



**Agricultural
Administration
Unit**

Overseas Development Institute
Regent's College Inner Circle
Regent's Park London NW1 4NS
Telephone: 01-935 1644

PASTORAL DEVELOPMENT NETWORK

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LIVESTOCK IN THE GEZIRA SCHEME - 1986

by

Roger Blench

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INTRODUCTION

1. Since the role of irrigation schemes throughout the world is generally to increase agricultural production, their planning and management rarely incorporate the needs of livestock. Indeed the problems involved in controlling animals within densely cultivated areas often lead to their virtual exclusion. This paper aims to provide a descriptive account of the status of livestock in the Gezira Irrigation Scheme in the Republic of Sudan, with a particular emphasis on socio-economic factors relevant to patterns of ownership and management.

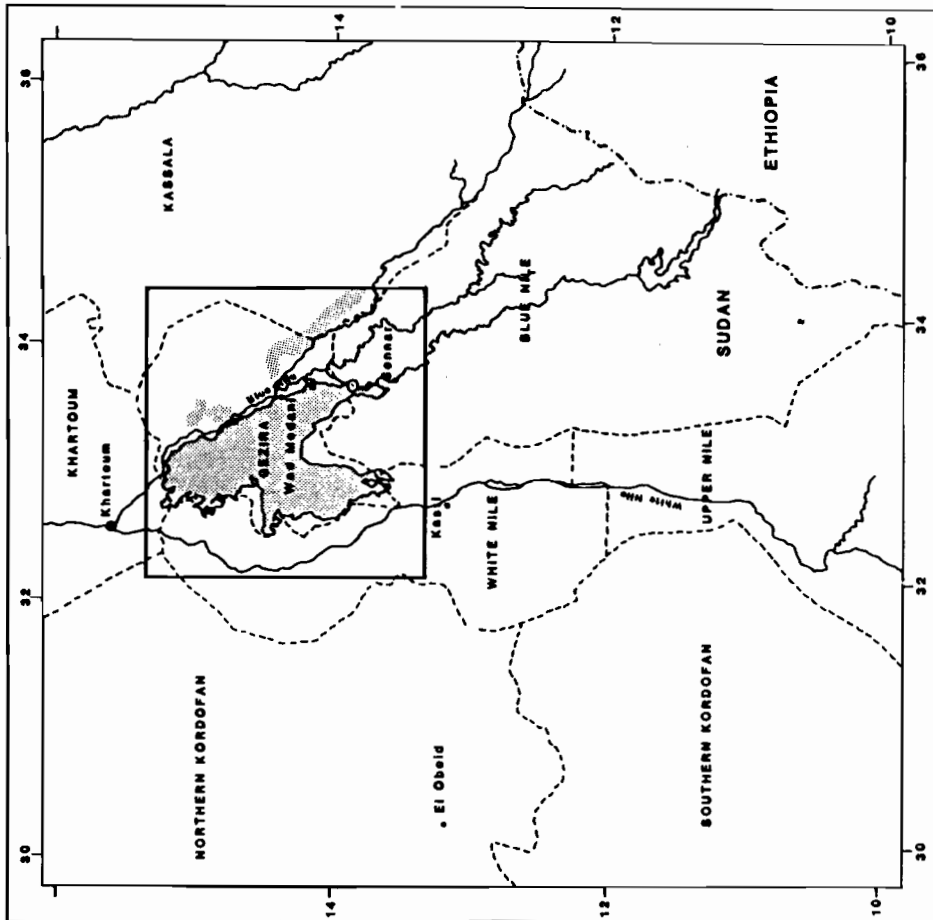
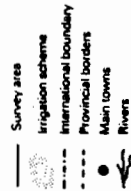
2. The Gezira Scheme (the Scheme) lies to the south of Khartoum, between the White and Blue Niles (Map I), and was originally set up to supply cotton to the mills of Northern England in the 1920's (see Barnett, 1977 for further details). It replaced the small-scale shaduf irrigation present in the region at that time with a system whereby the irrigated land was farmed by tenants who did not own the land they cultivated. The opportunities provided by the Scheme encouraged the settlement of nomadic and agropastoral groups in the region, so that the immediate forebears of many of the farmers now resident were nomadic pastoralists.

3. The area now occupied by the Scheme seems to have originally been almost entirely composed of rangelands. As tenants were not required to give up ownership of livestock, they continued to send the stock into the rangelands under the management of younger sons or hired herders. Such a system still obtains in many parts of the Scheme today, although climatic events such as the recent droughts have substantially modified the situation.

4. The history and general organisation of the Gezira have been dealt with elsewhere (Gaitskell, 1959, Barnett, 1977, Euroconsult, 1982 & DEVCO, 1987). Sudanese scholars, for example, Saleem (1984) and Yousif (1985), have also contributed a number of valuable studies of individual aspects of the Scheme. The Social and Economic Research Unit (SERU) undertook the preparation of a village directory (SERU, 1982) which gives an overall summary of human and livestock populations and describes the distribution of various types of infrastructure. This provides a valuable baseline with which to contrast the developments since 1980.

SUDAN GEZIRA LIVESTOCK
INTEGRATION STUDY
SURVEY AREA
LOCATION

Map I
Context Map of
Survey Area



5. It should be emphasised that the Scheme is organised both on a scale and in manner that is unique in Africa. The irrigated areas are divided into 'Blocks' of which there are presently some 107. Each Block has between 500 and 1500 tenancies and is subdivided into a 90 feddan area called a 'number'. This consists of eighteen 5-feddan units called hawashas; a tenant operating a four-course rotation will have each unit under a different crop. Tenancies are usually 15-20 feddans, but occasionally double this size or even larger.

6. The management of the Gezira Scheme is controlled by the SGB and is highly centralised, with an elaborate hierarchy of authority. All aspects of life in the Scheme are regulated through the contact between the Block Inspectors and the tenants in the Block. Tenants have little choice over the crops to be planted or the supply of inputs, which are all distributed centrally. A series of loans are made to the tenant throughout the year for the supply of inputs, such as pesticides and the payment of seasonal labourers. Both the distribution of seed and the purchasing of the cotton are exclusively through the Sudan Gezira Board (SGB).

7. For many years, the Gezira Scheme was based on a four course rotation in which were grown cotton, wheat, sorghum, groundnuts and assorted vegetable and fodder crops. This was substantially expanded in 1963 with the addition of the Managil extension which based on a 3-course rotation with 100% cropping. There is now a total of 2.1 million feddans, or approximately 850,000 hectares in command.

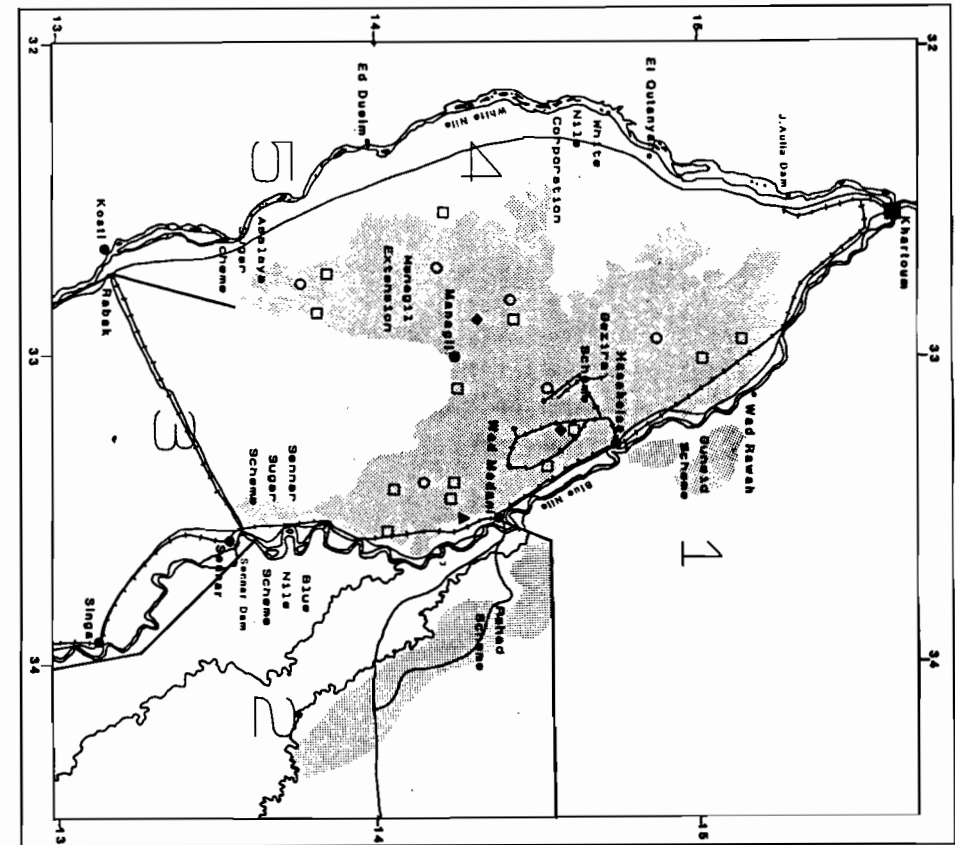
8. The Scheme is gravity-irrigated, which provides substantial savings in terms of maintenance of machinery. However, it has the consequence that the canals become silted up or weed-infested more quickly, thereby impeding the flow of water. As a result, the Blocks most remote from the Blue Nile rarely receive adequate water for the crops that have been sown. This situation was part of the stimulus for the Gezira Rehabilitation Project (GRP), the background to which was the study by Euroconsult (1982).

9. In addition to the Gezira there are a number of other centrally managed irrigation Schemes in the immediate vicinity, such as the Blue Nile Scheme, the White Nile Corporation, the Sennar Agricultural Corporation and the Rahad Scheme (Map II). There are also irrigated sugar Schemes such as the Sennar and Asalaya Schemes. Apart from these, there are the 'private pump schemes' managed by merchants and landlords. These range from single pumps to substantial irrigation schemes, such as the one directly south of the Gezira itself. There is also a considerable amount of rainfed cultivation surrounding the irrigated areas consisting largely of sorghum (see Sub-Zones 1, 2 and 3 on Map II), as well as some natural rangelands which provide wet season grazing for livestock to the north east of Sub-Zone 1 (Map II).

HUMAN RESOURCES

10. The principal populations in the region fall under the cover-term 'Arabs' and are nearly all Arabic-speaking. The Arabs in the area fall into a number of distinct 'tribes', large kin groups that are to some degree endogamous. The most important agropastoral groups are the Kawahla, Hassaniya and Kenana and among the nomadic populations, the Rufa'a, Shukriya and Butana. Originally, such groups were confined to circumscribed geographical regions. However, the effects of urbanisation, new economic opportunities and climate have combined to scatter the tribes and create a mosaic of interdigitated communities. Even so, loyalties remain strong and patterns of livestock movement in and out of the irrigated area often are determined by the location of 'cousins' in agropastoral villages outside.

11. The non-Arabic populations are rarely discussed in the written sources on the Gezira. They are commonly referred to as Fellata, are said to be Hausa-speaking and are identified with the FulBe (Fulani) of West Africa. However, interviews suggested that the majority of non-Arab populations within the Gezira are migrants from Western Sudan. Most prominent among these are the Tama, while Maba, Mararit, Berta, Zaghawa and Fur populations were also recorded. These groups



SUDAN GEZIRA LIVESTOCK
INTEGRATION STUDY
SURVEY AREA

are described in more detail in Doornbos & Bender (1983). Migrants are usually compelled to become share-croppers, contracting with tenants to undertake their farm labour in exchange for a percentage of the crops. Their large and still increasing populations are testimony to the precarious existence of arable communities in Western Sudan.

12. The most recent Tenants' Association figures suggest the Scheme has approximately 105,000 tenants. The survey by the Social and Economic Research Unit in 1981 (SERU, 1981) gave a total human population of 1,889,000 and estimated that 5.4% were tenants. The other 95% are thus either landless labourers or traders; a striking illustration of the substantial labour requirements of the Scheme. Tenants are usually male -SERU concluded that 87% were male, 13% female and >1% unmarried youths. From aerial survey data, by combining estimates of urban populations with the occupancy ratios of rural habitation, the total population was estimated at 2.1 million.

13. A large irrigation scheme such as the Gezira, with a high level of inputs and mechanisation, is extremely productive compared with the surrounding arable areas, and there is a need to recruit considerable amounts of labour, both permanently and on a seasonal basis, to pick cotton, for example. There are a variety of strategies to deal with this. The most important is probably share-cropping. The share-croppers settle on the margins of tenants' villages and work on their farms for a share in the crop, usually 50%. The main advantage of this for the tenants is that they do not have to pay in cash, which is often in short supply because of late payments for cotton etc. In addition, it frees them to find work outside the Scheme and so earn additional cash. In a survey of 515 tenants (quoted in Yousif, 1985) only one-third worked full-time on their tenancies.

Table 1: Sources of labour for cotton-picking, 1985-6

Source	Number	% Total
<u>Outside the Scheme</u>		
Recruited by SGB and Tenant's Union	33,522	8
Recruited by Tenants	139,502	34
Subtotal	173,024	
<u>From Within the Scheme</u>		
Tenant Household Labour	132,421	33
Non-household labour	87,584	22
Subtotal	220,005	
Mobile labour (not formally resident)	11,505	3
Grand Total	404,534	100

Source: SGB figures

14. A second major strategy is to hire temporary or seasonal labour. The disadvantage of hired labour is that cash must be found for immediate payment. The advantage is that it is available only for periods of acute labour shortage. A pool of resident labourers who work for cash payments exists in every village and their numbers have recently been swollen by dispossessed nomads settling on the margins of the Scheme. This supply is supplemented during the cotton-picking season in March-May by a massive influx from outside the Scheme. In part these are recruited by the authorities, but in general tenants make private agreements on an individual basis. Official SGB figures for cotton-picking labour within the Scheme for 1985-6 are shown in Table 1.

HOUSEHOLD ECONOMY

15. An unexpected feature of the tenancies is that they may not be very profitable enterprises in themselves, despite the avidity with which they are sought. Declining yields of recent years (Euroconsult, 1982) have substantially aggravated this situation, particularly in the outlying Blocks such as those of the Managil Extension where canals, and consequently cotton yields, have deteriorated the most.

16. The account books in the individual blocks were systematically sampled to establish the profitability of cotton for the season 1984-5. The system of loans to tenants by the SGB carries over debts from previous seasons so that sampling an individual year only allows an assessment of current indebtedness. Moreover, SGB figures do not take into account private debts contracted through the shall system (Barnett, 1977). Nevertheless, the figures provide an overview of both perceived profitability and the contrast between different parts of the irrigation system. Table 2 summarises these results;

Table 2: Perceived profitability of cotton

Location	Sample Size	Number and (%) making profit	Overall mean net profit in Sudanese Pounds*
Gezira	370	339 (92)	1670
Managil	214	120 (56)	654
Rahad	92	50 (54)	1504

* Tenants making no profit incorporated as 0. Figures may include repayment of outstanding debts from previous years.

Cotton is therefore only really seen as profitable in the Gezira principally because of the proximity of the river itself and distribution points for other inputs, such as pesticides and fertilisers.

17. In this situation, it is evident that there must be other advantages to being a tenant. Tenants are supplied with inputs from the Sudan Gezira Board, both in the form of pesticides and as loans for hiring labour etc. In effect these are used to grow the groundnuts, sorghum and wheat that are the other major crops of the rotation cycle. These form the basis of subsistence and in periods of drought, surpluses can be sold for substantial profits. In addition, all the residues can be fed to livestock.

THE ROLE OF LIVESTOCK

18. In the Gezira proper, where settlement has been in place for more than sixty years, the exclusive livestock orientation of the nomads who originally became tenants has been replaced or attenuated by the range of alternative economic enterprises, in particular external wage-labour and other types of commercial activity. Moreover, in the Gezira, water and other inputs are more reliable and there is more financial incentive to apply effort to the cotton and other SGB recommended crops.

19. Managil and Rahad, however, are more remote from the major markets and other infrastructure, but close to the rangelands. Moreover, many tenants have only recently settled and so retain large livestock holdings. Moreover, their privileged position, in terms of access to nutritious residues and purchased feeds, meant that they were able to buy up stock during the droughts of the 1970's and 1980's. As a consequence, therefore, ruminant livestock play an essential role in their domestic economy.

20. In contrast, the administration has always viewed livestock enterprises as essentially peripheral to the Scheme's primary role of maximising crop production. However, the large numbers of animals in the Scheme mean that their role has been discussed by the authorities from the earliest period. Initial policy was to favour grazing animals, cattle and sheep, over browsing animals, goats and camels, because of the potential damage to the cotton crop. A fodder crop, lubia (Dolichos lablab) was originally included in the rotation in the Gezira. Other crops have also been tried at various periods, including Philipessara, Clitoria and Abu Sabain (Sorghum vulgare).

All fodder crops were dropped in the 1970's because of their presumed role as hosts of cotton pests. However, falling crop yields and an rising internal demand for meat (Sudanow, 1986) has stimulated a re-examination by the SGB of the Scheme's potential for livestock integration. As a result, fodder crops are being introduced, on a trial basis, into Blocks associated with the Gezira Dairy Co-operative (GDC), close to the SGB Headquarters at Barakat (Map II). However, infrastructural support for livestock production remains inadequate; drugs, veterinary services, supplementary feeds and improved breeding stock are rarely available to producers particularly those in the remoter areas.

LIVESTOCK RESOURCES

21. The principal livestock species kept in the Scheme are cattle, sheep, goats, camels, donkeys and horses. Cattle are of two basic types, the Kenana and Butana, shorthorns with small humps, and the Baggara, animals with a variable conformation from the West. There are also some Mbororolonghorned red zebu along the southern margins of the zone. Cattle, goats and sheep are kept for milk and meat, while camels and equines are essentially kept for transport. In the southern part of the Managil extension there is a well-established donkey breeding tradition. Estimates based on records at Kosti bridge, which crosses the White Nile southwest of the survey area, suggest that some 6,000 donkeys are exported to the south every year.

22. Livestock are kept for milk, meat and transport both for the domestic group and for sale. The fattening of animals for sale at festivals is not very widespread, perhaps because of the priority on providing maintenance rations for all stock. However, the Tama people have made something of a speciality of sheep-fattening making use of spent grains. Of all the uses of livestock, dairying is probably the most important and prestigious activity; all the ruminants are milked, although only in the surrounding rangelands is there an emphasis on camel-milk. Milk is not only drunk fresh, but also made into a variety of products such as soured milk (ruup), yoghurt (zabaadi), butter (zibda), ghee (simmin) and cheese (jibna).

23. Cheese-making is not commonly a significant element in African pastoral subsistence. In the Gezira, however, the large numbers of nomads who exploited the rangelands and the dispersed population of cultivators meant that in favourable climatic conditions there was often a milk surplus. This was particularly true in the Managil extension, where a lack of urban centres and the livestock kept by the tenants has restricted demand for milk from nomads. A small amount of surplus can be processed into clarified butter or ghee, but cheese-making is a valuable alternative for larger quantities. In addition, cheese-making can be adapted to include any type of ruminant milk, although there is a premium on cows' milk.

24. As a study by Trilsbach (1980) shows, cheese-making was introduced in the early years of this century and has now become an important secondary industry in the region. Local cheese-factories are situated along both banks of the White Nile between Khartoum and Kosti and both within and south of the Managil Extension. Because of the minimal capital investment required - a shed, oil-drums and sieves - cheese factories can be closed and re-opened according to their relative profitability. In the dry season of 1986, most of those shown by Trilsbach along the White Nile had been closed for lack of surplus milk. Demand for the cheese, especially from Khartoum has remained high. The owners generally said that more factories would re-open as soon as the price of raw milk dropped.

25. To assess the ruminant livestock resources of the Scheme, a combined air/ground survey method was devised. Details of this method can be found in DEVCO/RIM (1987). Counts were made from the air, to which were added ground derived estimates of animals obscured from direct observation by human habitation. Animals concealed inside houses are normally young animals, often with their dams. In the case of small ruminants, with their greater fertility, this was found to contribute a substantial proportion of the total numbers (43%). Sheep and goats are indistinguishable from the air, and thus ground survey was used to assess the proportion of each species found in the visible flocks, which was then applied to the small ruminant counts to obtain the separate population estimates.

26. One of the original reasons for commissioning the survey was to establish the importance of nomadic migration into the Scheme and thereby estimate the significance of seasonal variation for pressure on feed resources. Surveys were conducted in February (the height of the dry season) and April (when livestock enters the Scheme from outside to exploit the cotton residues). The results, shown in Table 4, show that the Scheme contains a substantial livestock population, and that small ruminants and equines comprise a large fraction of the total numbers.

Table 4: Livestock populations in the Gezira and Managil.

Species	<u>February and April, 1986</u>					
	<u>February</u>			<u>April</u>		
	Number GU*	size	Density sq. km.	Number GU*	size	Density sq. km.
Cattle	217586	21	17.4	291281	33	23.3
Small ruminants	773244	46	61.9	998152	54	79.9
Camels	821	3	0.1	7625	12	0.6
Donkeys*	235300		18.8	235300		18.8

* Claimed ownership per rooftop multiplied by number of rooftops estimated from the air.

27. Studies of herd composition were carried out throughout the area (see Map II for study sites) - it became apparent that distributions were somewhat abnormal (Table 5). For example, the proportion of males of all the major species was found to be extremely low, to the extent that many stock owners had been forced to adopt the use of communal males for breeding. These atypical herd structures were almost certainly a consequence of the losses suffered during the recent droughts. Such losses were very substantial and amounted to between 40% and 60% of pre-drought stock and were due to both forced sales and direct mortality.

28. Despite the dramatic reduction in numbers, stocking levels have remained comparatively high. As a result the feed balance within the Scheme remains, at best, precarious, and severe seasonal feed shortages still occur during the late dry season. The majority of the Scheme's livestock is thus kept in nutritional conditions characteristic of subsistence production.

Table 5: Selected Herd Compositions and Productivity Parameters

Animal Category	Unit	Cattle	Sheep	Goats
Males	%	18.9	18.0	13.7
Females	%	81.1	82.0	86.3
Reproductive Females	%	40.6	51.3	52.4
Estimated total losses*	%	40.0	59.0	48.0
Age at first parturition	yrs	4.5 - 6	1 - 2	1.5 - 2

* Death plus forced sales

LIVESTOCK MANAGEMENT

29. The livestock in the Scheme are kept under a variety of management systems. Mixed herds are commonly encountered. It is not unusual to see herds that include all six ruminant species grazing crop residues, particularly in the Managil extension. Stock are herded either by residents' sons or by hired herdsmen. One of the effects of the drought has been to increase the number of specialised pastoralists without viable herds who are seeking such herding contracts. Meanwhile, the wealthier tenants have been able to increase the size of their herds through the purchase of stock. Inevitably this surplus stock must be accommodated outside the Scheme in the rangelands.

30. However, the most significant aspect of stock management in the area is the pattern of seasonal movements that are undertaken in order to ensure a sufficient supply of feed. The normal mechanism for providing adequate nutrition has been to send the animals out to

the wetter areas south of the Scheme, both to the region between the Niles and fording the river to the rangelands east and west. This has recently been encouraged by the deforestation associated with the charcoal-making that is occurring throughout the savannah woodlands. Cutting down the trees eliminates habitats for tsetse and decreases the trypanosomiasis challenge to ruminant livestock. However, the recent insecurity in the south has acted as a temporary brake on this process.

31. The other major movement is the recall of resident's animals onto the Scheme during April and May in order to utilise the wheat and cotton residues that are then available. Non-resident's stock are also permitted onto the irrigated areas at this time, and according to local sources, one of the problems of livestock intensification traditionally has been the massive influx of livestock owned by nomads from the adjacent rangelands. The nomads were seeking nutritious residues for their stock in the middle of the dry season, when nutritional shortfalls were pronounced.

32. The extent and location of this influx was assessed by comparing the results of the two aerial surveys. In addition, observers were posted on the principal crossing points along the Blue Nile, to monitor the animals coming over the river into the Scheme. Two conclusions emerged from this study; the first was that the influx was smaller than expected, and second, that the animals did not belong to nomads but rather to Scheme residents or to settled agropastoralists living in the nearby rangelands. Table 4 shows the actual increases in stock numbers between the surveys. In addition, some 106,000 small ruminants were recorded as entering the Scheme after the completion of the April aerial survey. Apart from trade animals, almost all were either from the Scheme itself or from agropastoral households living in the adjacent rangelands. The total population of sheep and goats at its maximum was thus of the order of 1.1 million, of which less than 10% belonged to non-residents.

33. The absence of nomads was striking, especially in view of the descriptions in earlier texts of the movements of such groups as the Rufa'a al-Hoy (Ahmad, 1974). The first aerial survey recorded a

number of wool tents originally ascribed to nomads. However, when the ground teams came to interview the occupants of these tents, they turned out, without exception, to be dispossessed; nomads who had lost their stock and were now depending on wage-labour or relief aid.

34. As late as the early 1970's, there was certainly a major influx of animals into the region, exploiting the abundant rangelands. The principal tribes seem to have been the Shukriya and Butana from the east, the Rufa'a and certain sections of the Nefediya from the South, and Baggara, Kababish from the West. Many of these groups seem to have crossed the Nile, either via the barrage at Jebel Auliya, or the railway bridge at Kosti.

35. The droughts that afflicted the pastoral zones of Sudan in the 1970's and 1980's have had a major impact on nomadic stock ownership. However, another reason for the absence of nomads from the region is the widespread cultivation of dura sorghum. Aerial survey clearly indicated that the region between the two arms of the Managil Extension is presently largely given over to sorghum cultivation. This change, from rangelands to arable cultivation, has occurred during the last ten years, and seems to be due to two factors; the need for pastoralists with non-viable herds to settle, and the widespread availability of tractors for hire. As the area is on the northern edges of the semi-arid region, sorghum yields are low, and its cultivation is only economic when extremely large areas can be sown and the stover can be consumed by livestock in the field. The recent drilling of boreholes throughout the region has made possible the establishment of permanent villages. The agropastoral subsistence patterns of the settled communities has prompted the exclusion of nomads who would inevitably compete for scarce resources.

LIVESTOCK OWNERSHIP

36. A complementary aspect of this stock influx is the expansion of livestock ownership by tenants and other residents of the Scheme. Interviews with tenants, especially in the Managil, suggested that many owned quite large herds of animals. Table 6 gives the major stock ownership

figures derived from household surveys on the ground (see Map II for study sites).

Table 6: Claimed Livestock Ownership per Household in the Scheme.

Owner Category/Location	Cattle	Small Ruminants	Donkeys
Scheme Average	4.2	12.7	1.27
Gezira	3.4	7.4	0.75
Managil	5.6	23.2	2.2
Tenant	8.6	25.1	2.4
Non-Tenant	3.6	20.2	1.8

37. Average holdings of cattle, goats and sheep in the Managil are almost double those in the Gezira, demonstrating the relative importance of livestock in the remoter regions. Transport animals, such as donkeys, horses and camels are also more widespread in such areas, reflecting the lack of all-weather roads in the west of the Scheme.

38. In almost all cases, tenants have substantially larger holdings than non-tenants. The exception, sheep, is almost certainly because the Tama people, who are widespread throughout the Managil Extension are specialised in sheep-fattening, and keep them almost to the exclusion of other stock. Despite this inequity, it is apparent that non-tenants own a substantial proportion of the livestock within the Scheme, perhaps as much as 40%.

39. The population estimates, even when adjusted for hidden livestock, show that the residents of the Scheme claim to own far in excess of the numbers actually present, even during the periods of maximum density in March-April. This confirms the statements of many Scheme residents, that the majority of their livestock are kept outside the irrigated area for much of the year, and also highlights the continuous flux of animals across the Scheme boundaries.

40. There has thus been a major reversal in the relations between Scheme residents and their neighbours in the semi-arid rangelands outside. Formerly, the region was exploited by specialised nomadic pastoralists with a range of livestock, more particularly camels further north and cattle in the southern parts. Now the herders are wage-labourers, and stock is largely in the hands of mixed-farmer entrepreneurs.

CONCLUSIONS

41. The series of development recommendations that grew out of these findings have been set out in detail in DEVCO/RIM (1987). This conclusion is not intended to rehearse them but rather to briefly summarise the major implications of this study, both for the Gezira and for the integration of livestock in irrigation schemes elsewhere.

42. Possibly the most important finding was the essential role of livestock in household economy in many parts of the Scheme. Far from being a peripheral economic activity, the ownership of domestic stock is often a dominant enterprise, especially in the Managil Extension and the Rahad Scheme. This has been accelerated by three factors; the uncertain profitability of cotton, the climatic crises of the early 1970's and 1980's which have entrained the transfer of stock from nomads to the relatively wealthy Scheme residents, and the terms of trade which continue to favour livestock owners rather than crop producers.

43. In addition, there is far greater variety of livestock enterprises within the Scheme than was formerly recognised. For example, it was estimated that the number of equines in February was actually greater than cattle. The export of donkeys to the south is clearly an important enterprise economically, as well as valuable to the nation and probably deserves greater attention than it has received. Similarly, the specialised fattening of sheep by the Tama people is both efficient and profitable, and would benefit from more study, as well as improved access to inputs.

44. A great proportion of the stock owned by Gezira residents stays outside the irrigated area in the rangelands for most of the year. It is only brought into the Scheme when there is an abundance of food, for example, when the cotton residues become available. If an intervention is designed solely to increase the amount of food available to animals, for example, by planting fodder crops within the rotation, then the effect may be simply to increase the proportion of stock that residents keep close to their house. This is unlikely to improve the nutritional status of their livestock, and therefore productivity is unlikely to improve unless the provision of increased feed supplies is linked to improved management practices.

45. The ethnic diversity of the Gezira and the recent influx of labourers and share-croppers from Western Sudan has probably expanded the density of small stock raising. In relation to this, the owners of livestock within the Scheme are by no means always the tenants. Indeed as much as 40% is in the hands of non-tenant residents whose needs are little-known and rarely taken into account when making policy decisions affecting the Scheme. An implication is that in a highly centralised structure where tenants are the passive recipients of administrative decisions, other producers are likely to be unaware of the potential of new types of inputs unless a special effort is made to reach them.

46. Another consequence is that the focus of development should be the producer rather than the secondary aspects of livestock, such as marketing. The distribution and marketing of dairy products is relatively efficient, and involves low capital investment and overheads. Demand far exceeds the existing supply because of the stock losses during the recent drought. However, as herds are rebuilt, the cheese factories will re-open and equilibrium re-established.

47. Inadequate veterinary care is unlikely to encourage stockowners to invest in their stock in order to increase productivity. This therefore suggests that any form of intensification must be an integrated package, with a spectrum of support services available to the prospective adopter.

48. Finally, these findings demonstrate that, even in areas that are well studied and documented, existing constraints on livestock production cannot be taken for granted, and that project planning must be based on current information rather than being too deeply rooted in long held assumptions.

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