areas around the sandy ridges that, at the peak of the Wet Season, see a concentration of cattle camps. (See Chapter 6)

The conditions of Dry Season grazing can only be induced from various other sources of information since forage samples were not collected during that time. In the years that Missiriya livestock also used the area, biomass was much higher and there may have been overutilization. If true, the three years since then and the resultant lower biomass have probably helped to regenerate the range. Given the under-utilization of the range in the Wet Season and present utilization trend in the Dry Season it is tentatively concluded that there is no danger, in the near future, of severe deterioration of range resources for cattle and sheep in the Ngok Settled Area.

In the Dry Season 1981, a few more Missiriya camps were using the area than in 1980. Even if this becomes a continuing trend (and the recent March 1981 Dinka-Missiriya peace accord may ensure that) there would still be ample room for at least 50,000 LU more in the Ngok Settled Area. However, the major constraint in the Dry Season is the lack of water. This means that the livestock must congregate on a few sources of water, and it is expected that the land around these sources will be heavily grazed. But in the Wet Season, the grasses are rejuvenated sufficiently so that there is no permanent overgrazing anywhere in the Ngok Settled Area.

At the present time, there is no competition for land between livestock and crop production. The traditional system with its fallow fields is actually complementary to livestock production. From the crude estimates of carrying capacity, there still seems to be room for expansion of the traditional cropping system, although the most efficient balance with livestock production can only be determined by more rigorous carrying capacity studies. Furthermore, the present results are inadequate for determining the effects on natural rangeland if large tracts of land are taken over by tractor cultivation.

Further research on carrying capacity is required to determine the effect on the natural rangeland of limited sources of water in the dry season, and limited areas suitable for campsites in the wet season.

Unfortunately, no information has yet been collected in the case of goats and the availability of browse. Goats are known to consume most types of bush and trees, especially the Acacias. At present there does not seem to be any areas that are in danger of permanent deforestation. The rate of firewood use is high, but only dead branches and trunks are collected. Yet, the combined effect of browsing on saplings, tree-clearing for cultivation and the use of trees for housing construction may be keeping afforestation at low levels. New uses of trees, such as the ADP experiments with wood-fired brick kilns, or greater investment in carpentry, may push the balance into the negative. It is therefore, advisable to encourage the planting of trees on a village-level or communal basis at an early date to mitigate the effects of deforestation, and to provide enough feed for goats.

The condition of the Ngok Use Area is a bit more unclear, since it is not known what the present biomass is, and whether the forage matter are of the same quantity (or quality) as in the Ngok Settled Area. However, reasonable it is to assume that there is a danger of deterioration and that steps must be taken to not only increase its overall quality, but also to prevent boom-and-bust conditions that result from alternating periods of drought and lush climates.

Both wet season and dry season range conditions, however, are not adequate for a complete sedentarization of the population. Further detailed study is

required to determine the extent of the carrying capacity, and to what level livestock populations can be increased without threatening resources.

Apart from research, a large scale and complex range species improvement program involving irrigation, fencing or tractorization (e.g. seedbed preparation) is not currently feasible in the Abyei Area because of logistical and managerial difficulties. Such a program would require extensive physical and financial resources as well as a full-scale project involvement.

3. Water Resources

The condition of water resources in the Abyei Study Area seems to be the worst of both worlds. Seven months of the year there is no rain so that surface and underground sources gradually recede as the dry season advances, causing parched soils and evacuated homesteads. For the remaining five months, the area receives tremendous amounts of rain that create marshes and waterlogged areas where diseases are readily transmitted.

The mean annual rainfall recorded from two stations are presented in Table 5.3. Data for 1973 to 1979 were collected from a station located in Abyei Town, and for 1980 from the station in the ADP compound, 1 km south of Abyei Town. Therefore the data give only a partial indication of rainfall in the total Ngok Settled Area.

Table 5.3 Total Annual Rainfall in mm

1973	1974	1975	1976	1977	1978	1979	1980	ave/year
698	1128	773	833	850	889	874	820	858

1973 was the tail end of the drought period, and shows less than average rainfall. 1974 had the highest rainfall of all years, which may show the "compensatory" nature of tropical rainfall. The remaining years fluctuate slightly around the yearly mean rainfall of 858 mm.

Fig 5.4 YEARLY RAINFALL

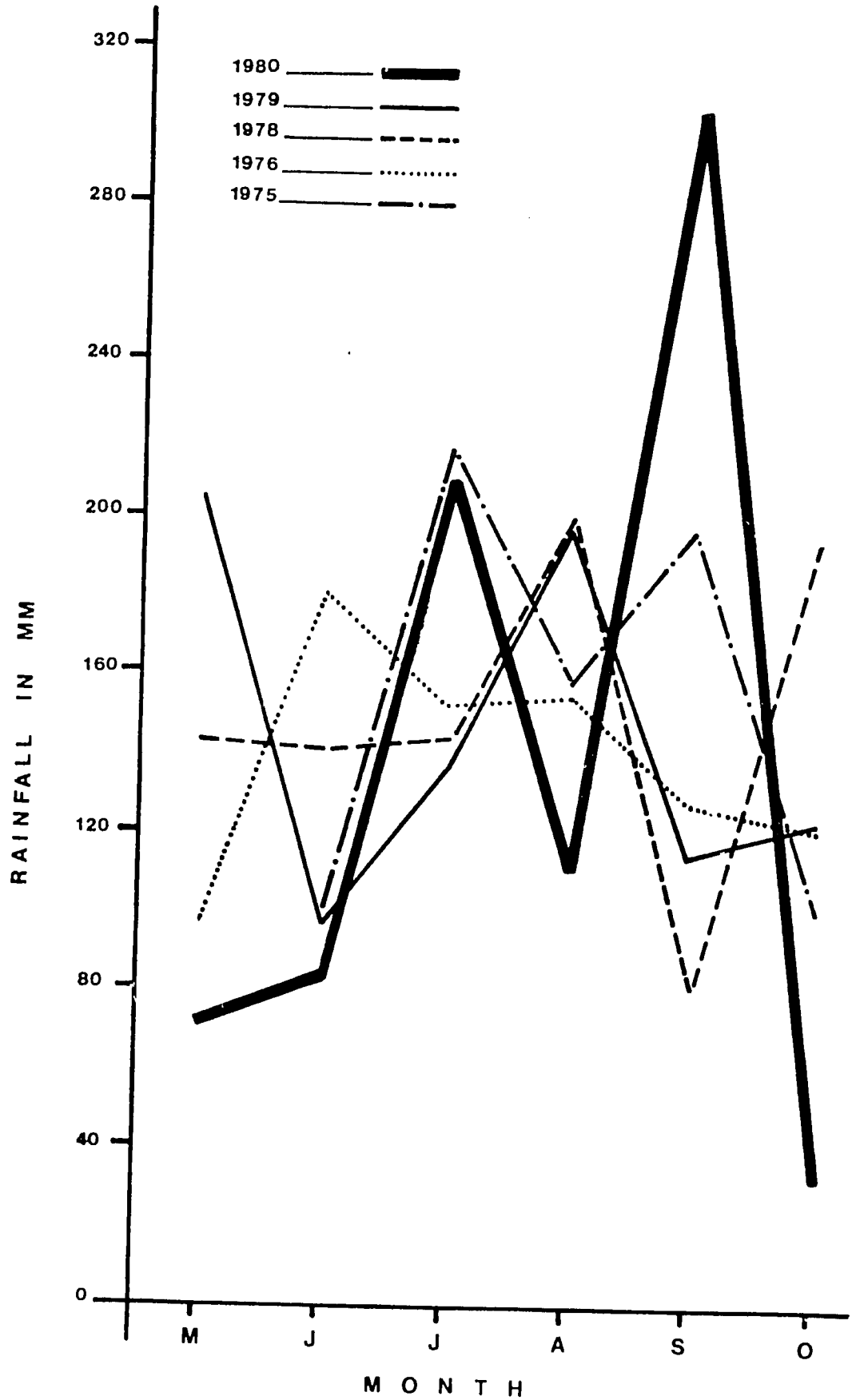


Fig 5.5

DISTRIBUTION OF WATER RESOURCES IN ABYEI STUDY AREA

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT : Dinka name — Noong

: Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

DEEP BOREWELL

FERRY

GROUP FARM

PERMANENT WATER SOURCE

0 1 2 3 4 5 10 20

Kilometer

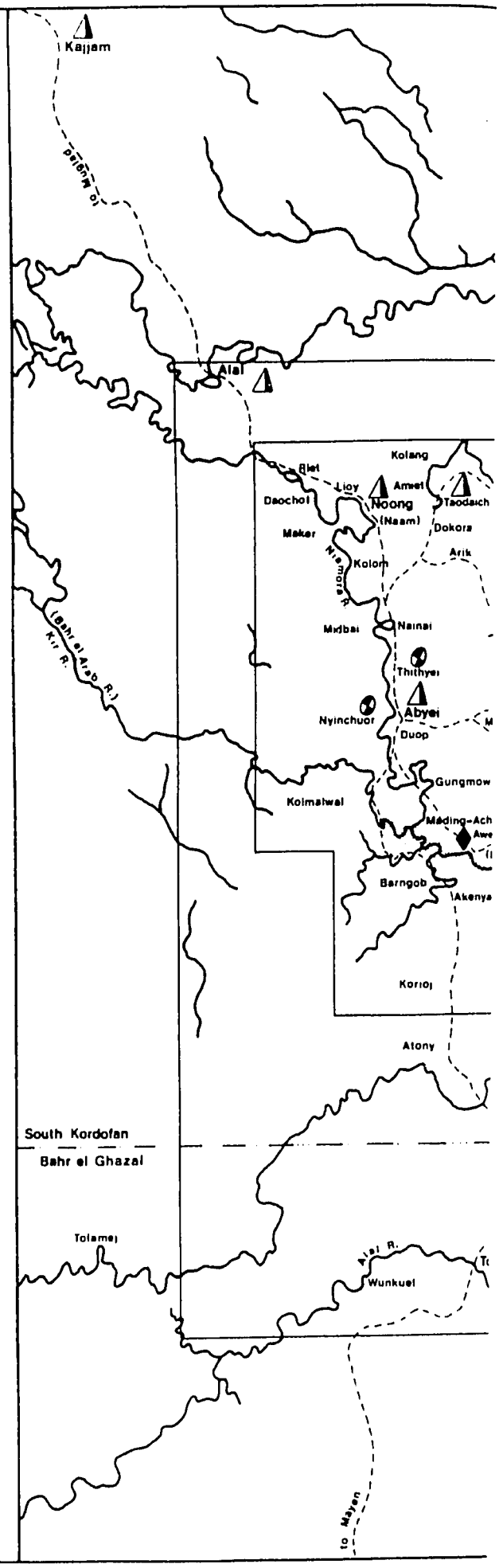
Names and boundary representations are not necessarily authoritative.

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March–May 1980 by Jane Hayes.

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir.

for Harvard Institute for International Development



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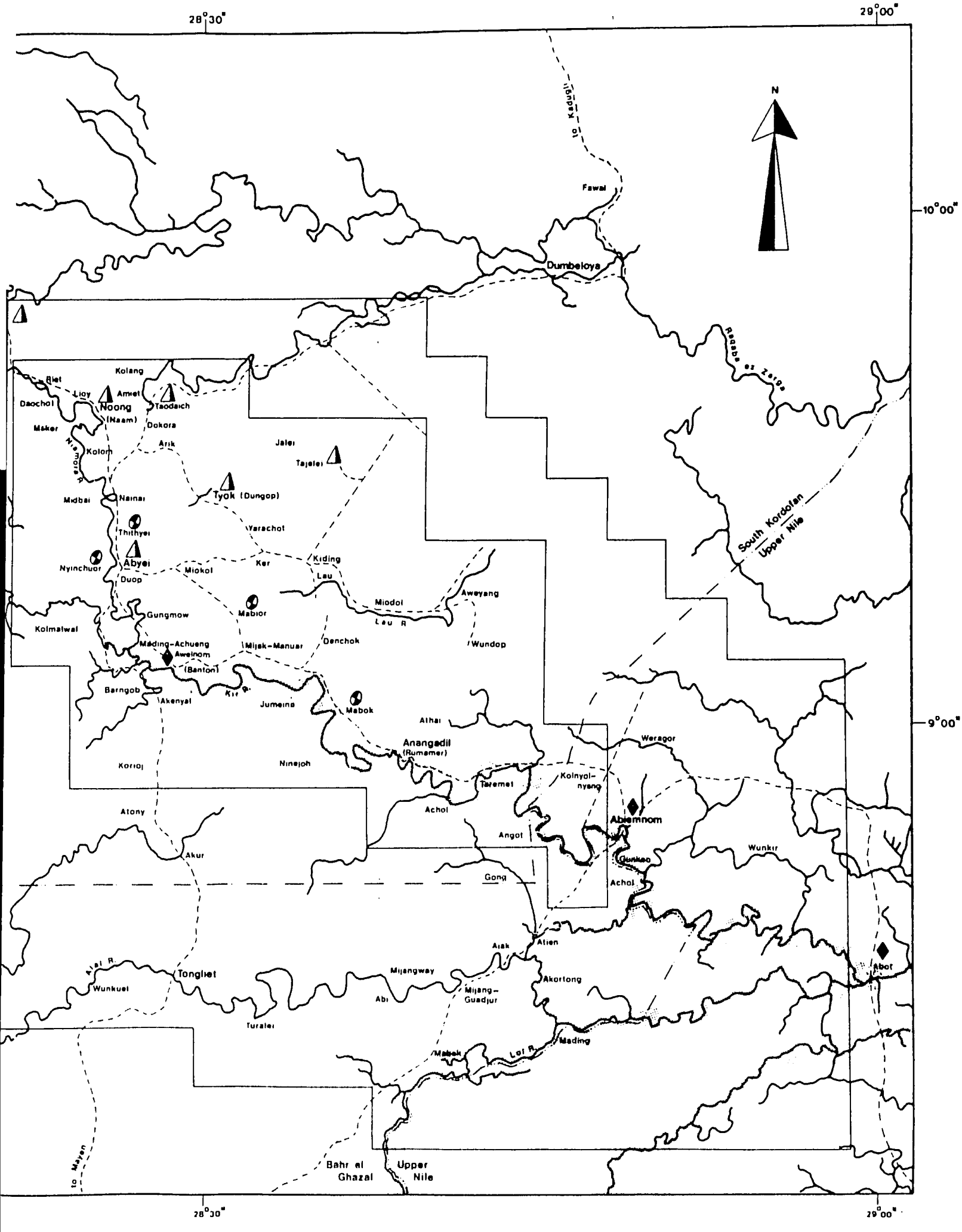

28°30"
29°00"
10°00"
9°00"
N
to Kadugli
Fawal
Dumbeloya
Bahr el Zeraf
South Kordofan
Upper Nile
Kolang
Biet
Lioy
Amiet
Daochol
Noong
(Naam)
Taodaich
Dokora
Meker
Arik
Kolom
Jalei
Tajelei
Midbai
Nainai
Tyok (Dungop)
Thithyei
Yarachot
Nyinchuor
Abyei
Miokol
Ker
Kiding
Duop
Lau
Miodol
Aweyang
Gungmow
Mabior
Lau R
Kolmalwal
Mading-Achueng
Aweinom
(Banton)
Mijak-Manuar
Denchok
Wundop
Barngob
Akenyal
Kir R.
Jumeina
Mabok
Athai
Anangadil
(Rumamer)
Weragor
Korriol
Ninejoh
Taremet
Kolnyol-nyang
Atony
Achol
Abiemnom
Angot
Akur
Wunkir
Gunkao
Gong
Achol
Atien
Aiak
Abot
Aiai R.
Tongliet
Mijangway
Akortong
Wunkuel
Abi
Mijang-Guadjur
Turalei
Mading
Mabok
Lol R.
to Mayen
Bahr el Ghazal
Upper Nile

Figure 5.4 reflects the tremendous monthly variation of rainfall. There seems to be some pattern throughout the years, but a definitive judgement on this issue cannot be done without longer time-series data. Monthly variation of rainfall, especially differences between the onset of rain, determine the emergence of grass cover every year, and by extension, determine the beginning of the north-westernly movement of the migratory population. In addition, they determine the arrival of Arab livestock traders to the Abyei Town market, who have to wait for good range conditions before they can trek cattle to Khartoum. (See Chapter 9 on Livestock Marketing) Most of the rainfall drains into streams, rivers and marshes. Only a very small percentage percolates into the soil because of the impermeable clay and compacted sand.

In the dry seasons, there have been three ways of providing water to the area. The first is through a system of deep borewells, dug many years ago by the government, as a means of improving the migration routes of the Missiriya. Starting from Mugland southward to Abyei, there are a line of such borewells, totalling about seven, every 10-15 kilometers. There are six other borewells located within the Ngok Settled Area. (See Figure 5.5) Of these, only the Abyei Town borewell operates all year round. The others operate only in the Dry Season. It was not possible to obtain water output data on these borewells. However, water output from the borewells to the north of the Abyei Study Area are available from the RM&R Watson survey, and may be used as an indication of the Abyei borewells. If anything, the Abyei water output is slightly higher because of a higher water table. On average, the borewells to the north provide 7,000 m^3/year although they are estimated to have a potential of 11,600 m^3/year. All borewells are used by both people and livestock although Abyei Town's is only for people. A nominal fee is charged, which tends to deter excessive amounts of livestock from remaining in the byres around the borewells, although those wells used by Missiriya and other big camps see heavy grazing around the borewells In present day values, the cost of installing a borewell is close to £S 40.000 or $60,000, and this does not include maintenance thereafter. The nominal fee charged to the users does not come close to covering costs, yet any increase in this fee will probably deter usage by the people. In Dry Season

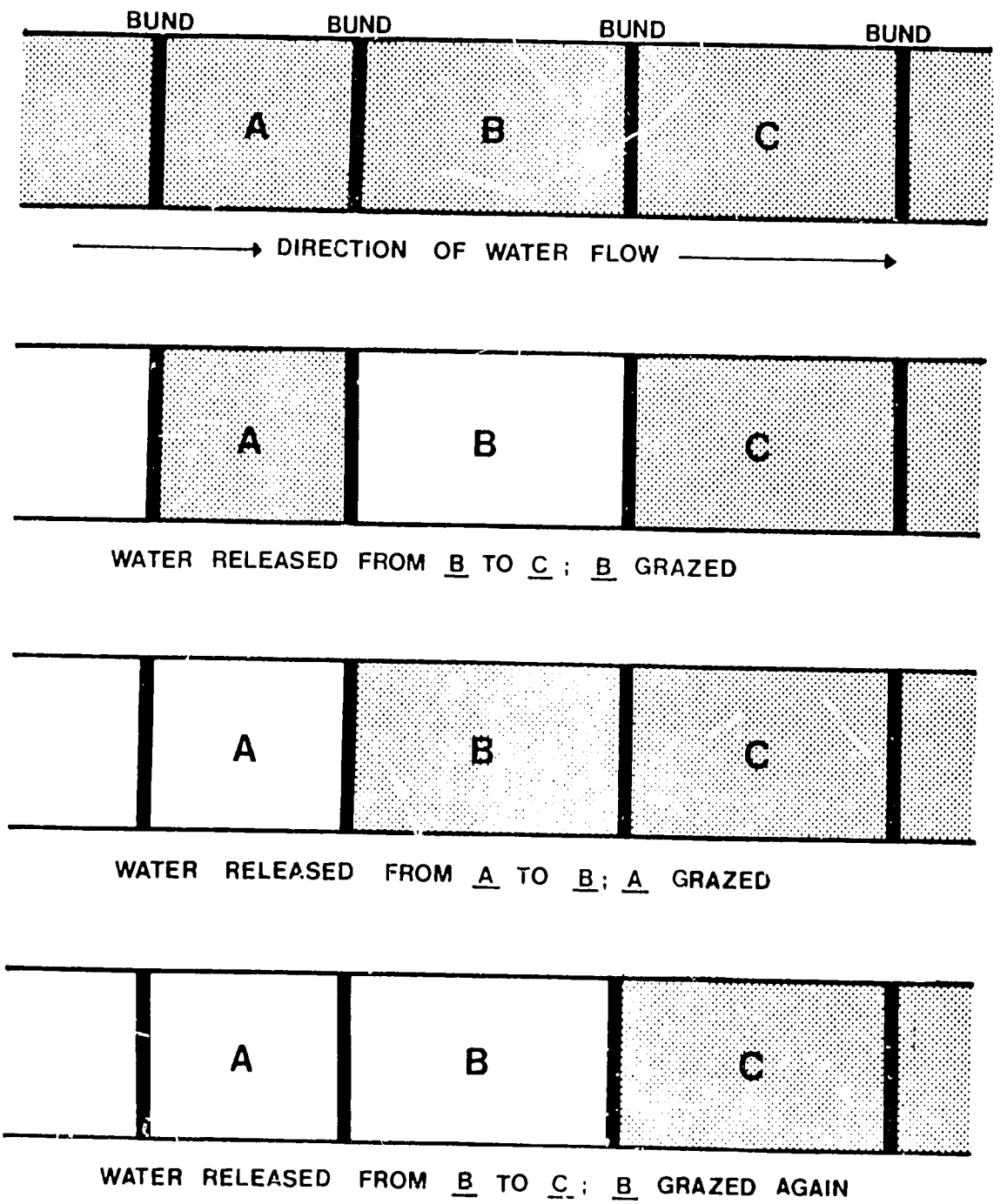
1981, because of political disturbances, the Noong and Taodaich borewells were not operated.

Locally, the effects of water shortage in the Dry Season are mitigated in one of two ways: a household will relocate near a flowing river or river-lake, or it will hand dig wells within dried riverbeds. These wells have a diameter of about 1-1.5 meters, and as they get deeper a lining of woven reeds and branches is used to prevent collapse. Such wells are dug beginning of February to a depth of 3-5 meters and have to be deepened as the Dry Season advances, sometimes reaching 15 meters. They are normally dug at the same site every year. Some wells are exclusively for human consumption, while others are for both animal and humans. The wells are dug by a community of a few villages and only very rarely do outsiders have the right to use them.

A third method of dealing with the seasonal water shortage has only recently begun. Under the supervision of the Abyei Rural Council, and with the cooperation of various groups of people in the Abyei area (local merchants, Dinka, local police), an earth dam was built across the Niamora River (near Mading Achueng) in October 1980. Its purpose was to create a barricade to lower the rate of receding water in the following Dry Season. The earth dam, made from sand bags, was about four meters wide and about 30 meters long. In terms of mobilization of labor and other resources, it was very successful. But they could not master the problem of placing the last few sand bags. By December 1980, long after the rains had stopped and water level was falling, the dam was still partially incomplete, and no further work was done on it. Thus the problems faced by the local people were rooted in the design and construction of the bonds, and probably its maintenance thereafter.

The design of earth dams could be improved by conducting a topographical survey on major water sources, to determine the amount of water, its rate of evaporation, and its direction of flow. An example of what might be accomplished to increase water as well as forage resources is provided by Dr. W.J.A. Payne, and is shown diagrammatically in Figure 5.6. Water would be held in Section A, but allowed to flow out of Section B into C. The forage of Section B would be

Fig 5.6 DIAGRAM OF EXEMPLARY DESIGN OF EARTH DAMS



grazed and then reflooded from Section A. The forage of Section A could then be grazed, followed by the forage in Section B after the water is allowed to flow into Section C. A pilot trial of such a system is required to ascertain the speed of regrowth of the forage, the quantity of forage that could be produced, and the people's ability to implement the design and construction, as well as control the grazing. Some additional advantages are that water could be retained for a longer peiod into the dry season for human and livestock use, and fish production could possibly be increased.

The ADP Well Drilling Program was successful in Jan. 1981 in drilling and developing a small hand-pumped tubewell, which has been operational and yields a steady flow of about 10 litres per minute.* At present it is only used by people. The development of other such relatively low-cost and simple technology wells is very desirable and feasible in the area. The local communities have expressed a willingness to accept user charges in one form or another that are reflective of the true costs of installing the wells. Separate watering tanks may need to be constructed to provide sanitary water for human consumption. The construction of a thorn fence or other enclosures similar to those locally constructed around river wells, may be necessary to control watering by livestock, especially small stock.

Compared to deep borewells, these small hand-pumped wells have lower output, and being manually operated, require more human time and energy. Thus it is not to be expected that any single well would increase the byre cattle population to any great amount. Unlike the area around deep borewells, these hand-pumps will not see heavy grazing around them. Yet, an increase in hand-pumps in the total Ngok Settled Area will eventually translate into higher livestock numbers in the dry season. So far, the byre owners maintain that each hand pump must be accompanied by a set of regulations established by the community, and the regulation of livestock numbers is one of the first issues that is mentioned. This rational approach to use of range/water resources is a good base from which to build a new and effective range management system in the area.

In conclusion, an increase in the water supply of the dry season in the settled area is necessary for the well-being of both people and animals. Small

* See Eaton, 1981.

hand-pumped tubewells and sand-bunds across river systems seem to be two appropriate ways of meeting this challenge. Much experience has been gained on hand-pumped wells, but bund construction will require an initial surveying of suitable basins and sites. In addition, the question of maintenance of both wells and bunds must be seriously studied in the future.

4. Minerals for Livestock Use

The partial analysis of forage samples from the Ngok Settled Area show moderately low to medium levels of mineral content. Most samples had adequate NaCl and Mg, but when the samples did not contain leguminous species they showed low Ca content.

Locally, the herders are aware of the importance of "salt" in their livestock's diet, yet only a few said that they had bought salt in the market for them. There are two sources of these minerals other than forage and water* that are recognized locally. One is the ash residue of dung fires available in the byres or campls, which cattle are known to lick. The herders maintain that too much consumption of this ash leads to stomach pains. Another source of minerals for cattle is through licking the top of ant-hills which contain elements brought up from under the surface. Table 5.4 shows the mineral content of a sample from each of these sources, which were analyzed by the Animal Research Laboratory in Khartoum.

Table 5.4

Mineral Content in % of Dung Ash and Ant-Hill Material

Sample	Ash	Ca	Mg	NaCl	Ph
Ant-Hill	93.97	6.8	1.45	0.187	1.2
Dung Ash	97.71	1.5	0.5	0.38	NA

* The mineral content of water in the Ngok Settled Area was not analyzed.

Even though moderate levels of minerals are available in the forage, it is not clear whether they are sufficient for the requirements of cattle. No data are available on trace elements like iron or zinc from the Abyei Area, although the literature would seem to suggest that iron is not a problem in tropical forage crops. In any event, it would be useful to conduct a pilot mineral-supplements program to see if both beef and milk production are increased.

5. Fodder and Silage

The nutritional level of byre cattle in the dry season is comparatively low. The cattle have to cover long distances not only to find adequate quantities of feed, but also water. The introduction of supplementary feeds through ensilage or post-harvest fodder may be two means of increasing the nutritional level of cattle in the dry season, thereby augmenting milk production for the settled population.

Silage

A silage experiment was conducted by the ADP in the dry season of 1978/1979 to provide supplementary feed for the 8 mature castrate cattle used in an experiment on animal powered plowing. The silage pit was constructed in September 1978. It was 3.7m in diameter and 4.9m deep, and was dug in predominantly clay soils. It took four men one month to dig it. The pit was filled with Echinochlea spp., available locally in swamps and riverbeds. (Probably E. Scabra (Stagnina) and E. pyramidalis). The grasses were chopped by hand into 3" pieces and 2 kg of salt (NaCl) was added to aid the ensilling.

The soil around the lip of the pit was landscaped at about a 55% slope away from the lip as a precaution against rain runoff. The sides of the pit were mudded to prevent aeration through the cracking soil. The pit was covered with 2 feet of mud and a grass mat, and opened at the end of February 1979. The cattle responded favorably to the silage, which was fed at their pegs during the evenings. On the 26th April 1979, a prematurely heavy rain and high winds filled the pit with 2 meters of water, which leached out the nutrient value of the remaining silage. Furthermore, the protective mound around the pit was not able to prevent runoff from an adjacent field and the sides of the pit caved in.

Extensive human labor is required to dig the pit in a soil that becomes almost rock-like during the dry season. Furthermore, the collection and chopping of ensilage material is also labor-intensive. The chances of getting a large labor force at a time when the people are busy harvesting is very low. If the digging of the pit was delayed until after harvest, (i.e. January) fewer types of grass would be available since most would have dried. Furthermore, the feed would be ready by the beginning of April, and probably usable for only half to one month.

Silage is beneficial in the dry season because it not only provides nutritional bulk, but also moisture. Yet there are many constraints to its introduction, at an appropriately low level of technology, in the area. The fact that the rains destroy the pit through erosion means that a pit has to be redug every year. Cracking clay soils create the danger of spoilage. The labor constraint will probably delay its construction, and one month of feed out of 5 months of dry season, is certainly not worthwhile.

Modifications to the design have been suggested by the ADP staff, such as wider circumferences, but shallower pits to make access to the ensilled material easier, or to locate the pit on sandy ridges to minimize erosion and flooding. In addition, more sophisticated material could be imported into the area to increase the level of technology, although the widespread extension of a more complicated technology to the Ngok population would be a logistical nightmare, and probably not feasible given the subsistence economy of the people.

Yet the main constraint of labor still remains, no matter what the technology. The ADP Silo, with 43 m^3 of ensilled matter, was deemed just sufficient for 8 mature castrates for 4-5 months of supplementary feed. A typical byre has the same amount of animals and thus would presumably require the same volume of feed. The ADP silo was completed in 2 months, with 4 diggers, 5 harvesters, 2 choppers and one ox-cart. It would take many communal beer-parties (nafirs) to supply enough labor to a byre for such an enterprise. The possibility remains that with enough experimentation and advertising, the technology could be improved

and the people would realize the worth of such a system, but it would be many years until silage could be introduced as a viable feed supplement into the area.

Fodder

A simpler way to increase the nutritional quality of byre cattle's diet is through the consumption of post-harvest residue in March-June of each season. Traditionally, cattle (both from the byre and the camps) will consume the crop residue immediately after the second harvest in December and January.

For the past 2 dry seasons, the ADP has tried to store the crop residue and use it as feed beginning in March, when the natural range around the Settled Area has deteriorated. In the first season, the residue was stored on a 1.5 meter high platform (similar to traditional designs) and feeding of 13 mature castrates (belonging to ADP) began in late February due to the relatively drier season. The fodder was fed in the afternoons, after a full day's grazing. By mid-April, the supply was depleted and the cattle had to rely solely on the natural range. Until the beginning of June, when the new grass had emerged sufficiently, the 13 castrates had lost a significant amount of body weight (average of 30 kg) since their April weight. (Body weights are computed by a formula using chest girths. See Chapter 4)

In the 1981 season, the stored residue was accidently destroyed by fire in February. The main problem was that the platform was too near to the pegged area and their dung fires. Yet, the experiments served to familiarize the local people with such a system. Many expressed the wish to try the system but felt hampered by various problems. Among them:

1. The labor required to build the platform and to carry the residue from the field to the platform.
2. The difficulty of stopping cattle herds who traditionally have consumed the residue right off the field.

A few heads of households had agreed by November 1980, to try out a fodder program. They had also asked the ADP to assist them by providing ox-carts to

haul the residue from the field to the storage platforms (which would be located half way between the byre and the crop field).* Unfortunately, the political disturbances of that year and the evacuation of northern homesteads did not allow a pilot program to be carried out.

The labor required to collect the residue and store it on platforms is not as much as the labor required for a silage program. On the other hand, the quality of sorghum fodder is probably less than ensiled material. This quality can be increased by the cultivation of grain legumes in conjunction with, or as a rotation system with sorghum. Agronomic experiments conducted by the ADP indicate that cowpea (Vigna unguiculata) may not be suited to extensive cultivation in the area, but other grain legume crops, such as pigeon pea (Cajanus Cajan), mung beans (Phaseolus mungo) and sesame (Sesamum indicum) might be suitable. (Fuller, 1981) It remains to be seen whether crop diversification can be introduced into the area.

In any case, it seems that a fodder storage program directed at individual byres and their milking cows is feasible. Its success will depend on the quality of an extension program that is designed to deal with the initial reluctance of the local people, to ensure good storage and feeding schedules, and to measure the milk production of cows as an indicator of success. Furthermore, the extension program must be able to advertise the successes of any trials, since the large scale extension of fodder storage has to be accompanied by a communal agreement that cattle, especially from the camps, be prohibited from consuming the harvest residue in December.

6. Conclusions

The wet season carrying capacity of range resources for cattle and sheep seems to be underutilized at the present time. Grass species are of adequate variety, except in the Forest Savannahs. A lack of leguminous species may be compensated for by pilot testing of suitable legumes, broadcasted onto the

* This acceptance of cattle-drawn carts by them is a radical departure from the initial reaction to the draft-animal program instituted by the ADP in 1978/79 (Fuller, 1981). It seems that the 3 years in which the ADP used cattle as beasts of burden served to demonstrate its benefits to a few people. It is hoped that this is an indication of trends to come, although the premature termination of the ADP decreases any such hopes.

pastures around the byres. On the other hand, the capacity of the dry season range, and the amount of browse available for goats are yet unknown. Further testing is required to determine the extent of these resources in all of the NUA before increases in livestock population can be contemplated.

Bush fires are a problem when uncontrolled. The survey recommends experiments with different fire-control methods that are sensitive to local management and economic problems. Training of herders in new forms of management (see Chapter 6) should include issues on range management and use.

Water resources are inadequate in the dry season and the vagaries of yearly rainfall create periods of boom and drought. Provision of small hand-pumped wells and earth dams are two ways of creating more reliable sources of water in the dry seasons which would reduce the extent of selective heavy grazing around present sources of water. Regulatory mechanisms must be devised and enforced by the people to mitigate excessively high cattle populations as a result of greater water availability.

Additional sources of feeds such as minerals and fodder may be worthwhile, but they require pilot testing to see whether the outputs are greater than the inputs. If deemed feasible, extension programs must then be effective in implementing these ideas on a large scale, and must be sensitive to the existing social regulatory systems. (See Chapter 6)

Chapter Six: Livestock Management

1. Introduction

In the tradition of development work, the myth of irrationality among nomads used to be a very strong perception. This myth, also termed the "Cattle Complex" refers to uneconomical and irrational management of a particular herd. By now, this myth has been refuted by almost all studies of nomadic societies; therefore, it is possible to go beyond, and to understand in detail, the reasons for particular management practicies. Harder to refute has been the "tragedy of the commons" perspective, since in some nomadic societies, it has been shown to be a major problem. This problem basically states that within a nomadic society, each unit will compete with other units over finite and often scarce resources, in such a way as to lead to a destruction of the common resources. As a result of studies that have concluded such a "tragedy", it appears that the term "Nomadism" has now acquired a negative connotation among development experts. So much so, that the initial perception of a nomadic society is one of deterioration of the rangeland and other resources

The ADP livestock survey was initially designed to address these questions and according to the "tragedy" assumption, to recommend ways in which deterioration of the common resource could be mitigated by better management practices. As a matter of fact, the Survey is now able to conclude that traditional management practices of the Ngok Dinka are actually designed to mitigate such a tragedy, and should be safeguarded against future change.

The management survey had three components:

1. Enumeration of herds and flocks to determine herd structures and other demographic indices.

2. Interviews and participant-observation on a daily basis of a sample of herds, both in the camps and byres, to determine specific management practices such as weaning and breeding.

3. Follow-up of a sample of migratory herds to determine migration routes.

Appendix A provides a sample of the revised questionnaire used in Dry Season 1981.

The following chapter looks at the livestock management system according to two levels: management of the individual herd, which is discussed in the first four sections, and the overall societal management system and its effect on the region discussed in the last section:

2. Herd structure
3. Livestock Ownership
4. Demographic Inidces
5. Daily Management
6. Migration Patterns

2. Herd Structure

Cattle were enumerated based on the unit of a hearth within a camp, and a byre, in both the wet season and dry seasons 1980 and 1981. Only part of the data have been divided into type of cattle, therefore for the purposes of this chapter only those data will be used.

Table 6.1 Average Number of Cattle in the Byre

	# byres sampled	% with cattle	avg./byre	standard deviation
Dry season byre 1980	10	90	20.67	21.79
Dry season byre 1981	5	100	34.0	8.4
Wet season byre 1980	30	87	15.92	9.77

A comparison of Dry Season 1980 and Wet Season byre data (Table 6.1) shows that even though in the dry season the herd size is larger, there is much variability from byre to byre (larger standard deviation). In the wet season the herd size is smaller, but more evenly distributed among byres. In the dry season, there usually is a concentration of both animals and people in areas that are close to water, usually with some relatives. In the wet season, people and animals return to their homesteads. The Dry Season 1981 data with the very high average cattle per byre clearly show the effect of political refugees evacuating their homesteads and concentrating even more in certain area.

Table 6.2 Average Number of Cattle in Hearths

	# hearths sampled	avg/hearth	standard deviation
Dry season 1980	14	123.86	45.48
Dry Season 1981	32	77.16	30.2
Wet Season 1980	24	87.29	30.06

In the Dry Season 1980 data, the hearth size was much larger and there was more variability than in the wet season data. This would show that with the beginning of the rains more cattle are returned to the byre. (Table 6.2)

In Dry Season 1981, the hearth size was smaller than in 1980, but there was less variability. Visual observation of the area suggested that there were more camps in 1981 than in 1980 because of the political disturbances, which may explain the smaller hearth size in 1981.

Ngok herds, both in the byre and camps, are composed primarily of females (Table 6.3).

Table 6.3 Demographic Composition of Herds by Sex

	% Total Male	% Total Female
Dry Season Byre 1980	34.41	65.59
Dry Season Byre 1981	32.4	67.60
Wet Season Byre	32.13	67.87
Dry Season Camp 1980	38.96	61.04
Dry Season Camp 1981	40.7	59.30
Wet Season Camp	41.85	58.15

There are proportionately more female cattle in the byre than in the camps, in both the dry season and wet seasons (although in absolute numbers there are less because there are less cattle in the byres). Furthermore, there are proportionately more milking cows in the byre than in the camps. On the other hand, there are more mature castrates in the camps than in the byres, for both seasons. This stratification of cattle among "sedentary" (i.e., byre) and "migratory" (i.e. camp) herds is a rational response to environmental

constraints. The sedentary herd has a finite amount of grazing resources even in the wet season since the herd cannot travel farther than a certain radius around the byre, while the migratory herd is continually searching for new and better grazing lands. Thus only those cattle that are more productive and can give something in return are allowed to use the finite resources around a byre. Pregnant cows are sent to the migratory herd not only because they are still not productive, but also because the better grazing resources can ensure a healthier offspring. The ratio of mature entire to mature females is higher in the camps. There are 15-30 females to each entire in the camps, and 20-40 females/entire in the byres. In comparison, an entire serves less families than its counterpart in the Nuer herd (Dahl, 1976, 29).

This apparent stratification between sedentary and migratory herds should not be exaggerated though. There are still quite a few heifers and castrates in the sedentary herd. The reason given most often is that these are favorite animals who are kept in the relative security of a sedentary herd. Furthermore, milking cows are also present in the camps since the migratory people subsist primarily on milk and its products. Nevertheless this beginning of a stratification of "milk producers" from "beef producers" has certain potentials for the development of livestock production in the Abyei Area.

Average or typical herd structures for the Ngok Dinka are shown in Table 6.4. Because of the civil wars and the 1972 drought, it is expected that there are very few old (10 yr +) animals in these herds.

There is no significant difference between the proportions of each category of cattle among the dry or wet season byre, but there are some differences among the camps. In the wet season camps there are fewer cows, heifers and mature castrates. Presumably these were sent to the byres, but since no significant difference exists among the byres of wet and dry season, then the cattle must be distributed more evenly among the byres during the wet season.

The following Table 6.5 shows the typical herd structures obtained from a sample of 6 Rueng Dinka hearths and 4 Rek Dinka hearths in Dry Season 1981.

These hearths had joined some Ngok hearths, and as such may be biased, but it is difficult to determine the direction of the bias. Rek hearths appear to be larger than Ngok hearth, while Rueng hearths are smaller.

There does not seem to be too much of a difference between the herd structures of these three tribes. There are the same proportion of males to females, and the same proportions of milking cows. The only significant difference is that there are proportionately less matures males, and more immature (but weaned) males in the Rueng herds. It is possible that more mature males are kept in the Rueng byres than for other tribes.

These data show that the Nilotic herd structures do not contain an irrational number of unproductive males; even the relatively large number of castrates is in response to the needs of paying debts, bride-prices and for enhancing the social prestige of a herdowner. In addition, they are labor saving, and can be sold at high market prices. In any case, since they are essentially segregated from milking and productive animals by being sent to the cattle camps, they do not compete for grazing resources around the byres.

Sheep and goat herds belonging to the Ngok are always sedentary, unlike the small stock herds of other southern tribes. Only in Dry Season 1981, because of political disturbances in the Ngok Settled Area, some herders sent their small stock along with the migratory cattle herd. The only reliable data available on typical herd structures is from the Wet Season Byre survey (sample of 28 byres).

On average, a byre will contain 20 sheep and 20 goats. (See Chapter 4). The ratios of entire males to mature female small stock is 1:10 for sheep and 1:11 for goats; considerably fewer females are served by Ngok entires than herds of other tribes; such as the Kababish (ratio of 1:30) (Dahl, 1976, 88). A sheep or goat herd is composed of 75-80% females, which shows the high percentage of culling of males. Furthermore, the majority of females are pregnant at any particular time (38% of all she-goats and 45% of all female sheep). Pregnant and milking small stock make up the absolute majority of a flock (57% of sheep and 52% of goats). (See Table 6.6) Small stock herds are valued primarily for their meat, although goat milk is consumed frequently.

Table 6.4 Average or Typical Herd Structures
(in absolute numbers)

	Castrate	Entire	Young Castrate	Young Entire	Suckling Male	Milking Cow	Pregnant Cow	Heifer**	Suckling Female	Total
Dry Season Byre 1980	3.3	.3	1.2	.7	1.6	4.9	1.4	4.6	2.7	20.7
Wet Season Byre	.4	.4	.9	1.2	2.2	4.7	1.2	2.6	2.3	15.9
Average Byre (in %)	10.1%	1.9%	5.7%	5.2%	10.4%	26.2%	7.1%	19.7%	13.7%	100%
Dry Season hearth 1980	25.4	4.9	6.5		11.4	22.7	14.4	27.4	11.1	123.8
Wet Season hearth	17.9	1.2	7.6	2.2	7.6	15.0	11.3	16.0	8.1	87.3
Average hearth (in %)	20.5%	2.9%	7.7%		9.0%	17.9%	12.2%	20.6%	9.2%	100%

* includes both dry and pregnant cows since the Dinka assume all dry cows to be pregnent
** includes both pregnant and immature
*** records of sterile or infertile cows are unreliable since the Ngok do not like to admit their existence, even though they will keep such cows in the herd for many years until they are sure of their unproductivity.

Table 6.5: Comparative Typical Herd Structures (in Percentages)

	Castrate	Entire	Young Castrate	Young Entire	Suckling	Total Male	Milking	Pregnant	Heifer	Suckling	Total Female	Total
Ngok *	20.5	4.0	5.3		9.2	39	18.3	11.6	22.[illegible]	9.0	61	100
Rueng	7.4	.8	9.4	6.4	13.0	37	22.7	9.2	22.2	8.9	63	100
Rek	18.2	1.4	6.8	2.6	10.0	39	22.5	12.2	13.6	12.7	61	100

* Dry Season Camp 1980 data

Table 6.6: Typical Flock Structure (in Percentages)

	Castrate	Entire	Immature Male	Suckling Male	Total Male	Milking	Pregnant	First Pregnancy	Immature	Suckling	Total Female	Total
Sheep	1.5	6.0	3.5	10.6	21.6	22.1	28.1	7.0	9.1	21.1	78.4	100
Goat	3.7	4.6	5.8	11.1	25.2	23.2	23.0	5.6	10.7	12.3	74.8	100

3. Livestock Ownership

The livestock survey was based on the units of sedentary byres and migratory hearths. Consequently, it was very difficult to estimate how many cattle or small stock were owned by each individual household. The majority of cattle in each byre is owned by the head of household, but there are some that are given to his sons, starting with their initiation period. Furthermore, relatives, neighbors and friends will keep cattle in his byre for three not necessarily mutually exclusive reasons. First, they wish to "hide" their cattle for fear of pushing up the price of various social obligations; second, they may not have a byre in their compound; and third, they may have sent the majority of their cattle to the camps, and thus will keep the remainder with another byre to be herded jointly. Any byre may contain cattle owned by from one to five households. In some cases, the cow may be owned by one and the calf by another.

The cattle of a hearth in a camp are also jointly-owned by various households. Informants say that each hearth is affiliated with at least ten households, however there is no precise way of verifying that. If the relationship of hearth members to the head of hearth is any indication of where the cattle came from, then it seems that the majority are from the head of byre (the father) 37%, the brother 16%, and himself 15%; in other words, the paternal agnates.

An individual never has total rights to an animal. Even if a cow is formally acknowledged to be "owned" by an individual, say the head of household, the women and children have rights to its milk, the son has a right (whether granted or not) to claim it as his own, the tribal priest has a right to claim it as his own for the purposes of satisfying dieties, and other relatives have a right to claim it for various payments. The only absolute control that the head of household has is to decide where to send it (either camp or byre), and whether to sell it. Some cattle are also owned by women (acquired through bride-price remittance, inheritance or purchase) but men still exercise control over their management and sale.

Sheep and goat are formally owned by both men and women. Yet they are under the management of women, although men may decide whether to sell them or not. Small stock are very rarely used for bride-price payments, but they are extensively used for sacrifices and entertaining guests. In addition, the extent of loaning small stock is much greater than for cattle. Thus the task of establishing absolute ownership of small stock is extremely difficult. Furthermore, if loaned small stock have offspring that are sold, and if the borrower buys cattle from the proceeds, both the lender and borrower have a share in the cattle, the precise amount of which is established by negotiation.

It stands to reason that the concept of usufruct is much more important than ownership in this pastoral economy. At any one time, an animal "legally" owned by an individual may be sued for by a number of other people, based on a traditional system of rights and obligations. It may be on loan to someone else for a practically indefinite period of time. A loan is initiated either on demand by a borrower who needs more milking cows, or by the lender who wants to "hide" his livestock. The offspring of a loaned cow or female smallstock are then "legally" owned by the borrower, if the lender was the initiator. Thus, the lender is paying a kind of "rent". If not, the lender has a right to retrieveboth the female and the offspring, and the borrower only has rights to the milk of the animal. Many court cases arise because the borrower has sold the cow or its offspring, or is refusing to repay the loan.

The elaborate system of bride-price has been described elsewhere (see Deng, 1971 and Deng, 1973). Suffice it to say that it is a complex system whereby wealth, in the form of cattle, is distributed among the Dinka and other tribes. Dinka marriages are exogamous, requiring that marriages occur outside the patrilineal clan of the father and mother. The bride price is based on the supposed wealth of both the bride and the groom's family. The more this wealth is, the higher the price. It is possible for a poor man to marry a rich girl because the bride price is tailored to both his family's capability, as well as the bride's family's prestige, but rarely do rich households consent to a marriage with a poor household. Thus the marriage seems to ensure more wealth accumulation within a few rich clans. This is

compounded by the fact that a rich man may have more wives and daughters than a poor man, and so his chances of further cattle accumulation are better. The price of marrying outside the tribe, for example, with the Twich or Rueng, is considerably higher than marrying within the tribe.

A typical bride price is made up of 5-10 heifers, 3-5 milking cows and their calves, 2-3 pregnant cows, 1-2 mature entires, and 2-4 immature males. This considerable amount is not paid all at one time, but is spread over as much as 10 years. There is also some reverse flow, where some (but not necessarily the same) heifers and male cattle are returned to the groom's family over this 10 year period. Usually, the best cattle are claimed for bride-price transactions, thus any program of selective breeding aimed at an individual household is not likely to succeed.

The two chiefly clans of Pajok and Diendior can be considered to be wealthier than other clans. But in general, the wealth of a man is usually judged according to the size of his family and cattle herd. Yet "status- (almost class-) consciousness, to a degree, (is) not normally exhibited by the Dinka" since they essentially form an egalitarian society. (Deng, 1973, 39) Wealth with its consequent social prestige, carries with it a range of social responsibilities, that ensures cooperation, wealth circulation and assistance within the whole society.

The priest (or banyabit=Dinka; kujur=arabic) is an important factor in the cirulation of livestock. From reports provided to the Livestock Survey, it seems that each subtribe has 2 priests, one for livestock and one for crops. The crop priests are active during the end of the dry season in making sacrifices for rain or a good harvest. They are also responsible for blessing newly constructed houses. The livestock priest is responsible for ensuring the health of the herd, adequate grazing resources, and for blessing the newly built byres. However, in many cases, one priest is responsible for both functions. In addition, some priests are more popular than others and there is a chiefly priest for the whole tribe. Priests have the right to claim any individual cattle from a herd for their own in return for services rendered. In addition, some cattle from each herd are dedicated to God or an ancestral

spirit. These cattle will often stay with and be used by the original household. But they are viewed as sacred animals that are not allowed to be sold off, and are well guarded against death or injuries.

Livestock are also circulated among homesteads that are affiliated to the same head of household. It is common to find that wives of the same man will live in two or more very distant areas, one household being more concerned with raising livestock, and the other with cultivation. In such a case, the head of houshold has to ensure that there are enough milking cows to support both the homesteads and the cattle camp.

The complex system of using cattle for social transactions ensures a measure of cooperation and sharing of resources among Ngok households. It serves to strengthen bonds as well as assist others in times of hardship. This communal character of Ngok society is balanced or contradicted by the desire of each household to be independent and wealthy, which has its roots in the dynamics within each household. (Niamir, 1979) Therefore, absolute ownership of livestock (as the major form of wealth in this society) is never precisely defined by any household, yet relative ownership is always discussed, with the aim of establishing social prestige, independence and power within the community. The ADP livestock survey attempted to quantify this phenomena of social transactions among the Ngok Dinka. Because of the sensitivity of the issue, two separate procedures were used so that the results could be verified.

Method A : Questionnaire Method

The samples included sixteen herds of byre-owning households and eight heads of hearths in six separate cattle camps, who were interviewed three times in a one-year period. The interviewees were asked to indicate how many catttle they had given, or received, in the 6 months previous to the interview. The problem with this method is that the interviewees were reluctant to disclose the full extent of their social transactions. This reluctance was less pronounced in follow-up interviews when a degree of trust was established between the surveyor and the sample. Therefore, only the last 2 interviews are analyzed. They were asked to refer their answers to the cattle that were under

their care at that particular moment, in an effort to relate the questionnaire results to a finite number of cattle. But as the interviews proceeded, it was clear that they would either be referring to all of the cattle they personally owned (regardless of where they were) or to the cattle in their byre, or to the cattle in their byre and in their hearth, etc. This uncertainty only allows relativistic conclusions to be drawn with this method.

Method B : Marking Cattle

252 head of cattle in three dry season 1980 camps, and 76 head in 11 dry season 1980 byres, were numbered and belted. The camp cattle were then followed up twice in the following year and the whereabouts of those cattle not in the herd were determined. In the second follow-up (April 1981), only 104 cattle were accountable, since the rest had gone beyond some major rivers. The byre cattle were also followed up twice, and by the 2nd follow-up only 65 head were accountable. The belted samples were representative of a typical Ngok herd. In other words, the camp sample had more mature castrates and pregnant cows, while the byre sample had more milking cows. It must be noted that this second method can only deal with decreases while the first method deals with both increases and decreases of cattle due to social and economic transactions. The results are presented in Table 6.7.

By far the most frequent way that cattle are exchanged is through marriage payments. Since these involve mainly milking cows and heifers, the byre samples show higher frequencies of marriage exchanges than camp samples. The low frequency of loan and debt exchanges in the first procedures is clearly due to the reluctance of interviewees in divulging such information. The second procedure gives a clearer idea of the extent of such transactions: lending is not as important as marriage payments but more frequent than marketed exchanges. Debt payments are not very frequent, probably because they involve lengthy court proceedings. Both lending and debt payments are more frequent in byre herds than camp. Marketing is more frequent in a camp herd. Only 2% of the byre sample (Method A) were due to sacrifices/slaughters. None were recorded under Method B mainly because that sample was biased toward healthier, favorite animals whom the herders wanted belted as a further sign of prestige.

Not these, but the weaker and uglier animals are always chosen for slaughter and sacrifices.

The relative picture emerges that social transactions such as marriage payments, lending, debt payments and sacrifices are more frequent in a byre herd, while economic transactions (mainly marketing) are more frequent in camp herds. (Table 6.7) This is due mainly to the fact that relatively more cattle suited to social transactions (i.e. milking cows and other productive categories) are present in the byre herd, while those suited to economic transactions (i.e. mature castrates) are in the camp herd. Nevertheless, since these transactions deal with the main form of wealth (cattle) they necessarily affect the economic viability of households.

Table 6.7

Percentage Frequency of Cattle Exchanges
by Type of Social and Economic Transaction

	Method A			Method B		
	Byre	Camp	Total	Byre	Camp	Total
Marriage	69	29	55	56	46	52
Loan	3	12	7	25	23	24
Market	25	59	36	13	31	21
Debt	0	0	0	6	0	3
Slaughter	3	0	2	0	0	0
Total	100	100	100	100	100	100

The second point that emerges is that social transactions involving cattle are much more frequent than economic exchanges. This is in part due to the fact that the camp herds (the main source of marketed cattle) are for the most part of the year far from Abyei Town (the only cattle market servicing the Ngok population). It is only in the months of June to September that the camps are in the proximity of the cattle market. Yet the main reason is that there simply are more diverse forms of social transactions in Ngok society.

These results indicate that along with the stratification of milk producers from beef producers within the herd structure, there is also a complementary stratification of the utilization of cattle for social versus economic transactions. Again, it is incorrect to exaggerate this stratification, since some of the camp cattle are used for social transactions. Camp cattle seem to act as a reserve bank of unproductive (non-milking) animals, from which, periodically, cattle are drawn out for the sustenance of the byre household, or for social and economic transactions.

4. Demographic Indices

4.1 Cattle Indices

Demographic indices were obtained from the same 2 methods as described in the previous section. The difference was that with the lack of better data, the reservations were set aside and the results from each questionnaire were related to the number of cattle under the management of the interviewee at that time. Furthermore, the data were tabulated according to 6-month periods and all interviews done in the Wet Season 1980 and Dry Season 1981 were used regardless of whether they were yearly follow-ups or not. Thus, there was a total sample of 14 hearths from 6 separate camps and 25 byres.

For the purposes of presentation, the 6-month data have been multiplied by a factor of 2, to represent yearly data. Therefore, there is a bias, where Dry Season data will mainly reflect dry season conditions, while wet season data will reflect wet season conditions.

4.1.1 Cattle Mortality

Table 6.8 presents age-specific mortality rates among cattle herds derived from questionnaires. The absence of deaths for immature males in both seasons, and none for mature males in the wet season make the data suspect from the beginning. On the other hand it was expected that the herdowners would actually overestimate the numbers dead in an effort to "hide" their cattle. Until this anomally is cleared, this report will proceed with the data available. In all categories except immature females the mortality rate increases in the wet season. During this season, even though level of nutrition is higher, the prevalence of parasites, diseases and widespread epidemics is much higher than in the dry season. Of a total sample of 328 belted cattle (method B) only 3.4% had died of natural causes (diseases and wild animals) after one year, whereas with method A, the overall mortality rate was 5-8%.

Data from other areas show a much higher overall mortality rate. Western Sudan is reported to have an overall mortality rate of 15.5% (Dahl, 1976, 38). On average, dry and wet season conditions give an overall mortality of 7.2% per year among Ngok cattle. The figures for the Ngok Dinka area seem to be quite low. Overall mortality rates show no significant difference between byre and camp herds in the dry season, but there is a difference between the two in the wet season: the mortality rate is higher in the byre. A migratory herd is able to evacuate an area if it is known that there is much disease there, whereas a sedentary herd has no chances of evacuation.

The calf mortality rates range from 8.8% to 17.9% (dry and wet season respectively). Calves are more susceptible to diseases in the wet season than older animals. Assuming their figures are reliable, the dry season mortality is very near to the optimum calf mortality rate of 5% (Dahl, 1976, 37). For the remainder of the report, the average calf mortality (wet and dry season) per year of 14.3% will be used.

Morbidity among cattle is on the order of 15-30% of the herds (see Chapter 7, Livestock Disease). It seems to be higher in camp herds than in byre herds, an interpretation that coincides with local Ngok herder perceptions. Yet it is surprising that mortality rates do not show much difference between camps and byres.

Table 6.8:

Age-Specific Mortality Rates - Method A

	% mature male	% immature male	% mature female	% young** female	% male calf	% female calf	% overall mortality
Dry Season	4	-*	4.3	7.8	10.2	7.3	5.7
Wet Season	-	-	9.0	3.9	16.8	18.9	8.2

* no natural deaths were recorded

** includes pregnant and non-pregnant heifers

4.1.2 Cattle Calving Percent

The calving percent was calculated according to the following formula:

$$= 100 \times \frac{\text{\# living calves (1-12 months old) + \# calves dead in one year}}{\text{\# mature female (pregnant heifers and cows, dry and milking cows)}}$$

The overall calving rate is 64% (out of a sample of 2492 mature females). The usual calving rates reported for African cattle are in the range of 40-60%. One report from Uganda gives a figure of 70% (Dahl, 1976, 35). If the calving rate is broken down some interesting patterns emerge. (Table 6.9)

Table 6.9: Comparative Calving Rates within Ngok Herds

Sample	% Calving Rate
All byre sample	80%
All camp sample	62%
All Dry Season sample	66%
All Wet Season sample	60%

The higher byre rate, as compared to camp rate, reflects the fact that the majority of mature females in the byre are milking cows. The higher rate in the Dry than in the Wet Season reflects the fact that calf mortality is higher in the Wet Season.

4.2 Small Stock Indices

The data on lamb or kid mortality and births among small stock were obtained from the enumerations of flocks during Wet Season 1980 and Dry Season 1981. Data on adult mortality were based on a questionnaire much like that for cattle.

The overall mortality of sheep is 35% and goats 28% of an average flock. Mortality in this case is defined to include natural death (old age and disease),

death by sacrifice or slaughter, and lost or stolen small stock (mainly due to wild animals). The higher sheep mortality rate shows the lower adaptability of sheep to the Abyei area, and also the fact that slightly more sheep are sacrificed or slaughtered than goats.

Dry season mortality is lower than wet season mortality in both species, although the difference is not very large. Male mortality is higher than female mortality in both species, which reflects the greater value of females based on their milk productivity. (Table 6.10)

Table 6.10 Mortality Rate of Small Stock

	Male Mortality	Female Mortality	Overall Mortality
Sheep	53%	27	35
Goat	38%	24	28

The data on lamb and kid mortality, twinning and lambing/kidding rates, show a much lower rate than reports from other pastoral systems. (Table 6.11)

Table 6.11 Lamb and Kid Births and Mortality

	Mortality % (Suckling animals only)	Twinning %	Tripling %	Lambing/ Kidding %
Sheep	1.8	5.8	0	42
Goat	6.5	9.9	1.2	49

Figures from Western Sudan (Dahl, 1976, 95) give lamb mortality rates of 30.5% and kid mortality of 29.54%. Twinning rates for goats in East Africa are 5-10%, although the Mubende goats have 30% twinning and 1.7% tripling rates (Dahl, 1976, 91). The average litter size is 1.04 for sheep and 1.06 for goats, slightly lower than comparative figures for Western Sudan of 1.14 lambs and 1.57 kids. (Dahl, 1976, 91).

Table 6.12 shows the number of small stock that are expected to be born or to have died after one year, from a flock of 20 sheep and 20 goats, given the 1980/81 indices.

Table 6.12 Rates of Growth Among Typical Small Stock Flocks (In Absolute Numbers)

	No. Animals in beginning of year	No. Deaths in Year*	No. Births in Year	Balance No.	Balance % of flock
Sheep	20	7	4.8	-2.2	-11%
Goat	20	5.6	5.1	- .5	-2.5
Total	40	12.6	9.9	-2.7	-6.8

* Includes natural death, slaughter and loss.

If we ignore increases and decreases due to socio-economic transactions, then the results indicate that small stock flocks, herded by the Ngok, are actually decreasing from year to year. Most of this decrease is due to slaughter for social purposes.

Analysis of livestock marketing data (see Chapter 9) have shown that an average flock of sheep will increase by 0.5% annually due to a balance of purchases over sales in the Abyei Town market, and an average flock of goats will increase by 1.5%. This is a combined annual increase of 1% for all small stock flocks. Rate of sales of small stock outside the market are not known, but they probably are not enough to offset the decreasing flock numbers due to death and slaughter. In conclusion, based on these 1980 figures, it is probably true that small stock flocks among the Ngok Dinka are decreasing gradually. Without more information it is not possible to say whether this is a long term trend or just due to yearly fluctuations. It is probable that small stock growth rates fluctuate both according to environmental booms and busts, and according to slaughtering. In other words, in boom periods there are more slaughterings which are reflected in low or negative growth rates, while in bust periods the flocks are expected to show positive growth rates.

The main problem encountered in surveying small stock was that women, who are responsible for the flocks, are more guarded in their responses than men. Furthermore, in the few cases where only men were available for interviewing, they admitted that they do not know much about small stock demographic factors since it is the domain of women. Therefore, the results obtained from

the questionnaire method are not entirely accurate. It may be that small stock indices among Ngok flocks are much more similar to general East African trends than is indicated by the survey results.

4.3 Offtake of Cattle

By their very nature offtake figures are generalizations based on scanty information and numerous assumptions. Furthermore, there is no consistent definition of this concept in the livestock literature. In this report, the concept is used to define the amount of cattle that are drawn out of an individual herd (whether byre or camp) during any particular period of time. Thus it includes the following:

1. Overall mortality due to disease, natural death and wild animals = 8.2% of a typical herd.
2. Marketed or commerical sale* including cattle that leave the Ngok system (trekked north) and those that remain in the system (bought by other Ngok)= 8.1% of each herd (byre and camp combined).
3. Social transactions, including bride-price, lending, debt payments and sacrifices. The figures obtained from the follow-up of belted cattle provide a combined (byre & camp) social offtake of 14% of any herd.

The overall offtake of Ngok cattle from any herd (byre and camp combined) is 30%. 22% of this offtake is due to social and economic transactions that generally return tothe herd because of a reverse flow of social obligations and market purchases. Increase in herds due to social transactions is related to the number of cattle under the management of the herder to produce a figure of 13%, i.e. 13% of the herd has been obtained through social transactions. Increase in herds (byre & camp combined) due to market purchases is 11%.**

* "Commercial Offtake" is a subset of commerical sales. In other words, only those cattle that are definitely destined for slaughter or are definitely taken out of the system will be called commerical offtake. In the Ngok Dinka case, this means the Ngok cattle that are trekked to Omdurman by the Arab traders.

**Changes in herd size due to sales/purchases is computed with data from Ch. 9, Livestock Marketing, (2534 head sold and roughly 3500 heads bought by Ngok in 1980), average herd size of 29 heads (byre & camp) and total number of herds in wet season 1980: 140 hearths and 935 byres. (See Chapter 4: Livestock Population)

The difference between increases (13%) and decreases (14%) in a herd due to social transactions is probably due to the few cattle that are slaughtered for social reasons. Nonetheless, the figures show an expected overall balance in these transactions. However, it is not possible to determine the direction of these transactions. In other words, are a few households or lineages or clans benefiting at the expense of others? If so, how gradual, or fast, is this process of "income" inequality? When we consider economic transactions, then the overall system is one of a yearly net increase of 2% in Ngok herds due to reasons other than natural birth and death. It is clear that most of this increase is due to net purchases of cattle.

4.4 Rate of Natural Increase in Herds

Results obtained from the questionnaire indicate that an average or typical herd in the byre of 16-20 head of cattle has more live births than deaths (natural or otherwise) by a numerical value of 3.2 cattle per year. The similar figure for a camp herd of 87-124 head of cattle is a positive balance of 15.8 cattle (Table 6.13). Thus considering only births and deaths, the Ngok Dinka herds are increasing at quite high rates. Assuming an average byre herd is 17 head (Wet and Dry Season combined) and an average hearth size of 100 head, then they are undergoing a yearly rate of natural increase on the order of 19% and 15.8% respectively. Compared to other East African herds, these figures are relatively high. It seems that the Ngok herds are still compensating for the devastations caused by the civil war.

Table 6.13

Balance of All Births Minus Deaths in Ngok Herds
(figures in # cattle)

	Byre Sample	Camp Sample
Wet Season (6 mo.)	+.3	+5.4
Dry Season (6 mo.)	+2.9	+10.4
All Year*	+3.2	+15.8

* This figure is a combination of the six monthly data and assumes that the six month data are representative of the whole population.

According to these data on natural birth and death, a female herd will double its size in 7 years, a growth rate of 13.6% per year. This figure is based on combining camp and byre indices. This length of time approaches the maximum theoretical limit of 6.5 years calculated by Dahl (1976, 61). The Ngok herd indices described so far, such as percent fertile females, etc. all are very close to the maximum growth model of Dahl, et. al. It is possible that the mortality figures described here are underestimations, but given 2% growth due to cattle purchases, all indications are that the Ngok Dinka herds were increasing at very high rates, at least between 1980 and 1981.

5. Daily Management

During the wet season cattle are released at around 10 AM, while in the dry season they are released at 7:30 AM so they have ample time to find enough water and grass.* In the camps, herds of up to 500 head are herded together during daily grazing. During the dry season, the paucity of resources requires experienced herders, while in the wet season, young boys alone will be in charge. There are usually 3-5 boys and 1-2 older men with each camp herd. Informants maintain that they direct the herd toward a general area such as savanna or riverein and especially make sure they do not encroach on restricted areas.

Among the sedentary herd, cattle from nearby byres (usually not more than 3-4 byres) are herded together, although there are some who herd their cattle individually. The determining factor for such cooperation is whether there are enough people in the homestead to herd the cattle. Usually 6-8 young boys will herd up to 100 cattle.

Goats are not herded in the wet season, and they will wander off in little groups. In the dry season, and beginning in the harvest season, goats are herded by young girls or boys. This is to stop them from eating the crops. During this time, the traditional law that unherded and trespassing sheep and goats

* The implication for research is that only 1½ hours in the morning and 1 hour at evening are available for contact with pegged animals.

can be confiscated is an effective deterrent to unmanaged small stock. Sheep are either herded by young children or allowed to follow goats.

The byre ("luak") was intially interpreted as a cattle barn by the ADP. Yet, the livestock survey shows that the byre is very rarely used by cattle. Only during a rainstorm will cattle be given shelter, and thereafter will be brought out again. Otherwise, the cattle are pegged immediately outside the byre. An average byre of 7 meters in diameter can probably hold 15-20 packed cattle, but will run the risk of cattle trampling the dung fires and setting fire to the byre or of pulling down the center post. In the dry season, the byre is empty of animals, while in the wet season, it is occuped by small stock and a few sick or weak cattle. There are two main reasons for this limited use of the byre. One is that the inside of the byre does not have enough ventilation and so the heat of animals and dung fires is insupportable. The 2nd reason, or possible consequently, the Ngok will use the byre as a second or third house, cooking meals and sleeping in it. Thus it seems that the byre is more of a symbol of prestige for a Ngok man than a cattle barn. A better design in the construction of the byre would probably see more use of it for livestock.

Daily grazing is determined very much by availability of resources, but generally the morning is spent on open land or sandy ridges. The cattle are watered at noon, and taken into the forest for a few hours. On the return trip they are watered one more time. During the dry season, in the southern pastures, the cattle graze the small green regrowth in riverbeds initially and then graze the forest standing hay. In the byres, there is only one watering during the day, and the rest of the day is spent getting to and from the water source. Generally cattle are rotated around a 2-3 km radius around the camp or byre; each area will be used for 6-8 days in the dry season, but longer in the wet season. In the dry season, the constraint facing the byre cattle is the lack of water. The major source is the Kir River to which cattle are taken once a day. This implies heavy grazing along the river slopes, which could be alleviated with the creation of other sources of water, especially bunding and small hand-pumped wells.

Calves of 1-6 months old are never allowed to graze. They are pegged under the shade of a tree for the whole day. Rottboelia exaltata and Setaria sphacelata, and in wet season Echinochloa spp. are brought to them in the morning. Water is bucket-fed just before the main herd returns in the afternoon so that the calves don't suckle as much. Calves of 6-9 months old are grazed separate from the main herd to avoid suckling while on the range.

Calves are normally weaned when they are 8-9 months old. This is also the time recommended by specialists. (Payne, 1977) Yet, there are variations which seem to be based on the calving interval of the mother. There are three types of cows distinguished by the Ngok. "Ber" gives birth every 12 months, but has the least milk output per lactation. "Jel" gives birth every 2-3 years, and has the most milk output. The former are sometimes referred to as Baggara cattle. The third, being the most common, has no Dinka name, and will be referred to as the "common type". It gives birth every 14-16 months and its milk output is between the other two.

Calves are weaned accordingly. A Ber calf is weaned much sooner, at 6-7 months, while a Jel calf is weaned as late as 14 months old. The frequency of these 2 types of breeds in a herd is very low, probably no more than 10% because the form of selective breeding used by the Ngok produces only a gradual improvement in the herd.

The Ngok practice selective breeding through controlled breeding and culling of animals of low productivity. The usual way of controlling breeding is to peg a heifer or cow in heat outside the pegging area and allow an entire to roam freely and serve her. But normally, the cattle on the open range cannot be controlled. There are certain characteristics of an animal that the Ngok try to perpetuate, and these are, in order of priority:

1. Productivity of mother. A Ber type or Jel type is always preferred over a common type. In addition, a Ber type is preferred over the Jel because not only does it increase the herd size much faster, but also in a 2 year period will produce as much milk, if not more, than the Jel.
2. Body size and color. The Ngok prefer large animals with long bodies and long legs. Color preferences are very individual. A wide range

of colors was noted on Ngok cattle, although the most common (36%) from a sample of 404 heads was basic white background with dabs of black, red, grey or yellow.

Horn shape and size. The size and shape of the horn is a major symbol in Dinka culture. The Ngok will choose cattle for breeding based on their large horn size but horn shape is not very important because horns are shaped when they emerge from the head.

Culling of low productive animals in a Ngok herd occurs in two major ways. The first is due to natural death of weak or disease-prone cattle. The second is that the weaker and less productive animals are sold or slaughtered. The practice of loans or bride-price ensures that highly productive animals will be distributed among herds thus ensuring a measure of equal productivity.

Yet the system is not perfect. Old infertile animals or sterile cattle are kept longer than necessary in a herd, since the doubt still remains that they may produce one more time. Given the long calving interval of the Jel type, this is not too surprising. At the present time, a more vigorous culling of low productive animals is not possible. Cattle herds are an insurance against disaster, whether a drought or a poor harvest. Therefore, more lower productive animals are maintained than in developed herds in Europe or America. Only when cattle populations increase can we contemplate a greater culling rate and a more rigorous selective breeding program.

6. Migration

6.1 Regional View

Because of environmental potentials and constraints, and the specific adaptive characteristics of different livestock, the migration routes of all tribes using the Abyei Area are very much complementary and synchronized.

As the seasons progress,each tribe occupies the area recently evacuated by another tribe. Over the years their livestock have become adapted to the conditions of the range. Generally speaking, in the dry season the Twich, Rueng, Rek and Nuer cattle are much more tolerant of wetter conditions and can move earlier and deeper into the swampland area. The Missiriya livestock are more suited to drier conditions so they arrive later and do not move as far south as the other tribes. The Ngok livestock migration is temporally and spatially in between these two groups. The wet season migration of all these tribes is a reverse of the dry season pattern. (See Figures 6.1, 6.2) The Missiriya and Rek tribes cover longer distances than other tribes because of politico-geographical reasons.

Some Rueng and Rek camps occasionally will mingle with Ngok camps and use the same general area at the same time, but they are only a small percentage of all camps. In the wet season some parts of the Ngok Use Area (NUA) are traditionally reserved for these kindred tribes, but they are not totally exclusive reservations. For example, in Wet Season 1980, the Ngok did use part of these lands for the reasons that the south had received less rain in that year and the southern tribes had not moved as far north as they normally do. Some Fellata camps have been noted in the area, but not much is known about them.

In the past 10 years, the migration routes have changed according to both climatic variations and political situations. Until 1977, the Missiriya Humr would sweep down during the dry season after the Ngok camps

had started their southward move and stop at the Bahr el Arab or Kir River. They would use the area described as the Ngok Use Area (NUA), mingling with the Ngok cattle left at the byres. Informants describe that period as a harmonious relation between the Ngok and Missiriya. Following the violent clash in June 1977 between Ngok and Missiriya, the Missiriya have avoided passing through the Ngok Use Area. Instead, since Dry Season 1978, the Missiriya camps have used two routes. One is immediately to the west of the NUA, but its use depended on how full the Bahr el Arab was. In bad years when the river was dry almost until the junction with the Niamora River, the western route has been avoided because it would encroach on the NUA. The second route, to the east of the NUA, became much more important after 1977. But since the NUA was no longer available and the amount of grazing land was drastically reduced, the Missiriya camps have had to move further south into Nuer country (beyond the Bahr el Arab). As a result, grazing pressure on the southeastern pastures has increased, since the Lol River, and "Sudd"(central swampland) act as barriers to further southwardly movement by Nuer and other southern tribes. It would be interesting to find out whether this change in environment, from the drier pastures north of Bahr el Arab to the relatively wetter pastures in the Nuer country, has affected the Missiriya livestock characteristics. For example, their cattle being less tolerant of parasites, are the herd mortality rate increasing?

At least one Missiriya camp in 1980, and two camps in 1981, were observed in the NUA. Thus, it seems that the M ss riya are trying to return to their former pastures, presumably because of its better suitability to their livestock. Given the political situation, which reached crisis proportions in 1980, it seems that the Missiriya are actually risking their lives and livestock to assert their right over the disputed NUA land.

Informants claim that 10 years ago the Ngok would move as far north as Alal in the wet season, but that ever since the 1977 incident, they have not only delayed the northward movement, but also do not go farther than the Taodaich area. In addition, without the added pressure of Missiriya grazing on NUA land, the Ngok are delaying the southward Dry Season movement.

Fig 6.1

DRY SEASON MIGRATION ROUTES: OCT - APRIL

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT: Dinka name — Noong
: Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

MAJOR MIGRATION ROUTE

MINOR MIGRATION ROUTE

0 1 2 3 4 5 10 20
Kilometer

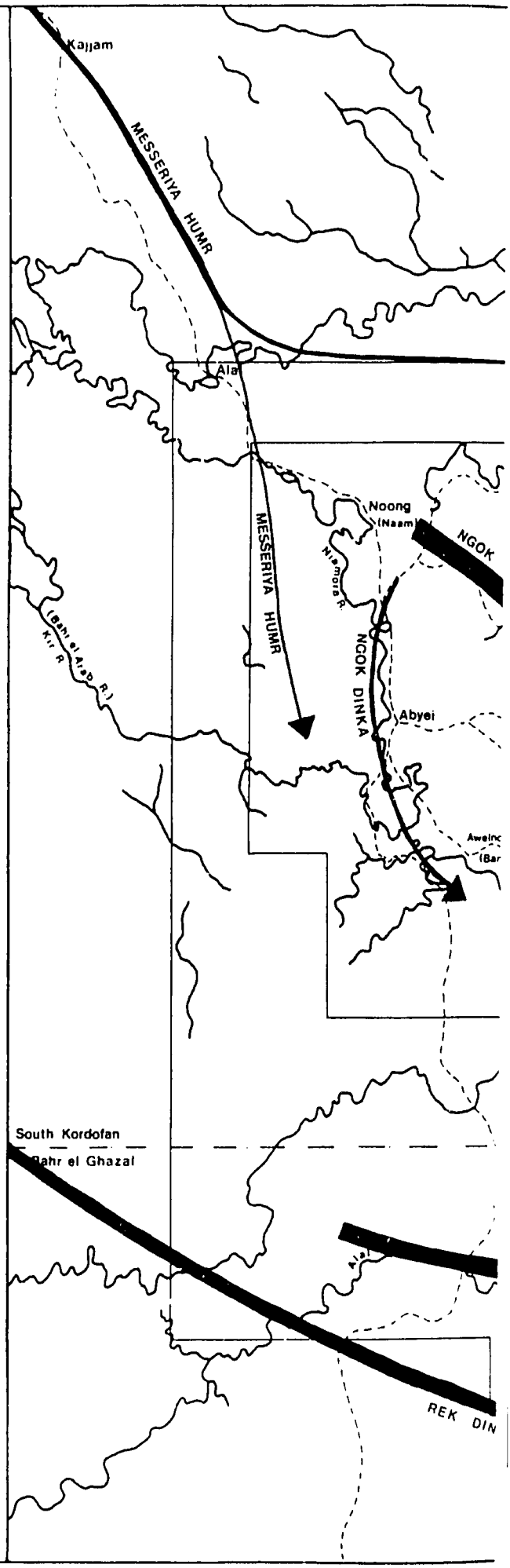
Names and boundary representations are not necessarily authoritative.

CREDITS

Topographic detail based on November 1972 LANDSAT 1 imagery and on field surveys March - May 1980 by Jane Hayes

All other work based on field surveys April 1980 to April 1981 by Maryam Niamir

for Harvard Institute for International Development



From th

Fig 6.2

WET SEASON MIGRATION ROUTES: MAY - SEPT

10°00"

9°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT: Dinka name — Noong

: Arabic name — (Naam)

NGOK SETTLED AREA

NGOK USE AREA

MAJOR MIGRATION ROUTE

MINOR MIGRATION ROUTE

0 1 2 3 4 5 10 20

Kilometer

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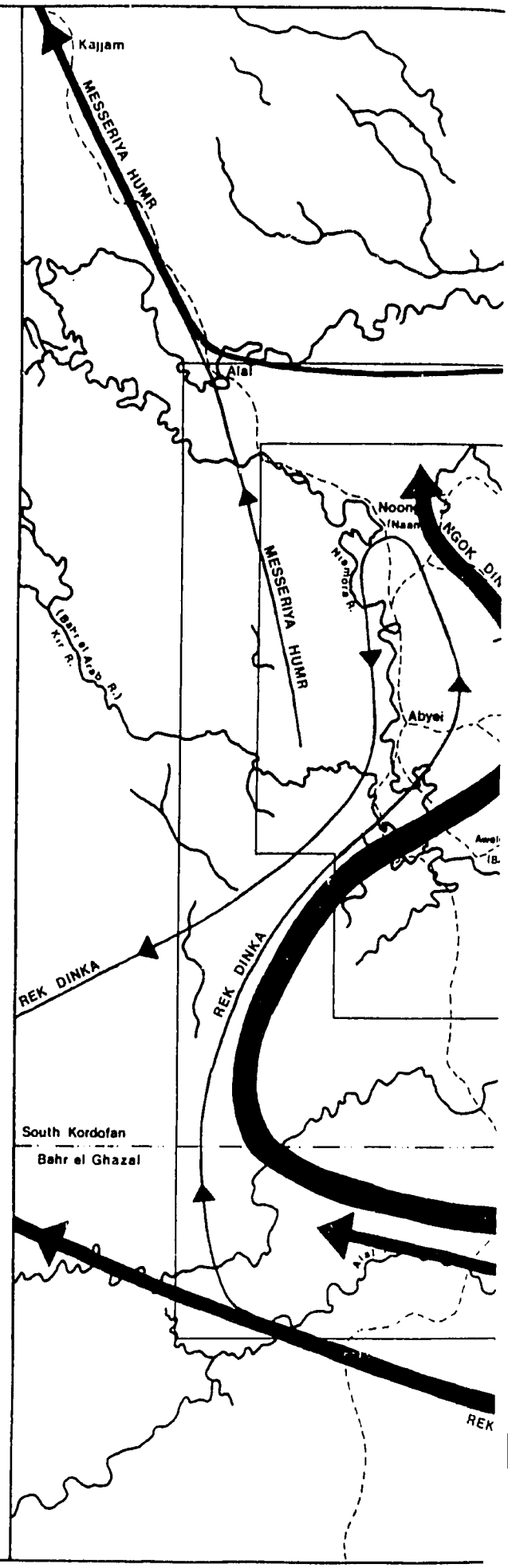

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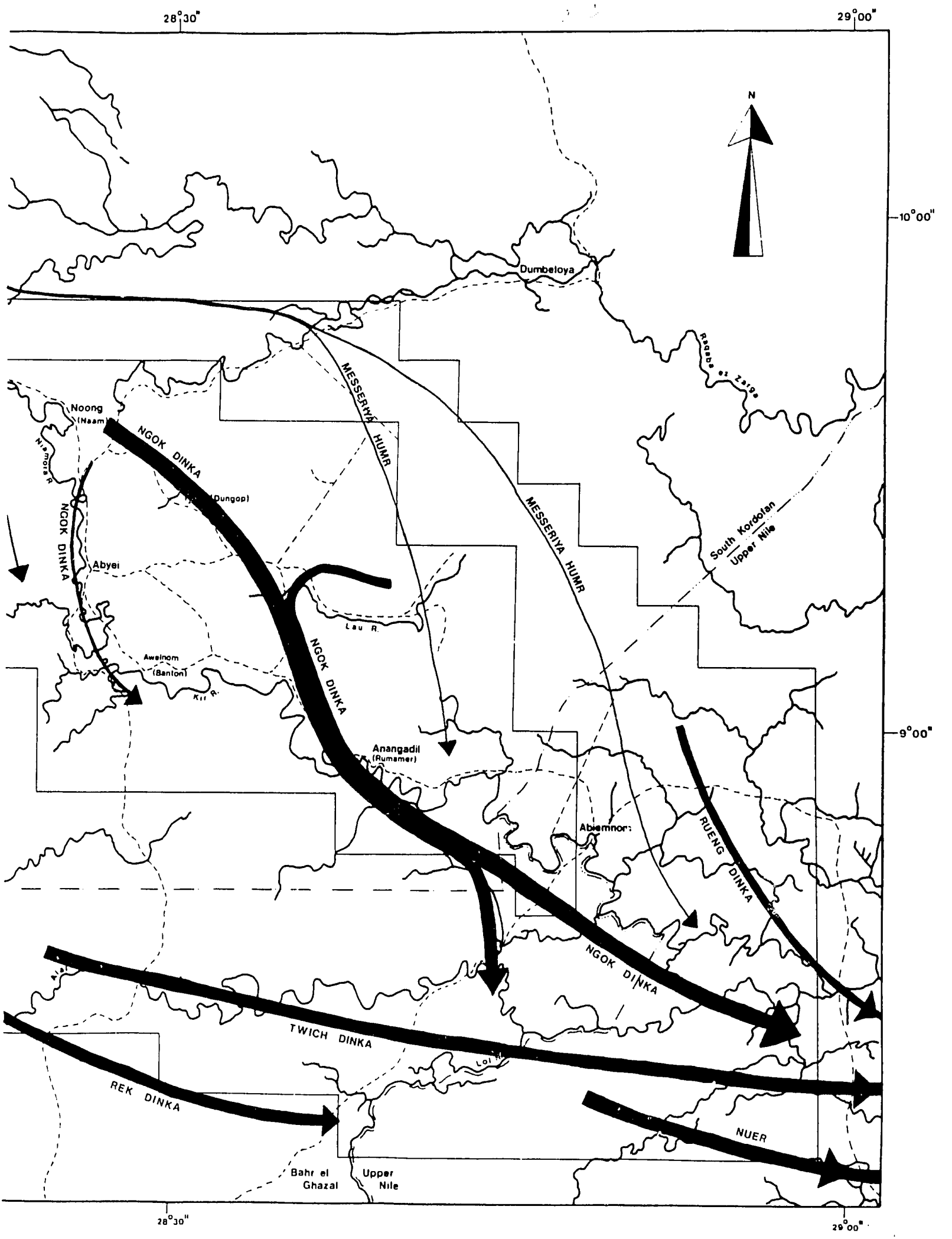

28°30"
29°00"
10°00"
9°00"
N
Dumbeloya
Ragaba el Zaraf
MESSERIYA HUMR
MESSERIYA HUMR
Noong
(Naam)
Nimora R.
NGOK DINKA
(Dungop)
NGOK DINKA
Abyei
South Kordofan
Upper Nile
Lau R.
Awelnom
(Banton)
Kir R.
NGOK DINKA
Anangadil
(Rumamer)
Abiemnom
RUENG DINKA
NGOK DINKA
Ayal
TWICH DINKA
Loi R.
REK DINKA
NUER
Bahr el Ghazal
Upper Nile

The Ngok Dry Season movement has spatially changed due to climatic and political factors. During the drought years of 1970-73, the Ngok would use the southeastern pastures, but would not venture too far for fear of raids by the Nuer. After the drought and until 1975/76 they used the southwestern pastures because of adequate rainfall. Since then, they have used the southeastern pastures again, presumably because of drier conditions. They are also striking deeper into Nuer country possibly because their fear of the Nuer is no longer as sharp. It would be interesting to see whether the recent clashes between Missiriya and the southern tribes (including Nuer) will serve to bring closer relations between all the southern tribes.

Not much is known about the changes in Rek Dinka migration, but the Twich and Rueng are also striking deeper into Nuer country in the Dry Season.

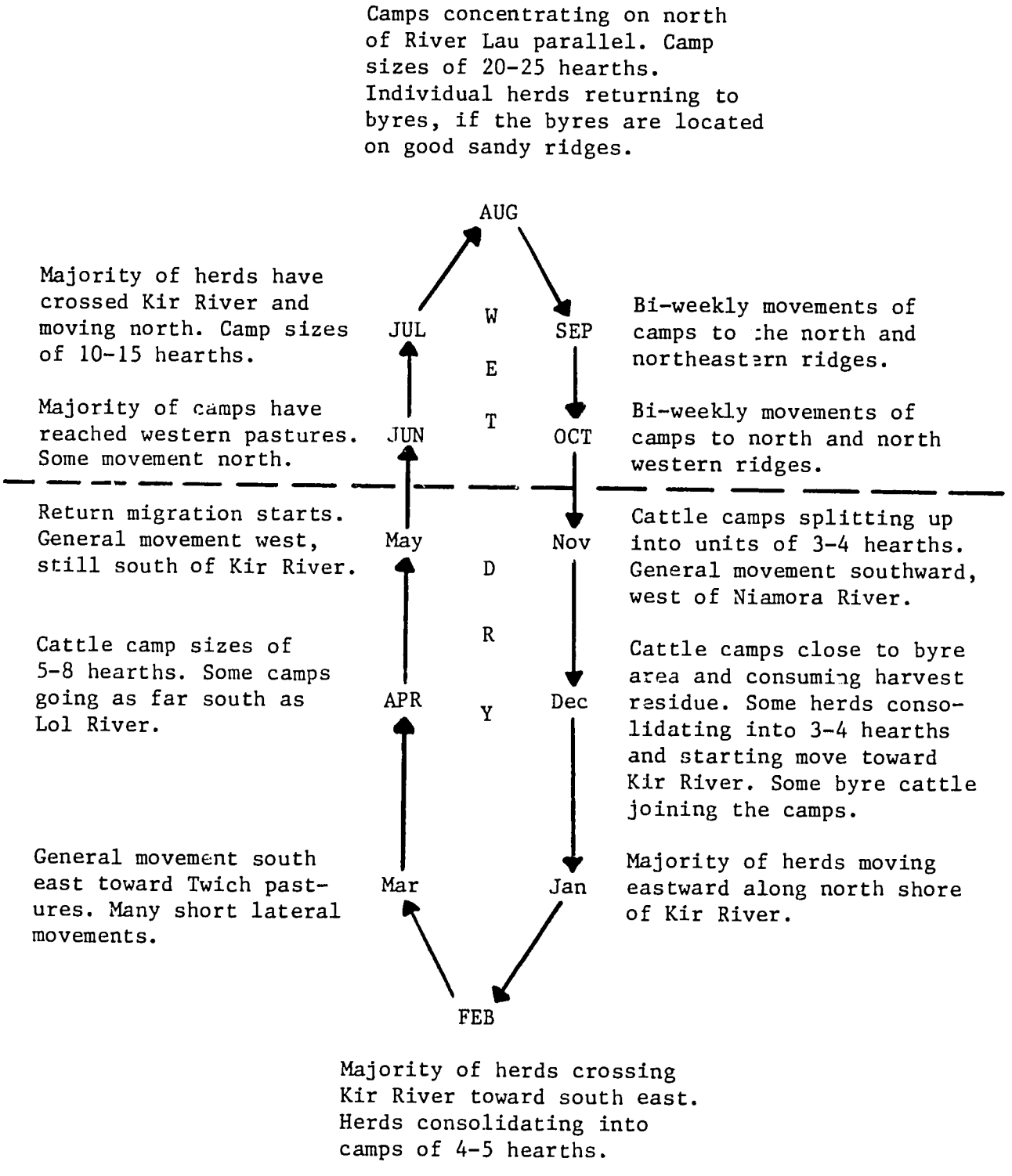
6.2 Ngok Migration

The Ngok Dinka divide their cattle between byres and camps. In total numbers, the majority of cattle (14,802 head) are kept at the byres, but are distributed among almost 940 byres. The rest (12,029 head) consisting of mainly mature males, pregnant cows and heifers, are continuously on the move and are distributed among at least 140 hearths at any one time in each season.

Data on migration of camp cattle were collected from a cumulative total of 59 camps (or 385 hearths) in all of the Dry and Wet Season 1980, and Dry Season 1981. Herders were asked to relate their route of that season and how long they stayed in each site. The data were then verified by other members of the camp. The data were divided into bi-weekly bits with subtribe as a variable and fed to a computer.

Figure 6.3 shows the timing of the migration routes and their fairly constant variations from season to season. The picture emerges of heaviest concentration of hearths into camps in the peak Wet Season. On the average 20-25 hearths

Fig 6.3 Migration Routes of Ngok Camps, Dec 1979 - Nov 1980



will form a camp, with a total of 2,150 heads of cattle. During this time of ample grazing resources, the constraint is one of finding good, sandy ridges where the cattle can be pegged for the night. In this way, they minimize stress caused by biting flies, tse-tse mosquitos, mud and parasites. But viral diseases, once caught, will reach epidemic proportions because of the concentration of cattle.

With the end of the rains, the wet season camps split up, some returning (in November) to the area close to the byre, others gradually starting the move south. There are enough watering points and standing hay during this time for the camps to be small, and there is much frequent movement from site to site.

In the peak of the dry season, camp sizes are 5-8 hearths, with a total of 990 cattle. During this time, the constraint is not so much finding an appropriate camp site, as availability of grazing resources, especially water which has deteriorated so that only a few good areas remain. These areas are found generally around rivers or river-lakes.

From May to June, with the beginning of the rains, the grass is still young, and although highly nutritious, is not much in quantity. Furthermore, heavy clay soils or forest land are no longer suited to camp sites. Thus, the camps remain at a fairly large size, and will gradually increase in size as more land becomes unsuited to setting up a camp.

Once again in the wet season more cattle are returned to the byres from the camps. Homesteads evacuated in the dry season also see a return of people and cattle. Cattle camps congregate onto certain camp sites. The distance to the homestead is not great and there is much movement of people and cattle back and forth.

Figure 6.4 shows the overall migration routes of Ngok Dinka from September 1979 to August 1980. In general, there was a movement from the

NUA to the southeast during the dry season. At and around the peak of the dry season there were short movements in all directions within the southern pastures. With the beginning of the rains in the south, there was a westward move, passing through Twich settled land. At this time, the Dil and Mareng subtribes did not move westward but stayed longer in the eastern pastures and later moved directly north. With more rains by May 1980, the northern move are begun so that by the peak of the wet season the northern pastures were reached. During this time, there were short lateral movements, from east to west. With the end of the rains in October, the cattle, now split up into smaller camps, will generally move south, some of them returning to the vicinity of their byres where they will consume the harvest residue. Others will gradually move southeast, consuming harvested residue wherever available, and the dry season migration is once more begun. In the 1979/1980 period, the migratory herds were avoiding the area between Banton and Mabok on the north side of the River. This may be a particular phenomena of that year, but more likely it is due to the fact that that is precisely the area that has the highest settled human population density, and by extension, the highest byre-cattle density, in all of the NSA. (See Chapter 3).

The highest concentrations of migratory cattle in the dry season reaching 2.4 ha/LU, were along the Niamora River in early dry season (post-harvest time), and in the southeastern pastures near Bombil, in the peak or end of the dry season. This concentration approaches the range carrying capacity potential of 2 ha/LU (See Chapter 5), although that was a figure computed for the NSA in the wet season. Therefore,it is possible that heavy grazing does occur in the dry season pastures, although it is not known whether it is leading to a deterioration of the range.

The data on migration routes reflect the situation in one year only. One cannot expect the exact configuration to be repeated in other years, but the general patterns are probably constant.

Fig 6.4

NGOK SUBTRIBAL MIGRATION ROUTES, DRY & WET SEASON 1980

10°00"

LEGEND:

DRAINAGE CHANNEL

DIRT ROAD

PROVINCIAL BOUNDARY

SETTLEMENT: Dinka name Noong

Arabic name (Noong)

NGOK SETTLED AREA

NGOK USE AREA

ABIOR; ACHUENG; ALEI; ANIEL; BONGO; MANUAR;

DIL; MARENG;

9°00"

0 1 2 3 4 5 10 20

Kilometer

Names and boundary representations are not necessarily authoritative.

CREDITS

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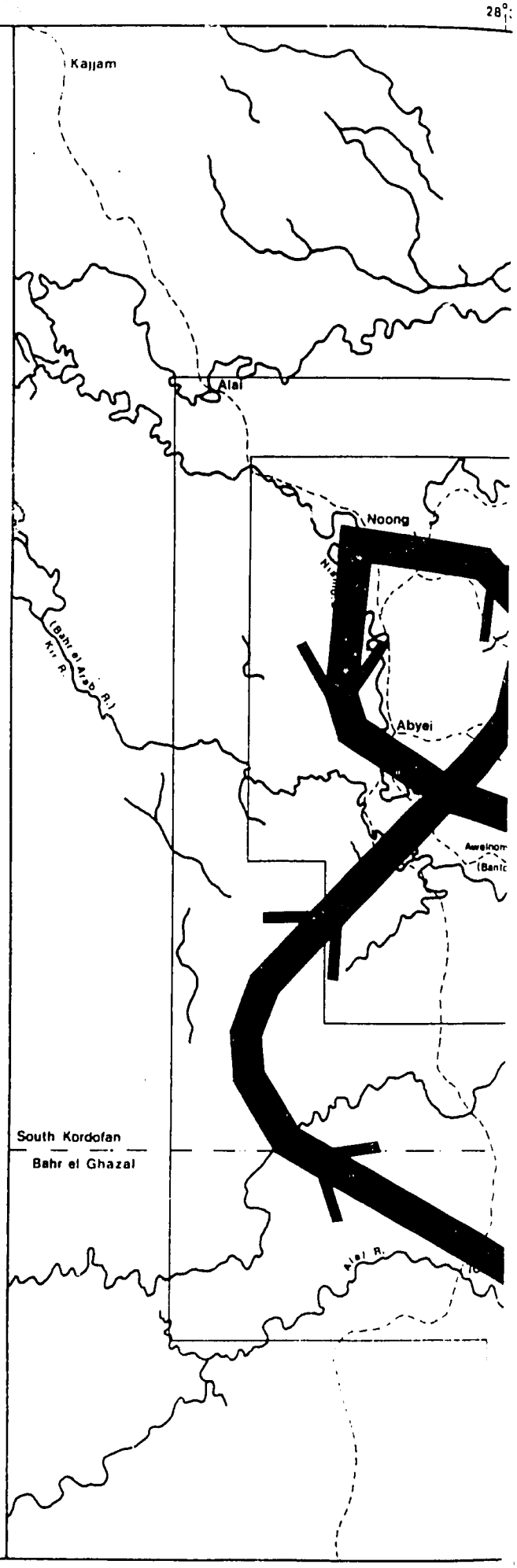

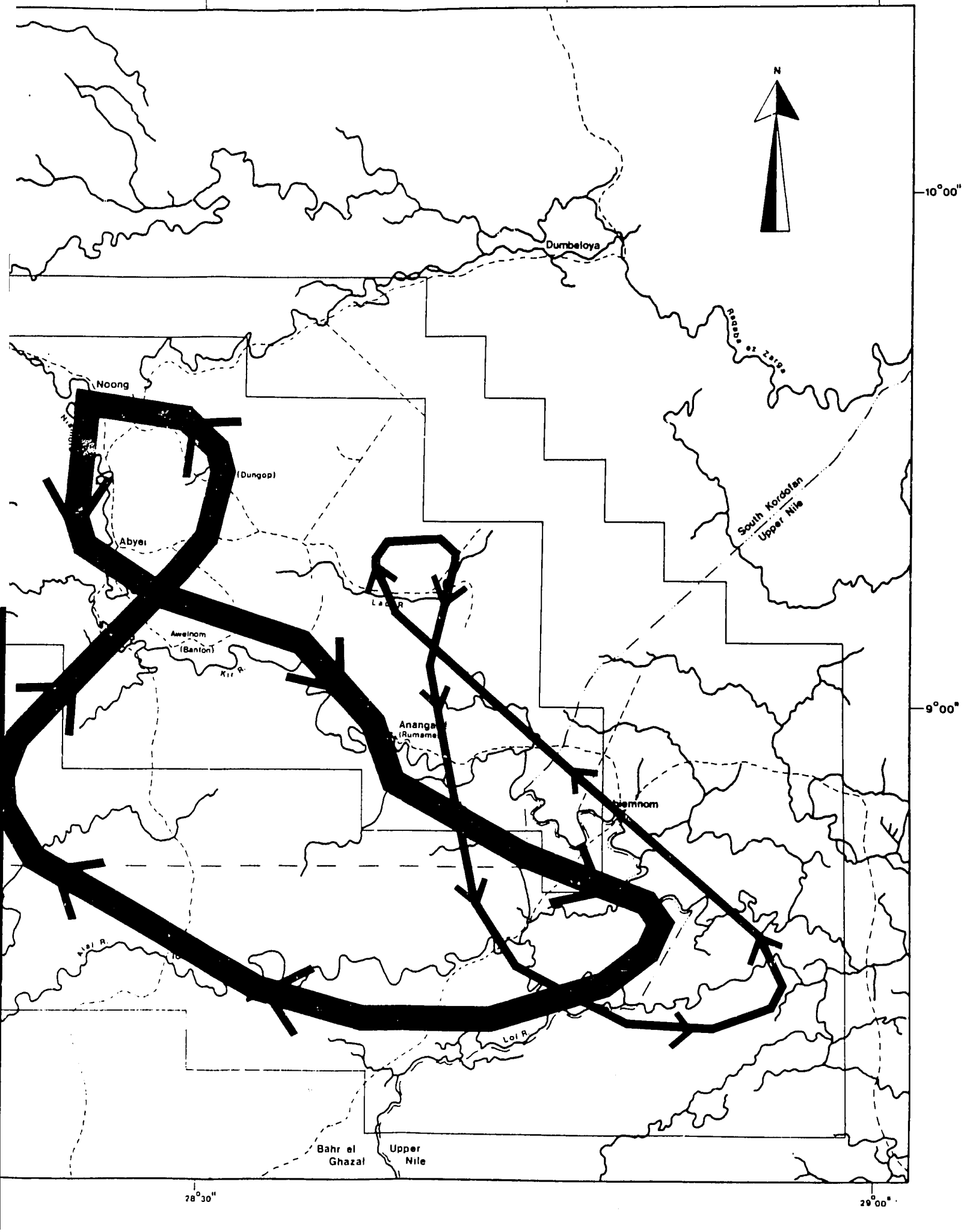
28°30"
29°00"
10°00"
9°00"
N
Dumbeloya
Noong
(Dungop)
Abyei
Awelnom
(Banton)
Kir R.
Ananga
(Rumame)
Bahr el Ghazal
Upper Nile
Loi R.
Kiai R.
South Kordofan
Upper Nile

The two separate northwardly routes, one taken by the Dil/Mareng subtribes, and the other by the rest of the subtribes is reported to be a traditional pattern. The main reason is geographical. The Dil and Mareng territories are situated in the eastern portions of the NSA, in other words, directly north of the southeastern pastures, and they do not see it worthwhile to take a detour through the southwestern pastures.

Local opinion indicates that the move to the south depends on yearly rainfalls. In drier years, the migratory herds will strike even deeper southeasterly than what was recorded in 1980. In wetter years, the camps will use the southwestern pastures exclusively because of the generally better conditions. Southwestern pastures are mostly open savannah and light forest, whereas the southeastern pastures have more medium to dense woodland.

In general, in the beginning of the dry season, the migratory herds do not completely graze all of the grass available, but move on to other pastures. By the end of the dry season, the herds have no choice but to consume whatever grasses are available. Therefore, a critical issue, the amount of rainfall during the preceding season, is beyond control, yet determines the availability of regrowth of dried grasses, and the extent to which any particular area is grazed.

During the beginning of the wet season, the grasses are young and contain high levels of protein. Again, the migratory herds will not completely graze an area, but will move on. As the wet season advances, fewer areas are suitable for camp sites, and the land around these sites are heavily, but not overly, grazed. Congregation by herds onto these sites is delayed as much as possible to ensure a greater supply of forage for the remainder of the season.

The use of grazing resources by camps and byres is regulated by two unwritten laws, both determined by a finite resource base. One is the system of camp scouts who will search for new camp sites and pastures. The decision to move to the site is based on physical considerations, such as: (1) how near are the other camps in the area, in other words, how crowded the area is; (2) in what condition the water and pastures are, in other words, how long has it been since another herd used the area; (3) whether there are too many flies or wild animals in the vicinity. In addition, there are socio-economic criteria, such as: (1) whether there are hostile camps nearby, such as Nuer or Missiriya; (2) whether there are settled populations nearby so that milk can be exchanged for sorghum. The scouting system ensures a rational use of grazing resources. If, by chance, two camps move simultaneously into an area, one will invariably leave the next day or two, unless there is enough grazing for both.

The second unwritten law is that a 2-3 km. radius of pastureland around settled areas, called "Wudijow," is reserved for the byre cattle. This is true for both the dry and wet season. Thus, camps will generally stay away from those areas although there have been court cases where the byre owner will complain about the transgressions of a camp. Such complaints are less frequent in the wet season when there is ample grazing to go around. The only time when this regulation can be broken is in December-January, when the camp cattle eat the harvested residue from the fields.

In the areas settled by Twich or Rueng Dinka it was noticed that fewer cattle are kept at the byres than in Nogk areas. Even though land around the byre is still reserved for byre cattle, the Twich and Rueng are not very strict about enforcing it. In many cases, they actually invite a camp to set up a site on their fields, so that they can fertilize their plots with the manure.

This distinction between byre pasture and camp pasture is a form of land demarcation which is not based on fencing posts or other barriers.

It is based on a traditional social understanding and is enforced by the traditional judiciary system. As such, it presents a base as well as a potential for a more sophisticated land use system.

This rudimentary grazing land demarcation, as well as the rational use of rangeland by the herds, in which not all of the forage is consumed by any one herd, contradicts the usual characterization of nomadic rangeland use. In many areas, nomadic tribes are perceived as independent decision makers whose actions serve to deteriorate the rangeland and to act against the collective good. The Ngok Dinka seem to have built up a traditional system that allows for independent decision, but also safeguards the collective resources.

Migratory camps will generally cover on average 15 kilometers per day when they move from site to site. Distances vary with the season. During the lateral movements of the peak seasons (wet & dry) they will average 8 km/day. During the off-peak seasons, they may travel as much as 30-35 km/day, putting added strain on the cattle.

The hearths in a camp are generally affiliated by subtribal-territorial distinction, although it is common to find two or three other subtribes in each camp. Dil, Manwar and Mareng camps are more or less mutually exclusive, but there is more intermingling between the rest. It is unclear whether the local socio-political situation and the power struggle between the Abior and Manwar/Dil Subtribes has influenced these divisions, or whether it is due to the geographical location of each subtribe.

Among the Dil, Manwar and Mareng, peak wet season camps are in fairly constant and traditional sites throughout the years. These are located on the northern portions of each subtribe's territory. (See Map 6.5: Subtribal territories) Thereafter camps split up but are from only one subtribe, although they are not necessarily the same hearths as the year before.

Among the other subtribes, the situation is more fluid. Wet season campsites are located on the northwestern portions of the Abyei Study Area, but

they are not reserved for any particular subtribe. Furthermore, both wet season and dry season camps change members year after year. A follow-up study of 14 hearths from Dry Season 1980 and 4 hearths of Wet Season 1980 showed that only 2 hearths (11%) were together in the same camp by Dry Season 1981. The main reason for this fluidity of camp affiliation is that affiliation within the Ngok society is based on not one but two identification systems: 1. clans and 2. subtribal territories. The former are based on blood-bonds, while the latter are based on residential location. Therefore, it is not surprising to find a fluidity in subtribal affiliation of hearths in a camp from year to year.

Each cattle camp has a camp leader (mijongwut) who is elected by the heads of hearths, based on his notoriety as a good decision-maker. He is not necessarily a "richer" or more powerful member of the camp. He will reside over disputes within the camp and with other camps or byres. He has the final word on migration routes and timing of movements, but he will discuss it first with the scout and other camp members. Because of the fluidity of the camps, camp leaders may not necessarily lead a camp from one season to the next. Thus there is no basis for accumulation of power by such people, although they do accumulate experience and reputation as good camp leaders.

There is usually one camp leader for up to 20 hearths. Once beyond that size another camp leader is elected. If two camps occupy the same site, they will normally retain their own camp leader, unless they plan to join together for the rest of the migration.

Given this fluid organizational system, the camps can be divided into 2 groups. One is the more constant affiliation within Manwar, Dil and Mareng subtribes. The other group includes all other subtribes. The first group will generally use its own territory in the wet season, while the second will pass through this territory to get to its own.

However, subtribal migration routes must not be exaggerated. Unlike byre vs. camp pastures there is no regulation that can be enforced by the judiciary

systems. Camps are free to go into whichever subtribal territory they choose, but the fact is that they tend to stick to their own territories whenever they are in the NUA. The main reason is that during the wet season, there is much movement of people from the camps to the byres, allowing the agricultrual labor force in the homesteads to be increased. It is also a time for members to join households for festivities. Therefore hearths tend to return to the vicinity of their homesteads.

Compared to Missiriya and other northern migration patterns, the Ngok's is very fluid. In the view of the author, this is actually beneficial to long term development in the area. Even though in the short term it is much easier to select subtribal and clan leaders as agents of change, in the long term it may lead to more political problems and clashes between subtribes. In the Abyei Area, the absence of a definite subtribal grazing organization requires that the system be seen as a whole, and that "agents of change" if required, be from a much lower level than the subtribal hierarchy.

7. Conclusions

Management of nomadic or transhumant herds can be categorized into 1. management of each individual herd, and 2. the overall societal management system that affects all herds. Fortunately, the "cattle complex" or the myth of irrational management practices of individual herds is no longer believed by most development experts. Therefore, it is possible to go beyond this myth to understand the details of herd management.

The Ngok Dinka herds are generally 63% female, with a high majority of mature females. Such a percentage shows that given their social and environmental systems, the Dinka do not keep an unduly large number of unproductive males in the herd. Even the few castrated males are "productive" since they are used for social and economic transactions. The high number of infertile females in the herd is understandable since without the aid of modern technology, it is not possible to detect infertility until a few years have passed.

Both weaning and breeding practices are based on the maximization of milk output for human consumption. Late, (although not unduely late) weaning means a lengthening of lactation period and maximum milk yields. Controlled breeding is not very rigorously applied among the Dinka because it is difficult to do so on an open range system. Yet the milk output of the mother is a primary criterion for breeding whenever it is carried out purposefully.

In an overall sense these features of the management of livestock herds serve to maximize the benefits from each herd. The most important benefit is milk output which forms the main part of the diet of the people. Another important benefit is that livestock, especially cattle, act as bank reserves where the wealth of a household is stored in a very "liquid" form. Yet the household is not an exclusive economic unit; rather, it interacts with other people and households in the society to produce a wide and complex system of cattle rights, claims and exchanges. Therefore, the herd under the management of a household is like a credit union, whose members are drawn from a relatively large and fluctuating segment of the society, and who can withdraw "credit" in times of need.

On a larger scale, what is occurring on the societal level? Are the Ngok Dinka individually increasing their herds and using the range resources in such a way as to be detrimental to the common good? Two patterns within the Ngok system might suggest so. The first is the very high rate of growth in cattle herds recorded in 1980/81 which is primarily due to relatively high calving rates, but also to higher cattle purchases. High growth rates lead to greater pressure on the range resources. The second pattern is the fluidity of camp affiliations. Among other nomadic groups, the strong kinship affiliation of camps is used to argue that each individual is constrained by this affiliation to function for the common good of the camp*. Therefore, by extention, the freedom of individual herds in choosing camp affiliations among the Ngok would suggest a very individualistic use of the range.

As a matter of fact, the Ngok Dinka do not act in such a way as to be detrimental to the common good. The reason is that the above patterns are tempered

* Incidentally, this has usually meant that each camp will act detrimentally for the tribal good.

by two very strong regulating systems. One is the stratification of cattle into byre and camp herds, and a traditional demarcation of pasture land between these two which ensures enough grazing for the sedentary herd. This traditional land demarcation is expected to continue since it is tied in so firmly with the social and cultural system accompanying stratification.

The other point is the use of the range capacity by the migratory herd. Whenever possible, the Ngok herds will avoid completely grazing a piece of pastureland and will move on. This is true in early-to-mid dry and wet season. By the end of each season, certain constraints such as the lack of water in the dry season and the lack of adequate camp sites in the wet season, leave the camps no choice but to congregate sometimes reaching a level of use of 2 ha/LU. Therefore, light grazing of pastureland in the early parts of each season not only ensures adequate pastures for the end of the season, but also leaves enough behind for use by other camps.

What does the system look like when the whole region is brought under scrutiny? Is each tribe working to preseve its resources to the detriment of other tribes? It does not appear to be so. The synchronization of tribal migration ensures that there is no heavy concentration at any particular time and place which may lead to overgrazing. This synchronization also minimizes potential tribal conflicts. In other parts of Sudan, especially among the Baggara and Nubans, political conflicts have led to deliberate destruction of grazing land by setting fire to the bush after one tribe has used it. This was not seen in the Abyei Study Area, even in the southeastern pastures that are used by the Missiriya in the dry season.

In conclusion, the current management of livestock among the Ngok and neighboring tribes is geared to an efficient utilization of resources by all and maximization of outputs, especially milk, for human consumption. The management system is firmly linked to the social and cultural systems, and can be expected to continue unless irreversible changes occur in the regulatory mechanisms. Not only is the range capacity good (Chapter 5) but also its use is designed to mitigate deterioration.

New ideas on management of herds, especially supplementary feeding, better disease control (described in Chapter 7), and increasing water resources, will help to increase the productivity of the herds. Their introduction must be sensitive to the existing regulatory mechanisms facing individual herds. They must, if required, have their own regulatory mechanisms, to ensure that not only does the individual herd benefit, but so does the whole region.

Fluidity of camp affiliations from year to year may present problems for the administration of programs and delivery of services, since there are no camp leaders who can act as agents of change. On the other hand, the camp fluidity among the Ngok Dinka is actually an advantage in the long run, since it minimizes the effect of tribal or subtribal conflicts. "Agents of change" then become individuals, who, by their acceptance of a change, act as models, rather than authoritative leaders. Such an approach suggests that extension programs be based on group training.

Among the sedentary segment of the population, "agents of change" may be selected among village leaders, since they are constant from year to year. But such an approach is only advised for expediency and not necessarily for long run success, since it may run into local poltical problems, or the leadership may not be effective.*

Finally, the initial mandate of the livestock survey to design ways in which deterioration of the common resource can be stopped, must be changed. The assumption of deterioration, whether willfully or because of uncoordinated actions, does not hold up among the Ngok Dinka. What is important is to design new ways in which productivity can be increased with appropriate techniques. These techniques must be sensitive to local resources such as skills, fund, labor, etc. and to local social regulatory systems.

* For an example, see the experience of the ADP with Group Farms, reported in Fuller, 1981.

Chapter Seven: Livestock Disease

1. Introduction

The Livestock Survey conducted a simple disease survey in Wet Season 1980 which asked herders about the major diseases currently affecting their herd. In the Dry Season 1981 survey, the list of diseases was expanded. Since the Survey Team did not have adequate facilities, it was not possible to verify herder responses, therefore, the results only reflect the disease situation as perceived by the Ngok herders. The sample covers 79 byres and hearths in both wet and dry seasons.

The main purpose for the disease survey was to obtain an indication of what types of diseases are prevalent and which are more important, among Ngok Dinka livestock. The survey was designed as a first attempt at research in an area never before surveyed, and was expected to provide a crude baseline by which other more sophisticated surveys and pilot action programs could be implemented.

This chapter covers the following points:

a. Description of types of diseases existing in Ngok Use Area (NUA).
b. Traditional cures used by Ngok Dinka.
c. Abyei Veterinary Clinic.
d. Availability of verterinary drugs in the market.
e. Animal health training program.

2. Description of Types of Diseases Existing in Ngok Use Area

By far, the most important disease affecting the Ngok livestock is trypanosomiasis among cattle, and pleuro-pneumonias among small stock. The literature states that tse-tse flies (Glossina) do not habitate north of the Lol River, so presumably they do not exist in the Abyei area. (Payne; 1977; 58). However, other types of flies do transmit the disease mechanically, particularly biting flies such as Tabanus. *T. Talniola* was one of the biting flies

identified in the Abyei Area at the Soba Central Laboratories, Khartoum. Pathogenicity of different trypanosome species differs from area to area, and varies according to animal affected. From the low level of mortality among Ngok cattle, it is suspected that Trypanosomiasis is more of a wasting rather than fatal disease. Of the total disease survey sample, 15% were reported to have Trypanosomiasis. Most of this was in Dry Season camps, and it is suspected that the herders find it understandably difficult to distinguish between trypanosomiasis and general wastage due to poor nutrition in the Dry Season, and numerous other causes.

Another important disease, Lumpy Skin Disease (LSD) (Phier) appeared apparently for the first time in the NUA during the Wet Season and approached epidemic proportions. It was also recorded by Soba Central Laboratories in Khartoum as having affected almost all of south and central Sudan at the same time. The camp herders of Abyei claimed to have encountered it on their way north from the southern pastures, especially around Tongliet. The disease quickly spread from camps to byres in the Ngok Settled Area. In one post-mortem case, there were signs of jaundice, indicating the presence of a secondary infection such as babesiasis or anaplasmosis.

The herd owners initially had to rely on antibiotics available from the market at inflated prices. The ADP made available some antibiotics and sulfonamides, at cost, to the herders. By September 1980, only a few residuals were left. It is suspected that in total about 20% of the cattle population had been affected, but that less than 5% had actually died from this epidemic. There are no treatments for the virus, but the secondary infections can be cured with drugs. Therefore, it is suspected that this low rate of mortality is due to both natural recovery and the effect of the drugs on secondary infections.

In cooperation with the FAO-Tick and Tick Borne Disease Control Project, Khartoum, samples of live ticks were collected from cattle for identification. The following table lists the ticks identified (beginning with the most abundant) and some of the diseases attributed to these vectors. (Hall: 1977; Hoogstraal: 1956; Williamson: 1978; Payne: 1977).

Table 7.1 Ticks and Tick-Borne Diseases of Ngok Dinka Cattle

Hyalomma rufipes: Forms abscesses that are vulnerable to attack by Chrysomyia and other flies that deposit their larvae and cause extensive damage. It may be associated with foot rot in sheep.

Amblyomma lepidum: Not known to be a vector of human or animal disease pathogens, but causes sores on cattle.

Rhipicephalus evertsi: Known to transmit East Coast fever, babesiasis (or Tick fever) and Borrelia spp.

R. sulcatus: Disease relation has not yet been studied.

R. sanguineus: The sample was found on dogs. Transmits canine rickettsiosis, and spirochaetosis in cattle and small stock.

Boophilus decoloratus: It is a vector of Babesia spp.; Anaplasma marginale and Borrelia theileri.

B. annulatus: It is a vector of babesiasis, transmitting B. bigemina (Texas Tick fever) in the Americas.

It remains to be verified by future research whether such diseases do exist in the NUA, and to provide a more complete list of ticks.

The elimination of ticks is probably, next to vaccination, the most important form of disease control. The ADP Livestock Survey was able to carry out a product-trial in Dry Season 1981. Two acaricides were obtained from Ciba-Geigy, Inc. in Khartoum: Steladone (dose: 16 ml/animal) and Neocidol (10 ml/animal), and a third had been used by the ADP previously with good results: Bercotox (16 ml/animal). Three ADP mature castrated cattle were hand-washed with each acaricide totalling nine animals. There were three applications, each 10 days apart. Neocidol performed the best of all three, and Steladone the worst.

Hand-washing is not the best way of applying tickicides, but requires the least amount of imported material (therefore costs less), and does control the tick population to a certain degree. Gamatox, another powder acaricide

is available locally, and has also been used successfully by the ADP. The local herders do not use it although they know about its benefits. They also have misconceptions of the way the drug should be used. Hand-washing is labor intensive and probably not feasible on a large scale, for example with camp cattle. But it could be extended to byre cattle. The ADP experience showed that it took four men (two to hold the animal and two to apply) about two hours to treat 12 mature castrates. The ADP also used a simple corral, but it is suspected that such a structure is not necessary for hand-washing byre cattle, given the gentleness of Ngok cattle, and the knowledgeable way they are handled by the people.

Biting insects are a constant nuisance to the animals as well as vectors for various diseases. Over the long years of adaptation, the Ngok Dinka have acquired two methods of dealing with biting insects. The first is through dung fires, lit at the campsite or byre, which minimize the number of insects when the animals are pegged for the night. The second method is used in the Wet Season when the incidence of insects increases tremendously. During these times the campsites are located on the top of prominent sandy ridges, where, even with a height of only one meter, there is marked decrease of biting insects. It is believed that the tree Balanites aegyptiaca attracts flies, and calves are never pegged under one.

3. Traditional Cures Used by Ngok Dinka

The ADP Livestock Survey in Dry Season 1981 conducted a survey of traditional cures. Given that these cures are a result of knowledge handed down over the years, the herders were asked to discuss in groups, what common pool of knowledge they had. In all, eight groups of herders were questioned. They represent people from six different subtribes. It was not possible to conduct pharmaceutical analysis of the herbs, but the consistency in responses between the groups may be an indication of their effectiveness.

Table 7.2

Traditional Cures Reported by Ngok Dinka For Various Livestock Diseases

Anthrax: No cures.

Blackquarter: Sacrifices performed by priest (Banyabit) - otherwise no cure.

CBPP: Root of *Balanites aegyptiaca* soaked in water and fed orally. Root of *Calotropis procera* soaked in water and fed orally. Otherwise priestly sacrifices or no cures.

Foot and Mouth: Blisters washed with urine of a healthy cow. Animal walked through water to cool the hooves. An unidentified herb ("Bulchuak" in Dinka) crushed and placed on sores, similar to treatments of physical injuries. Otherwise conduct sheep sacrifices or no cures.

Haemorrhagic Septicaemia: Either no cures or priestly sacrifices.

Rinderpest: No cures.

Trypanosomiasis: Root of *Albizia sericocephala* soaked in water and fed orally. Otherwise no cure.

Mastitis: Hot stone placed on udder, usually by a left-handed man. Some people milk the cow continuously until the blood is gone. Others will make a small cut on udder and squeeze fluid out.

Bloat: Most frequent cure is no food and water for one day. Root of *Khaya senegalensis* crushed, soaked in water, and fed orally. Leaves of an unidentified ivy-like plant ("Awenagow") crushed, soaked and fed orally. Warm water is poured into stomach.

Streptothricosis: Bark of *Adansonia digitata* soaked and rubbed on scalping. Lizard's fat rubbed on scalping. Fish oil used as ointment.

Ringworm: Usually the ear of calf is cut, either by small boy with milking teeth, or a man who has killed a hyena with one spear. Sometimes hyena oil is rubbed on.

Liverfluke: No cure usually. One group reported soaking onion in water as cure for calves.

Diarrhea: No cures for mature cattle. For calves: roots of Cassia sieberana or Sclerocanya birrea added to mothers milk and fed orally. Leaves of Tamarindus indica soaked in mother's milk. Root of Khaya senegalensis, Ziziphus spina-christi or Albizia aylmeri, crushed, soaked in water and fed orally.

Calf pneumonia: Leaves or seeds of Butyrosperum parkii var. niloticum dried, crushed, soaked in water and fed orally. Root of unidentified bush ("Achitag") crushed, soaked in water. Calf is prevented from suckling until cured. Seed of Balanites aegyptiaca fried in ghee, ground and fed. Leaves of unidentified bush, ("Luang Luang") bearing same name as the disease, dried, crushed and soaked in water.

CCPP: Root of Albizia sericocephala, dried, crushed and soaked in water, fed orally.

Physical injury: Ointment of hot clarified butter (ghee) and leaves of unidentified weed ("Bulchuak").

Some major fatal diseases such as anthrax and rinderpest have no cure, whether magical or herbal, although other diseases, such as blackquarter and haemorrhagic septicaemia are "cured" by magical means. The advent of modern medicine, especially vaccination campaigns, has probably resulted in less reliance on magical cures for these major diseases. Quarantining of affected animals is not a familiar practive among the Ngok. Upon questioning, they state that it would require too much time and labor, especially since separate quard has to be kept over the quarantined animals. Furthermore, affected animals are not culled, in the hope of an eventual cure.

All the other endemic diseases surveyed have cures that are a mixture of mineral, herbal and magical practices, that are not necessarily used at the same time. However, the efficacy of some cures seems to be questionable; for example, Foot and Mouth seems to be cured just like any other physical injury. Furthermore, during the length of the one-year Livestock Survey, not one were traditional curative measures observed in action, leading to the suspicion that traditional cures are no longer extensively used. It seems that the advent of modern medicine has eroded the reliance on traditional herbal cures, yet at the same ti e, not all herders have equal and adequate access to modern medicines. A very grim picture emerges indeed.

4. The Abyei Veterinary Clinic

Abyei Town has the only Veterinary Clinic in the Ngok Use Area; it is a small clinic which is funded and staffed by the Provincial Administration. At the present time, its main functions are the yearly vaccination campaigns, "office" cures and meat inspection at the local butcher stands. Vaccination campaigns are normally done in January in cattle camps only. In the past five years only three campaigns were carried out: in 1976, 1978 and 1980. In 1978 and 1980, the campaign involved anthrax, haemorrhagic septicaemia and rinderpest, at a cost to the herder of Ł.01/head of cattle. The campaigns are well received by the herders, but in the disease survey, only 40% of the herds had been vaccinated in those last two years of the campaign, and only a few of these had all of their cattle vaccinated. The main reason for the low outreach of the Clinic, expressed by both herders and clinic officials, was the lack of adequate vaccines. The other problem, even if enough vaccines are available, is that a January campaign cannot reach those camps that have already crossed the major rivers for the south. The reason why vaccinations are done in January is because of the time required for the Abyei staff to go to the Provincial Headquarters once the roads are passable, and return with the vaccines and funds.

Because the Clinic does not have independent means of transportation, the staff cannot travel to byres or camps on request. Therefore, the only time the Clinic is engaged in curative measures is when the cattle are trekked, sometimes over long distances, to the Clinic in Abyei. As a result, the number of cases that are seen is not very high.

There are various constraints that hamper the operation of the Clinic. The Clinic's budget comes from the coffers of the District Headquarters in Babanusa and is independent from the local Rural Council. As mentioned previously, this causes delays in the availability of funds each year. Furthermore, for various political reasons, the Abyei Clinic seems to run into more bureaucratic muddles within the Provincial Administration than other northern clinics.

For the past few years, the head of the Clinic has been a Ngok veterinary assistant who has had his own share of problems. Two years ago he was accused of embezzling the Clinic's funds and was recalled to Kadugli. By November 1980 he had cleared his name sufficiently to be placed back into his former position Supporting him in the Clinic are two other Ngok veterinary assistants and a technician. The staff at the Clinic does not appear to be sufficiently qualified to handle the responsibilities of a veterinary clinic.

Medicine is brought each year to the Clinic. The paucity of funds is claimed to be the reason for an insufficient store of drugs. The lack of adequate storage facilities, especially refrigeration, reduces the variety and quality of drugs available. The national supply of veterinary drugs is inadequate, and the drugs are distributed on the basis of quotas to the Provinces. For areas such as Abyei, not as easily in the reach of the governmental administration, the supply of drugs is even less. This is true both for the southern portions of the Northern Administration, and the north and northwestern portions of the Southern Region - in other words, Central Sudan.

The Abyei Veterinary Clinic does not have its own mode of transportation, and has to rely on the Rural Council and Police establishments in Abyei Town. Therefore its effectiveness and outreach are clearly reduced.

The ADP established and maintained a good working relationship with the Clinic. The ADP construction program instituted some repairs in the Clinic building, furniture, and storage spaces. The ADP livestock program, itself constrained by inadequate supplies of drugs and transportation, was only able to assist the Clinic with refrigeration for some drugs, provision of some tools such as a microscope, the sale of drugs whenever the program received an adequate shipment, and periodic advice by the ADP livestock officer.

5. Availability of Veterinary Drugs in the Market

Apart from the drugs circulating in the governmental system, some drugs are available, at highly inflated prices, from private enterprises. In Abyei Town, it is the Arab merchants who sell such drugs, and one reason why herders

claim they do not purchase drugs is because of the high costs. There are three kinds of drugs available in the market: antibiotics such as Geomycin, Ethidium Bromide, and some acaricides like Gamatox.

In Dry Season 1981, the ADP livestock program acquired a fairly good shipment of antibiotics and Ethidium Bromide, and provided these at cost (initial price plus transportation) to the herders. This program was designed to test the feasibility of establishing a pharmaceutical enterprise. In the four months in which it operated, it was well received, even though the herders had to travel fair distances to the ADP offices in Abyei Town. However, the main problems for establishing a pharmacy are on the supply side. National regulations require a qualified pharmacist to be on the staff. A privately-owned pharmacy would only be able to acquire a small variety of drugs from the private sector, while a government pharmacy would be hampered by the inadequate distribution of government quotas. Furthermore, a privately-owned pharmacy may turn out to be no different than the present suppliers of drugs in Abyei Town. The third alternative, a cooperatively-owned store, is worth a trial, although it must proceed with caution given the past experience of the local people with failed cooperatives.

6. Animal Health Training Program

One of the suggestions given repeatedly by the Ngok camp leaders in the Dry and Wet Season 1980 Survey was the establishment of a program to train herders in new and better animal health practices. As a result, the ADP livestock program designed a training package that would teach better diagnosis of diseases, ways of using medicine for curative measures, and disease prevention strategies. The latter included new ideas on livestock management. The main problem of such a program was logistical, in other words, how to reach as many herders in the camps as possible. Since there is no consistency in camp affiliation (See Chapter 6 on Management), it was not possible to select a few people as "representatives." Therefore, trainings would have to be done on the basis of 3-4 days spent with each camp and involve all members of the camp in group discussions. It was hoped that each camp could be visited at least twice during the training period, therefore only four camps were contacted and selected to be included in the initial pilot project.

The ADP livestock officer and two assistants, all Ngok Dinka, were to carry out the pilot project. To minimize transportation constraints, the pilot project was due to begin in November 1980, at a time when cattle camps were close to Abyei Town. Unfortunately, the political disturbances of that year occupied the ADP livestock officer's time, and the pilot project was never carried out. Nevertheless, given the enthusiastic response of the four cattle camps, such a training program is worthwhile, and with an adequate motivation and extension service, could produce useful results.

The traditional cures collected in this chapter probably include a few cures that are effective. It is suggested that these cures be pharmaceutically tested, and those that prove to be effective be included in the Animal Health Training Program, so that their use can be reinforced.

7. Summary and Conclusions

The most important diseases among Ngok livestock are Trypanosomiasis among cattle, and pleuro-pneumonias among small stock. The NUA witnessed an epidemic of Lumpy Skin disease in Wet Season 1980. It is suggested that appropriate ways of controlling ticks must be found that would be feasible for general extension to the herds.

There are a host of traditional cures reported by the Ngok Dinka. Serious and fatal diseases such as anthrax cannot be cured traditionally, while other endemic diseases, such as CBPP, depend on a mixture of mineral/herbal and magico-cultural cures. As a generalization, it appears that the advent of modern medicines has reduced the reliance on traditional cures, even though the medicines are not readily available.

The Abyei Veterinary Clinic is understaffed, underfunded, and does not have adequate supplies of drugs. As a result vaccination campaigns, the main responsibility of the Clinic, are carried out only some years. The inadequate drug supply is linked to overall national shortages, while the other constraints are due, in part, to the unfavorable political position of the Abyei Clinic

vis-a-vis the Provincial network. The Clinic would greatly benefit from more cooperation and support from the Provincial Administrative structure.

A limited range of veterinary drugs are available in the Abyei Town Market which are brought from private enterprises in the national capital and sold at very inflated prices in Abyei. There is sufficient demand in Abyei to establish a pharmacy, although a question remains as to it organizational structure.

There is also great demand by the herders to institute an Animal Health Training Program. The ADP livestock program designed a pilot project, but was not able to implement it due to the recent political disturbances. It is strongly suggested that a pilot Training Program that would include issues on Animal Health and Range Management be implemented.

Chapter Eight: Livestock Productivity

1. Introduction

The livelihood of the Ngok Dinka depends significantly on the productivity of their livestock, especially cattle. Productivity of the livestock in turn depends on the breed, the quality of management, and the way the resulting product is consumed. In this chapter, an attempt is made to quantify the various outputs gained from livestock production, and to relate these to the way they are presently utilized. The data are based on various surveys carried out during the dry and wet seasons, and they are presented in the following sections:

2. Milk

3. Meat

4. Manure

5. Hides and skins

2. Milk Production and Consumption

Milk is a very important item in the diets of pastoral people. Among the Ngok Dinka, milk is consumed mainly in the form of soured milk. Ghee, or clarified butter, is occasionally produced, but only if there is a substantial surplus of milk. Milk is consumed fresh only by children, although adults may consume it with tea.

In the pastoral society, cattle are kept mainly for their milk and not for their meat. This fact has strong implications for the development of livestock production. Most livestock production schemes in the Third World have been directed at improving beef offtake. But they have been unsuccessful precisely because they ignore the importance of milk, and the great reliance of the people on live rather than dead cattle.

The ADP livestock program conducted a survey of milk production in the are in Dry and Wet Season 1980. Cows are milked twice a day by women: in the morning before they are released and in the evening when they have been pegged for the night. The survey measured the amount milked for human consumption from all cows in a herd for 3-4 consecutive days. Not all cows in a herd are milked every day and the stage of lactation of the sample varied. Therefore, the results have been averaged out. Measurements were taken from four sets of herds: Dry Season Camp, Dry Season Byre, Wet Season Camp and Wet Season Byre. These represent a total of 17 herds and 110 milking cows. The results are summarized in Table 8.1.

Table 8.1: Results of Milk Production Survey

	Average no. of milking cows in herd	Yield per cow per day (litres)	Total yield from herd per day (litres)	Yield per day per capita (litres)	Yield per day per adjusted capita* (litres)
Dry Season Camp	17.0	.73	6.4	1.6	4.1
Dry Season Byre	3.9	.34	1.03	.15	.27
Wet Season Camp	13.5	1.5	9.0	2.0	3.8
Wet Season Byre	3.6	.83	2.8	.43	1.2

* In the camps, it is assumed that milk is almost 100% of diet. Therefore, figures are based on adult equivalents: 20+ years = 1, 5-20 years = .75, and <5 years = .5.

In the byres, milk is the major diet of young children. Therefore, figures are based on child equivalents: <5 years = 1, 5-20 years = .5, 20+ years = .25.

The highest yield of 1.5 litres per cow per day is achieved in Wet Season camps when the pastures are lush and water is abundant. Wet Season byre yields per cow are fairly high although not as high as in the camps. This fact shows

the benefits of a migratory system over a sedentary system. Migratory herds are able to seek out new and better pastures while sedentary herds are essentially confined to a particular area.

The difference between dry season camp and byre yields per cow are insignificant and they are both less than wet season byre yields. It is obvious that even with a migration to the south, milk yields are not as high as in the wet season. As expected, yields per cow are lower in dry season byres than camps. It is quite possible that byre cows are milked longer in byres than they would be in camps so that the nutritional needs of the household can be met. To what extent this may affect the diet and health of the calf is not known.

The dry season byre data does not include one household that lived near a deep bore-well, where cattle were watered twice a day from the bore-well. On average, the yield per cow per day from this sample was 1.03 litres, considerably higher than the average for the other byres (.34 litres) who did not live by a bore-well.

The total daily yield from a herd and the amount available per adjusted capita depend on the number of cows in the herd as well as their productivity. Even with fewer cows, the wet season camps have higher milk yields than dry season camps. The same is true in the byres: wet season byres have more milk per herd per day than in the dry season, even though less cows are kept in the wet season byre. Lower milk output in wet season byres than camps is compensated for by alternative food sources, especially vegetables, fish and birds.

The average daily milk available for human consumption, per cow, is similar to that found among Dinka cows in Param, Jonglei Area (Payne; 1977; 81), and in other parts of Africa (Dahl; 1976). It is assumed that the ADP livestock survey covered a representative range of stages of lactation. If we also assume an average lactation of 10 months (see Chapter 6 on management), then the total amount of milk derived for human consumption per lactation

is at the most 147 litres in the dry season and 313 litres in the wet season. As previously mentioned, not all cows are milked every consecutive day; therefore the actual amount consumed by people would be slightly less.

The potential amount of milk available for Ngok consumption is presented in Table 8.2.

Table 8.2: Potential Total Yields of Milk Per Lactation* in Abyei Area, Available for Human Consumption

	Average yield per lactation (litres)	Estimated no. milking cows	Total yield of Ngok cows (litres)
Dry Season Byre	102	3,503	357,306
Dry Season Camp	219	2,205	482,895
Total Dry Season	147	5,708	840,201
Wet Season Byre	249	4,375	1,089,375
Wet Season Camp	450	2,066	929,700
Total Wet Season	313	6,441	2,019,075

*A 10-month lactation goes beyond a 6 monthly wet or dry season, but in this table it is assumed that most of that period falls into a specific season.

Assuming that the total Ngok human population is 31,000, then each person can expect to get 27 litres of milk over the length of a lactation period that occurs predominately in the dry season. In the wet season, the comparative figure is 65 litres per person, or almost double. Of course there are many variations that have not been taken into account: for example, age of the cow, her breed, whether the calf is dead or alive, etc.

The daily adult protein requirement of a pastoral group subsisting on an all milk diet (e.g., in Ngok Dinka camps) is equivalent to 3.4 kg. or

about 4 litres of milk. (Dahl; 1976). The people in both the dry and wet season Ngok camps come close to consuming that amount of milk daily. Byre households do not subsist on such a pure diet. It is difficult to estimate the exact dietary requirement of a byre household, but it is clear from visual observation and a Human Malnutrition survey (Byerly; 1981) that byre households are undernourished during March-June, when milk yield is low due to lower grazing resources, stored sorghum has been depleted, nuts, vegetables, seeds and fish are no longer available, and the new sorghum crop is not yet ready for harvesting.

Sixty samples of fresh cow's milk were analyzed for their nutritional composition by the Massachusetts State Labs in Jamaica Plain, USA. Of these, 55 were analyzed for fat content, 36 for protein and 10 for the remainder of contents. In addition, one sample of 12-day-old sour cow's milk was analyzed at the Animal Research Lab in Khartoum (see Table 8.3).

Table 8.3: Nutritional Content of Milk

	% Fat	% Protein	Total Solids	Moisture
Fresh milk from Ngok cows	1.8	3.1	5.7	89.4
12-day-old sour milk from Ngok cow	4.3	2.88	11.64	81.18
Fresh milk from average temperate cow (Williamson and Payne; 1978;663)	3.7	3.2	12.4	87.6
Fresh milk from Bor Dinka*	4.3	4.1	15.2	76.4

*Six samples taken in early rainy season (Payne; 1977).

The Ngok milk samples were taken in the end of the dry season; therefore they are expected to show lower fat and protein contents than rainy season milk. Sahel Zebu milk is reported to contain 2.5-2.8% fat and 3% protein at the end of a dry season (Dahl; 1976; 154). Thus, it seems that the

protein content of Ngok fresh milk is similar to other areas, but that the fat content is slightly lower. A better indication of human nutritional quality comes from analaysis of soured milk, the main form of milk product. Even in the dry season, these have high contents of fats and solids, although they have slightly less protein. (These figures are subject to random variation since there was only one sample.)

Sheep are almost never milked by the Ngok Dinka. They believe that sheep's milk is unhealthy even if boiled. On the other hand, goats are occasionally milked. When there is enough cow's milk for the household, only small children will drink goat's milk. When there is not enough cow's milk, then goat's milk becomes much more important in everyone's diet.

Goats are milked only once a day and the milk is boiled before it is drunk. Not enought quantitative data is available on milk production from goats to allow generalizations. On one occasion when informal sampling of eight she-goats was done, the amount milked from one goat averaged roughly 250 millilitres per day. The stage of lactation of these goats was not known.

Ngok Dinka milk seems to be of moderate quality, with much room for improvement. It is suggested that a combined system of salt, fodder and increased water would improve the quality of the milk and therefore the health of both animals and people.

3. Meat Production

Beef is very seldom eaten by the Ngok. By far the most common reason for meat consumption is due to the death of an animal from old age or illness. Given that cattle mortality is higher in the wet season, the Ngok have a higher protein intake during that time. The other reason why cattle are eaten is as a result of ceremonial killing. In both cases, the carcass is divided up according to strict rules among those present. For example, if an animal dies of illness in a camp, each hearth member receives a portion. They are then required to reimburse the owner with token gifts of cash or

other commodities. If the camp is close to a settlement, then the homesteads also receive a portion of the animal as a gift. Thus, a carcass will feed anywhere from 30-60 people. In the Ngok area, and also among other southern tribes, beef is stored for not more than one or two days. Smoked red meat is not a practice in these areas.[1]

In Dry Season 1981, a slaughter-weight survey was conducted. This included the measurement of skin, hooves, head and blood-drained carcass (minus the offals). Five old castrated males and twelve old females were weighed at the Abyei Town butcher stand. Average live-weights of cattle[2] are based on the Jonglei survey results (See Chapter 5, Range Resources). The results show that 31-32% of live-weight is "meat"[3], while 8% of the animal is the hooves and head and horns. Offals were not measured directly, but given that normally 8% of body weight is blood, and another 8-10% is skin (from survey results), then the offals would be around 42% of the body weight. Since the Dinka eat everythink except the skin, then total edible meat is roughly 85%, or 194 kg. from an old cow, and 295 kg. from an old castrate.

Comparable data for small stock meat was not collected as thoroughly since only cattle are butchered at the Abyei stand. From a sample of four sheep and five goats butchered for the ADP staff, it was learnt that on average, the legs and bodies, excluding offals weighed 9 kg. for mature sheep and 7 kg. for mature goats. The offals, heads and hooves probably comprise another 11 kg. for sheep and 10 kg. for goats.

Even though each sheep or goat contributes very little meat, the fact that small stock are raised mainly for their meat makes them more important in the Ngok Dinka diet. In some households cattle mat be slaughtered every two or three years, whereas sheep or goats are probably slaughtered three or

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1. Smoked fish is available, but is brought by Arab merchants and does not seem to be a Dinka tradition.

2. Average live weight of mature castrates is 359 kg. and of mature cows is 236 kg.

3. All the meat and bones are considered edible by Western standards.

four times a year. Cattle are raised primarily for their milk, whereas small stock are raised primarily for their meat. These facts have important implications for the development of the livestock industry. Small stock will require a different set of development programs than cattle.

4. Manure Production

Manure is one of the more important by-products from livestock production. A survey covering three byres and three consecutive days was carried out in October 1980 (end of wet season), and included a total of 35 head of cattle. It showed that for each 100 kg. of live-weight, 2 kg. of wet dung is produced per day. Wet dung allowed to sun dry for two days contained 32% dry matter. Therefore for each 100 kg. of live-weight, 640 gm. of dry dung is produced per day. These are lower rates of production than among Indian cattle (Bhatia, 1980).

To deter mosquitoes in the wet season, dung is burned in the camps or byres longer into the night than in the dry season. Therefore its rate of use, estimated at about three-quarters of total production, is higher than in the dry season.

Dung ash, although not as useful as fresh manure, still has certain minerals that are useful for crop production, but rarely is it spread over fields. Spreading fresh or dried dung manually over a field is not very common, probably due to terminte attack which decreases returns to labor. However, cattla are pegged on a rotation system around the arable fields near the homestead (ngai), and cattle trampling serves to spread the dung. Even though very labor saving, this system cannot provide manure to the large arable fields (domdit) that are normally located 500 meters or more from the homestead. The cattle have to be pegged close to the homestead so that watch can be kept over them.

5. Hides and Skins

Skin of all livestock is used to prepare ropes for pegging the animal and woven mats for a bed or chair. The hide is not cured, but sun dried, cut into long strips and stored as a tied bundle. Before these are used again, they are soaked in water for a few hours. Apart from ropes, beds and the occasional floor covering from small stock hide, hides are not used in any other form by the Ngok Dinka. One reason is that the humid wet season limits the utilization of hides. Another is that the amount of hides and skins available (far less from cattle than small stock) is not enough to go beyond the present use. Only when the supply is increased through greater culling can it be possible to talk about inroducing new ways of curing and utlizing hides and skins.

6. Conclusions

The migratory management of cattle results in greater milk output for human use since new pastures are always sought out. The quality of milk is moderate to moderately low. Camp people have enough milk to satisfy their dietary requirements, but in the byres the people are hard pressed, and during the "hunger period" suffer from malnutrition.

The decision of how many milch cows to keep in a byre is currently based on:

1. The condition of grazing resources, especially water, around the byres.
2. Supplying the migratory members of the household with enough milch cows to satisfy their demand which is based on an almost 100% milk diet.

One way to increase milk production in the byres is to have more cows at the byre. If the number of migratory members were to be decreased (given that at the moment migratory people are much more than what is required to herd the cattle), then more milking cows could be kept at the byres. Yet it is highly unlikely that the number of migratory members could be decreased in the near future, given that migration is regarded as

almost a vacation and is highly prized by the Ngok. In any case, a larger number of cattle kept at the byre would put more pressure on the pastures, something that must not be done until further work is done on the dry season carrying capacity of the land.

The other way to increase milk production in the byres is to increase milk yield per cow. This can be done in various ways:

1. The most important, especially in the dry season, is to provide additional sources of water. The potential effectiveness of this was shown by the sample of cows that were kept near a deep borewell where milk yields for human consumption were almost three times higher than cows that had to travel long distances to the Kir River. As described in Chapter 5, additional sources of water can be provided by small hand-pumped wells or earth dams. The people are well aware of the problem of overgrazing that may ensue if more cattle were kept at the byres, but are prepared to mitigate such effects.

2. Provision of better health services through better training and appropriately priced drugs will reduce calf mortality and general ill health. (See Chapter 7.)

3. A more rigorous selection of cattle for milk production may be feasible, given the wide variation in milk production per animal, and the present effort by the Ngok to select for higher milk production. (See Chapter 6.) Nevertheless, such a program must await a greater increase in cattle populations to allow effective culling of low productive animals.

4. Provision of additional sources of feed in the dry season, such as fodder, will not only mean an improvement in the quantity, and possibly quality, of feed (especially if grain legumes are also planted), but also shorter distances to be traveled in search of daily grazing. (See Chapter 5.)

5. Overseeding of appropriate forage legumes on the "Wudiyow," or byre pastures, may be feasible by individual villages given the proximity to the homestead of these pastures. This would serve to increase the quality of the range in the wet season. (See Chapter 5.)

6. The feeding of minerals to the byre cattle may be worthwhile, if it is shown by pilot testing to increase milk output substantially. (See Chapter 5.)

7. The provision of tree shade to reduce climatic stress on livestock is one beneficial by-product of reforestation. (See Chapter 5.)

Most of these measures require a good initial pilot testing, and if shown worthwhile, a good extension program.

Red meat, especially from cattle, does not constitute a large part of Ngok Dinka diets although it is favored over other meats. The lack of large amounts of meat in Dinka cattle is compensated for by the consumption of offals, heads and hooves, that is, in total 82% of the live weight of cattle. The storage of meat, such as smoked meat, is not a practice since almost 60 people are entitled to consume one carcass, leaving none for other days.

The present use of hides and skins in the form of mostly cattle rope is due to the fact that the supply of the raw material is limited. The traditional processing technology is adequate for such a limited use. Thus, similar to the case of storing meat, new processing technologies can only be talked about when there is greater supply (through greater slaughter) and a diversification of its present use. Greater supply of these raw materials can only be achieved with greater livestock production through greater direct investment in livestock and/or through investment in crop production which then may allow investment in livestock.

Manure, a valuable by-product, is produced at lower rates among Dinka cattle than elsewhere. Furthermore, almost three-quarters of the daily production is burnt in dung fires to ward off insects. One of the ideas of the ADP appropriate technology programs was to test the feasibility of bio-gas (methane) generators. The measurement of cow dung production and consumption showed that without substitutes for the present use of burning dung, not enough manure is left over for bio-gas plants.

What manure is left over, and dung ash, is trampled into the ground by the cattle. The plots around the homestead (ngai) benefit from this labor-saving system while the far plots and the main production fields do not. It is not known to what extent the addition of manure increases crop yields. But the fact is that the people themselves do not find it worthwhile to spend their valued energy to spread dung manually over the fields. Whether other forms of manure, for example, slurry, are worthwhile must be left to future research and testing.

Chapter Nine: Livestock Marketing

1. Introduction

At first glance, Abyei Town and its market seem very small and insignificant compared to other regional markets. This first impression of the Town was held by the ADP and is still the view of central Government organs such as the Livestock Meat and Marketing Corporation (LMMC). It was only with the implementation of the livestock survey that it was understood that Abyei Town houses one of the larger livestock markets in South Kordofan Province. It acts as one of the three major routes by which southern cattle west of the White Nile are trekked to Khartoum for slaughter or export.

Other commodities, such as food and manufactured goods, are imported into the market and bought by Abyei residents as well as other southern tribesmen. In other words, there is a high degree of commercialization in this market. There is an active local involvement in the Abyei Livestock Market. Local transactions are not necessarily for slaughter or commercial offtake; rather, they are a means by which cattle are exchanged for the purpose of rebuilding herds or fulfilling social obligations among the Dinka. The milk market, run exclusively by women, is also fairly active and supplies mainly the Abyei Town residents. The same is true for the local butchers. The hide market is relatively less significant but serves to supply northern towns and tanneries with the raw material.

The Livestock Survey conducted a major market survey during April 1980-April 1981 that had the following components:

1. Interviews of traders and sellers, both northern and southern.
2. Daily observation of the markets; livestock, milk, meat and hides.
3. Complete recording of prices and type of livestock sold every day from livestock sales receipts stored at the Abyei Rural Council Offices. Sampling of livestock sales receipts, first week of

every month to obtain data on the tribal affiliation of buyers and sellers of livestock. All these data are complete for the year 1973, but because of the problem of termite attack on stored sales receipts, the data are incomplete for the later years. 1976 includes only April, May, June and December. 1979 does not include December. 1980 does not include March and November. Data were also collected for the intervening years, but have not yet been analyzed.

There is quite a degree of confidence in the sampling procedures used by the Survey. In the case of sales receipts, it is assumed that termite attack is essentially random in nature. The interviews were carried out as much as possible in private and with all efforts to minimize interviewer bias. The total sample of interviews of sellers is not large, but is representative of the more important tribes. The sample of trader interviews is a good representation of all the traders present in the area (25%).

The overall goal of the study was to suggest ways by which in the first place income of all producers could be increased through livestock marketing, without detrimental effect on the viability of any household, and only then to increase the supply of beef from the area to satisfy urban and export demands. It is only by a careful analysis of the livestock marketing survey that the whole system can be understood, both internally and within the overall framework of Ngok Dinka society. Only then can suggestions for or against change be given.

2. Livestock Trade

The Abyei livestock market is the only market in the Ngok Use Area. The next closest market is in Dumbeloya (40 Km NE) which is operational only from December to April and caters exclusively to Missiriya and other northern tribes. Other livestock markets in South Kordofan are located in Muglad (200 Km to the NW of Abyei), Kadugli (200 Km NE), and other major

towns to the north. These are areas that are not in the migratory paths of southern tribes and therefore are not frequented by them. (See Figure 1.2)

The closest southern markets are in Madol (100 Km SW), Bentiu (150 Km SE) and Gogrial (130 Km SSW). The Bentiu market is the second major route by which southern cattle are exported to Khartoum. In 1978, an estimated total of 5,319 head of cattle were sold in this market. (Mogga; 1979) Madol market has more of a local character although it still is a collection point for cattle destined for the north. Gogrial Market is larger than Madol, but not as large as Bentiu. The number of cattle sold in this market had actually been declining between 1972 and 1976, due to fewer heifers being brought in. (PDU, 1978) These three markets are operated on an auction system. The auction was designed and implemented by the Southern Government as a way to benefit the small herder/producer. Yet its success has not been obvious to the producers interviewed by the ADP. One problem is attitudinal: the sellers comment that they do not like the long wait and the crowded conditions. The other problem is economic: during the peak seasons when there are enough competing traders, the auction system works well in pushing up prices. During the times that there are a few traders, the prices are low because the traders cooperate and coordinate their actions to depress the price. A study of the Bentiu auction in 1979 shows that even with an auction system, average prices of cattle decreased in the peak selling months (Mogga; 1979). Since no comparative study has been done, it is difficult to say whether auctions benefit the producer more than a free-market system.

On a national scale, the price of cattle increases from south to north and from west to east. The Omdurman livestock market in Khartoum is the largest livestock collection point in Sudan. The LMMC in Khartoum has been recording sales and slaughter data in the Omdurman market. The LMMC's research officers acknowledge that the data are biased downward as they only reflect the formally recorded sales and it is not known how much is sold or slaughtered outside the market. This is true, especially for sheep and goats, since they are just as easily slaughtered in the backyard. From

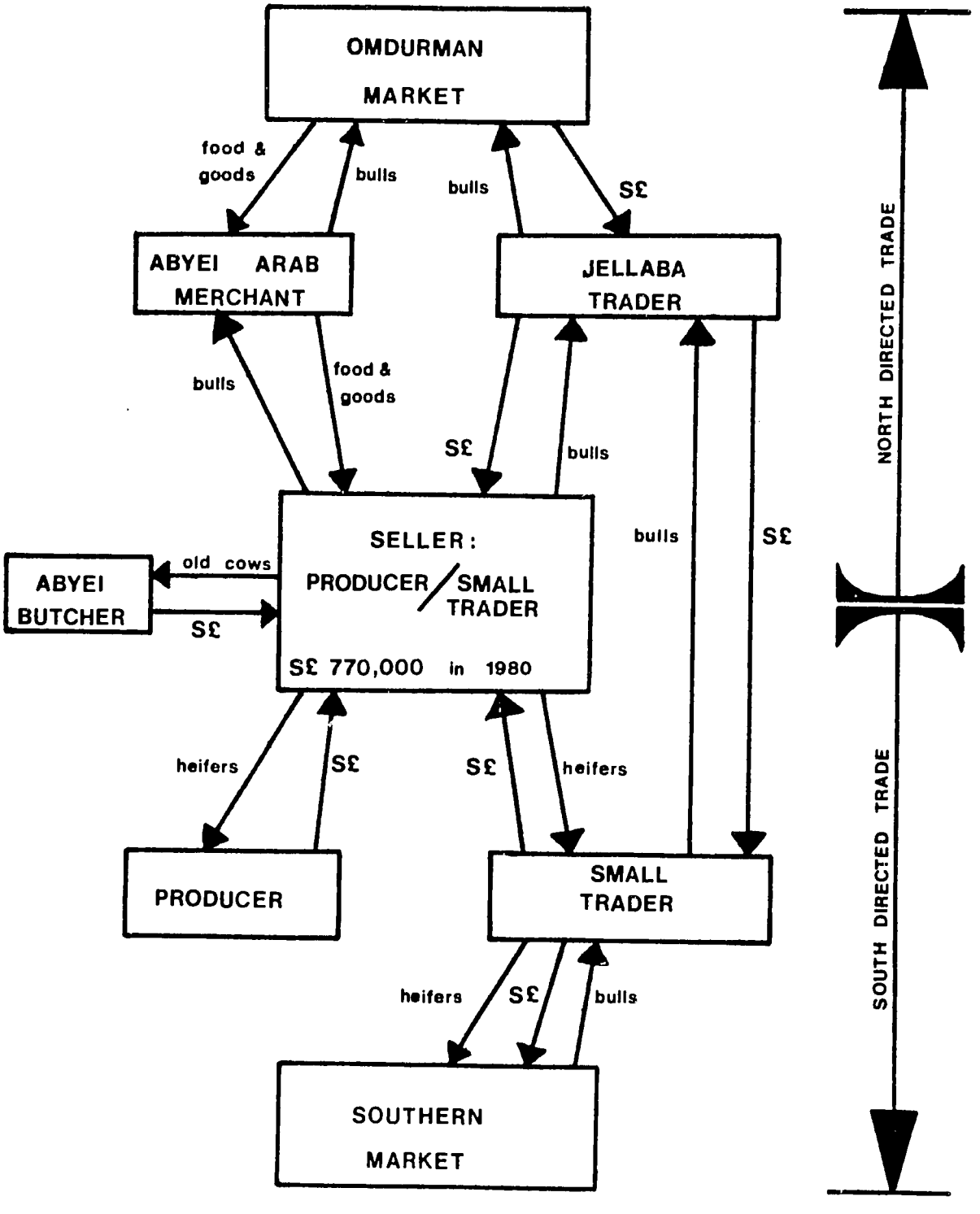
July 1979 to June 1980, there were an estimated total of 168,500 heads of cattle sold in Omdurman, 33% of which were slaughtered in the market. Since 1976, the Government has lifted the ban on cattle exports. The major destinations of cattle and sheep are Saudi Arabia and Yemen Arab Republic (FAO; 1977). The government and private traders (jellaba) are involved in exports, although without adequate records of the jellaba's activities, it is difficult to tell how much of the export market is under their control.

The Abyei Market sees the transaction of all manner of livestock, including (to a lesser extent) donkeys and horses. Cattle are the most important item in the market. The sellers come from a wide geographical area and diverse tribal backgrounds. The Abyei Market attracts sellers from a region that is perhaps as large as 20,000 km^2. .

Apart from the sellers and buyers, the other actors in the market are the "Damin" or guarantor, the middleman, and the market police. Sellers are responsible for bringing a guarantor who will pledge that the animal is not a stolen one. There are many professional guarantors in the Abyei Market. They generally will guarantee a seller from their own tribe. They operate on the strength of their popularity and will charge a fee to the seller. Given that most court cases deal with stolen cattle that have surfaced in the market, the role of the guarantor is quite important in ensuring an orderly system. Complementing the guarantor is the market policeman. This "policeman" is employed by the Rural Council and is separate from the regular Police Force. He does not bear arms, but has the authority to make arrests.In fact, the "policeman" is probably better described as an agent/translator. He will be hired by the buyer to seek out livestock at the right prices. In some cases he may be given a certain sum and asked to buy cattle until the buyer's return. At times when there are not enough buyers and the market is slow, the middlemen do act as petty traders, but normally their effect on depressing sales prices is minimal.

Fig 9.1

LIVESTOCK TRADING SYSTEM IN ABYEI TOWN



The Abyei market is an important economic link between the national commercial system of the Arab North, and the semi-nomadic Nilotic-speaking herders of the economically less advantaged Southern Region. The system is diagrammatically represented in Figure 9:1. On the northern link of this chain (dominated by regional Arab merchants, or "Jellabas"), great wealth leaves Abyei on hoof and is later returned into the economic system in the form of manufactured goods and food commodities. This north-directed trade is highly commercialized. On the southern link, heifers or cash are taken south by Ngok traders and exchanged for bulls, some of which are then sold into the northern commercial system, and others into increasing the Ngok cattle herds.

The market facilitates local exchange of livestock among the Ngok, but it is this role as a north-south link based on the cattle trade that gives the Abyei market its predominant character. In the years since the Peace Accords ending the north-south civil war (1972),the volume of cattle trade has increased quite rapidly. This expansion is manifested in two ways. One is that more sellers are bringing their cattle up from the south. The other is that more cattle is being trekked up north.

The remainder of this section describes in detail the dynamics of the livestock marketing system in order of their importance and impact on the overall system:

2.1. Cattle Market

2.2. Small Stock Market

2.3. Donkey and Horse Market

For the sake of discussion, each market system is divided first into Sellers and Buyers, and then is brought together in the form of Conclusions.

2.1 Cattle Market

2.1.1 Sellers of Livestock

In 1973, Ngok Dinka were the majority of sellers of large stock (40%), but they soon were overshadowed by Twich Dinka sellers who have kept a slight edge since then. The other southern tribes, Rek Dink, Rueng Dinka and Nuer have been increasing since 1973 so that by 1980, they held 21% of the share of the supply. Fellata (Hausa) sellers were fairly active in 1973 (6%), but by 1980 they accounted for less than one percent of the total sellers. Arab residents of Abyei and other Arabs (Rizeygat, Hamadiya, etc.) hold a negligible share of the total supply of large stock throughout the years studied. The Missiriya and Nuba sellers were abundant in 1973 and 1976 (13% and 15%, respectively), but they had completely disappeared from the Abyei market by 1979. Although 1977 and 1978 data have not been analyzed yet, it seems probable that as a result of the 1977 violent incident, Missiriya and other northern Arab tribes ceased to frequent the Abyei market. Nevertheless, instead of witnessing a drop in the absolute number of cattle sold, one sees that their place was taken over by Twich and other southern sellers.

Ngok Dinka Sellers of Cattle: Ngok Dinka sellers can be divided into two groups. The majority are herdsmen who will bring heifers, bulls, and small bulls, but mostly sheep and goats into the market. Those living nearby are willing to wait longer for the right price, sometimes as much as a week. In informal discussions, most Ngok sellers explained their reasons for various sales as being the need for cash for grain purchases, school fees, or debt repayments. Other reasons were also given. One man was selling 17 head of cattle at a total of about £1700 in order to accumulate capital to enter the Livestock Trading business. Another needed cash to pay for transportation north to find wage employment.

The second type of Ngok sellers are the cattle traders. Their total

number is difficult to ascertain since some are part-time traders, but there are at least 10 known cattle traders. They engage in two types of trading: 1) buying any type of cattle from the Abyei market when prices are low and selling when prices are high, usually from one month to the next, and not necessarily to Arab traders, and 2) buying heifers from the Abyei market, trekking them down to Nuer or Twichland and selling at a much higher price. They then will buy bulls from the south, trek them to Abyei and sell to Arab traders, with a substantial profit of about 200% of their initial investment.

The results of 1973, 1979 and 1980 show Ngok seller involvement in the market has been consistently at a peak in July throughout the years. In both 1973 and 1979, 50% of all Ngok sellers in those years were trading in the peak months of May, June and July. In 1980, the comparable figure was 64%. During these months three factors combine to produce a peak supply rate. In the first instance most of the migratory cattle have returned from the dry season pastures and are in the vicinity of the Abyei area. Secondly, these are the lean pre-harvest months when sorghum supply is short or running out and sorghum prices are high. Therefore, in order to have large quantities of cash on hand, more large stock are sold off (as compared to small stock). In the months of April through July of 1980, 1,234 cattle were sold by the Ngok, almost double the 622 Ngok small stock sold in the same period. Thirdly, demand by Arab traders is up because with the beginning of rains,northern pastures are becoming green, and it is then possible to move cattle to Omdurman.

The yearly percentile share of Ngok sellers (out of total sellers) shows a general decline throughout the years analyzed. This share was the highest in 1973, at 40% and then decreased until it reached a low of 24% in 1980. In terms of absolute numbers, however, there is an increase of Ngok cattle sold through the years. We estimate that 1,414 head of Ngok

cattle were sold in the Abyei market in 1973, 2,406 head in 1979, and 2,534 head in 1980. This represents an average increase of 12% per year from 1973 to 1979, and 6% from 1979 to 1980. Therefore Ngok cattle sales have greatly increased since 1973, probably due to the end of the Civil Wars, but seem to be leveling off in recent years. Furthermore, the Ngok share of the sellers is gradually decreasing. These results suggest that the Abyei market is increasing,acquiring a "national" rather than "local" character.

Comments from a sample of cattle sellers in the market indicate that the number of cattle sold outside the market is negligible since the market offers higher prices as well as guarantees against accusations of theft. Thus the recorded figures are assumed to represent the true level of sales by the Ngok. With an estimated 27,000 cattle owned by the Ngok in 1980 (see Chapter 4), the number sold in the Abyei Market in the same year represents 9% of all Ngok cattle. Unfortunately, we are not able to tell at the moment what the "commercial offtake" of Ngok cattle is. In other words, we do not know what percentage of these cattle are bought by Arab traders and taken permanently out of the system.

Most of the reports on Southern Sudanese cattle trade refer to commercial offtake. One exception is the Jonglei Area Survey (Payne; 1977) which estimates that only 1.2 to 2.4% of all Bor Dinka cattle were sold in 1976/1977. Therefore it appears that the Ngok involvement in the large stock market is higher than other kindred Dinka tribes.

An examination of Ngok sales according to animal category provide some interesting insights into the nature of the economic management of herds. The number of cows sold has remained at the same level between 1973 and 1980. (See Table 9.1) Since cows are a direct mechanism of maintaining or increasing herd sizes, they are normally sold only if they lose their productivity (old age or sterility), or if a herd-owner hopes to exchange her for a better quality cow or heifer. Thus it is not surprising to find an almost static and comparatively low sale of cows.

Table 9.1 Total Number of Cattle Sold by Ngok Dinka

	1973	1979	1980	1980 Sales as % of Ngok Cattle
Cow	291	271	280	3.04%
Heifer	472	438	703	9.0
Bull	576	1018	686	20.3
Small bull	75	679	865	13.5
Total	1414	2406	2534	9.4

Note: For the remainder of this section, a cow is defined as any mature female, and a heifer is any immature female including suckling ones. A bull is defined as any mature male (castrate or entire) and a small bull includes suckling and immature males, whether castrate or entire.

On the other hand, heifers do not contribute directly to the rebuilding of the herds, until some time in the future. Nevertheless they are regarded as a very important asset. The number of heifers sold by the Ngok has increased between 1973 and 1980. Such an increase indicates that the Ngok cattle population must have increased substantially to allow the herders to dispose of heifers without endangering the future economic viability of their herds.

Mature bulls are the major source of liquid cash since they are the highest priced animals, due to the demand by the Arab traders. The number of bulls sold by Ngok saw a major increase in 1979 (by 77%) but then in 1980 fell down to approximately the 1973 level. The increase can be attributed to the greater demand by Arab traders. The decrease is probably due to a greater competition in supply by Twich and other southern people. The number of small bulls sold has seen a high and steady increase throughout the years. This is most probably due to greater purchases by Arab traders who must satisfy urban demands, and Ngok buyers who wish to increase their herd sizes.

From the sampling of livestock sales receipts, it can be shown that the majority of Ngok sellers come from the chiefly Abior subtribe (35% in 1980). There are 4 major reasons for their heavy involvement:

a. We have no population figures for each of the 9 subtribes, but indications are that Abior is one of the larger subtribes. In the African context, it is generally the chiefly group that tends to assimilate other people, and becomes the largest minority. Furthermore, the population density survey (Chapter 3) showed that the highest density areas were located in the Abior territory. Because of their larger size, the Abior are expected to sell more cattle than other subtribes.

b. The Abior subtribe has the largest share of wealthy and educated people, such as the chiefly family and civil servants, who may have the means to be more involved with the commercialized system.

c. The majority of Ngok traders are Abior.

d. The Abior homeland is closer to the market than other subtribes, making it more convenient for them to visit Abyei Town.

Twich Dinka Cattle Sellers: The Twich cattle sellers have been increasing their involvement in the Abyei market. By 1980, they accounted for 53% of all cattle sold. There are essentailly two types of Twich cattle sellers. The first are the producers who find it more convenient to come to the Abyei market than the other makets in the south. They usually bring 1-4 head of cattle and expect to use the sales money for purchasing goods, paying school fees, debts or taxes. The second type are the traders who compete with the Ngok traders by bringing bulls up to the Abyei market for sale to the Arab traders and taking either heifers or sorghum down south. Out of 7 Twich sellers interviewed, 2 said they were traders, suggesting that many of the Twich sellers are traders.

The Twich sellers are very active during the peak months of April through July. In 1973, 87% of all Twich cattle were sold in the peak months; in 1979, 70% and in 1980, 87%. This is the period of heavy demand for cattle, as well as the "hunger" period for the Twich. The rainstorms and muddy condition of roads do not seem to be a deterrent to the Twich sellers.

The Twich sold an estimated total of 1080 head of cattle in 1973, 3210 head in 1979 and 5654 head in 1980. These represent a 193% increase between

1973 and 1979, or an average yearly increase of 20% in those years. Between 1979 and 1980 there was an increase of 76%. Twich cattle sold in the Abyei market rarely find their way back to a Twich herd, and therefore can be interpreted as true commercial offtake. Since no intensive study of the southern tribes was carried out by the present livestock research, then interpretations of results must remain mere conjectures. The following are some interpretations and explanations of the increase of Twich cattle sold in the Abyei market:

1. Over the years there has been an increase in the number of Twich traders who find Abyei a lucrative market due to the increasing demand for cattle for exporting to Khartoum and beyond. Prices of cattle in the Omdurman market have risen sharply in recent years which acts as a stimulus for more regional markets.

2. The Twich herd has been increasing at a fast rate since 1973 and a high commercial offtake does not endanger its viability.

There have been very large increases in each category of animal sold by Twich between 1973 and 1980. The greatest increase has occurred with the small bulls. (See Table 9.2)

Table 9.2: Number of Cattle Sold by Twich Dinka

	1973	1979	1980	% Change 1973-80
Cow	224	637	826	+269
Heifer	177	230	669	278
Bull	643	1753	2791	334
Small Bull	36	590	1368	3700
Total	1080	3210	5654	423

In terms of tribal affiliation, the majority of Twich cattle sellers have come from the Chier subtribe. Their involvement in the market has been increasing both proportionately as well as numerically since 1973, so that by 1980 they were the owners of 50% of the Twich cattle sold in the Abyei market. The involvement of the other three subtribes have all numerically increased, but in terms of percentages the Lang and Nyol subtribes have been

decreasing, whereas the Thon subtribe has been increasing. Not enough is known of the various Twich subtribes to give adequate explanations. Informal talks with various Twich herders suggests a common perception held by the Twich: that the Chier subtribe has traditionally been more involved in selling cattle not because they have more cattle, but that they have more traders among them.

Rek, Rueng and Nuer Cattle Sellers: In 1980, these groups accounted for 21% of all cattle sold in the Abyei Market. Popular perception has it that there are very few herdowners among the Rek and Nuer sellers who come to the Abyei Market, since they are much closer to the other cattle markets in Madol, Gogrial and Bentiu. Therefore, those who do come to Abyei are probably traders. On the other hand, the Rueng sellers are probably mostly herdowners because of the proximity of their homeland. The Rek usually have their highest involvement in the dry season. In 1979, 95% of all trade occurred between January and May. In 1980, however, 94% of their trade occurred in the traditional peak months of April to July. The supply pattern of the Rek is determined by two factors: 1) The migration pattern that is so dependent on seasonal climatic conditions. The Rek will generally be returning westward to their northwestern Bahr el Ghazal homeland by May or June. 2) The high demand in the Abyei Market for cattle may be stimulating a delaying of the return trip.

The Rueng Dinka, the tribe immediately to the east of the Ngok, did not show seasonal variation in their involvement in both 1973 and 1979. But in 1980, a clear seasonality is shown, with 81% of all trade concentrated in the peak months of April through July. It is suspected that given the low level of involvement (only 2% of all sellers during all the years studied) that the Rueng Dinka are only just beginning to get involved in the regional cattle marketing system.

The Nuer sellers are more active in the Abyei Market towards the end of the rainy season. In 1973, 76% of all trade occurred between October and November and in 1979, 97% occurred between July and November. This is due to the greater distance which they must travel. In 1980, 92% of all Nuer cattle trade occurred in the peak months of April through July. The earlier involvement in 1980 may indicate that the Nuer did not travel as far south for their Dry Season pasture as they had done in previous years.

The combined involvement of these three southern tribes in the cattle market was 21% of all sellers in 1980, 16% in 1979 and only 8% in 1973. This increase is shown more effectively by a look at the absolute numbers. (See Table 9.3)

Table 9.3: Number of Cattle Sold by Rek, Rueng and Nuer

	1973	1979	1980	% Change 1973-80
Rek	179	856	1350	+654
Rueng	80	137	202	153
Nuer	52	155	849	1532
Total	311	1148	2401	672

The Rek, with the highest number of cattle, show a low yearly increase of 6% between 1973 and 1979, and a jump to 54% in the following year. Both the Rueng and Nuer show the same patterns, although at slightly lower percentile. Overall, there has been an increase of almost 680% in cattle sales between 1973 and 1980. This figure underscores the increasing importance of the Abyei Market in the regional economic system.

It appears that these groups are mainly catering to the Arab trader demand. Most of their cattle (50-75%) are bulls and small bulls, with the number of the latter increasing at high rates. They bring very few cows and heifers.

Missiriya Cattle Sellers: The Missiriya sellers were mostly nomadic herders who would be active in the Abyei market during their Dry Season migration (November to April). There also were a few Missiriya traders who would buy cattle and small stock from camps farther away and sell them in Abyei. Thus, in 1973, 79% of all Missiriya cattle were sold between November and March.

In that same year, the Missiriya sold a total of 424 head of cattle in the Abyei Market. In other words, they had 12% of the share of the market

supply. In 1976, the percentile share of the Missiriya sellers declined slightly to 11% of all sellers. Comparison of the four months of April, May, June and December of 1976 and 1973, shows a total sale of 169 heads and 173 heads respectively, a slight decrease of 2%. Since the total figures for 1976 are not available, the nature of Missiriya involvement between 1973 and 1976 must remain inconclusive.

In 1979 and 1980 the Missiriya had completely disappeared from the Abyei Market. Probably the single most important reason was the violent clashes between the Missiriya and Ngok Dinka in June 1977, when about 150 people from both sides were killed. It is suspected that the Dumbeloya seasonal market became a much more important cattle trading post for the Missiriya and other northern tribes, after the June 1977 incident effectively barred them from entering the Abyei Market as well as the Ngok Use Area.

The only records existing for the Dumbeyloya Cattle Market cover the months of January and March 1977 (before the June incident). There was a total of 479 head of cattle sold in those two months. During those same months, a total of only 161 head of cattle were sold by northerners in the Abyei Market. Since the number of northern cattle sold in the market is probably determined by migration timings and routes, and these in turn are determined by climatic factors, comparison of data from essentially arbitrarily defined monthly periods is not very meaningful. Yet, with the lack of better information, these data seem to suggest that the Dumbeloya Market was more important for the Missiriya and other northern tribes than the Abyei Market even before the 1977 incidents.

In 1973, of all the cattle brought by the Missiriya into the Abyei Market, 56% were heifers, 19% small bulls, 14% bulls and 11% cows. Figures available for 1976 show essentailly the same pattern, but with slightly more small bulls. Interesting to note is that in 1977, the cattle sold at the Dumbeloya Market can be broken down as follows: 3% heifers, 19% small bulls, 51% bulls, and 27% cows. Popular opinion among the Dinka says that Missiriya cows are better milkers and breeders than their southern counterparts. Therefore the large number of Missiriya heifers in the Abyei Market probably reflects the strong demand by Dinka who are rebuilding their herds with these heifers. The Missiriya, unlike the Dinka, value bulls as a beast of burden and it is to be expected

that the Dumbeloya market sees more Missiriya bulls being exchanged among Missiriya herders. Another important explanation for the large number of Missiriya bulls is that the Dumbeloya market also sees a lot of Arab traders whose major demand is bulls.

The majority of Missiriya sellers in the Abyei Market in 1973 came from the two Higaira subsections of Mazaghna (53%) and Awlad Kamil (42%). The other sellers were from the Fiarin, Fadlia and Awlad Omran subsections (all Higaira subtribe), and very few people from the Falaita subtribe. The Awlad Kamil (Paramount Chief's subsection) and Mazaghna are the two subsections which traditionally have come through the Abyei Area during the dry season. The other subsections travel much more to the east of Abyei (See Chapter 6, on Migration).

In the two months studied for Dumbeloya Market, the majority of Missiriya sellers were of the Awlad Omran subsection (78%). The Awlad Omran traditionally pass east of Abyei towards Upper Nile Province. It is not known why the Fiarin and Fadlia subsections, who presumably do pass through the same general area, are not as actively involved in the two markets as the rest.

Nuban and Other Northern Arab Cattle Sellers: As would be suspected the involvement by Nuban and other Arab herders in the Abyei Market is minimal because of its inaccessability. Yet in both 1973 and 1976, there was some activity. In 1973, an estimated total of 38 head were sold by the Nubans and 38 head by other Arab tribes such as Hamadi, Um Jodi and Um Mahdi. In April, May, June and December of 1976, there is no record of sales by other Arabs, while the Nubans sold 65 head alone. This represents an increase in Nuban trade, especially since only 17 head were sold by them in the comparable months of 1973. Yet, by 1979 and 1980 there is no record of transactions by either Nubans or other Arab traders. Clearly they have been affected in the same way as the Missiriya by the 1977 clashes.

Nubans and other Arabs are more involved in the Dumbeloya Market, although even there, they held only 10% of all cattle sold in January and March 1977. Yet they sold almost twice as many cattle in this market as in Abyei's in those months.

In 1973, the Nubans tended to sell more heifers (55% of all Nuban-sold cattle) in the Abyei Market, while the other Arabs sold more bulls (45%). Since neither the Abyei nor the Dumbeloya markets are situated on or near Nuban and other Arabs' migration routes, even this minimal involvement is surprising. Presumably these are individual friends of the Missiriya who have opted to migrate with them rather than with their own tribes.

The other category of Northern Arab sellers are the Arab, Abyei residents. They are mainly people who have abandoned their migratory life to become merchants. Invariably they are involved in some kind of trade, whether it is hide market, importing manufactured goods, trading sorghum and other food stuff, cattle trading, or all of the above. There are those who will act as petty traders, buying cattle at low prices and selling at high prices in the same Abyei Market. Some may sell sick or infertile cattle from their own family herd. The other Arab residents who sell in the Abyei Market are employed in the police, military and other government offices.

In all the years studied, these people comprised only 1-3% of all sellers of livestock. For the sake of expediency it is assumed that their influence is negligible and they will not be included in further analyses.

Fellata Cattle Sellers: The Fellata herders who pass Abyei on the long distance migrations occasionally are involved in the market. In 1973 they were 6% of all cattle sellers, but by 1980, they had dwindled down to less than 1%. In absolute figures, the Fellata sold an estimated 225 head in 1973, 21 head in 1970 and 81 head in 1980. Their continued involvement in the Abyei Market after the 1977 incidents, albeit decreased, heightens the fact that to the Dinka, the Fellata are, and are not, Arabs. Thus it is not surprising to see some of the braver souls presenting their animals in the Abyei Market even after the 1977 incident.

As with the northern tribes, the Fellata are more active from November to March. In 1973, 81% of all their 1973 cattle sales were done in those months. The Fellata tended to bring mostly bulls (45%) and mature cows (34%) to the Abyei Market in 1973. The same relationship holds true in 1979 and 1980.

The Fellata sold 72 head of cattle in the Dumbeloya market (January and March 1977). This is comparable to only 13 head sold in the same period in the Abyei Market.

2.1.2 Buyers of Livestock

The only data available on buyers of livestock are from the sales records. It is impossible to make tribal distinctions since only the names of the buyers are recorded on the registration slips. From the names it can be distinguished if they are 1) Arab or 2) non-Arab.

Arab Buyers of Cattle: There are five types of Arab buyers. The most important are the outside Arab traders, or Jellaba, who annually or bi-annually visit Abyei to buy on a large scale and trek the cattle all the way to Omdurman, picking up other cattle from northern markets on the way. Others may trek the cattle to regional centers such as El Obeid or Kadugli where the cattle then change hands. These traders start buying cattle as early as January and send one to six herds (of 100-200 head) in the early part of each rainy season. Their major constraint is the condition of the trekking routes. The rainy season with its adequate grazing and water points is the only time they can move cattle without an unreasonable trekking loss, therefore, most of the cattle are bought just as the rains begin in Abyei.

Each year there is an influx of 20 - 25 big traders. The nature of their competition varies depending on the circumstances. During the beginning of the buying season, the traders are gradually arriving and the few that are there are able to cooperate with each other to depress the price of cattle. Later, as the buying season advances and more traders join the market, such cooperation is difficult and a rise is witnessed in the average monthly price. Nevertheless, the Arab traders are in a slightly better position than the sellers since they will spend anywhere from one to two months at the market while sellers can only wait 5-10 days.

The second type of Arab buyer is the local Arab merchant, who in addition to being involved in commodity trade, is involved in the cattle trade in

varying degree. Some may trek north as often as the Jellaba every year, but they generally will sell their animals mid-way in the provincial centers. Some will travel south to other market centers during the dry season and will keep the cattle in their Abyei byres until the trekking season. Some act as agents for the Jellabas while others buy when the price is low and sell in the Abyei Market when it is high. This group of buyers is involved in the market at all times of the year, buying cattle whenever they are at a low price, and keeping them in their own byres until the trekking season, or until the price increases.

The third type of Arab buyers are the middlemen who act as agents for all the traders. It is unusual for an Arab trader to deal with a non-Arab middleman unless he wants to relieve the language barrier with the seller. The middlemen generally hold commissions and will charge £2/head to the trader. They may also trade on their own with money borrowed from the traders. The middlemen have to be licensed by the Abyei Rural Council for which they pay £7.55 per year. The chairman of the Rural Council maintains that there is no limitation on the number of middlemen since the Council is in need of the license fee. It is estimated that there are 25-30 Arab middlemen in the Abyei Market who are all residents of the town.

The fourth type of Arab buyer consists of the three local butchers, who will buy, in total, 6-8 head of old cows per week for local slaughter. This is a total of 310 to 415 old cows in all of 1980. The three butchers in a sense form a monopoly, since they have an agreement that only two butchers will open shop on any particular day, and they rotate during the week. In 1980, the price of boneless meat was £.70 per kg. and unboned-meat was £.60 . It is estimated (from a sample of 19 butchered cows) there are 84 kg. of meat per cow (excluding head, skin, hoofs and offals). At an average price of £48/cow in 1980, each butchered cow will bring £7 of profit. Yet the profit figure is much higher considering that the offals, head and hoof are also sold off to the consumer, and the skin is normally sold to hide merchants.

The fifth type of Arab buyer consists of the police and army butchers who will buy a constant rate of 10-15 head per week (usually old cows) for the mess halls. This amounted to 500 to 780 cows in 1980.

Table 9.4 Number of Cattle Bought by Arabs and Non-Arabs

	1973	1979	1980
Arab	1696	4609	7090
Non-Arab	1836	2374	3652
Total	3532	6983	10742

The Arab share of the Abyei Market increased from 48% in 1973 to 66% in 1980. During the same time, the number of cattle bought by them has increased by about 200%. (Table 9.4)

As previously mentioned, peak Arab activity occurs between December and July, although it is more marked between May and July. In both 1973 and 1979, 83% of the cattle were bought in the period of January to July. In 1980, 95% were bought in those months, thus showing the greater involvement by Jellabas in recent years.

Given the latest Missiriya-Dinka clashes in September 1980 - January 1981, it was expected that the Arab buyers would present a low profile in the market. But data available on January and February 1981 show no deviations from the patterns typical of other years studied. Business will go on.

A look at the type of cattle being bought by the Arab traders shows certain trends that indicate the growing national/commercial, rather than local, character of the Abyei Market. (Table 9.5)

Table 9.5 Number of Cattle Bought by Arabs by Category of Animal

	1973	1979	1980
Cow	339	830	851
Heifer	305	92	213
Bull	905	3042	4821
Small Bull	102	645	1205
Total	1696	4609	7090

There are mostly bulls and small bulls in the purchases of a jellaba since they are generally destined for slaughter in Omdurman. Some cows are also bought, but jellabas prefer to buy northern cows since they are known to have more milk, and they are mainly destined for northern commercial ranches. The number of cows bought by Arabs in the Abyei Market increased two-fold between 1973 and 1979, but declined insignificantly after that. This increase between 1973 and 1979 is partly attributed to the increase of local (Abyei) slaughter by the butchers.

The number of heifers bought by Arabs has declined considerably between 1973 and 1980. There are two reasons for this: 1) More non-Arabs were investing in heifers in the later years, thus decreasing the number bought by Arabs. 2) In earlier years, the Arab trade was more regional in character, rather than national. Regional trade is geared mainly toward reinvestment into herds, hence more heifers are bought, while national trade is geared to slaughter for urban consumption and export. In summary, not only is the Arab trader increasing his involvement with the Abyei Market, but he is also buying those cattle that ensure him higher profits, in a commercialized national system. This involvement is expected to continue because of the high profit margins.

In 1980, interviews were carried out with 6 jellabas and local big traders. The interviews were carried out in private and included detailed questions on capital formation, types of transactions, trekking frequency and route, trekking loss and total costs. Needless to say, the interviewees would invariably try to overestimate costs and underestimate revenues. Yet the picture emerges of a considerable profit margin made from the Abyei Market. No attempt was made to calculate the profit margins these jellabas accrued from visiting other northern markets, but they are assumed to be on the same level, if not slightly less (because of higher cattle prices in the north).

On average, the jellabas had to pay £790 per herd trekked, for additional costs such as employee wages, veterinary vaccinations, middlemen and agents. There are on average about 100 head of cattle per herd. They would trek anywhere from 1 to 6 herds out of Abyei Market during the rainy season, and one interviewee claimed to trek during the dry season. Three of the respondents

operated on a large-scale, with an average yearly total cost (purchase price and additional costs) of £43,800. The other three had an average yearly total cost of £13,200.

Table 9.6 Profits of the Jellaba Cattle Trade in 1980

	Total Cost	Min. Profit (May)	Max. Profit (July)
Large Scale Trader	£43,800	61,100	91,000
Small Scale Trader	£13,200	23,200	34,100

Since the monthly price fluctuations in the Omdurman market are considerable, the calculations of revenue (# of cattle - trekking loss X average monthly price) are based on a low and high monthly price. If the traders arrive in Omdurman in May, they will see a lower profit than if they arrive in July (peak prices). Yet even the minimum profits show considerable margins. (See Table 9.6)

The Jellaba who visit the Abyei Market have an advantage over the Jellaba from further west, for example South Darfur. The Abyei area receives rain earlier than the western region, therefore the Jellaba can trek their cattle as early as June and arrive at the Omdurman market in July at a time when they would be the major suppliers of cattle.

Non-Arab Buyers of Cattle: There are at least 3 types of non-Arabs in the Abyei Market. The majority are the Ngok Dinka herdowners who seek cattle mainly for augmenting their herds. They prefer to come to the Abyei Market rather than buy on the road since the sales receipts which they obtain guard against accusations of theft, a very common court action.

The second type of buyer is the other southern herdowner whose numbers are relatively few, but probably come from nearby tribes such as the Twich and Rueng Dinka. Most of these are probably small time traders who will buy heifers to sell in southern markets.

The third type of non-Arab buyer is the Ngok Dinka trader. The number of these traders has been increasing steadily in the past few years, and

by now there are no fewer than 10 traders.[1] Typically a Ngok trader will buy heifers in Abyei, trek them to southern markets and exchange them almost one to one for bulls. They then will resell the bulls in Abyei to the jellabas, and make a comfortable profit.[2] Important to note, is the complementarity between the Arab and Ngok trade. Most Arab traders will rely on both Ngok and other southern traders/purchasers to bring cattle to them. Only a very few Arabs themselves will visit the southern markets. Conversely, there are no records of Ngok traders trekking cattle north. The reason given is the Missiriya-Dinka conflicts.

Some traders will shuttle between other southern markets during the Abyei off-season. Others will act as middlemen to Arab traders, charging them £2 per head, or to other Ngok traders, charging them only £1 per head. Or they may engage in small trade within the Abyei market, buying low and selling high.

In earlier years, non-Arabs bought the majority share of cattle (50-60%) but by 1979 and 1980 they had only 34% of all the cattle. In absolute numbers the amount bought by non-Arabs has increased by only 4% per year between 1973 and 1979, with a jump of 54% in the following year to a total of 3652 head of cattle. In 1973 and 1979 the non-Arabs bought 80% of their cattle between December and June. Yet in 1980, this same proportion was bought between March and July. It seems that in earlier years, non-Arabs (the majority being herdowners) would buy cattle in the months after crop harvest, when they had surplus sorghum. During this time the price of cattle is relatively higher, so some herdowners would prefer to wait until the price dropped in the beginning of the rainy season hoping that their money did not run out till then. Because in 1980 the greater majority of non-Arab purchases were concentrated in the peak season (April-July), it seems that the herdowners were consistently preferring to wait for favorable prices. Such a subjective conclusion must be taken with some caution until the intervening years (1974-1978) are fully analyzed. In addition, it may be

1. Of these, five were interviewed in 1980. Three had started trading in 1978, and two had started in 1974 and 1972. Thus it seems that the Ngok trader phenomenon is a recent one. Being new at the trade, these traders are not as astute as their Arab counterparts. Some Ngok interviewed had clear misconceptions of price fluctuations in the market.

2. A trip of four Abyei heifers exchanged for four southern bulls and sold to jellabas will net a profit of £160 in 1980, or £40 per head. The prevailing prices in the Abyei Market, in May 1980 were: heifers £57.000 and bulls £97.000

that part (but certainly not all) of the increase is attributable to larger Ngok trader purchases. Nevertheless, all the indications so far are toward an increasingly commercialized market.

A breakdown of the types of cattle bought by non-Arabs shows that the number of cows bought has remained fairly stable throughout the years with a slight increase in 1980. (Table 9.7) Yet the number of heifers has increased significantly by at least 53% between 1973 and 1980. Clearly the Ngok and other non-Arab herdowners continue to regenerate their herds, and the Ngok traders are becoming more active.

Table 9.7 Number of Cattle Bought by Non-Arabs by Category of Animal

	1973	1979	1980	% Change 1973-80
Cows	330	309	438	+33
Heifer	716	736	1315	+84
Bull	661	522	584	-12
Small bull	129	807	1315	+919
Total	1836	2374	3652	+99

The number of bulls bought by non-Arabs is much less than heifers and has seen a decline of 12% between 1973 and 1980. This is probably due to the greater competition by Arab traders for bulls. The number of small bulls bought by non-Arabs has leaped tremendously between 1973 and 1980. Data show an estimated yearly increase of 36% between 1973 and 1979, and 63% in the following year. It is unlikely that this increase can be attributed to the dealings of the Ngok trader since they purchase mostly heifers from the Abyei Market. Therefore, most of it is probably bought by Ngok herdowners. Since only a small percentage of a typical Ngok herd is made up of young entires then most of these small bulls are probably young castrates. The logical conclusion is that, no longer worried about herd viability and regeneration as they were in earlier years, the herdowners are now looking toward building up their herd sizes. In 1980, the Ngok sold 865 small bulls; if we assume that most non-Arab buyers of small bulls are Ngok, then they would have bought at least 1000 small bulls in the same year. In other words, they are

buying more than they are selling. Most Ngok are increasing their herds. Small holders are probably selling males to buy fertile females, while larger holders are buying small bulls to increase the size of their herds, and to raise them until such time as they sell them to Arab traders in the form of mature bulls.

2.2 Small Stock Market

The small stock market in Abyei is much less spectacular than the cattle market, but nevertheless quite significant. This trade is entirely local and does not have formal links with the national or provincial market.

The exchange of small stock in Abyei is very localized, and there are no records of exports to other areas. Apparently, in earlier years when the Missiriya tribesmen still visited the Abyei Market, small stock were an object of trade to be exported to other regional centers, but since then, small stock have been transacted only among local and southern people.

The major problem in collecting data on small stock sales is that many small stock are transacted outside of Abyei Town much more than cattle. The data collected from the sales receipts of the Abyei Market, only reflect a certain portion of all small stock sold in the Abyei Study Area. The advantages offered by the Abyei Market over on-the-road sales are that a sales receipt guards the buyer against accusations of theft, and that, from all reports available, the prices of small stock in Abyei Town are higher than outside prices. Yet outside sales are more convenient. Sheep and goats have higher reproductive rates than cattle, and their offtake from the herd does not represent as drastic a change in the herd as cattle offtake. Furthermore, most daily expenses of nomadic people involve small amounts of cash. Therefore, small stock are a more liquid asset than cattle. Yet the figures derived from the livestock sales receipts show that fewer small stock (than cattle) were sold in the market in all the years studied. Two factors contribute to depress the numbers, and it is difficult to distinguish the two. One is that home-slaughter of small stock is much more prevalent than cattle. The sale of sheep and goats depends on the rate of slaughter. A combined slaughter and sales rate must be

lower than that which endangers the viability of the herd. Secondly, many more small stock are sold "on the road" or bartered for sorghum than cattle.

2.2.1 Sellers of Small Stock

In the earlier years, the Missiriya and other northern tribes were fairly active in the small stock market and in fact sold more sheep than cattle. With their departure only the Ngok and other southern tribes remained in the market, and in the subsequent years the total yearly number of small stock sold in the market never equalized or surpassed the 1973 level. (See Table 9.8)

Table 9.8: Total Number of Small Stock Sold in Abyei Market

	1973*	1979	1980
Sheep	366	1289	994
Goat	858	690	1314
Total	2521	1979	2308

* The total includes a category identified only as "small stock" which would include both sheep and goats.

Ngok Dinka Sellers: The Ngok Dinka are the major suppliers of small stock in the Abyei Market. Their share has always been above 50% and the highest was in 1979 (82%). Table 9.9 provides the numbers of small stock sold per year by the Ngok.

Table 9.9:

Small Stock Sales by Ngok Dinka Recorded in Abyei Market

	1973	1979	1980	1980 Sales as % of Total Small Stock Population
Sheep	306	1125	809	6%
Goat	1083	492	638	2%
Total	1389	1617	1447	3.4%

The months of May through August see the highest volume of sales by Ngok Dinka. This is similar to the cattle trade and probably reflects their need for pre-harvest acquisition of sorghum. In 1980, 65% of Ngok small stock were sold during those months. The sale of small stock as compared to large stock is more evenly distributed throughout the year.

Since most small stock is destined for local slaughter rather than herd regeneration or other social purposes, it is assumed that the commercial offtake of small stock is close to the sales rate (% sold). If we assume that there are 13,400 sheep and 29,000 goats owned by Ngok Dinka in 1980, then the recorded sales rate (i.e., from the Abyei Market) is 6% and 2% respectively. These figures suggest that the Ngok prefer to sell sheep than goats. Goats are raised by the Ngok not only for their meat, but more importantly for their milk, while sheep are raised solely for their meat.

The majority of Ngok Dinka small stock sellers are of the Abior subtribe (34%) in all the years studied. The next active subtribes are Bongo, Alei, Manwar and Aniel. These four subtribes made up 86% of all Ngok sales in 1980, and they are more conveniently located close to the Abyei Town.

Other Southern Small Stock Sellers: The number of sheep and goats brought by the Twich into the Abyei Market is comparatively limited. In all of 1973, the Twich brought only 156 head of small stock into the market. By 1979, this figure had risen to 251 (an increase of 10% per year). The greatest increase occurred between 1979 and 1980, so that there were 700 head sold by the Twich (an increase of 179% from 1979). The number of small stock sold by the Rek, Rueng and Nuer southern tribes is negligible in all the years studied. All three tribes combined sold 27 head in 1973,

Very rarely do southern tribesmen come all the way to Abyei to sell only small stock. Normally a few small stock are brought along with the cattle, to be sold for food and other items that would cover their 3-7 day stay in Abyei Town. As expected, the data show a seasonality in the sales of small stock by southern tribesmen that is markedly similar to their cattle sales.

Unlike the Ngok, the southern tribesmen tend to sell the same amount of sheep as goats. Since there are presumably fewer sheep further south, then it is not too surprising to find fewer sheep brought into the market by the southerners.

Missiriya Small Stock Sellers: It is estimated that the Missiriya sold 730 head of small stock in 1973 in the Abyei Market (29% of all small stock sellers). In the four months of 1976 they accounted for 17% of all small stock sellers (210 head). In 1979 and 1980 there were no Missiriya small stock sellers. The small stock trade by the Missiriya is seasonal with 77% being sold between November and March when they are on their Dry Season migration. The Missiriya sold almost twice as much small stock as cattle in the Abyei Market.

Nuban and Other Northern Arab Small Stock Sellers:

An estimated total of 76 head in 1973 and 27 head in the four months of 1976 were sold by other northern tribes in the Abyei Market. The Nubans were the major owners. Again by 1979 and 1980 these people had disappeared from the small stock market. The number of small stock they sold in the Dumbeloya market was also negligable.

Fellata Small Stock Sellers:

A total of 141 head were sold in 1973 in the Abyei Market. In 1979 there were only 10 head and in 1980 only 21 head. The pattern is one of declining involvement with the Abyei Market. The Fellata tend to sell as many sheep as goats. There are no records of Fellata small stock being sold in the Dumbeloya market.

2.2.2 Buyers of Small Stock

Non-Arab Buyers of Small Stock:

The non-Arab buyers of small stock are mainly herdowners from nearby settlements who for various reasons believe that market purchases are better than on-the-road purchases. These may be perceptions of better (i.e. lower) prices, due to seller competition, or the safety of having registered the purchase. Purchases of female stock are designed to regenerate the herd, while male stock will end up slaughtered in the course of the year. Since there are very few males in a typical Ngok herd, then on occasions when sacrifices are needed (for deity, guests or nafirs), a trip to the market is probably made.

In all the years analyzed, most of the small stock purchases in the Abyei Market occur between February and July (76% in 1973, [illegible] in 1979 and 71% in 1980). These are precisely the months when there are nafirs (agricultural working parties) for clearing and weeding, and rain sacrifices increase.

The total number of small stock bought by non-Arabs has actually been decreasing (by a total of 20% between 1973 and 1980). (See Table 9.10). Even though part of this may be due to yearly fluctuations, still it seems that the small stock herds, coming out of the 1972 drought, may have been hastily regenerated, so that by 1980 they had achieved a certain minimal degree of 20 in 1979 and 137 in 1980. The Rek Dinka are more active than the other two tribes.

viability. The number of sheep bought has increased while the number of goats has decreased since 1973. Not surprisingly, this follows the same pattern as Ngok small stock yearly sales. Since 3/4 of all buyers and sellers are Ngok, then the small stock market approaches a closed system. The number of small stock sold by Ngok is almost the same as the number bought by Ngok in 1980. Whether this is due to a replacement of low-producing animals with high productivity ones, or due to the expansion of certain herds at the expense of other herds is as yet unverifiable.

Arab Buyers of Small Stock: There is no sheep and goat trade by Arabs in Abyei, although such trade does occur in northern markets like El Obeid. It is highly unlikely that in the earlier years, Missiriya herders would have tried to augment their herds with nilotic small stock, since these are known locally to be of lesser productivity. Nevertheless, the Missiriya may have used the Abyei Market to trade northern small stock amongst themselves. In recent times, it is highly probably that all small stock bought by Arabs are by residents of Abyei and are destined for slaughter and home consumption. This is so, because none of them are known to maintain small stock herds. Furthermore, meat consumption among Arabs is very high.

In all the years studied, the Arab share of small stock purchases has fluctuated between 15 and 25%. In absolute numbers, however, there has been a decline from 434 head in 1973 to 412 head in 1979, and 317 head in 1980. The Arabs tended to buy more goats than sheep in the earlier years, but lately since 1979, they have bought more sheep. This probably is due to the fact that sheep meat is preferred and also more sheep are being brought into the market.

Table 9.10

Number of Small Stock Bought by Non-Arabs in Abyei Market

	1973	1979	1980
Sheep	480	827	830
Goat	1607	528	830
Total	2087	1355	1660

2.3 Donkey and Horse Market

In 1973, 1979 and 1980, only 42 donkeys and 3 horses were transacted in the Abyei Market. The majority of sellers were Fellata tribesmen in 1973, but by 1979 the Twich Dinka supplied most of the donkeys. There are no records of sales by other southern tribesmen or Nubans. It is not clear where these animals originate, and for what reason they are sold in the Abyei Market.

Most of these animals (83%) are bought by Arabs: Missiriya in 1973 and 1976 and Abyei residents in 1979-80, and the rest by non-Arab buyers, probably mostly Ngok Dinka. Donkeys and horses are not well suited to the Abyei climate; thus only those more enterprising Ngok, who have been influenced by northern attitudes to use donkeys as beasts of burden, will buy these animals. A number are now used for hauling water from the wells to the houses in Abyei town.

3. Milk Market

The Ngok Dinka sell surplus cow's milk mostly in the form of sour milk and some ghee. Sale of fresh milk is not common and occurs only on commission by Abyei Town residents (mainly the Arab population). The bulk of transactions occur outside the Abyei Town market, in the form of barter for sorghum. In this way, the diet of camp members is diversified with sorghum, and the diet of the byre population is improved with more milk. Among the byres, milk is also shared among neighbors, usually as a gift, and more rarely, for barter with sorghum. The only regularity of sale or barter of milk was observed in the camps where a certain amount would be exchanged every day. In the byres, it is far less regular and depends on the need for cash or other goods, and the availability of excess milk.

In order to get an idea of the extent of sale of milk, a survey was conducted in the Abyei Town Woman's Market. The survey involved participant-observation of the market during off-peak days (Monday) and peak days (Thursday) in February 1981. A complete record of number of sellers and buyers, size and value of transaction, and types of milk products was kept from 9-2 o'clock on each day. Because of the greater volume of transactions on peak days, a

representative sample of sellers was observed in detail, although a record of total volumes of supply and sales was also kept. The results of sour milk sales have been summarized in Table 9.11.

Table 9.11 Results of Milk Market Survey Transactions of Sour Milk

	Off-Peak Day	Peak Day
Total supply in the day	25.05 litres	38.0 litres
Total amount sold in the day	16.73 "	20.68 "
Amount sold as % of supply	67% "	54% "
Number of sellers in market	16	21
Average supply/seller	1.62 litres	2.22 litres
Average amount sold per seller	1.20 "	1.19 "
Volume of each transaction	.31 "	.35 "
Value of each transaction (₵)	₵ 0.22	₵ 0.25
Total value sold (₵)	₵11.68	₵14.75
Average value per seller (₵)	₵ 0.84	₵ 0.70

The results indicate that whether sold on off-peak or peak days, the demand is less than the supply, by about 40%. The value of each unit sold (one tea cup = 125 ml) is ₵.05 and does not change with the days. Actually, the price has been the same since January 1980. There are more buyers on peak days, but each transaction has about the same volume of milk as on off-peak days. Thus it seems that the demand for sour milk in the Abyei Town Market is limited and does not vary much during the week. Visual observation suggests that the majority of buyers are Abyei Town residents. Given that there is less livestock per capita in the Town, this result is not surprising. Some milk is also bought by outside people who have come into the market to sell their goods and will consume the milk on the spot.

There are more sellers and more milk brought by each seller on peak days. Given that the volume and value of each transaction remains the same, and that the total amount sold does not increase much more in peak than in off-peak days, the revenue to each seller is actually slightly less on peak days.

It was expected that peak activity (Thursdays) would be much higher than off-peak activity, yet that was not borne out by the survey results. The obvious reason is the limited demand that makes the Abyei Town milk market characteristically a buyer's market. Even though the majority of buyers are from the Town, where dairy cows per capita is low, their total demand is not sufficient to cover the total supply. In other words, the sellers are willing to supply more than the buyer is willing to purchase.

The majority of sellers in February 1981 were from nearby byres. The farthest byre recorded was from Mabior, six kilometers away. It was expected that, with the recent clashes between Missiriya and Dinka, the supply would be lower than normal and that the numbers of buyers would remain the same. Since we do not have comparative data, it is difficult to prove or disprove this hypothesis. Nevertheless, the surplus of supply over demand seems to indicate that the political disturbances may not have affected the milk market very much, just as they did not affect the livestock trade.

Given the higher volume of milk production in the Wet Season and the fact that the cattle camps are close to the market, the supply of sour milk is expected to increase then. Unfortunately, it is not known whether the demand is also affected.

The cash value of sour milk in the market is low, yet only when demand is increased can the price also increase. The amount of milk transactions outside Abyei Town is unknown, but is assumed to be great in volume. If there is any shortage of supply there, the source of the demand may spill over into the Abyei Town Market, but this probably would not be very large. Thus, it seems that if the cash value of milk in the market were to be increased as an incentive to increasing the supply, then demand either by Abyei Town

residents or export to the greater region would have to increase. Further research is required on the demand for sour milk before any definitive judgement can be given.

4. Hide and Skins

There are only 2 people in Abyei Town, both Arabs, who are engaged in trading hides. They buy hides from the local butchers only. They maintain that they would buy from the Ngok if the Ngok brought hides to them, but they do not go out to them. Both traders send dried and uncured hides, whether from cattle or small stock, to Muglad or other northern towns. They each send about 10 hides per month in the dry season and 30 each in the wet season. The local butchers charge £1 per cattle hide and £.25 per small stock hide. In turn the traders sell the cattle hides in Muglad for £1.80--£2.00 in El Obeid and £6 in the Khartoum Government Tannery. Small stock hide goes for £.60 in El Obeid. Considering the cost of transportation, they do not have a very wide profit margin.

Only one trader claimed to process hides locally. He would process small stock hides for use as water bags. Dried skins are soaked and washed in water. After drying, they are put into a mixture of Acacia nilotica* seeds to soften the skins, and lime and soda to eliminate the hairs.

Both traders say that there are two constraints to increasing the amount of hides processed locally. The first is the high cost of the chemicals, especially lime and soda. The second, and more important reason, is that there just is no local demand for leather.

Livestock marketing in the Abyei Study Area is highly developed in terms of commercial trade of live cattle, but milk, meat (by the local butchers), and hide markets are comparatively very limited. All of these systems are dependent to a large degree on the well-being of the subsistence economy.

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* Acacia Nilotica has been known to contain 25-34% tannin in the pods ("garat") and the same amount in its bark. (See Chapter 5).

Only when overall economic production in the area, mainly in the form of sorghum and livestock, is increased, can we expect to see an increase in subsidiary markets such as milk and hides.

5. Economic Aspects of Livestock Trade

The most important activity in the Abyei Market is the cattle trade. The size of total cattle transactions in the Abyei Market is comparable to the market in Bentiu, but seems to be higher than the nearby cattle markets in the South (e.g. Gogrial). This heightens the fact that both Abyei and Bentiu are commericalized collection points for the export of livestock from the Southern region to the North. "Southern cattle" are brought up to Abyei either by southern producers or southern traders, and are joined by Ngok Dinka cattle in the market. From there, they are trekked north by Arab traders to Omdurman or other regional markets, with the final destination being the Omdurman slaughterhouse, or export to other Arab countries. (See Fig. 9.1) On the return trip, food items and other goods are brought to Abyei to service both the Ngok Dinka as well as the other southern tribesmen. It was not possible to interview food merchants on their profit levels. But informal discussions indicate that the commodity trade, although profitable, is not as worthwhile as the livestock trade. In any case, the merchants on the one hand provide an important service to the users of Abyei Market, but on the other hand earn substantial profits.

If average prices in Omdurman market increase, then it is to be expected that more cattle will be bought by the Arab traders in Abyei. Average prices in the Omdurman market had been increasing at a steady rate of 20-25% per year between 1976 and 1978. But in 1979, the average yearly price rose 68% and in 1980 by an additional 45%. This rise in prices in 1979-80 was probably due to greater export demand for cattle, resulting from devaluation of the Sudanese Pound in June 1978.*

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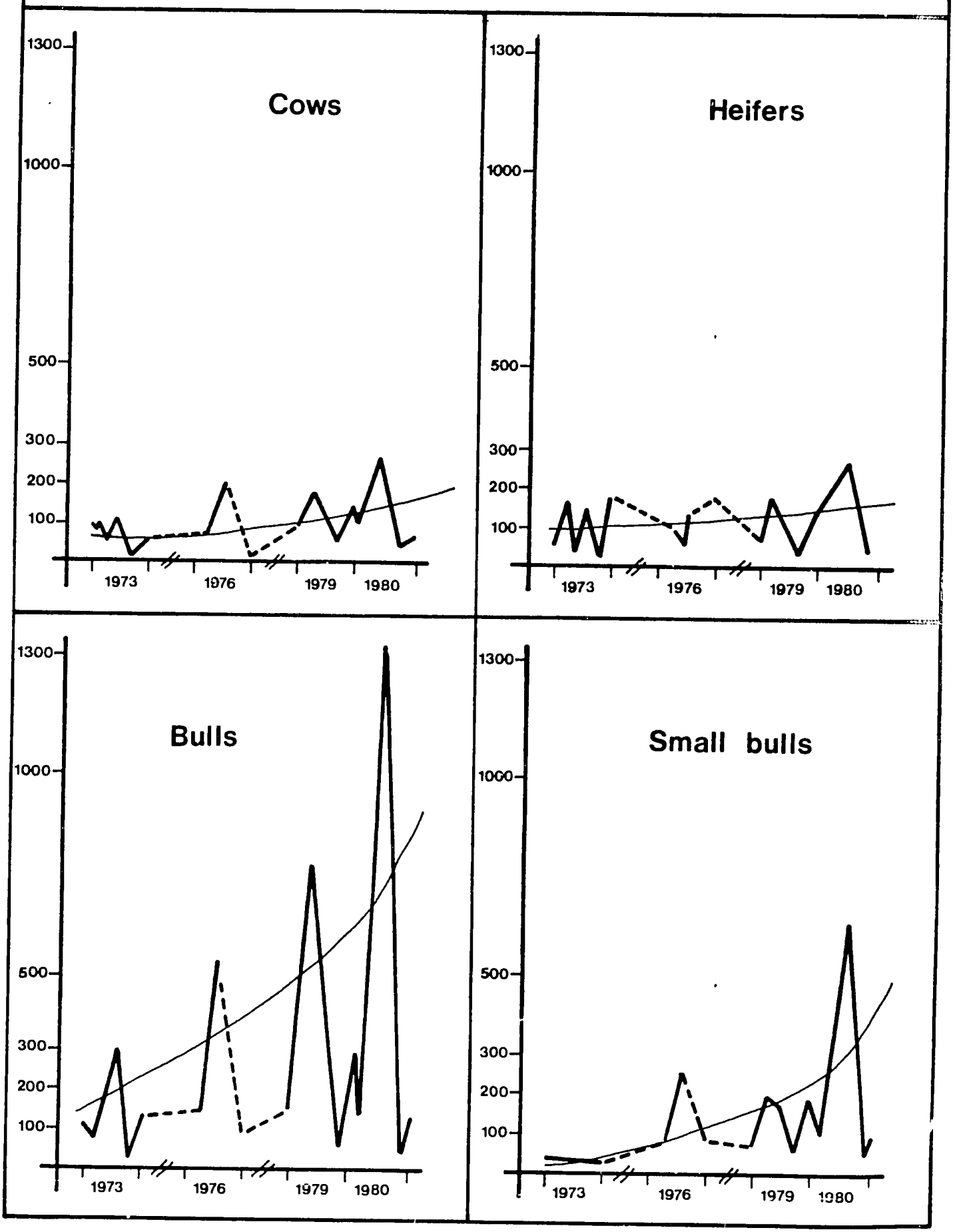
* Figures on the Omdurman cattle market are based on data obtained from the LMMC, Khartoum. Unfortunately their average monthly prices are not true means, but simply averages of high and low prices. Furthermore, it is not known how their data have been collected.

Fig 9.2 Annual Changes In Number Of Cattle Sold In Abyei



The effect of this price increase in Omdurman becomes visible in 1980 in Abyei, when the number of cattle sold jumped from 7000 head in 1979 to almost 11,000 head in 1980. A look at the numbers sold in the peak months of each year (Table 9.12) shows that most of the increase in 1980 is due to bulls and small bulls. Figure 9.2 graphically illustrates this point.

Table 9.12 Number of Cattle Sold in Abyei Market in Peak Month of April, May, June and July

	1973	1976	1979	1980
Cow	314	483	537	800
Heifer	363	343	382	791
Bull	813	1191	1948	3753
Small bull	100	591	595	1795
Total	1590	2608	3462	7139
% increase per year	18%	10%	106%	

From the data it is not possible to tell whether this increase is due to more Arab traders visiting the market, or more cattle being bought by the same number of Arab traders, but it is clear that the increase in cattle sold in Abyei is due to more purchases by Arab traders. In both 1979 and 1980, the Arabs bought 66% of all cattle, whereas in 1973 and 1976, they bought only 40% of the cattle. It is clear that the price increase in Omdurman was a major factor influencing increased purchases by the Arab traders.

The data from the Omdurman market show that there was a significant average price increase of Ł68 between 1978 and 1979, and Ł75 between 1979 and 1980. It was hypothesized that a similar price increase would be found in the Abyei Market. Unfortunately, prices for 1978 are not available, but there was a significant increase of Ł42 between 1976 and 1979. It is not possible to tell whether this increase is part of a general trend, or whether an unprecedented increase in 1979 was influenced by the Omdurman market. There was an increase of Ł 5 between 1979 and 1980 prices in the Abyei Market, but these were not statistically significant.

With the lack of more complete data, it is only possible to state that Omdurman price increases may affect the Abyei Market prices, but that they definitely do affect the number of cattle sold. Figure 9.2 reveals this phenomena. Most of the increase in the yearly sales of all cattle is due to large increases in peak season activity. There is only a small trend of gradual increase during the years if the peak seasons are ignored. Since peak season activity is directed toward the export of Ngok and other southern cattle to the north, then it is clear that changes in the Abyei Market are mainly influenced by factors originating from the north. Clearly the Abyei Market is not an isolated entity in the region, but is linked directly into the national economy. Before a livestock survey was initiated in the Abyei Area, it was widely believed that Abyei was a small insignificant and localized market. Certainly daily observations of the market are sometimes deceiving. But it is now known that the Abyei Market, livestock as well as other commodities, is directly influenced by market dynamics in the north, and probably in turn influences the southern markets.

The Ngok, as well as other southern tribesmen, use the Abyei Market to exchange cattle for much needed commodities, such as salt, tea, cloth and especially sorghum. In years of bad harvest, it is to be expected that more cattle are brought into the market. Table 9.13 shows the annual percentile share of sales by different tribes. The share of the four southern tribes has increased from 39% in 1973 to 74% in 1980, whereas the Ngok Dinka share has declined from 40% in 1973 to 24% in 1980. It seems that the increase in the number of cattle sold in Abyei in 1979-1980 has been due to more southern cattle being brought up. Unfortunately, the lack of information on the quantity of sorghum production in the south, and its yearly fluctuations, hampers any interpretation of this increased involvement by southern tribesmen. However, it is known that in certain years, Abyei does export sorghum to the south.

By 1980, almost £770,000 worth of cattle were transacted in the Abyei Market. (See Table 9.14) The share purchased by Arabs rose from one-half in 1973 to two-thirds in 1979 and 1980. Given their very high profit margins,

Table 9.13: Annual Percentile Share of Cattle Sellers According to Tribal Affiliation and Annual Growth Rates

	1973	1976	1979	1980	1973 to 1979 (%)	1979 to 1980 (%)
Ngok Dinka	40	33	35	24	12	5
Twich Dinka	31	42	46	53	33	76
Rek Dinka	5	5	12	12	63	58
Rueng Dinka	2	1	2	2	12	47
Nuer	1	1	2	7	33	448
Missiriya	12	11	0	0	--	--
Nuban	1	4	0	0	--	--
Fellata	6	0	1	1	-15	+286
Arab of Abyei	2	3	2	1	+42	-64
Total	100	100	100	100	12	54

Table 9.14: Total Value of Cattle Transacted in Abyei Market

	1973	(1976)*	1979	1980
Number of Animals	3,532		6,983	10,742
Average Price	£ 15.60		£ 66.70	£ 71.28
Total Value Purchased by Arabs	£26,500 (48%)	(£19,400) (40%)	£307,400 (66%)	£505,400 (66%)
Total Value Purchased by Non-Arabs	£28,600	(£29,000)	£158,400	£260,300
Total	55,100	(48,400)	465,800	765,700

* Includes only April, May, June and December

- Figures in Actual £S.

- Figures rounded to nearest £100.

the increasing involvement by the Arab traders is expected to continue, depending on the situation in the Omdurman market. As long as there are Arab traders, it is expected that southern traders, including Ngok Dinka, will also be present.

The average prices of livestock sold in the Abyei Market in 1973, 1979 and 1980 are presented in Table 9.15. They indicate that cattle prices have risen more rapidly than have the prices of sheep and goats, and that bull and small bull prices have led the cattle prices. These latter are the main categories of animals sold to the northern markets so the relatively strong price increase probably reflects that growing demand. Donkey prices have risen most sharply, but this is a special situation in that not many donkeys are sold in the market and the demand has risen recently for donkeys that are used to distribute water from the deep borewell in Abyei to the town residents. This business has been commercialized and expanded rapidly just in the last two years.

Table 9.15: Average Prices per Animal (in Sudanese pounds)

	1973	1979	1980	% Change 1973-80
Cow	14.75	38.20	47.49	+222
Heifer	14.80	56.58	61.84	318
Bull	17.61	88.39	94.89	439
Small Bull	8.85	40.07	41.41	368
Sheep	2.29	6.11	7.42	224
Goat	1.69	6.04	6.91	309
Donkey	5.24	27.97	58.64	1019

Missiriya and other northern Arabs together were supplying only a small percentage of all cattle in 1973 and 1976. The 1977 violent incident between the Missiriya and Dinka effectively barred them from futher involvement in the Abyei Market and probably shifted their business to Dumbeloya and other northern markets. Nevertheless, their vacated place was taken

over by the southern tribes and Ngok traders bringing southern cattle who not only filled this gap, but also became responsible for most of the increase in cattle in the latter years.

The increase in the number of cattle sold by the Ngok Dinka has been declining gradually, and will probably stabilize in the near future, since the Ngok have reached a fairly high rate of commercial offtake. It is expected that the southern tribesmen will also not go beyond a certain rate of commercial offtake, but it is not known when that limit will be reached. In any event, yearly fluctuations in the number of cattle sold will exist, because of the direct link between sorghum production (in both Abyei area and the south), and cattle sales by the southern tribesmen in the Abyei Market.

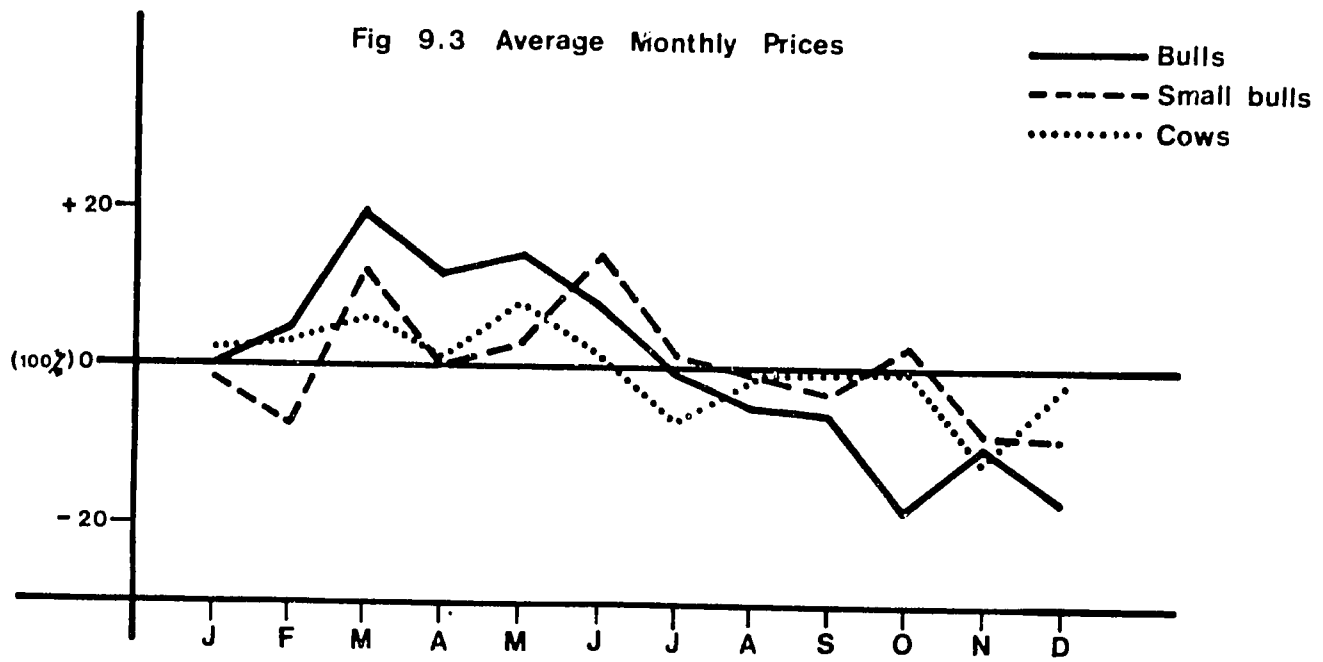
In addition to yearly fluctuations that are dependent mainly on climatic factors, there are seasonal variations each year. Seasonal fluctuations in the number of cattle sold are very marked. A look at Table 9.16 shows the seasonal variations in average monthly prices and numbers sold, averaged for three years, and adjusted for the inflationary trend. Figures 9.3, 9.4 and 9.5 graphically show these fluctuations.

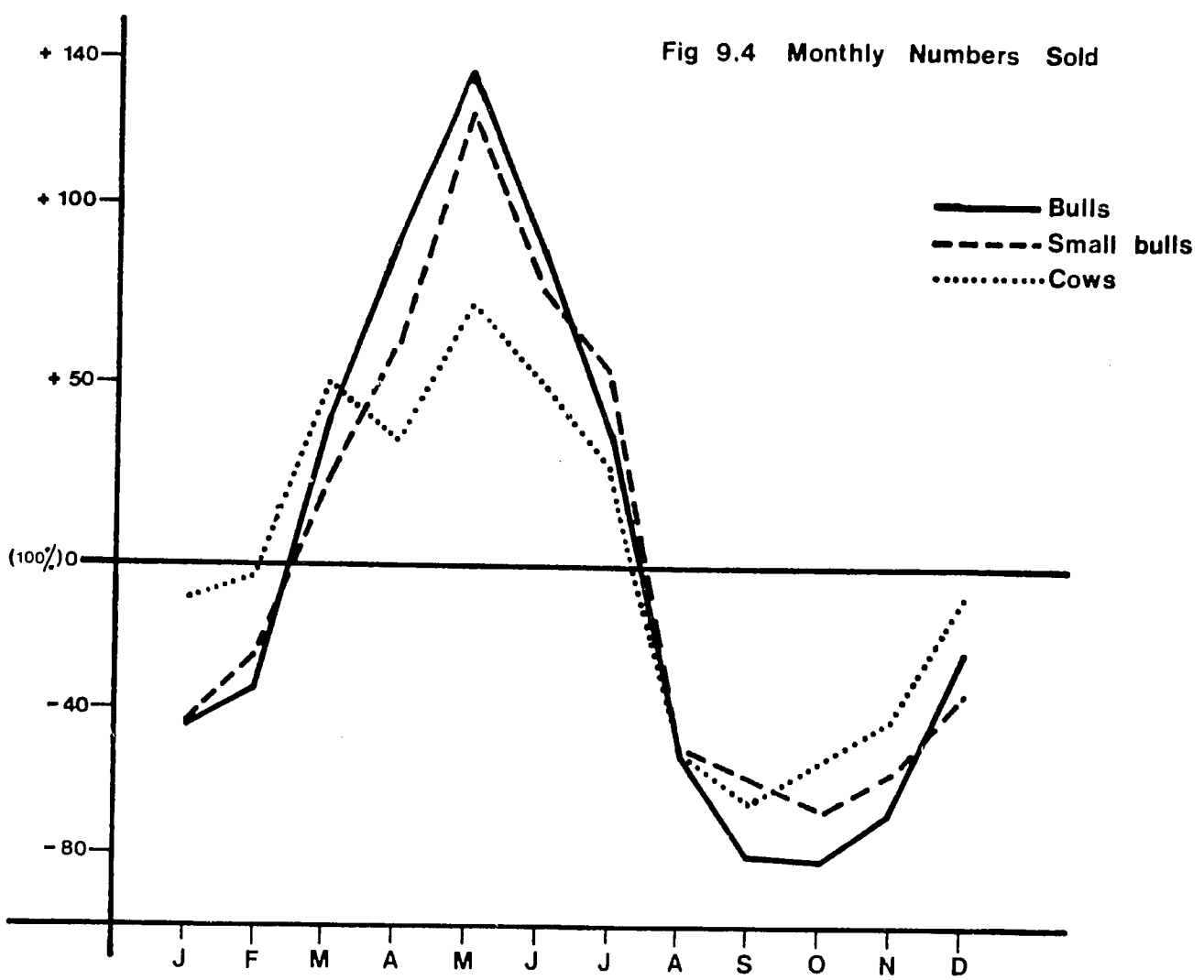
Table 9.16: Seasonal Variation of Cattle Prices and Numbers Sold in 1978, 1979 & 1980, (expressed in percentage deviation from mean)

	PRICE				NUMBER SOLD			
	Cow	Heifer	Bull	Small Bull	Cow	Heifer	Bull	Small Bull
J	102	146	100	99	91	76	55	56
F	103	93	105	93	98	122	66	75
M	106	94	119	112	151	159	135	122
A	101	115	112	100	135	142	188	160
M	108	106	114	103	171	181	236	225
J	101	88	108	114	149	131	187	176
J	93	107	100	102	126	121	136	152
A	99	89	95	99	49	48	50	53
S	99	104	94	97	35	30	20	41
O	100	105	82	103	43	22	19	31
N	87	83	90	92	58	43	32	43
D	97	74	83	91	94	122	77	66

-Price fluctuations are adjusted for inflationary trend.
-Because of using weighted averages of monthly prices, the data give more weight to fluctuations in 1978 and 1980.

Figs 9.3 & 9.4 Seasonal Variation of Bulls, Small bulls & Cows, percent deviation from mean





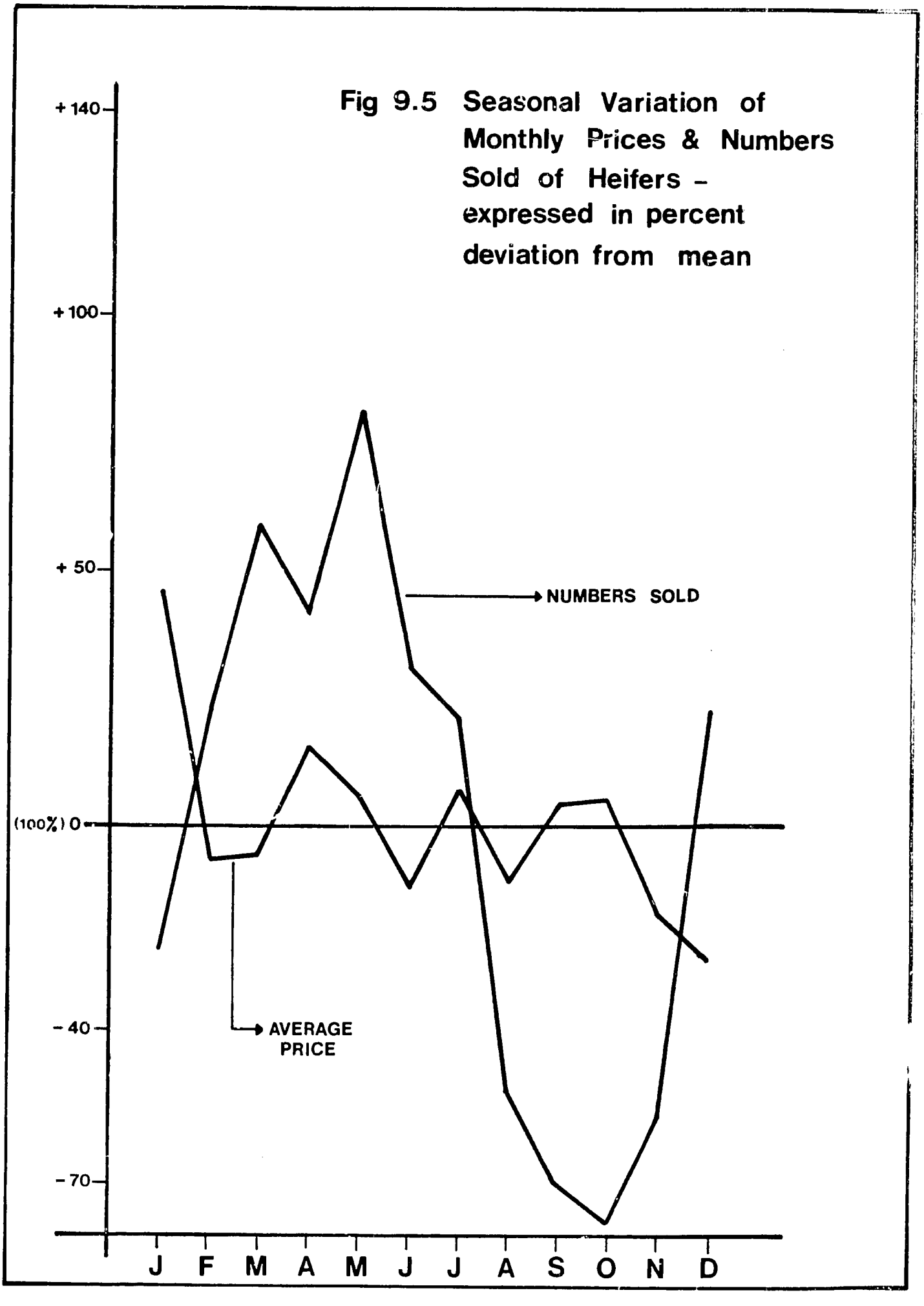


Fig 9.5 Seasonal Variation of Monthly Prices & Numbers Sold of Heifers - expressed in percent deviation from mean

For all cattle categories, the period of March to July is the peak supply period, and May is the peak month. (Deviations range from 20 to 136%.) This is the time that the southern tribesmen will bring their cattle into the market for various reasons:

1. Towards the end of the dry season, their sorghum supply is diminished and possibly finished, and they will sell cattle to buy sorghum in Abyei (where prices per sack are lower than in the south).

2. The peak season is traditionally the time of the year that Arab traders have come into Abyei to buy up bulls and small bulls to trek to Khartoum before the rains close the roads around Abyei.

Between August and November, the supply of cattle is uniformly much lower than the typical monthly average. (Deviations range from 40 to 80%.) This is the time of harvest, when people are busy in their fields and the southern tribesmen have returned south.

Between December and February, the supply of cattle increases relative to the preceeding four months. This is more apparent among heifers. This is the time of year that the Ngok have finished harvesting their fields and are buying new stock or culling unproductive animals from their herds. But as the main herd moves out on its dry season migration, fewer animals are available for marketing. This period is also the time for purchasing such items as cloth, salt, tea, etc., which have been brought into the Abyei market with the opening of the roads, and may be at somewhat lower prices than in the wet season, when only a few merchants will have supplies left.

The seasonal variations in average prices for each category of cattle are surprisingly small. Deviations from the mean fall mainly within a range of plus or minus 15%. Among cows, there are not very large seasonal variations. January through June show above average figures, suggesting that at almost the same time that more cows are being transacted, the price is also higher. Similarly when less cattle are being transacted, the price is lower than the average. The same trends can be discerned for small bulls and bulls. These figures suggest that even with a high increase in numbers

sold during the peak periods, the demand has risen more than the supply. The highest price deviations are from March through May. This is the time that most Arab merchants will visit Abyei, in order to get a head start on merchants from other areas. October is another month when demand rises more than supply, resulting in above average prices for small bulls. This is the time that the first harvest is in and people may be selling some surplus sorghum to acquire small bulls.

Seasonal fluctuations in prices of heifers are very pronounced and seem to be eratic, up one month and down the next. (See Figure 9.5) Yet it seems that at certain times the demand may rise more than the supply, such as September, October and January but at other times, such as February, March and June, the supply appears to go up more than the demand. These results suggest that post-harvest months are the times when more people are exchanging sorghum for much prized heifers, and so the prices are relatively higher. Towards the end of the dry season and into the hunger period, more people are forced to sell heifers to buy sorghum and other commodities, and therefore, prices are relatively lower. For two months in the peak season (April and May) the price of heifers tends to rise most probably due to increased activity by Ngok traders, who will buy heifers to exchange for bulls in the south.

In summary, the seasonal variations in the prices of cows, bulls and small bulls indicate that the supplier is almost always in a reasonably favorable position, in that prices are pushed higher in peak selling seasons due to greater demand from the north. On the other hand, prices of heifers, which reflect more a decision to invest in new productive capital, are more irregular and dominated by local seasonal factors. Local opinion in Abyei is that the Arab merchants are able to control prices and push them down by cooperating with each other. Yet seasonal fluctuations do not support such an hypothesis.

While selling older cows and bulls to the Arab traders, the Ngok Dinka are also buying heifers in order to regenerate the herd and possibly increase

its quality. They will also buy small bulls in order to increase their herd sizes, with the possible aim of selling them as mature bulls in later years. The excess of purchases over sales of heifers and small bulls in 1980 (Table 9.17) suggests that the Ngok Dinka were still building up their herds from the civil wars and the 1972 drought.

At the same time, some Ngok are selling cattle, especially heifers, bulls and small bulls. Normally, the sale of cattle is directly related to the amount of sorghum produced in that year. If sorghum production is very low, then cattle are sold off in late dry season, at a time when prices are higher than average, to buy sorghum at even higher prices (due to shortages). If sorghum production is at a sufficiency level, then cattle may be sold to buy better cattle. If sorghum production is high, with considerable surplus, then sorghum is sold to invest in cattle. It should be noted that small stock are like small denomination currency and serve as substitutes for cattle in this process. Investment in livestock is like investment in a diversified portfolio of real assets. Heifers produce not only current income but also from time to time additional capital goods. Small bulls on the other hand appreciate and yield substantial capital gains.

Table 9.17

Number of Heifers and Small Bulls Bought and Sold by Ngok in 1980*

	Sold by Ngok Producer	Bought by Ngok Producer
Heifer	703	993
Small Bull	865	1108

The number of cattle bought by the Ngok producers in 1980 is an estimate based on a subtration of a crude estimation of how many animals were bought by Ngok traders and other southern people.

It is possible that the same people are buying and selling, albeit at different times of the year and the herds decimated in the civil war and 1972 drought are being gradually regenerated in quality as well as quantity. Yet it is also possible that the relatively poorer Ngok herd-owners are being forced to sell off cattle in the hunger period, thus gradually depleting their herds, while relatively richer Ngok herdowners are buying cattle and therefore expanding their herds at the expense of smaller holders. A definite judgement on this issue must await further analysis of data, but given the experience of similiar trends in other developing countries, it is wise to keep such a possibility in mind. Any program or strategy designed to change the Abyei livestock market must move cautiously so as not to aggravate any tendencies toward greater inequality.

The small stock trade is a comparatively closed system, with static total volumes and very low price increases throughout the years. Within the overall static volume, the number of sheep and goats has been fluctuating. These fluctuations may be due to three factors: a) yearly fluctuations that are not visible until all the years are analyzed, b) fluctuating herd viability related to rates of offtake, c) fluctuating number of small stock sold <u>outside</u> the Abyei market.

The majority of sellers are Ngok herdowners (70%) and the majority of buyers are also Ngok (75% estimated). The Ngok will sell small stock to buy sorghum either for their own consumption in the hunger period (May through July), or to make beer for local agricultural work parties (June through August). In a good year, small stock are sold to buy cattle.

Small stock are bought throughout the year by the Ngok but mainly from February through August to engage in sacrifices for newly built houses and cattle byres, or rain ceremonies in the dry season, and to supply communal work parties with food.

In general, the total number of small stock sold in Abyei show higher than average activity in February through August. (See Table 9.18)

Table 9.18

Seasonal Fluctuations in Numbers Sold and Average Monthly Prices of Small Stock - 1979-1980 Expressed in Percentage deviation from Mean

	Sheep		Goat	
	# Sold	Price	# Sold	Price
J	45	120	94	88
F	63	102	108	97
M	141	108	159	99
A	126	91	183	97
M	193	98	189	99
J	108	95	102	110
J	114	95	86	108
A	137	97	85	106
S	84	100	40	107
O	34	111	28	103
N	63	88	52	90
D	92	99	74	95

-- Prices have been adjusted for inflationary trend

Seasonal price fluctuations are not as pronounced as fluctuations in numbers sold. The analysis of the two data show a classical inverse relationship between supply and price in most months of the year. Therefore, it is a seller's market in roughly July to October, and a buyer's market in February to July.

Compared to the price increase of cattle during the years, the price of smallstock has barely moved. Between 1973 and 1980, there was a price increase of £S5 for both sheep and goats. The limited price inflation clearly shows the localized nature of the small stock trade in Abyei Town.

The milk, hides and skin markets are also very limited. The milk market is hampered by a low volume of demand which keeps prices low and does not encourage the sale of surplus milk. The export of hides and skin to the north, on the other hand, is constrained by a low volume of supply, which is directly related to both the low rate of local slaughter of cattle and the local use of small stock hides. Only when these constraints are relieved can we expect a higher volume of activity in these two markets.

6. Comparisons with Similar Markets

There are two other major cattle markets to the east of Abyei that link southern cattle producers with northern buyers. One is in Bentiu in the heart of Nuer land. The other is Malakal, in Shilluk country. We have information from Mogga on prices and numbers of animals sold in those markets but unfortunately not for the same years as our data for the Abyei Market. Nevertheless, it is possible to get some sense of the comparative prices and quantities by assembling the data that are available for the three markets. This is done in Tables 9.19 and 9.20.

It appears that the number of animals sold in Malakal is 30 to 50 percent greater than in Bentiu and that the prices average about 20 percent higher in Malakal. The numbers traded dropped from 1976 to 1977 and then recovered in 1978, but they do not suggest any strong upward or downward trend. The number of years observed is clearly limited, but it does appear to differ from the strong rising trend in numbers sold in the Abyei Market.

Table 9.19:

Relative Shares of Cattle Sold in Markets
at Abyei, Bentiu and Malakal

	Abyei Avg. 1979-80	Bentiu Avg. 1976-78	Malakal Avg. 1976-78
Bulls	50.6%	37.3%	40.2%
Cows	13.7	26.6	30.4
Calves	35.7	36.2	29.4

Table 9.20:

Comparison of Prices and Quantities of Cattle
Sold in Abyei, Bentiu and Malakal

	ABYEI		BENTIU		MALAKAL	
	Number	Avg. Price	Number	Avg. Price	Number	Avg. Price
1976						
Bulls			2052	27.31	2376	25.11
Cows			2756	23.10	2722	28.39
Calves			1440	16.57	3370	27.98
Total			6248	22.98	8468	27.31
1977						
Bulls			1755	37.84	3699	30.19
Cows			810	26.56	1404	37.01
Calves			2241	19.86	1164	32.98
Total			4806	27.56	6267	32.24
1978						
Bulls			2295	47.13	3213	46.06
Cows			783	29.96	2889	41.71
Calves			2241	25.18	2268	32.62
Total			5319	35.35	8370	40.80
1979						
Bulls	3564	88.39		68.02		64.65
Cows	1139	38.20		43.66		54.10
Calves	2280	46.07		35.72		38.71
Total	6983	66.39		49.91		53.84
1980						
Bulls	5405	94.89				
Cows	1289	47.49				
Calves	4048	49.12				
Total	10742	71.95				

There is only one year, 1979, for which we have price data for all three markets, and even that is questionable in that Mogga's report was published in September 1979, so his data only cover the early part of the year, whereas the Abyei data are for the whole year. And cattle prices were sharply rising in 1979. On the other hand, as we have shown, most cattle sales occur in the first half of the year, so the data may be roughly comparable. They do suggest that Abyei Market prices are somewhat higher than either the Bintiu or Malakal prices even though Abyei is farther from the main market in Omdurman than either of the other two towns. We do not have any information on the relative difficulty of trekking animals from the three towns, such as availability of water, grazing conditions, dangers of attack or theft. But it does seem surprising that Abyei prices are higher. It is conceivable that the animals in the Abyei Market are of better quality, or in better condition, but we have no way of assessing that.

It is clear from Table 9.19 that a significantly higher portion of bulls is sold in Abyei than in Bentiu or Malakal and bulls command the highest price of all types of animals. On the other hand the proportion of cows sold was significantly higher, and the relative prices of cows in 1979 was higher in Bentin and Malakal than in Abyei suggesting that more fresh cows are transacted.

The number of animals sold in Abyei in 1980 was well above the averages for Bentiu and Malakal from 1976 to 1978, but we do not know what numbers were sold in those two markets in 1980 so nothing definitive can be said about the relative size or growth trends of the three markets in recent years.

7. Recommendations

The livestock marketing survey has shown that the Abyei Market is a major collection point for southern cattle destined for the north, as well as a smaller, but substantial center for local trade of other livestock. The market is generally a benefit to the individual producer, especially those selling cattle, since the season of high demand seems to coincide with that of greater supply. This has stimulated higher rates of cattle

sales among the Ngok Dinka, than what the literature reports to be common among southern tribes. The high involvement of other southern tribesmen in the Abyei Market suggests that the literature may be underestimating the sales rate among the other Nilotic tribes. The Abyei Market is a dependable source of cattle for urban Sudanese populations and probably for export markets.

The other activities in the livestock market, such as small stock and milk, are localized and function more clearly according to classical competitive forces. The limited local demand has probably prevented prices from increasing along with the inflationary trends in cattle and other food commodities. The hide and skin market, also an export item similar to cattle, is hampered by a very low supply because so few cattle are slaughtered locally.

The overall goal of this study is to recommend ways by which 1) income of all producers can be increased through livestock marketing, without a detrimental effect on the viability of any household, and 2) meat production can be increased for urban populations. Given these goals, given the relatively smooth functioning of the Abyei Market, and given the generally self-sufficient nature of Ngok Dinka pastoral economy, it is recommended that large-scale changes of the market system be delayed until the pastoral economy has achieved a higher level of productivity. Until then the following suggestions are made:

6.1 Research

a. More study is needed on why producers are selling livestock, and as an extension, what is happening to income distribution (defined broadly to include animals, food and cash).

b. Since small stock are traditionally a means of increasing cattle herds, to what extent can small stock offtake increase without endangering the households pastoral economy. In other words, is there a possibility of stimulating more small stock offtake before an increase in cattle productivity is seen? Furthermore, is the small stock market a buyer's market

that has a surplus of sellers, as the low increase in prices seem to indicate? If so, how can the demand for small stock be increased?

c. Questions asked in this survey of Ngok traders and local producers show that they are generally in favor of a government scheme such as one planned for Babanusa. In this scheme, the LMMC plans to establish freight trains in Babanusa as its western-most collection point, to freight cattle to Omdurman. The Abyei respondents understood the benefit to themselves in terms of higher prices if they trekked cattle to Babanusa. But given the current political conflict between the Missiriya and Dinka, they are very reluctant to trek cattle north through Missiriya territory. Research should be done on whether it is economic to haul cattle by truckload from Abyei to Babanusa, and what would be the effect on the regional market dynamics of such a scheme.

d. A more comprehensive survey of the Dumbeloya market with a view to benefit the Missiriya and other northern participants.

6.2 Action Research

a. Experience with auctions in southern markets has been inconclusive. Given the baseline established by this current survey, it is recommended that an auction be tried experimentally in Abyei and close watch be kept, to compare results with the baseline, and to see whether producers actually benefit under such a system.

b. If, and when, the Babanusa freight scheme is established, it is recommended that Ngok traders be encouraged to trek cattle cooperatively to Babanusa. To date local security forces in Abyei have usually provided escort services to Arab traders, probably because of their political power. It is hoped that Ngok traders will also be provided equal treatment.

c. A second way to encourage Ngok traders is to strengthen the "southern link." Further study is needed to determine the constraints faced by the Ngok, for example, lack of capital, and how these can be reduced. Greater involvement by traders on the southern link will probably serve to increase prices in southern markets, thus benefiting the southern producers.

6.3 Action

a. Improvement of Abyei and Dumbeloya Market sites. Such physical improvements involve provision of shaded areas for cattle and people; provision of cattle watering facilities in the Dry Season; construction of a bund on the small curve of the river to stop rainy season flooding of the Abyei Market site. (Such a bund should be designed so that it does not affect the natural drainage to the river.) The materials for these improvements are all available locally and the costs are not expected to be very high. Initial capital can be drawn from the Rural Council, but may also be collected from donations from Arab traders. The local merchants of Abyei are very much involved in community development efforts. Failing these measures, a user tax can be levied under the guise of increased registration costs.*

b. More rigorous data collection and surveillance by the Rural Council (RC). An attempt was made by the ADP livestock researcher to encourage the head of the RC and the clerk responsible, to collect and analyze better data for future work. It is hoped that this will continue. The LMMC in Khartoum is currently engaged in a detailed recording of livestock market dynamics in most of the major centers in South Kordofan and elsewhere. Given the importance of the Abyei Market, it is highly recommended that Abyei data be linked into this effort.

The state of the registration records stored in the Abyei Rural Council is depressing. The Rural Council has acknowledged this shortcoming but has not initiated any efforts to redress the situation. A link up with the LMMC has the added effect of stimulating a better understanding of the importance of record-keeping.

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* In 1980, the registration fees were as follows:

Ł1.40 for cattle
Ł .45 for sheep
Ł .35 for goats

The registration fee is given by the buyer.

APPENDICES

1. Detail of Survey Methodology and Samples of Some Questionnaires

2. Plant Collection from Abyei Study Area - 1980

APPENDIX 1

Detail of Survey Methodology and Sample of Some Questionnaires

Because of the limited resources of time, labor, and funds, it was decided to forego a complete census of the area and concentrate on a detailed small sample survey. The Resource Management and Research (RM&R) aerial survey (1976) of the region would be used to provide broader generalizations.

Dry Season 1980: (April-June)

The Survey Team toured the dry season pasture area for 12 consecutive days and contacted 20 camps, 3 of which were studied in depth for 3-4 days each. The survey included:

1. Cattle enumeration--In the early mornings or late evenings when the cattle were pegged at the campsite, the head of hearth would be asked to point out the cattle he was responsible for, and detailed account of sex/age categories were recorded. This procedure later would be verified by a count of the pegs in each hearth. In total 14 hearths were counted.

2. Cattle belting and measurement--A representative sample of 249 cattle from all hearths were belted with sturdy plastic belts. A year later these belts were still untorn and in place. After the animal was allowed to cool down, the chest girth (from behind the hump) length (from the point of shoulder to the pinbone) and height (from the lowest depression on the back to the ground) were taken by the livestock officer. Care was exercised to perform consistently, but inconsistencies were inevitable since the cattle may have been nervous and uncooperative. The age (be definition) and colour-name of the cattle were also recorded. On average it took 2 hours to belt 25 animals.

3. Interviews--the 14 heads of hearth were interviewed for about 1/2-hour each, usually at night after the cattle had been safely pegged. Privacy between interviewer and interviewee was difficult to maintain. Questions included the number of hearth members, migration route, increase and decrease of cattle in the past 6 months, ownership of cattle in the hearth. The latter two questions are sensitive issues and it is expected that survey results are not entirely accurate.

4. Calf Weighing-- Calves between the age of 0-8 months were measured for chest girth, aged by dentition and weighed on a suspended scale. This was done with the reluctant consent of the herders. It was found that taking polaroid pictures of the calves (to be used later for identification) helped to create a more congenial atmosphere. Nevertheless, attempts to weigh the same calves six months later were thwarted. The herders accused the surveyors of inflicting diseases on the calves by the weighing method. A total of 79 calves were weighed in Dry Season 1980.

5. Milk Yield measurement--One hearth from each camp was chosen and the amount milked from each cow for the hearth's consumption was measured. Initially, there was a tendency to milk more than normal to "show off" their cows, but after the first round of measurements, surveyor bias was considerably decreased. Readings were taken twice a day, for 3-4 consecutive days. The choice of which cows to milk was left entirely up to the milker. In some cases the cows showed signs of nervousness (especially at night when the use of flashlights were necessary), which may have decreased the yield, but not to a statistically significant degree.

Upon completion of the Dry Season Camp 1980 survey, a Dry Season byre survey was carried out. Because of the short time remaining until the beginning of the rains, only 11 byres were sampled, but they were chosen from fairly representative geographical areas. Cattle enumeration, milk yield measurement and interviews were conducted in much the same way as the camp samples, although further questions on livestock marketing, vaccinations and cattle diseases were included. A total of 79 cattle were belted with a plastic tag and rope tied around the neck. This device was much less sturdy than the plastic belts.

Wet Season 1980: (June-October)

The months of June and July 1980 were spent in conducting a survey of the livestock market, and collecting plant species.

Livestock Market: Each livestock sale in the Abyei market is required to be registered with the Rural Council. The sales receipts from 1973 to 1981 were available from the Rural Council, although the receipts of 1973 to 1978 were in various states of deterioration due to termite damage. Thus, gaps appear in the data which require some extrapolation. The data from the receipts include type of animal, price, tribe of seller and whether the buyer is an Arab or non-Arab (deduced from the name).

Nine Arab traders and five Dinka traders were interviewed concerning the scale and economics of their trade.

Plant Species Collection: Upon maturity, 70 species of plants were collected in the Abyei area. They include grasses, legumes, trees and agricultural weeds. Some of the species were identified at the U. of Khartoum Herbarium, U. of Grezira Herbarium (Wad Medeni), and the Range and Pasture Division of Soba Central Laboratories. The rest were sent to the Royal Botanic Gardens, at Kew, London.

In August 1980 a wet season cattle camp survey was conducted. Seven camps were contacted, two were visited extensively. Among these were eleven of the original fourteen hearths. Milk measurement, interviews and cattle measurement were conducted consistent with the previous surveys.

September-October 1980 were spent conducting a Wet Season byre survey. A total of 29 byres were intensively studied, 10 of which were included in the original Dry Season survey. Cattle measurements and enumeration, interviews and milk measurements were conducted.

Dry Season 1981 (November 1980-April 1981)

As part of the continuing livestock market survey, the hide traders of Abyei Town were interviewed. In addition, a sample of livestock sellers of various tribal affiliations were interviewed at the market. A milk market

survey was carried out which involved participant observation of peak-activity (Thursdays) and off-peak activity days.

In February 1981, in response to a need to gain a better understanding of the overall population norm, a population distribution survey was carried out. The Dry Season byre follow-up survey was unsuccessful in reaching six of the original survey byres because they had been evacuated after the Messeriya-Ngok Dinka conflicts. Cattle measurements, enumeration, interviews and a disease survey were conducted.

A final visit to the Dry Season 1981 camp pastures resulted in the contacting of 14 camps, 8 of which were intensively studied. Cattle measurements, interviews, and a disease survey were conducted.

A copy of the main interview form for herders and for livestock traders is included in the following pages.

CAMP SURVEY

MAIN QUESTIONNAIRE

ADP LIVESTOCK SURVEY

sample #_____

date_____

1. Location of camp_____

2. Name of head of camp_____

3.1 Name of head of hearth_____

3.2 Subtribe_____

3.3 Relation to head of camp_____

3.4 Age_____

4. Name of head of household from which most of the come

_____

4.1 Location of his byre_____

5. Who are the people with you in your hearth?

Name	Relation to Head of Hearth	Age	Sex	Location of Byre

6.1 Did you return to the byre at the end of the rainy season?

_____yes _____no

6.2 If yes, when did you leave the byre again?_____

6.3 If no, when did you leave the wet season pastures?_____

6.4 Describe migration route: (written in order after leaving for dry season pastures)

Name of Camp	Length of Stay	Name of Accompanying Hearths

6.5 In what direction do you expect to move next?_____

7.1 Which hearth member(s) herd the cattle to daily pasture?_____

_____

7.2 Where do the cattle drink water?_____

7.3 How many times a day do they drink water?_____

7.4 How far away do the cattle go on their daily pasture? (distance to be approximately measured)_____

8.1 Number of cattle kept here in the hearth:

Males		Females	
Castrate	_____	1st Time Milking	_____
Entire	_____	Milking cow	_____
Young Castrate	_____	Dry Cow	_____
Young Entire	_____	Pregnant Cow	_____
Suckling & Grazing	_____	Pregnant Heifer	_____
Suckling	_____	Heifer	_____
Total	_____	Infertile (old)	_____
		Sterile	_____
		Suckling & Grazing	_____
		Suckling	_____
		Total	_____

Grand Total_____

8.2 Number of dogs in the hearth

Male	Female
Adult	Adult
Young	Young

9. Increase and decrease in cattle number in the hearth: check one: _____since last year this time

_____since September 1980 (6 months) _____ other, give date

Increase:	Castrate	Entire	Y. Male	Milking	Pregnant	Heifer	Y. Female	Total
Born into Herd								
Purchased for								
Bartered Cash								
Received as Bride Price								
Rcvd. on Loan								
Sent from Byre								
Other (give reason)								
Decrease:								
Died								
Sacrificed or Killed								
Given as Bride Price								
Sold for Cash								
Bartered								
Loaned Away								
Lost or Stolen								
Sent to Byre								
Other (give reason)								

10.1 Do you have cattle in your hearth belonging to someone other than mentioned in question 4? Yes_____ No_____

If yes, please give following information:

Location of his Byre	His Relation to Head of Hearth	Approximate # of Cattle
_____	_____	_____
_____	_____	_____

10.2 Does your head of household have cattle in another camp? Yes____ No_____

If yes, please give following information:

Location of Camp	Relation to Head of Hearth	Approximate # of Cattle
_____	_____	_____
_____	_____	_____

11.1 When was the last time your cattle were vaccinated?_____

11.2 What vaccinations were applied?_____

11.3 How many of your cattle were vaccinated?_____

QUESTIONS FROM THE WOMEN:

12. Do the hearth members consume all of the milk produced in the hearth?
Yes_____ No_____

If no, what is done with it? Given to other camp members_____

Given to neighbors_____

Sold for dina_____

Other_____

TRADER SURVEY QUESTIONS

1. Name and Age
2. Brand Mark
3. Hometown
4. What does you father do?
5. What did you do before becoming a trader?
6. When did you start cattle trading?
7. Apart from cattle trading what else do you do?
8. How much capital does it take to start trading cattle?
9. Where did you get your initial capital?
10. Do you have a partner?
11. Apart from Abyei, where do you buy cattle from?
12. Where do you sell the cattle?
13. Who do you sell it to?
14. Do you have prior arrangements with the buyer?
15. How much do you sell cattle for?
16. Are you an agent for someone else?
17. Do you buy or sell on credit? Do you charge interest?
18. Do you or someone you work for export any cattle to other countries? If yes, do you export live or dead cattle? What countries?
19. Do you use the same middlemen each time? How much do you pay them?
20. How large a herd do you trek at one time?
21. How many times do you trek in the dry season and in the wet season?
22. Do you trek your cattle with other people?
23. What routes do you take?
24. How many hours do you trek each day?
25. How long does it take to go from Abyei to the final stop?
26. How many cattle do you lose on the way and for what reasons?
27. Give an estimate of how much weight the cattle lose on the way?
28. How many people do you hire to trek the cattle?
29. Where are they from?
30. How much do you pay them (return trip)?
31. Do you prefer auctions?
32. What do you think of the government proposal to set up a freight train in Babanusa to take the cattle to Khartoum?
33. Do you treat your cattle for disease? How much do you pay for vaccinations?
34. Do you buy drugs from the market? From which market and how much does it cost?
35. What is the biggest problem for you now?

Appendix 2 - Plant Collection from Abyei Study Area - 1980

Sample No.	Local Names Dinka-Arabic	Ecosystems	Dates Collected	Plant Type	Botanical Names
GRAMINEAE					
1	Apaich - El Birdi	riverbed	3/4; 3/8; 2/11;	forage perennial	Echinochloa scabra (Retz) Beauv. (previous classification: stagnina)
2	Gau - El Fula	riverbed	11/4; 3/8; 3/8; 6/11;	#1 forage	Echinochloa sp. (genus currently being revised at the RBG.)
3	Ayey - Umbalileh	slope of sandy ridge and open savannah	30/7; 31/8; 5/10;	forage annual-tufted	Rottboelia exaltata L.F.
4	Arol - Umbiada	sandy ridge	3/8; 15/10; 2/11;	4th class forage perennial-stoloniferous	Setaria sphacelata (Schumach) Moss; better known as S. anceps stafp ex Massey
5	Non - Hambarere/Na'al	open and forest savannah	3/8; 3/10; 15/10;	forage - perennial-tufted	Andropogon gayanus Kunth.
6	Achongmior	sandy ridge	3/8; 5/10; 14/10;	forage - annual	Pennisetum ramosum (Hochst.) Schweinf.
7	Billit - Eldiffra (Abuasabe in Goz)	swampland	3/8;	forage - annual	Echinochloa Colona (L.) Link.
8	Alok - Ghaleil - aj jegawa	slope of sandy ridge	3/8; 29/9	forage annual-tufted	Setaria pallide-fusca (Schumach.) Stapf & Hubb.
9	Abiet	open savannah	3/8; 31/8;	forage perennial-tufted	Panicum coloratum L.
10	Agok - Elanchere	swampland	3/8; 28/9	forage perennial-rhizomatous	Echinochloa pyramidalis (Lam.) Hitchc. & Chase.
11	Adik	open and forest savannah	3/8; 3/10;	forage - annual	Sorghum purpurea-sericeum (A.Rich.) Asch. Schweinf.
12	Lum	sandy ridge and open savannah	3/8; 26/9; 29/9;	forage - annual	Hyparrhenia confinis (A. Rich.) Stapf var. nodiglumis (Hack)Clayto
13	Awejwej I	sandy ridge	21/8; 12/10;	forage - annual	Sporobolus festivus

Sample No.	Local Names	Ecosystem	Dates Collected	Plant Type	Botanical Names
GRAMINEAE (cont'd.)					
14	Rabguk II	sandy ridge	21/8; 12/10; 31/8; 6/10;	forage - annual	Urochloa trichopus (Hochst.) Stapf
15		sandy ridge	21/8;	forage annual-tufted	Brachiaria ramosa (L.) Stapf
16	Athied	swampland	21/8; b=14/10;	forage - edible seeds - annual	Leersia drepanothrix
17	Lob	swampland	21/8; b=28/9;	forage - wild rice - edible annual	Oriza barthii A. Chev.
18	Nuor I	open savannah	31/8;	forage - annual	Eragrostis cilianensis (All.) Lut.
19	Nuor II	sandy ridge	31/8; 6/10;	forage - annual	Leptochloa panicea (Retz) Ohwi
20	Nyanalaj	sandy ridge	31/8;	forage - annual	Eriochloa fatmensis (Steud.) Hack & Stapf ex Thel (previous: nubica)
21	Yol awen	sandy ridge	27/9;	forage - annual	Aristida hordeacea
22	Agina	sandy ridge	29/9;	forage - annual	Schoenefeldia gracilis Kunth
23	Nytika	sandy ridge	29/9;	forage - annual	Tetrapogon cenchriformis (A. Rich W.D. Clayton
24		sandy ridge	6/10;	forage perennial	Rhynchosia minima (L.) DC.
25	Dog / Atogyol	sandy ridge	7/10;	forage annual-tufted	Setaria verticillata (L.) Beauv.
26		sandy ridge	7/10;	rare forage perennial-tufted	Cenchrus ciliaris L. (Pennisetum ciliare (L.) Link.)

Sample No.	Local Names	Ecosystem	Dates Collected	Plant Type	Botanical Names
GRAMINEAE (cont'd.)					
27	Mior	sandy ridge	12/1	forage - annual	Dactyloctenium aegyptium (L.) Willd.
28	Athol	open savannah	6/11;	good forage - perennial	Eriochloa meyeriana (Nees) Pilger (Panicum meyerianum Nees)
29		sandy ridge	14/10;	forage - perennial	Ischemum afrum (Gmel.) Dandy
30	Rabguk III	sandy slope	6/10	forage - annual	Chloris virgata Sw.
31	Rabguk I	sandy slope	31/8	forage - annual	Panicum hygrocharis
32	Awejwej II	sandy slope	12/8	forage - annual	Sporobolus microprotus Stapf
33		sandy slope	29/9	forage - annual	Andropogon fastigiatus Sw.
34	Abet	sandy ridge and riverbanks		forage - annual	Sorghum sudanense (Piper) Stapf. Group Arundinacea
35		sandy ridge	21/8	forage - annual	Echinochloa crus-galli (L.) P. Beauv.
CYPERACEAE					
36	Aguot	swampland	28/9; 14/10;	annual	Fimbristylis miliaceae (L.) Vahl.
37	Achuol	swampland	14/10;	annual	Scleria foliosa Hochst.
38		swampland	28/9	annual	Cyperus iria L.
39	Ayek	swampland	5/3/81	used for making mats - perennial	Cyperus papyrus

Sample No.	Local Names	Ecosystem	Dates Collected	Plant Type	Botanical Names
SHRUBS AND HERBS					
40	Loblob - shehet	sandy ridge	26/7;	forage - bush	Combretum aculeatum Vent.
41	Akier I	sandy ridge	30/7; 12/10;	agricultural weed - annual browzed	Cassia tora
42	Tillim	sandy ridge	25/9;	herb - edible annual	Indigofera numularifolia (L.) Livera ex Alston
43	Adarak	sandy ridge	12/10;	herb annual	Indigofera hochstetteri
44	Byong	sandy ridge	30/7;	wild okra annual	Hibiscus trionum L.
45	Aokuet	sandy ridge	30/7; 14/10;	agricultural weed annual	Merremia emarginatus
46	Atiolget	sandy ridge	30/7; 18/10;	agricultural weed annual	Aristolochia bracteata
47		sandy ridge	30/7; 14/10;	agricultural weed annual	Caperonia serrata Presl.
48	Apad	waterlogged and marshland	30/7; 31/8; 18/10;	agricultural weed annual	Ipomoea aquatica
49		sandy ridge	30/7; 14/10;	agricultural weed annual	Striga gesnerioides Vatke
50	Athil	sandy ridge	30/7; 31/8;	agricultural weed annual	Spermacoce sphaerostigma (A. Rich.) Vatke
51	Burguak	sandy ridge	30/7;	agricultural weed annual	Desmodium repandum
52		sandy ridge	30/7;	agricultural weed annual	Salonum dubium

Sample No.	Local Names	Ecosystem	Dates Collected	Plant Type	Botanical Names
SHRUBS AND HERBS (cont'd.)					
53	Kuoljok	sandy ridge	30/7;	agricultural weed annual	Mukin maderaspataria (L.) M.J. Roem
54	Amiedgob	sandy ridge	30/7; 18/10;	agricultural weed annual	Chrysanthellum americanum
55	Kuruej - Eldressa	sandy ridge	3/8;	herb - annual	Tribulus terrestris L.
56	Tunjmoyet/Acob-aweng	slope of sandy ridge & open savannah	31/8;	agricultural weed annual	Acalypha crenata Hochst. ex. A. Rich.
57	Tej	open savannah	31/8;	agricultural weed annual	Euphorbia hypericifolia L.
58	Theo	sandy ridge	31/8;	creeper annual	Euphorbia aegyptiaca Boiss.
59	Atil	sandy ridge	31/8;	agricultural weed annual	Justicia flava (Forssk.) Vahl
60	Akier II	sandy ridge	12/10;	herb - annual	Alysicarpus glumaceus (Vahl) DC.
61	Adhon	sandy ridge	14/10;	unpalatable shrub-perennial	Sida alba L.
62		sandy ridge	18/10;	weed (dominates pastures) annual	Acanthospermum hispidum DC.
63	Byong Agok	sandy ridge	18/10;	unpalatable agricultural weed-perennial	Sida cordifolia L.
64		sandy ridge	18/10;	agricultural weed - annual	Spermacoce chaetocephala DC.
65		sandy ridge	18/10;	agricultural weed - creeper - annual	Commelina forskalaei

Sample No.	Local Names	Ecosystem	Dates Collected	Plant Type	Botanical Names
SHRUBS AND HERBS (cont'd.)					
66		sandy ridge	18/10;	agricultural weed annual	Ocimum basilicum
67	Riey	sandy ridge	23/10;	agricultural weed annual	Ethulia conyzoides (L.)
TREES					
68		river slope	5/4	tree - browzed	Piliostigma reticulatum
69	- Sisaban	sandy ridge	20/5;	tree-seeds used to clarify water	Moringa oleifera Lam.
70	- Suffarabyad	forest savannah		tree	Acacia seyal Del.
71		forest savannah		tree	Acacia drepanolobium
72		forest savannah		tree	Acacia sieberana DC.
73	Thau - Heglig	sandy ridge & open savannah		tree	Balanites aegyptiaca (L.) Del.
74	Chuey - Ardeib	sandy ridge & open savannah		tree	Tamarindus indica L.
75	- Subagh	forest savannah		tree	Combretum hartmanniamum
76	Lang - Nabak	sandy ridge & open savannah		tree - shrub	Ziziphus spina - christi (L.) Willd.
77		forest savannah		tree	Acacia scorpioides (L.) var. nilotica (L.) A. Chev

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