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Agricultural Sector Review

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CURRENCY EQUIVALENTS

Currency Unit	=	Somali Shilling (So.Sh.)
US$0.1589	=	So.Sh. 1.00
US$1.00	=	So.Sh. 6.295

WEIGHTS AND MEASURES

1 hectare (ha)	=	10,000 m^2
1 square kilometer (km^2)	=	100 ha
1 metric ton (ton)	=	1,000 kg

ABBREVIATIONS

ADC	-	Agricultural Development Corporation
ENC	-	National Trading Company
FYDP	-	Five Year Development Program
GDP	-	Gross Domestic Product
LDA	-	Livestock Development Agency
MLFR	-	Ministry of Livestock, Forestry and Range
MOA	-	Ministry of Agriculture
MNP	-	Ministry of National Planning
NBB	-	National Banana Board
NES	-	National Extension Service
NRA	-	National Range Agency
ONAT	-	Farm Machinery and Agricultural Services Organization
SPC	-	State Planning Commission
TYDP	-	Three Year Development Program

FISCAL YEAR

January 1 - December 31

SOMALIA

AGRICUTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

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SOMALIA

AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

I. RESOURCES AND PRODUCTION SYSTEMS

A. General

1.01 Livestock is the mainstay of Somalia's economy. Some 2.5 million people (about 60% of the population) are nomadic or semi-nomadic pastoralists while a further 0.8 million (20% of the population) are crop farmers who keep livestock. Livestock not only contributes to the subsistence of these 80% of the population, it also provides the remaining 20% who are urban consumers with animal protein in the form of meat, milk and eggs. Livestock accounts for about three quarters of national exports and the trend is rising. Furthermore, it provides agro-industrial raw materials such as hides and skins for the tanning industry and blood and bones for the production of animal feeds. Livestock are used for transportation by the nomads, and by crop farmers for draft and manure.

1.02 According to a Government census the national herd in 1975 consisted of 5.4 million camels, 3.9 million cattle, 9.5 million sheep, and 15.0 million goats (Table 1). This is a sizeable increase over earlier estimates (Table 2). These 34 million domestic animals (11 million animal units 1/) share the grazing resource of some 36 million ha (or 57% of Somalia's surface area) with an unknown but abundant wildlife population, which at present contributes little to the economy.

B. Production Systems and Herd Productivity

Traditional Systems

1.03 There are three traditional livestock production systems in Somalia: (a) nomadic pastoralism, (b) livestock production by settled farmers, and (c) specialized livestock production by urban dwellers. In addition, the Government has launched specialized livestock enterprises in the form of ranches, specialized dairy farms, cattle feedlots and poultry farms.

1/ According to FAO norms, cattle 0.8; camels 1.0; sheep and goats 0.1.

1.04 Nomadic Pastoralism. About 60% of the Somali people practice nomadic pastoralism adapted to the arid and unreliable climate (para 1.01). The harsh environment and the system of communal grazing make wide movement across the rangelands necessary for survival. The major determinants of seasonal migrations are the availability of drinking water for livestock and herders, pasture, salt, and the incidence of disease. With the onset of the Gu rains, pastoralists disperse widely to exploit pastures that in drier times are inaccesible for lack of water. Movement into the Haud and other parts of the Ogaden and into Northeastern Kenya is not uncommon, but most of it is within shorter ranges. As surface water dries up, the pastoralists are forced to come closer to permanent watering points and areas with known feed resources. In the absence of regular mineral and salt for the animals, the pastoralists try to avoid mineral deficiencies by moving their herds for a short period into areas where salt concentrations are found in the soil. Livestock owners try to avoid areas that are infested by tsetse fly, the transmitter of Trypanosomiasis; however, some of the best dry season grazing in the river valleys is infested with tsetse. Under famine conditions, pastoralists will run the risk of trypanosomiasis infection to save their herds from starvation. In the dry season, the pastoralists of the coastal lowlands move to the plateau to avoid the heat and the dusty winds.

1.05 The range of nomadic movement is influenced by livestock water requirements. During the dry season, animals must be watered with approximately the following frequencies:

	Days between watering	Equivalent safe grazing distance from water
	days	km
Camels	20	70
Goats	6	20
Sheep	5	15
Cattle	2	15

As a result, the animals tend to be herded in different groups. Cattle and sheep are normally herded by women and children close to the dry season watering point, goats and milking camels are herded up to 20 km away from the water also by women and children, and camels plus a small number of milking camels are herded further away from the water under the charge of the young men.

1.06 The location of attractive markets for surplus stock is a further determinant of migrations. In the South, cattle move towards the slaughterhouses and ports of Kismayo and Mogadishu. But in the northern and central areas north of Belet Uen, camels, sheep and goats and some cattle move northwest towards the export staging Hargeisa-Burao-Berbera triangle. Local producer prices are attractive in comparison to prices in neighboring Kenya and Ethiopia, and there is no longer an outflow across the border as was the case some years ago.

1.07 Most of the nomads keep a mixture of livestock species (camels, cattle, sheep and goats) in their herds. Three subsystems may be identified:

(i) Camels, Goats and Sheep are predominant in the five northern regions; typically the family unit keeps about 7-10 camels, 40-100 sheep and goats, and very few cattle; half the livestock units are camels; sheep and goats constitute about 20% each of total animal units (see Tables 3 and 4).

(ii) Camels, Cattle, Sheep and Goats: In the Central Rangelands and in the inter-riverine area (Gedo, Bakool), camels are still the dominant species but cattle are more important than small ruminants; pastoral families typically keep 10-20 camels, 5-13 cattle, and 20-90 sheep and goats.

(iii) Cattle, Camels, Sheep and Goats: In the Juba and Shebelli River Valleys, cattle are the most important livestock species followed by camels; sheep and goats are comparatively unimportant. Typically a nomadic household would keep 6-13 head of cattle, 4-5 camels and 3-30 sheep and goats.

1.08 A species mix is preferred by livestock producers, in order to minimize risks and maximize benefits, but they seldom keep more than three species for ease of management. A species mix has several advantages. First, the feeding habits of different species vary, and a mixture offers an even exploitation of available vegetation; the camel predominantly browses higher trees, the goat lower bush, cattle graze tall grass while sheep prefer short grass. Second, the different classes of stock serve different economic purposes in the nomadic herd: camels are kept for milk production and as transport animals, sheep and goats produce subsistence meat and are sources of small amounts of cash, and cattle are kept for milk and market livestock production in higher potential areas. Third, these classes of stock have different biological coefficients and drought tolerance: camels have the highest survival rates during drought but they multiply slowly; goats are the second most drought tolerant and have high reproduction rates; sheep are slightly less drought tolerant than goats and have lower reproduction rates, but goats have higher losses from pleuropneumonia. Cattle have low drought resistance but a high reproductive efficiency compared to camels.

1.09 There is considerable variation in herd size and species mix among the nomads of the same area. For example, about one-third of the households in the Burao area keep only sheep and goats, no cattle or camels (Table 5), but in the Juba area over half of the households keep cattle as their only class of stock, with a further 30-44% keeping either camels alone or camels and cattle (Table 6). Equally, herd sizes in the sample areas vary considerably. In Burao, 90% of the households have no cattle and over one-third no

camels, but over two thirds of the households keep 50 or more sheep and goats. In the Juba region samples, over 90% of the households keep no sheep and goats, and over half no camels, but only a minority (10-27%) have no cattle. The percentage of very large herds is small, a function of the managerial difficulties involved.

1.10 Crop/Livestock Producers. Cropping and livestock activities are often combined in the Juba and Shebelli River Valleys, the Bay Region, the North-West and - to some extent - around Erigavo in the North East. In these areas, nomadic herds are typically interspersed with those of the crop/livestock producers whose livestock wealth is generally lower than that of the pastoralists (Table 7). They tend to keep lactating cattle and a few sheep and goats near their homesteads, while camels and dry cattle are herded further off in a way similar to nomadic stock.

1.11 Urban Livestock Producers. Urban livestock producers are the main suppliers of milk for the Mogadishu market; and they are also important milk producers for Hargeisa and Kismayo. In Mogadishu, the cattle are kept in private compounds on the outskirts of the city and most of their feed is carted from the Shebelli valley. Sheep, goats, and chickens are kept for subsistence purposes.

Herd Productivity

1.12 Compared to other pastoral societies in Africa, Somalis make intensive economic use of their herds, for subsistence milk and meat production, for the provision of market slaughterstock and urban milk supplies. The distorted sex ratio for the different classes of stock in sample surveys (Table 8) indicates that more males than females are extracted from the herd. Livestock producers are not keen to dispose of females because future herd growth depends on them. In a sample survey in the Lower Shebelli Region, 52% of the cattle were adult females but only 4% adult males, about the minimum required for reproductive purposes. Only about 16% of the immature cattle over 12 months were males. Equally, among sheep over 15 months of age, there were seven times as many females as males.

1.13 The herd offtake consists of four categories:

(i) live animals for export, especially sheep, goats and cattle;

(ii) local slaughter for export;

(iii) local slaughter for the local market; and

(iv) local slaughter for subsistence.

A rough estimate of the annual herd offtake in 1977-78 can be made by aggregating the figures for live animal exports and the purchases of hides and skins including a provision for home consumption of the latter (Table 9).

	Mission Calculation	Other Studies 1/
	(%)	
Cattle	4 - 5	7 - 11
Sheep	15 - 20	11 - 35
Goats	11 - 15	11 - 35
Camels	1	3 - 6

The calculated offtake rates are generally lower than those assumed in other studies, in particular for camels. This may be explained by an abnormally high retention of breeding stock for herd build-up following the 1974-75 drought.

1.14 The proportion of herd output retained for further herd build-up fluctuates between years. Following a severe drought, there is rapid herd reconstruction. The short generation interval of sheep and goats permits rapid rebuilding of the flock while cattle and camel need longer reconstruction periods. With growing flocks and herd numbers, individual animal care deteriorates, the competition for pasture increases, birth rates decline and mortality increases. During subsequent periods of severe drought, herds are decimated through lack of water and starvation, with little or no economic benefit.

1.15 Camels. Camels account for about 49% of the animal units, and are the most important livestock species in Somalia. As burden animals they facilitate nomadic movement, but their main function is to produce milk for subsistence. Lactation milk yields (1 year lactation period) for East African camels are reported at 1,460 kg with 17% of the total herd being in milk; 2/ however, under the harsh conditions of Somalia, lactation milk yields of about 1,000 kg with 35% of the adult females in milk (annual yields of about 350 kg per adult female) appear to be more realistic. Females calve for the first time at 5-6 years, and the calving rate is about 35%. The calculated offtake rate of 1% is regarded as abnormally low, and the long-term average is more likely to be 3% at an average liveweight of about 300 kg for all camels being extracted from the herds. Young camels are vulnerable to disease; calf losses are estimated as high as 25% in normal years, while adult camels have losses of no more than 5%.

1/ World Bank, 1975.
Dahl and Hjort, Having Herds, Stockholm 1976.
Huntings et al., 1976.
FAO, 1977.
World Bank - Central Rangelands, 1978.
World Bank - Bay Region, 1979.

2/ G. Dahl and A. Hjort: Having Herds, Stockholm, 1976.

1.16 Cattle. There are four types of indigenous cattle in Somalia, the Jiddu, Boran, Duara and Abgal, all of them East African shorthorn zebus. The Jiddu are the most numerous, along the Juba and Lower Shebelli Rivers. The Boran occurs west of the Juba River, the Duara, a fine dairy-type zebu, in the Middle Shebelli and around Mogadishu, and the Abgal in northern Somalia. Liveweight of mature cattle increases from north to south, the range being 250-285 kg for females and 300-350 kg for males. Annual milk yields per cow are estimated at 140-350 kg, calving rates in normal years are around 60%, and calf losses 15-30%; adult losses are 5-8%. Heifers calve for the first time at 4-5 years. Average liveweight before slaughter is about 220 kg. The low estimated offtake rate of 7-11% reflects the harshness of the environment, but higher herd productivity could be achieved with improved management. Market forces and water development have helped to increase the relative importance of cattle, but the severe drought of 1974-75 decimated their numbers and changed the attitudes of the pastoralists.

1.17 Sheep. The indigenous Somali sheep is a fat-rumped hair sheep with characteristic black head and white body. It is known for its hardiness, being able to go without water for up to five days. Somali sheep are the foundation for the Blackhead Persian sheep which were imported into Southern Africa during the 1920's for crossbreeding with the English Dorset Horn to form the "Dorper," a new breed of sheep which is expanding in several other African countries including Kenya. In a normal year, herd offtake from Somali sheep is estimated at 15-20%, with a lambing rate of about 90%, 30% lamb losses and 10% adult losses. Milk yields available for human consumption are about 50-80 l per ewe per year, where camel and cattle milk does not meet family needs. The average liveweight at slaughter is about 26 kg; export sheep for Saudi Arabia weigh about 30 kg. Somali sheep are preferred in Arabian markets and fetch a premium over Australian imports.

1.18 Goats. While even hardier than sheep in surviving drought, goats are more susceptible to disease, in particular to Contagious Caprine Pleuropneumonia (CCPP). Offtake rates are, therefore, somewhat lower than those for sheep (11-15%), but birth rates appear similar. Milk yields are also estimated at about 50-80 kg per ewe per year.

Modern Production Systems

1.19 Range Development. Early efforts to introduce range management date back to the 1950's when the British government established grazing schemes' in the northern part of the country, aimed at the introduction of rotational grazing practices by pastoralists and a greater degree of sedentarization. These schemes collapsed after Independence, but subsequently US- and UN-sponsored range development efforts have concentrated on the Northern Rangelands (Toghdeer, Sanaag and Nugaal) and to a lesser extent on the South (Afmadu). Present development efforts for nomadic pastoralists concentrate on the Northern and Central Rangelands. Pastoralists participate in the development effort through Grazing Reserves, Range and Livestock Associations and Grazing Cooperatives.

1.20 Grazing reserves consist of a variety of Government efforts to regulate range use by pastoralists, in order to prevent range degradation and to permit better utilization of the land. About 15 village and town grazing reserves of 400 km^2 each are operational in the Northern Rangelands, 17 in the Central Rangelands and four in the Southern Rangelands. Originally, these grazing reserves followed a simple rotation by closing half the grazing areas during the Gu and half during the Der seasons, but current programs subdivide the range into four quadrants of 100 km^2 each, one of which is closed for a full year, to be followed by the next quadrant and so on, in a four-year rotation. Eight grazing guards are employed by the National Range Agency (NRA) to prevent nomadic herds from using the closed areas. Larger range grazing reserves of about 900 km^2 with quadrants of 225 km^2 are being planned around new boreholes. Following the severe drought of 1974-75, the NRA is also setting aside one famine reserve of about 500-600 km^2 per district. These reserves would remain closed under normal rainfall conditions and only be opened by the NRA during periods of drought.

1.21 In order to obtain greater cooperation from the pastoralists in managing the grazing reserves, the Government is working through NRA to form Range and Livestock Associations. The committee members are elected by their communities and are responsible for (i) mediating between the authorities and the graziers; (ii) helping with demarcation of grazing reserves; and (iii) ensuring that grazing regulations, once accepted, are respected. About 45 such associations have, so far, been established in the Northern Rangelands.

1.22 The final stage of the development of pastoral organization is expected to be the Range Cooperatives, 14 of which are already operating in the Northern Rangelands. Exclusive land rights are being given to the cooperatives which manage their own affairs with substantial government assistance and subsidies. For example, the Government provides one range guard per cooperative, issues food rations and donates materials, for example for construction of sheep dips. Eight of the existing cooperatives were formed by pastoralists, and six by traders. Although the level of current subsidies to range cooperatives could not be duplicated countrywide, and although the selected sites may be exceptionally favorable, existing range cooperatives offer interesting insights into ways to make social services available in pastoral areas. Pastoralists are getting together to build schools, to arrange for medical services and to procure goods in general demand from the nearest market center.

1.23 Government Ranches. The Government operates two ranches at Warmahan (3,700 ha, 1,150 head of cattle, dairy ranching); and at Assura (20,000 ha, 1,100 head of sheep). Furthermore, one backgrounding ranch, part of the Trans-Juba Livestock Project, and three demonstration ranches in the Northern Rangelands are being developed. The Warmahan ranch has about 650 Duara breeding females and the herd is being upgraded by cross-breeding with

Friesian and Sahiwal. The management system is dairy ranching and about 80,000 kg milk per year is sold (corresponding to about 200 kg per cow. The calving rate is 50% and calf losses are 2%. Altogether, 60 people are employed on the ranch, which is fenced into 10 paddocks; there are three boreholes, and 360 ha are under fodder crops (sorghum, Sudan grass).

1.24 Government Dairy Farms. The Government operates three dairy farms at Afgoi, Qoryoley and Geed Deeble near Hargeisa which are more or less developed. The Afgoi dairy farm was established in the 1960's with German technical assistance and has recently been expanded by the addition of 600 ha of irrigable land to a total of 1,200 ha but it is only partially developed. The farm is poorly equipped with machinery and has a labor force of 57, with additional casual labor being employed seasonally. The farm herd of 900 head consists of about 340 cows, 200 heifers, 50 males and 310 calves of local zebus, Sahiwals, Friesians, and crosses between Friesian, Guernsey and Sahiwal and the local Zebu. Milk production during 1978 was reportedly close to 130,000 kg, an average of 382 kg per cow per year. Other output included the transfer of 94 bulls to private and cooperative farms, 242 bulls to the Government feedlot, three animals for experiments and 101 in-calf heifers to the Qoryoley dairy farm, the provision of 860 tons of hay to other Government operations, and the sale of 813 quintals of maize to ADC. Some limited farm recording has furnished the following data on milk yields of the various breed groups per lactating cow over an unspecified period.

	Head	Milk Yield kg/cow/day
Zebu	60	1.36
Sahiwal	80	7.36
Friesian x zebu	113	13.91

In a feeding trial over 39 days, zebu cattle showed no response to concentrate feeding while Friesian x Zebu crosses (20 per group) had the following yields:

	Control Group	Fed Group
Beginning	11.35	11.21
After 13 days	10.68	17.55
After 26 days	10.63	16.32
After 39 days	11.54	17.01

Little is known about the economic performance of the Afgoi farm. During 1978, it had operating costs of So.Sh. 925,000, but most of the output was intra-governmental transfer.

1.25 The dairy farm at Geed Deeble consists of a dairy yard and 40 km^2 of undeveloped grazing around it. This includes some high potential river valley grazing with stargrass (Cynodon plectostachyus). The 300 head of cattle with 90 milking cows are kept as a dairy ranching herd. Daily milk yields are reported at about 60 kg which is all consumed on the station.

1.26 The Qoryoley dairy farm started operating in 1978 with 100 in-calf heifers transferred from Afgoi. The 106 ha farm will produce fodder under irrigation for the crossbred Friesian/Zebu, Sahiwal/Zebu dairy herd and is intended as a livestock development center to support smallholders in the area.

1.27 Municipal Dairy Farms, Mogadishu. Two municipal dairy farms were set up in 1975 to provide city cattle owners with facilities for improving living conditions at their homesteads, increasing milk yields through better cattle management and feeding and health care. Each of the two farms has eight large cattle barns with a capacity of 100 cows each. Due to lack of response by private producers, the municipality decided to buy its own dairy herd from the Livestock Development Agency. These cattle, mainly of Boran type, perform poorly and 600 cows are producing no more than 900 kg per day. The municipality now intends to replace the Boran cows by Duara cattle which would be crossbred with the Friesian for higher productivity. The fodder for the farm is trucked daily from the municipal fodder farm at Warmahan near Afgoi, and financial losses are substantial.

1.28 Feedlot. An experimental feedlot was set up in Mogadishu with UNDP/FAO assistance in 1972. About 900 beef cattle have been fattened in this 200 head capacity feedlot over the last seven years, in order to study the performance of different breed types and different lengths of feeding period. Average daily gains in the feedlot over a 75 to 142 day period have ranged from 0.25 to 1.16 kg/day, with the bulk of results between 0.45-0.75 kg/day. No economic analysis is available from past experiments.

Poultry

1.29 Farmyard Poultry Production. Traditionally, poultry has played a minor role in Somali agriculture because it does not fit into a nomadic system. Sample surveys in Mogadishu and in the Middle Shebelli, however, indicate that poultry are of some importance in sedentary holdings, at 0.4 to 3.4 birds per family (Table 4). These farmyard poultry are kept on an extensive production system, frequently without any input. In turn, productivity is low, at about 30-40 eggs per hen per year with cull birds weighing about 1.5 kg. Losses from Newcastle disease, coccidiosis, salmonellosis, leucosis, fowl typhoid and fowl pox are thought to be considerable.

1.30 Modern Poultry Production. Government started its first poultry unit at km 7 in in 1972, in order to produce day-old chicks both for egg and broiler production. The unit has a hatchery capacity of 40,000 eggs, incubators for 16,000 eggs and eight poultry houses for a total of about 6,500 birds. In addition, the following units were developed, bringing total Government capacity to about 165,000 birds:

Unit	Capacity	Comment
Km 13, part 1	15,000 laying hens 2 brooders	farm being expanded to accommodate 50,000 birds
Km 13, part 2	20,500 pullets and cockerels	farm being expanded to accommodate 50,000 birds
Km 15	50,000 laying hens 20,000 chicks to be reared at any one time 3 ton/hour feedmill	site development, construction of building completed, 27,000 birds on hand
Govt. Resettlement Poultry Farm, Brava	4,000 layers	1,500 White Leghorn on hand
Kurtun Waare) Sablale) Resettlement Dujuma) Farms	25,000 layers	
Hargeysa Poultry Farm	15,000 layers 0	not yet fully operational

The police corps is operating a poultry farm at Waaya-Arag, and a private producer at Afgoi has a capacity for 3,000 laying birds. Major problems are regular feed supplies and losses from disease outbreaks. Performance data are, therefore, somewhat lower than in countries with an advanced poultry industry.

C. Wildlife

1.31 Game Resources. Somalia has one of the most abundant and diverse wildlife populations in Africa. The Juba and Lower Shebelli Regions are the richest in wildlife, but it is of significance in Galgudud, Bakool, Mudugh, Bari and West Galbeed also. Some of the animals, such as the sea turtle, dugong, greater kudu, dibatag, wild ass, baira, and Pelzeln's gazelle are either unique to Somalia or rare elsewhere. More than 100 species of

mammals, 600 species of birds and many species of reptiles, amphibians and fish are found in Somalia. 1/

1.32 Competition with man and his animals threatens this valuable and irreplacable resource. Predators are often poisoned and farmers are often hostile to other species because they compete for grazing and cause crop damage. Many species are faced with extinction. Although hunting and trapping of game is forbidden by law, poaching is at present the only way in which game resources are exploited despite the interesting development possibilities they offer. Eleven game reserves have been set aside and are under the authority of the NRA, but they earn no revenue since they charge no entry fee and, apart from Bushbush and Mandera, exist only on paper. During the 1960's when hunting was still permitted, wild animal skin exports were substantial (1965: 112,000 gazelle; 17,000 kudu; 506,000 dikdik; 1966: 68,000 gazelle; 10,000 kudu; 315,000 dikdik).

II. SERVICES TO THE SUBSECTOR

A. Ministry of Livestock, Forestry and Range (MLFR)

2.01 The MLFR has four departments: animal health, animal production, planning, training and research; and administration. In addition, there is a tsetse unit directly reporting to the Director General. The Ministry also supervises the operations of two parastatal agencies in the livestock subsector: the Livestock Development Agency (LDA) and the National Range Agency (NRA). The MLFR employs about 1,250 permanent and 800 temporary staff, including 55 graduates of whom 21 graduated from the Somali national university, and 10 are expatriates (Tables 11 and 12). Top-level staff in the Ministry are adequately trained and qualified, but field staff frequently are not, either through lack of qualifications or experience. These problems are compounded by poor transportation facilities, irregular supplies of inputs such as vaccines, drugs, feeds and minerals and by poor management. Although some central services function reasonably well, services at the producer level are usually poor and sometimes non-operational.

1/ Other important species include rhinoceros, hippopotamus, buffalo, Grant's and Grevy's zebra, giraffe, bushpig, warthog, oryx, gerenuc, greater and lesser kudu, topi, Hunter's hartebeest, waterbuck, bushbuck, Grants, Soemmering's and Speke's gazelles, oribi, klipspringer, several species of duiker and dikdik, lion, leopard, cheetah, caracal lynx, wild cat, serval cat, spotted and striped hyena, bat-eared fox, wild dog, jackal, genet, baboon, bush baby, white-throated gueneon, vervet monkey and the ostrich.

Department of Animal Health

2.02 The Department of Animal Health is the largest within the MLFR, currently with 18 professional staff at Ministry headquarters and about 25 veterinarians in the field. The department is responsible for animal disease control including vaccinations (except for LDA holding grounds), the treatment and movement of animals, meat inspection, the diagnosis and investigation of diseases, and the production and distribution of vaccines and drugs for veterinary use.

2.03 The Serum and Vaccine Institute at Mogadishu is one of the three operational veterinary laboratories in Somalia, the others being at Kismayo and Hargeisa. It has been developed since 1969 with UNDP/FAO assistance and currently has a staff of 14 veterinarians (eight of them expatriate), 26 technicians (one expatriate), and about 60 other staff. The Institute provides diagnostic services and produces vaccines and sera against common livestock and poultry diseases. It also carries out field investigations and conducts research. Diagnostic services are carried out in the virology, bacteriology, parasitology, pathology and histology sections, and a further expansion into biochemistry, hematology, mycology, tick-borne diseases and poultry diseases is being considered. Vaccine production covers anthrax, haemorrhagic septicaemia, blackquarter, bovine paratyphoid, CBPP, CCPP, Newcastle disease, fowl pox, enterotoxaemia of sheep and fowl typhoid (Table 13). Two mobile units collect samples in the field for laboratory analysis, but linkage with the field is weak and field staff hardly ever send in samples on their own initiative.

2.04 The Veterinary Laboratory at Kismayu was established with assistance from the Federal Republic of Germany; it currently employs a staff of 36 including six veterinarians (three expatriates), and 30 other staff (three expatriates). The laboratory consists of bacteriology, parasitology and pathology sections and has a workshop. The project, when fully operational, will have two veterinary field officers to assist in the reactivation of the regional veterinary field service and to integrate the diagnostic services fully into it. In its early operations, the laboratory has had little cooperation from the field service.

2.05 The Veterinary Laboratory at Hargeisa, which was developed with British assistance, is not fully operational, with a current staff of only one Somali veterinarian and a few support personnel. As with the other two laboratories, the diagnostic services on offer are not adequately utilized by the veterinary field service. Reasons given are the veterinary field staff's customary practice of diagnosing a disease by inspection only, long distances, lack of transport, poor road conditions, and suspicion of veterinary field staff and pastoralists.

2.06 During 1978, the Serum and Vaccine Institute in Mogadishu handled about 500 samples in virology, 5,000 in bacteriology, 500 in parasitology, 2,000 in histopathology and 15,000 in serology. Important diseases isolated were:

- foot and mouth disease type SAT 2 in cattle;
- foot and mouth disease type 0 in goats;
- Nairobi sheep disease in sheep;
- salmonella and clostridium bacteria in sheep;
- brucellosis in cattle;
- actinobacillosis in horses;
- mycoplasma mycoides;
- theileria (but probably no East Coast Fever);
- trypanosomiasis;
- CBPP; CCPP and salmonella in poultry.

A survey of tick species is underway. The new Veterinary Laboratory at Kismayo handled about 900 samples and diagnosed high incidences of theileria (assumed to be mutans), anaplasma, trypanosoma (congolense, theileri, evansi); skin fungi, brucellosis, and worm and liver infestations. The Hargeysa laboratory identified CCPP, tickborne diseases (Nairobi sheep disease, an unidentified camel disease and babesia), CBPP, anthrax, blackquarter and sheep pox as the main diseases.

2.07 Veterinary Field Service. Vaccinations are normally carried out by mobile units based at the regional headquarters. These units were established during the JP15 campaign against rinderpest in the late 1960s. Vehicles and equipment are now worn out and need to be replaced. Vaccinations are given free and are compulsory against rinderpest, CBPP and CCPP throughout the country, and for anthrax, haemorrhagic septicaemia and sheep pox. Nevertheless, there is a declining trend in the number of vaccinations (Table 14) because of the field services' operational difficulties. Shortages in CCPP vaccines have resulted in substantial losses in the past, but the Vaccine and Serum Institute should now be able to produce enough. Veterinary offices at the regional, district and village level also treat animals against external and internal parasites as well as trypanosomiasis. Livestock producers pay for the cost of the drugs and medicines. Because of distribution difficulties, livestock producers frequently collect the drugs at the regional or district offices. Statistics of Veterinary Service deliveries of acaricides for tick control and of drugs for treatment against trypanosomiasis in camels are detailed in Table 15. Receipts from drug sales were So.Sh. 8.0 million in

1977, So.Sh. 8.2 million in 1978, and So.Sh 4.6 million during the first five months of 1979. About 60% are trypanocidal drugs. Livestock producers know the utility of veterinary drugs and medicines and are prepared to pay for them. Logistical shortcomings of the veterinary field service are mainly responsible for the illegal import of drugs and the danger of the Veterinary Service's losing control over drug regimes. It is said that many livestock producers have their own syringes with which they administer illegally obtained drugs.

2.08 Livestock Movement. In principle, movement permits are required for livestock to pass international and regional boundaries and these permits are issued by the Regional Coordinators. In fact, however, the system does not function because of long, uncontrolled boundaries and pastoralist's nomadic life-style. Only in the Berbera-Hargeisa-Burao triangle, where livestock are assembled for export to Saudi Arabia, is there an effort to regulate the movement of stock in an attempt to prevent the blockage of the export trade route through disease outbreaks. Export stock are supposed to pass through a two-week quarantine at the two Livestock Development Agency (LDA) holding grounds at Qolcaday (Hargeisa) and Arrori (Burao), where they are inspected and vaccinated against anthrax and rinderpest. They are then moved to Berbera where they are held for 48 hours. Following another health inspection, the animals are loaded into ships, which carry an average of 10,000 sheep and goats at a time.

2.09 Meat Inspection. Qualified veterinarians are posted for meat inspection at the Kismayo meat factory and at the Mogadishu municipal slaughterhouse, while in the rest of the country, meat inspection is the duty of the general animal health service. In the absence of national statistics, no judgment can be made on the effectiveness of this service.

Tsetse Control Unit

2.10 Almost one fifth of Somalia is said to be infested by four species of tsetse fly, the transmitter of trypanosomiasis in livestock and man (*Glossina pallidipes*, *G. longipennis*, *G. brevipalpis* and *G. austeni*). Some of the best potential grazing land in Somalia is covered by tsetse and optimum utilization by livestock is thus prevented. The MLFR tsetse control unit with about ten graduates, five technical assistants and some 60 junior staff is mainly engaged in survey work in the Balad area and formerly operated a pilot control project in the Galwein-Kurtun Waare area. During 1978, the graduate and technical assistant level staff underwent an ODM training course in the biology of the tsetse fly and in tsetse control methods, in preparation for a larger project (para. 5.02) which is expected to provide basic information and staff training for a larger eradication program.

Animal Production Department

2.11 The Animal Production Department has a professional staff of nine and one expatriate adviser; it consists of three Services: Administration and Finance, Livestock Production and Technical Services.

The main operations of the department go through the Livestock Production Service which has a Breeding and Selection Section and a Poultry Section. The Technical Services Section provides technical back up through its Fodder Production and Machinery and Equipment Sections.

2.12 Breeding and Selection Section. This relatively young service started off with direct production efforts, and only recently turned to support services for producers. The five oldest operations are the Warmahan Ranch, Afgoi Dairy Farm, Hargeisa Dairy Farm, Assura Sheep Farm and km 7 and Balad feedmill and feedlot. None of these has reached the stage of full development or financial viability and all of them are still being carried under the development budget. Private livestock producers have, so far, had limited benefits through the distribution of a few breeding cattle from Afgoi Dairy Farm, sheep from Assura, and concentrate feeds - mainly for poultry producers - in the Mogadishu area. Among the four newer projects under the Livestock Service, two - the artificial insemination service and the dairy and poultry extension project at Qoryoley - are giving assistance to private producers, and the other two - the Beef and Sheep Fattening Farms planned for the Afgoi-Balad area (para. 5.04) are large-scale production enterprises. A livestock extension service is planned for all areas of the country suited to intensive animal production. So far, staff shortages have prevented realization of this plan.

2.13 The Artificial Insemination Service was started in 1976. Its present staff of 20 is composed of one animal husbandry technician (officer-in-charge), one veterinarian, four inseminators, four drivers, seven bull attendants and three other subordinate staff. In addition, the Government farms using artificial insemination (Afgoi Dairy Farm, Warmahan, Qoryoley) each employ two inseminators. There are six Friesian, one Sahiwal and one crossbred bulls at the center from which fresh semen is collected. A liquid nitrogen plant is currently being installed, in order to change over to deep frozen semen. During 1978, about 3,500 doses of semen were delivered to Government farms and about 1,200 doses to private livestock producers in the Afgoi and Qoryoley areas. The latter are usually nomads who move with their herds into the vicinity of the A.I. center, stay there for a week or so while they have their cows that come on heat inseminated, and then proceed in their normal nomadic pattern.

2.14 Poultry Section. The main emphasis is on large-scale poultry production on existing specialized state farms in the Mogadishu area (para. 1.30) and two new poultry complexes (par. 5.06). Poultry extension for private producers is given through:

(a) the provision of day-old chicks and feed from the km 7 poultry farm and feed mill in the Mogadishu area;

(b) the poultry farms in the resettlement schemes at Brava, Kurtun-Waare, Sablale and Dujuma;

(c) The Hargeysa poultry farm; and

(d) the Qorioley dairy and poultry extension project.

The Department of Planning, Training and Research

2.15 The department has few planning and no research activities. One going concern is the Training School of Animal Science which was established with UNDP assistance in 1967. The school is now operating under an FAO Trust Fund Project with an annual intake of 120 students and a provision for short courses. Two-year Assistant-level courses are offered in animal health, animal production, meat inspection, range management and for laboratory technicians. Short courses have been held for Junior Laboratory Technicians; Junior Range Management Assistants; Junior Hides and Skins Assistants, poultry specialists and in-service officers. Total output of the school, so far, is about 490 Assistant-level and 130 Junior Assistant-level staff (Table 16). Under another FAO-supported Project (NECP/SOM/503/FAO), the Department of Planning, Training and Research is also compiling statistics on the livestock sector in Somalia, evaluating ongoing projects of the Ministry, participating in meetings for the five-year development plan and appraising studies related to the livestock sector.

B. Other Government Services

Livestock Development Agency (LDA)

2.16 The LDA was established in 1966 as an autonomous Government agency to coordinate and promote livestock development and marketing, and the export of livestock and livestock products. Until 1974, it pursued a broad range of activities including those of the Serum and Vaccine Institute, the km 7 Pilot Feedlot, the Hides and Skins Agency, and there were plans for a shoe factory. Since then it has limited its activities to livestock marketing and implementation of the IDA-financed Trans-Juba Livestock Project. Livestock marketing activities include buying and selling of livestock in markets, mainly in southern Somalia, operating holding grounds for quarantine and vaccination of export livestock, and operating the marshalling yards at the ports (Berbera, Kismayo). In February 1979, the agency lost its franchise rights to buy livestock in the Juba area, and is now competing with private traders. In addition to its Mogadishu headquarters, LDA operates 10 regional offices and four holding grounds (Qolcaday, Arrori, Gelib and Kismayo).

National Range Agency (NRA)

2.17 The NRA was established in 1976 as an autonomous Government agency, and its range activities are regulated by the Range Development Law of 1979. In addition, NRA is charged with the development and regulation of Somalia's forestry and wildlife subsectors. NRA is headed by a General Manager who reports directly to the Minister, MLFR. At headquarters, it is divided into

five functional departments: general administration; range and environment; research, training and planning; forestry; and wildlife. In July 1979, total headquarters staff was 176, including six directors, 17 senior staff, 24 assistant level staff, and 129 other support staff. NRA has 15 regional field offices, but normal district level staffing and below has only been achieved in the Northern Rangelands Project area. The forestry and wildlife field staff was inherited from the previous Ministry Departments, with concentrations in the North and in the Juba Region. In total, there are about 590 field staff, including 15 Regional Directors, 14 senior staff, 67 Assistant-level staff, and about 500 other support staff.

2.18 The NRA is reasonably efficient in the range disciplines, but is not really functional in the forestry and wildlife departments. The Central Rangelands Project is expected to strengthen the NRA headquarters through addition of an expatriate Project Coordinator and three expatriate technical directors for administration, range and environment, and forestry. Further international support would be required in the Research, Training and Planning and Wildlife Departments, in order to permit effective services.

III. MARKETING, PROCESSING AND INPUT SUPPLY

A. Livestock Marketing

3.01 The traditional marketing system is well established. Market stock enter the channel through a transaction between the producer and the trader or his agent, either in the bush or in village markets which are held daily. Market sales are facilitated through brokers who are paid 2-3% of the sale price by both the seller and the buyer. In large villages and in towns, most of the livestock are offered by small traders and some by producers, for sale to large traders and - in three large market centers (Afmadu, Badada and Kismayo) - to the LDA. The market infrastructure is usually simple, with a large holding area and watering facilities. Sales are based on visual appraisal; the introduction of weighbridges and sales on a liveweight basis was a failure. Payment is usually made at town council offices where market levies are collected. Market levies include a tax corresponding to 5% of the sale price to be paid to the District Commissioner; a development levy of So.Sh. 3/- per head of cattle and So.Sh. 5/- per camel for the local Government; and a sports development levy of So.Sh. 0/50 per head. Movement permits are issued free-of-charge. The market tax is paid only once in the marketing channel, but tax receipts are only valid for 45 days. By-passing of market taxation is forestalled by issuing export permits or permits to enter slaughterhouses or slabs only for animals bearing a market brand.

3.02 Livestock Movement. About half of the cattle and camels, and one quarter of sheep and goats sold in markets are consumed domestically, the rest is exported to the Middle East. Practically all camels and cattle and the majority of sheep and goats are trekked. Trucking of sheep and goats is common along well developed roads such as the paved road from the Central Rangelands to Berbera and to Mogadishu. Because of higher livestock values, trucking is more common in the north and staging and reconditioning operations are also common. Animals which are being grouped for trekking or which have been bought at a time when it is inconvenient to move them are put in care of sedentary pastoralists until trekking can commence. Butchers and traders in the North try to improve the condition of slaughterstock through supplementary feeding of hay and sorghum. Large export herds and flocks graze the highland pastures to the north (Hargeisa-Burao-Berbera triangle). Hay is transported 70-150 km for the final staging of livestock for export through Berbera, mostly by private arrangements and LDA's four holding grounds are under-utilized. The final collection point for export livestock in the north is the veterinary inspection yard in Berbera. This LDA-run facility is poorly managed and constitutes a health hazard to export livestock. Some traders have established their own holding yards where they are allowed to keep their animals before export.

3.03 Livestock Exports increased substantially in 1978 over previous years (Tables 17 and 18). The export of female animals is prohibited. Up to 1978, Government's share of all livestock exports was 12%, comprising about 4% of trade from the North (LDA) and 80% from the South (LDA, KMF). About 50% of the cattle exported and 3% of the sheep and goats make up this Government share. Government does not export any camels. The bulk of exports is handled by some 200 traders. Marketing prospects for live animals on the Arabian peninsula are favorable, although Saudi Arabia, Somalia's main customer, subsidizes the import of frozen meat from the world market.

3.04 Specific problems for the export livestock trade through Berbera are the organization of shipping, congestion of the Berbera port, poor communications and letter of credit arrangements. Saudi Arabia has introduced new regulations that allow only larger carriers to transport livestock to Jeddah, with consequent interruptions, delays and bottlenecks in movement of livestock. The Somali Shipping Agency and Line is in the process of acquiring two livestock carriers in an attempt to remedy this. A Livestock Traders Committee, a self-help initiative, deals with the consecutive use of export licenses, letters of credit and serial numbers, claims for damages, and notifies dealers where holding pasture is available. Although LDA is paid to provide hay and water during the passage (the veterinary code prescribes 1.5 kg hay for sheep and goats, 6 kg for cattle and 12 kg for camels per day), traders realize that they have to provide hay themselves if they wish to avoid unnecessary weight, losses and death. The price for a truckload of hay varies from So.Sh. 800/- to So.Sh. 2500/- according to season; fodder production in river valleys is thus becoming increasingly lucrative.

3.05 Prices. Livestock prices have increased rapidly in recent years with strong demand from the Middle East, especially Saudi Arabia. Statistics on prices paid in local markets are not available. The Government sets official export prices, but these are only relevant for the amounts that the traders have to repatriate; they are free to use the extra for the repatriation of goods, effectively at the shadow exchange rate. 1/ At the end of 1978, livestock prices were considerably higher in the North than in the South, reflecting lower transport costs to Jeddah, the main port of destination, and also lower trade margins for the private traders in the North than for LDA in the South, which at that time was still protected by a franchise. This price differential is illustrated in the following Table 2/.

	North	South	Differences
	-So.Sh./kg carcass-		%
Sheep and goats	14-20	12-18	+ 13
Cattle	7.5-11	6- 8	+ 32

Since the lifting of LDA's privileges in the South in February 1979, private traders have offered considerably higher prices, making it almost impossible for LDA to acquire cattle at the official price of So.Sh. 4/- per kg liveweight (corresponding to So.Sh. 8/- per kg carcass). Traders margins are narrow, in the order of 10-15%; butchers also take a very modest trade profit, in the order of 6-14%. Private trade thus appears to offer an efficient service both to the producer and the consumer.

B. Hides and Skins

3.06 The Hides and Skins Agency (HASA) has the monopoly on hide and skin exports from Somalia. Its Director General reports directly to the Minister of Commerce. The agency operates six marketing offices in Mogadishu (HQ), Hargeisa, Burao, Bakool, Gedo and Kismayo; in a further 10 Regions it employs one or two Hides and Skins Improvement Officers with assistant level training. There are about 290 staff of which 130 (45%) work at the Mogadishu headquarters. At the village level, HASA collaborates with cooperatives, companies and private traders in the collection of hides and skins. It faces competition from Kenya in the southwestern part of the country. Up to the

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1/ Official fob prices were US$219 for cattle and US$21.5 for sheep and goats until March 1979; since then they are US$260 for cattle and US$53 for sheep and goats.

2/ Source: E. Reusse; Livestock Marketing Performance, 1979.

1974-75 drought, HASA was able to buy about 4.4 million hides and skins per year but since then, purchases have declined to 1.9-2.4 (Table 9). Increased values for hides and skins have permitted HASA a small operating surplus of about So.Sh. 1.4 million from total revenues of So.Sh. 33.0 million in 1978.

3.07 FAO assisted in developing a hides and skins improvement service during the period 1971-76 and the EDF financed construction of hide drying sheds to assist Government with its policy of providing drying sheds for communities which slaughter more than 15 animals per week. Three types of hide drying facilities are being developed:

(a) for large towns, sheds for suspension drying of 600-1,000 skins and facilities for the preparation of wet salted cattle and camel hides;

(b) for medium sized communities, sheds for suspension drying of 50-300 skins; and

(c) for villages, sheds for suspension drying of 10-100 skins.

Nine large, eight medium and 12 village drying sheds are completed, and 15 large, 17 medium and 20 village sheds are under construction, but EDF funds are exhausted. HASA has identified the need for a further six large, seven and 24 village drying sheds to meet the country's needs for a total of 114 sheds.

3.08 HASA purchased wet and dry salted hides, and suspension and ground dried hides and skins in the following proportions:

	Camel	Cattle	Sheep and Goats
	----------percent----------		
Wet salted	50	-	-
Dry salted	40	95	-
Suspension dried	-	-	80
Ground dried	10	5	20
	100	100	100

Ground dried hides are of low quality. Hide and skin values are also reduced by bruising and branding of live animals, and poor flaying and handling techniques in municipal slaughterhouses.

3.09 At purchase, HASA officers sort the hides and skins into four grades with substantial price differentials. From 1976-79, producer prices were constant at the following levels:

Grade	Camel	Cattle	Sheep and Goats
	----So.Sh. per kg-----		So. Sh. per skin
1	24.00	4.00	9.00
2	18.00	3.25	6.50
3	10.00	2.50	4.50
4	-	1.00	1.00

The percentages of skins in the different quality graces is as follows: 1/

Grade	Camel	Cattle	Sheep and Goats
	----------%		----------
1	15	25	45
2	25	30	45
3	35	25	7
4	25	20	3

3.10 The Agency sells both in the domestic and export markets. Sheep and goat skins are mainly exported; 50% of the cattle hides go to export, but no camel hides. Exports are either in the form of raw or semi-processed materials. 70% of the skins are exported as raw material and 30% as chrome blue semi-tanned product; all exports of cattle hides are as blue chrome semi-tanned product (Table 19). The Kismayo and Burao tanneries (paras. 3.11 and 3.12) act as agents for HASA in producing the semi-finished product. Hides and skins are exported to several countries; Italy and China are the main customers.

3.11 Technical assistance is required to help Somalia produce and market a better product. HASA has asked for a hides and skins adviser and one hides and skins marketing adviser to serve for three or four years. There is also need for more training of hides and skins officers and producers.

C. Tanneries

3.12 There are four Government tanneries located in Kismayo, Mogadishu, Hargeisa, and Burao under the responsibility of Ministry of Industry. In addition, there are three non-governmental tanneries, one at Brava, and two in Mogadishu (Missione and Salah Abdallah Nbanassah). The Kismayo tannery started operations in 1977 with a capacity of 500 cattle hides per day, producing wet blue hides, sole leather and finished upper leather. Raw materials shortages due to discontinuation of slaughter at the Kismayo Meat Factory and inability of the local HASA office to make delivery have forced the tannery to include sheep and goat skins in its program. The current daily

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1/ Source: HASA, Mogadishu.

throughput is about 200 cattle hides, and 2,000-3,000 sheep and goat skins. Camel hides are to be added shortly. The tannery regrades its intake from HASA, normally downgrading the hides and skins to its own standards. Tannery purchase prices are about 30-50% higher than HASA producer prices. The tannery has 110 employees, its estimated throughput in 1978 was:

Sheep skins (wet blue)	150,100
Cattle hides (wet blue)	36,275
Finished leather	14,000 sq. ft.
Sole leather	2,270 sq. ft.

3.13 The Mogadishu Tannery, a fairly small facility, is currently being expanded to handle about 2,800 pieces daily of wet blue hides and skins, and finished and sole leather pieces. The Hargeisa and Burao tanneries are specialize in sheep and goat skins. The Hargeisa tannery, which was built with East German assistance, has a capacity of 1.2 million pickled skins per year; all its production will be exported to East Germany under a bilateral agreement. The tannery has been out of operation at times for lack of chemical supplies.

C. Meat Processing

3.14 The Kismayo Meat Factory (KMF), which is under the responsibility of the Ministry of Industry, has a slaughter capacity of 50 head of cattle per hour and can process up to 250 head/day or about 60,000 per year for canning. The factory was financed by the Soviet Union and until the relations were broken in 1977, it produced mainly canned stewed meat for export for the Soviet Union under a special financing agreement. During the mid-70's, the factory also produced sizeable quantities of cooked corned beef for African and Mediterranean markets, and during the 1973 drought it also produced frozen meat (Table 20). Following the loss of the Soviet market, the factory reduced its operations and was closed for an extended period in 1979 to make repairs and improvements. KMF has reached agreement to market its products through the Italian Star company which also provides technical assistance to the factory. Despite a remarkable effort by KMF to improve slaughter hygiene in the factory, acceptance by European Common Market countries is doubtful. In addition, KMF has little chance of competing successfully for slaughter stock to produce low-priced corned beef for the European market (Italy, Germany) since private traders can export live animals at much more attractive prices. In June 1979, LDA calculated that it required a price about 33% higher than KMF was able to pay for slaughter stock (So.Sh. 5.33 against So.Sh. 4.00), in order to be a competitive buyer in the market. Under these circumstances, KMF would need either to receive sizeable subsidies for continued operation or to shut down for the foreseeable future until the export of meat and meat products becomes attractive again.

3.15 SOPRAL Meat Factory, Mogadishu. The factory is jointly owned by the Government (51%) and the Italian Star Company (49%); it has not slaughtered any animals since 1977 (Table 21) because it cannot offer competitive prices. There are plans to reopen the plant and produce corned beef and special cuts for export, but the economics of this are doubtful.

3.16 Municipal Slaughterhouses. The municipalities operate slaughter houses where butchers have to take their animals for slaughter and have the meat inspected; but because of slaughter fees and other inconveniences, some slaughter takes place elsewhere. A new slaughterhouse has been established in Mogadishu with 328 butchers licensed to sell their meat in 32 outlets. The municipality collects the following fees:

	Camel	Cattle	Sheeo and Goats
	---------So.Sh. per animal----------		
Slaughter fee	50.00	40.00	5.00
Transportation tax	5.50	3.50	1.50
Government tax	13.00	7.00	2.00

Slaughterers are paid So.Sh. 20/per camel; So.Sh. 10-15 per head of cattle and So.Sh. 5/- per sheep or goat. During 1978, 10,166 camels, 37,567 cattle and 68,683 sheep and goats were slaughtered. Hides and skins are collected by a cooperative society operating a skin drying shed and producing wet salted cattle hides. Bones are collected for bone meal production, but blood and stomach fill are still discharged into the sea.

3.17 Hargeisa Cold Store. This was established by LDA in 1973 and can store about 40 cattle carcasses but it has never been used, and although the Government plans to add an abattoir in the current three year Development Plan period, there are no indications that it will ever be needed. It may be more appropriate to utilize the store for perishable goods other than meat.

E. Dairy

3.18 Mogadishu Dairy Factory. This factory, with a potential output of 10,000 l per shift, was built in 1965 with assistance from the Soviet Union. Daily intakes have ranged from 3,500 l in 1970 to 11,000 l in 1974 and 10,000 l at the time of the mission's visit in June 1979. The factory equipment is almost worn out and needs replacement. The main problem is adequate fresh milk supplies. There are three city collection stations with a total intake of 7,000-8,000 l/day and a cooperative collection point some 60 km away. The Mogadishu municipal dairy farms (para. 1.27) have so far failed to come up to expected production. The factory pays So.Sh. 1.40 per liter of whole milk to producers and sells standardized milk at 2.8% butterfat for So.Sh. 2/-per liter to retailers and for So.Sh. 2.40 per liter to consumers. At the same time, city milk producers can sell their milk directly to the consumer

at So.Sh. 1/50 - 4/- per liter in the wet and dry seasons, respectively. It would thus appear that city producers are only prepared to sell to the factory during periods of oversupply; however, the dairy factory provides bran from the pasta factory (para 3.23) at a subsidized price (So.Sh. 23/- per quintal compared to So.Sh. 60/- in the market), and this apparently attracts many producers to sell some milk to the dairy factory (about 10-15% of the Mogadishu market). Consumer milk prices in Hargeisa are reported as high as So.Sh. 6/- per liter, twice the price at Mogadishu; consumers in Kismayo only pay So.Sh. 1/- per liter.

F. Feeds

3.19 Feed supply. The development of an intensive livestock industry depends on the availability of feed. Higher yields from ruminants (cattle, sheep and goats) depend on the quantitative and qualitative improvement of rations; the poultry industry is entirely dependent on highly concentrated feed. Potential resources of feed with high nutritional value are:

(a) improved pastures;

(b) fodder crops;

(c) crop residues;

(d) agro-industrial by-products;

(e) feed grains;

(f) oil seeds; and

(g) animal by-productt;

3.20 Improved pastures. Because of Somalia's climate, improved pastures are technically feasible only in the river valleys which would also be suitable for crop production. Pasture improvement in the dryland farming areas is as yet unknown and must be studied. In the absence of farm management data, it is doubtful whether any farm enterprise with grazing ruminants can compete witn intensive crop production. A 300 kg steer could be expected to gain 0.5 kg per day during the 180-day vegetation period on high quality pasture. At a dry matter production of 6 tons per ha and feed losses of 50%, the carrying capacity would be one steer/ha/year and production would be 90 kg liveweight; at a value of So.Sh. 4/- per kg this represents So.Sh. 360/- per ha. In comparison, a crossbred dairy cow of 450 kg would be expected to yield about 8 kg milk/day during the 180 day vegetation period making a total of 1,440 l milk. At a carrying rate of 1.5 ha per cow, and at a milk price of So.Sh. 1/40 per kg, the per ha value of the milk output alone would be So.Sh. 1,344/- or three times more than the value of steer fattening. Similar gross returns are feasible at current crop prices. But with a maize yield of about 1.6 tons/ha, the costs of maize production are likely to be lower than the costs of a dairy enterprise.

3.21 Fodder Crop production data are scarce in Somalia; early trials at the Trans-Juba Livestock Project produced 10-13 tons of green matter of lucerne per monthly cutting, and 40-70 tons of green matter of maize during a three month growth period. Lucerne would thus yield about 25-30 tons dry matter/ha/year, sufficient to feed about 10 head of cattle. Equally, two maize crops would produce 16-28t dry matter/ha/year to feed a similar number of animals. The economic feasibility of fodder crop production under irrigation has yet to be established. The collection of precise data collection at the Trans-Juba Livestock Project for beef production and at the Afgoi Dairy Farm for milk production is urgently required.

3.22 Crop Residues. Somalia's important crop residues are maize and sorghum stovers, some rice straw and groundnut hay, and possibly sugarcane tops and banana waste. Most of these residues are already being utilized. Incremental crop residues will depend on new crop development projects.

3.23 Cereals and Cereal By-products. With the possible exception of small quantities of sorghum in exceptionally good rainfall years Somalia is not likely to produce any surplus cereal grains for animal use in the foreseeable future. Raw materials for the feed industry are produced by the milling of maize, sorghum, wheat and rice. Bran is produced at five maize and sorghum mills, the Mogadishu Flour and Pasta Factory and the rice mill at Schelambot. Output for 1977 and the optimistic projection for 1979/80 were:

	1977 Actual	1979/80 Projected
	t/year	
Wheat Bran	3,650	6,000
Maize and Sorghum Bran	4,170	9,900
Rice Bran	400	900
Total Bran	8,220	16,800

Source: AGROTEC, November 1977.

Cereal brans are more suitable for ruminants than for poultry, and are particularly suitable as dairy rations.

3.24 Oilseeds. There are many small-scale oil-expelling units working in the private sector, and one industrial vegetable oil plant operated by the Ministry of Industry, with a daily capacity of 20 tons of oilseeds. Only the industrial oil plant produces oilcakes for animal feeds but the planned consolidation of the smaller establishments into one cooperative may increase availability.

	1977 Actual	1979/80 Projected
	t/year	
Sesame cake	1,875	5,500
Cotton seed cake	110	1,500
Groundnut cake	12	600
Total Oilseed Cakes	1,997	7,600

Source: AGROTEC, November 1977.

Oilseed cakes are valuable plant protein carriers; sesame and groundnut cake have a higher value than cotton seed cake and are used in poultry and cattle rations, while cotton seed cake is not recommended for poultry.

3.25 Molasses. The Jowhar sugar factory currently produces about 12,500 tons of molasses per year which is used for alcohol production. In addition, the Juba sugar scheme is expected to produce 20,000 tons of molasses by 1980 and 50,000 tons by 1983; this will be available for export or as animal feed. Price projections are So.Sh. 460/-/ton fob Kismayo and So.Sh. 150/-/ton transport costs, i.e., So.Sh. 310/- ton ex-factory. According to an earlier study by Preston, the use of molasses for cattle fattening should be economically competitive with its use for alcohol production.

3.26 By-products from the Slaughter Industry. Actual production consists of about 110 tons meat and bone meal by the Kismayo Meat Factory and about 600t of crushed bones from the Mogadishu municipal abattoir and from SOPRAL. The supply of these materials is dependent on the continued operation of the two meat factories. Additional raw materials from the Mogadishu municipal abattoir, and possibly from SOPRAL, could be utilized if a meat, bone and blood meal plant were operational in the Mogadishu area. Meat, bone and blood meal are valuable sources of animal protein, especially in poultry rations.

3.27 Fish Meal. This is being produced at a rate of about 300 tons per year by the Las Koreh Fish factory, Somalfish and the FAO Fisheries Project. There is considerable scope for expansion. Fish meal is a valuable animal protein carrier in poultry rations; and it is less important in cattle rations. Fish silage with formalin is not yet sufficiently researched to be developed for practical use.

3.28 Km 7 Feed Plant. This small compound feed plan consists of a feed-stuff plant, a demonstration unit for the utilization of slaughter offals, a laboratory and two vehicles which were all provided by FAO. Mixed feeds are produced mainly for the Government poultry and dairy farms, and to a lesser

extent for settlement and private producers. Feed production has declined from 1,500 to 1,200 tons over the last three years. Poultry feed mainly for layers constitutes about 80% of the output, totalling some 950-990 tons in 1977 and 1978. Concentrate feeds for dairy/beef rations were only about 250 tons during the same period. A comparison between the purchase price of feed ingredients and prices charged for compounded feed suggests a substantial element of subsidy (Table 22). Most feed is not even sold but handled through administrative transfer. The ingredient value alone of layer and dairy rations is about 25% higher than their selling price, it is about 9% higher for starter rations and only the broiler rations are sold at a price close to the ingredient value. Somalia's small feed industry is thus not based on economic principles, a situation which should be changed in the interests of optimum resource allocation. The necessity of importing maize for about 40% of the feed produced is a further issue.

IV. TRAINING

4.01 Training in the livestock and wildlife subsectors is widely spread among Government Ministries and Departments. At the degree level, the University under the Ministry of Higher Education has a Faculty of Agriculture and a Faculty of Animal Production and Veterinary Science. At the assistant level, the Ministry of Education is currently developing the Livestock and Forestry School in Afgoi, to be combined with the existing Agricultural Secondary School there. MLFR operates the School of Animal Science at Mogadishu and the National Range Agency is in charge of the Range Training School at Burao and the now defunct Forestry School at Jamaama. Non-formal education in the subsector is undertaken through the National Adult Education Center. Nomadic Education Centers and Regional Adult Education Centers are being planned.

4.02 The National University of Somalia offers 4-year degree courses in agriculture, veterinary science and animal husbandry. Some 140 students have graduated from the Agriculture Faculty since 1975; present enrollment in the second and third years is 137 and 36 respectively. After the second year, students have to undergo six months' language training in Italian; lecturing is mainly by Italian technical assistance staff. The facilities for practical work are poor, giving the relatively young students no chance to obtain practical skills. The current Three Year Plan provides for the introduction of a graduate program to bring 20 agriculturalists and 10 veterinarians up to M.Sc. level. Some 15 students are being transferred to the Animal Production and Veterinary Faculty to join third year students for the Animal Production degree course. Under the Central Rangelands Project, provision is made for a lecturer in range management to offer students the opportunity of specializing in this subject.

4.03 The Animal Production and Veterinary Faculty has a current intake of 60 students per year. The first class of 21 veterinarians graduated in 1978, and in 1979 the output was 29 veterinarians and 27 animal production specialists, some of the latter having come from the Agricultural Faculty after their second year.

4.04 The Range Training School at Burao trains about 20-25 students with primary school education over a two-year period after which they graduate as range assistants. Once the Livestock and Forestry School at Afgoi is operational, the Burao school is expected to be converted into a field training center which will include adult education facilities.

4.05 Non-formal education for pastoralists will be an important activity under the Central Rangelands Project.

V. CURRENT DEVELOPMENT EFFORTS

(Three-Year Development Plan)

5.01 A complete list of development efforts in the livestock and wildlife subsector under the Three-Year Development Plan (TYDP) is given at Table 23. Many Projects are carry-overs from earlier development plans which have not yet been fulfilled or achieved financial viability. The plan makes no clear distinction between replacement investments in older projects, which by now should be part of the ordinary budget, and new investments. It thus overstates the resources that will be allocated to incremental development. About 10% of capital expenditures under the plan will be channelled to the livestock and wildlife subsector; So.Sh. 645.0 million (88%) through the MLFR, So.Sh. 71.0 million (10%) through the Ministry of Industry, and the remaining So.Sh. 16.0 million (2%) through the Ministries of Education and Commerce. The principal items in the plan are: range development (34% of investment); poultry production (17%); animal production (14%); animal health (13%); livestock marketing (7%); tannery development (4%); an animal feed plant (2%) and forestry and wildlife (2%).

Animal Health

5.02 The seven animal health projects in the plan aim to support ongoing developments in the veterinary service. About So.Sh. 28.0 million (of which So.Sh. 15.0 million will be UNDP assisted) will be spent to complete the development of the Serum and Vaccine Institute at Mogadishu and the regional laboratories at Kismayo and Hargeisa. Six new regional diagnostic centers and 48 local centers will be set up and equipped with dipping tanks for sheep and goats; 60 mobile vaccination teams will also be established. The service will be provided with suitable transport, maintenance facilities and field equipment. Completion of the Dujuma quarantine station is expected to improve

disease control along the Juba River and facilities at the school of Animal Science at Mogadishu will be expanded. A grant is expected from the Arab Fund for Economic and Social Development (AFESD) for a preliminary project to undertake tsetse surveys and spary trials, and to consider the implications of tsetse and trypanosomiasis control on land use systems. The British ODA is expected to provide the 13 technical assistance staff required. If successful and economically feasible, this would be followed by a large-scale eradication program of tsetse from the Shebelli and Juba river areas.

Animal Production

5.03 Six of the 10 animal production projects enumerated in the TYDP are existing projects, implementation of which has not yet been completed. The Artificial Insemination Service will be equipped to handle deep frozen semen and to participate in the FAO Artificial Insemination and Breeding Development Program; the target is to inseminate 4,000 cows annually by 1980. The Afgoi Dairy Farm, will be modernized and intensified; 600 ha of irrigable land will be developed for mechanized fodder and grain production and for pasture. The herd will be upgraded through cross breeding (A.I.) with Sahiwal and Friesian. Artificial calf rearing and machine milking will be introduced. Development of the Warmahan Ranch will be completed. The objective is to double present stock numbers to about 1,200 Livestock Units replacing indigenous cows with improved breeds through upgrading. An additional 240 ha of good land will be developed for hay crops and 500 ha will be cleared selectively for grazing. On the Assura Sheep Farm (Nugal Region), 3,200 ha will be ring-fenced and sub-divided into four paddocks for rotational grazing; water facilities and housing will be culled and be replaced by 1,000 selected local breeding ewes. The Qoryoley dairy and poultry extension center (para. 1.24) will be developed as an A.I. sub-center and demonstration and training unit for farmers in fodder crop production and intensive systems of milk, meat and egg prodution. The dairy herd and the poultry unit will be increased, providing farmers with improved breeding stock. The km 7 feed plant (para. 3.28) will be renovated and annual output doubled to 4,800 tons. The Balad feedlot will be expanded from 250 to 2,000 head capacity; fodder will be produced under irrigation and about 1,500 ha of land will be cleared for grazing.

5.04 Four of the animal production projects under the TYDP are new large-scale Government undertakings. Hargeisa Dairy Farm. A large modern dairy farm producing milk and dairy products for the town, and crossbred heifers for local farmers, is to be established. About 200 ha will be put under fodder crops and 500 indigenous heifers will be inseminated with Friesian semen. A Feed Mill with an annual capacity of 16,000 tons of mixed feeds to supply the poultry industry will be established in the Afgoi area. A beef fattening complex with 10,000 head capacity will be developed in the Afgoi-Balad area. Annual output is expected to be 30,000 head of beef cattle. A sheep fattening complex with 30,000 head capacity and an annual output of 90,000 sheep is also to be developed in the Afgoi-Balad area.

5.05 Poultry Projects. In addition to ongoing poultry production development, there are plans for two industrial poultry complexes to be funded from a Romanian loan under the TYDP. A Broiler Complex would produce about 2.5 million broilers annually for export to the Middle East; meat from culled birds, feed meal, inedible fats and eggs would be sold locally. An Egg Production complex will produce about 30 million eggs for export; broken eggs and meat from culled birds will be sold domestically.

Livestock Marketing

5.06 The TYDP includes five projects with livestock marketing components. The most important is the Trans-Juba Livestock Project, an integrated effort to improve animal health, animal production and livestock marketing. It is assisted by an IDA Credit of US$10 million; following a review in 1977 the project was reduced to the development of five cattle markets, one new holding ground, water supplies and staging points, a 50,000 ha grazing ranch, an irrigated fodder farm and feedlot for fattening about 14,000 head of cattle per year, a veterinary component for construction of centers, dispensaries, staff housing and provision of vaccinators; veterinary drugs and equipment. Technical services, training, feasibility studies and future project preparation are also included in the project which became effective in October 1974.

5.07 The Government intends to add an abbatoir and by-products plant to the existing unutilized freezing and cold storage plant in Hargeisa, which would be modified to chill up to 9,000 tons of meat annually for export. The Gelib holding ground in the South and the Qolcaday and Arrori holding grounds in the North are to be improved and LDA will establish a major holding ground (20,000 ha) and marketing center at Warmahan to provide better movement control of slaughter stock and to channel cattle for export through Mogadishu harbor.

Rangeland Development

5.08 Rangeland development is under the responsibility of NRA and is the most important part of ongoing and planned development in the livestock subsector. The Northern Rangelands Project which covers the Togdheer, Nugaal and Sanaag Regions became effective in 1976 and is expected to be completed in 1981. Among its principal components are provisions for demarcation and management of grazing reserves and development of famine reserves and fodder production units. It also contains provisions for stock water development, pastoralist education, training and veterinary facilities and for technical assistance. It is complemented by the Central Rangelands Project in the Mudug, Galgadud and Hiran Regions which became operational in mid-1980. This project also provides for non-formal and formal range training, rangeland studies and trials and strengthening NRA's headquarters services and its Forestry Department Field activities. Furthermore, a stock water service and a range monitoring unit will be established.

5.09 World Food Project 719: Rangeland and Reforestation Development. This Project started in 1974 and was expanded in 1978. Rural workers receive food currently worth about So.Sh. 150 per month for work in demarcating and guarding grazing and forest reserves, watering fodder crops, maintenance of forest nurseries, planting trees for fuel and shelter belts, and work on sand dune reclamation. About three quarters of the food aid is distributed under the Northern and Central Rangelands and the Tsetse Survey and Control Project.

5.10 Livestock Planning and Extension: MLFR intends to implement two projects to improve its planning capability and to establish a Nucleus Extension Training and Education Unit. A livestock and range specialist and an economist will be internationally recruited to serve for about 15 months each under an FAO trust fund arrangement. They will review planning procedures in the Ministry and train Somali staff. The Extension Training and Educational Unit is MLFR's first attempt to prepare its staff for an extension role. The Project will be supported by an internationally recruited Extension expert, audio-visual technicians and animal health, animal husbandry and range management specialists.

Forestry and Wildlife

5.11 Priority is being given to the improvement of the manpower base to enable Somalia to plan, develop and manage its forestry and wildlife resources better. Emphasis will also be given to the protection and preservation of existing tree species, and the demonstration of tree planting. Development Projects in the subsector include the continuation of WFP Project 719. The Forestry and Wildlife Departments of the NRA will be strengthened in order to support the WFP project activities and a ten-year Forestry Development Program will be carried out to conserve, manage and develop forestry and wildlife resources. A national park will be established at Lag Badano in the South and UNIDO financing is expected for studies on the development of charcoal production.

Agro-Industries

5.12 Four projects, one of them new, are intended to expand existing livestock-based agro-industries. The Mogadishu Milk Plant (para. 3.18) is to be modernized and six milk collection centers are to be established. The Mogadishu Tannery at km7 (para. 3.12) is being expanded and the Kismayo Tannery (para. 3.12) will receive additional equipment. Plans exist for a Shoe Factory to be added to the Kismayo Tannery producing 300,000 pairs of shoes per year for export. The Ministry of Industry is also planning a new Animal Feed Plant in the Mogadishu area with an annual output of about 21,000 tons of concentrate feeds. The Juba Sugar Complex (para. 3.25) and the Mogadishu Oil Mill (para. 3.25) are expected to produce additional feeds for intensive animal production.

Training

5.13 A Livestock and Range School (para. 4.04) currently being developed at Afgoi with assistance from the third IDA-assisted Education Project will train about 120 animal husbandry, range and forestry assistants annually in a three-year intermediate-level course for school leavers.

Commerce

5.14 The uncompleted portion of the 1974-1978 development plan, for provision of hides and skin drying sheds, slaughterhouse equipment, means of transport and technical assistance is to be completed by HASA. A second project would provide offices and stores in Hargeisa and more transport equipment.

VI. MAJOR ISSUES

Manpower

6.01 Low qualifications, competence and motivation, lack of experience and a high turnover rate of staff are the most important constraints in the subsector. Apart from the live animal trade and smallholder milk production for Mogadishu, both dominated by the private sector, there are few efficient operations. The veterinary field service is ineffective at the producer level; this has led to a black market for drugs; livestock producers beleaguer regional veterinary offices to obtain drugs and vaccines. Field staff have not yet understood the utility of the diagnostic laboratories; no disease survey on which to base an appropriate general vaccination program has been made nor is advice given on the treatment of individual animals. Control of livestock movement is ineffective, holding grounds do not function properly and marshalling yards are a health hazard.

6.02 Animal husbandry extension does not exist, and government production enterprises are unable to adopt modern technology effectively. The Afgoi dairy farm is already in a poor state and further expansion will certainly increase the management burden. The municipal dairies in Mogadishu are a drain on public funds and on manpower and the poultry enterprises have suffered a costly disease outbreak. The manpower problem is likely to be most severe in the upcoming large-scale animal production complexes such as beef and sheep feedlots and poultry production.

6.03 LDA is unable to give effective services to the livestock trade and the NRA, although its range development efforts have been positive, does not have enough staff to carry out meaningful forestry and wildlife programs. HASA badly needs outside management assistance to keep it moving and to complete the interrupted investment program while the Hargeisa tannery has had to stop its operations altogether because of lack of tanning chemicals.

6.04 Prospects that manpower efficiency can be improved in the short term are poor. It is not just a matter of paying higher salaries or improving the benefit package, but work attitudes of school and university leavers would have to change drastically. The exodus of energetic and able staff to the Arabian peninsula, where salaries are much higher, is a further constraint.

Technical and Economic Data Base

6.05 The data base in the subsector is poor. The decision to go ahead with major investments is frequently based on insufficient technical and economic knowledge and on alien concepts. For example, none of the ongoing large scale production enterprises has so far achieved financial viability, yet still bigger ones are being planned and implemented. There is an urgent need for more studies, trials and research programs to establish the basis for future development projects. The animal disease situation should be studied systematically to define the requirements for an effective disease control program. This could be undertaken by the three veterinary laboratories with support from veterinary field staff. The Government is engaged in a sizeable animal production program, all based on vague technical projections and without due consideration of production economics. For example, the Afgoi Dairy Farm is to be developed into a modern large-scale dairy unit with 600 ha of irrigated land, modern equipment and improved livestock, yet the average milk yield in 1978 -- after about 20 years of development activity -- was on the order of 380 kg milk per cow per year, not much higher than the average of indigenous cows. Two large-scale feedlots are being developed and two more are detailed in the TYDP. Only a few cattle have so far been fed experimentally, however, and the economics of the feeding trials have never been analyzed and little is known about fodder crop yields. There are plans to establish a large-scale sheep fattening complex with an annual throughput of 90,000 head per year. To date, however, not a single sheep has been fed experimentally. In neither the irrigated nor the rainfed smallholder areas are technical packages available for extension to farmers; artificial insemination permits the introduction of exotic genetic material into nomadic herds but the utility of this has not been established or studied. Nothing is known about the comparative economics of alternative farm enterprises. There are no data on gross margins from crop and fodder production under irrigation which could permit optimum use of scarce irrigation water, or on the best use of concentrate feed, for beef, dairy cattle or poultry. The transfer of goods and services without proper cost and benefit accounting and the subsidizing of inputs distort the whole pricing system. The use of capital-intensive technology in a country with low wage rates should at least be questioned.

6.06 In the range areas, large scale development projects are being launched. They are essentially experimental and it will take considerable time for benefits to occur; the technical and socio-economic impact of these projects should be carefully monitored and studied. The heavy subsidization of cooperative ranches is precarious and may raise expectations which the Government cannot fulfill countrywide. In forestry, little is known about the

condition and trend of forest reserves, firewood production or the comparative advantages of different forest species under Somali conditions. The wildlife resource has been badly neglected and the information which would permit optimal utilization of wildlife for the national economy is not available.

Ecological Potential

6.07 Nomadism is a practical and effective response to conditions of low and variable rainfall. The present effort to establish range and famine reserves and range cooperatives is an attractive rational approach to the problem of range management and it should be supported. Care must be taken, however, that the investments and recurrent expenses in the ecologically fragile areas stay in line with the limited economic productive capacity of the land.

Lack of Feed

6.08 According to a recent inventory of Somalia's animal feed resources (para. 3.23-3.27), no feed grains can be expected from local production in normal years, and the feeds available for intensive livestock production consist of the roughly 8,200 tons of bran, 2,000 tons of oilseed, 100 tons of meat and bone meal, 600 tons of crushed bones, and 12,500 tons of molasses which are currently used for alcohol production. The inventory predicts a rapid increase in available feed, to about 17,000 tons of bran and 7,600 tons of oilseed cakes annually; the Juba sugar scheme is expected to produce an additional 50,000 tons of molasses by 1983. Apart from the Juba sugar scheme projections, these figures are subject to doubt. In contrast, Government intends to expand intensive animal production and develop feedmills rapidly. By the end of the current development plan period (1981), Government-operated animal production enterprises alone would require over 25,000 tons of concentrated feed per year. Demand from the private sector, especially dairy and poultry producers around Mogadishu and in the Shebelli valley, will also have increased. Locally produced feeds are more suitable for beef and dairy cattle than for poultry. If poultry industry plans were to be realized, feedgrains would have to be imported from the world market producing a situation of higher feed costs and lower prices than world market levels if the produce were to be exported. There is no advantage to Somalia in importing feed grains in order to export poultry meat. Wages are low, but they constitute only a small part of the cost of producing broilers and eggs. The saving in labor costs would not offset the higher cost of feed. Until Somalia is able to produce grain surpluses, there seems little point in developing an export oriented poultry industry subject to fluctuations of feed prices and other imponderables. Equally, the planned development of several feed plants appears unnecessary in the absence of raw materials.

Animal and Meat Exports

6.09 Following the breaking of relations with the USSR in 1977, and as a consequence of increasing demand for live animals from the Arabian peninsula, the two meat factories are having difficulties obtaining slaughter stock.

The SOPRAL meat factory in Mogadishu has been closed for years, KMF for extended periods. Yet the Government, confident that there is a role for meat plants in Somalia, intends to invest in a third abattoir and cold store in Hargeysa and is determined to keep the two existing meat plants operating. Current prices offered for live animals and for frozen and chilled meat point strongly in favor of live animal exports as indicated below.

FOB Prices, End of 1978 at Kismayo

	Cattle	Sheep
	------So.Sh./kg------	
Live animals	11.40	18.60
Frozen meat	6.30	8.40
Chilled meat	8.40	12.60

Source: Reusse, 1978.

This comparison may be somewhat distorted, as the quality of live animals for export and slaughter stock for chilled beef may be somewhat better than the raw material required for frozen beef. But live cattle have a 35% and live sheep 48% higher fob price than chilled beef, more than can be compensated for by the value of slaughter by-products (4-7%) retained in Somalia for the local market or as an industrial raw material (hides, skins and bones). On the other hand, the live export of slaughter stock bears its own risks. Disease outbreaks or political conflicts may suddenly close the Saudi Arabian market. The Government may be forced to organize emergency slaughter in times of drought to salvage some of the value of animals which would otherwise die. It may therefore be in Somalia's interest to maintain an operational slaughter facility, but this must be weighed against the probability that the facility would operate at a loss, necissitating subsidies from Government.

Dairying

6.10 Private producers in and around Mogadishu have independently picked up a market opportunity and are supplying the bulk of Mogadishu's fresh milk, at the same time as Government and municipality large-scale production units are failing. Most of the milk is directly delivered from the producers to the consumers; the dairy plant is working below capacity because it cannot pay competitive prices to producers, although it does attract some milk by distributing concentrate feed to small producers. A more flexible price policy, careful observation of consumer preferences for butterfat content and taste and efforts to increase production and reduce prices through improved breeding, feeding and management could help remedy this situation. Milk could also be collected from parts of the Shebelli Valley.

Artificial Insemination

6.11 Upgrading of nomadic cattle with the Friesian brings the risk of reduced walking ability and drought tolerance of the crossbreds with a consequent reduction in productivity. The success of a crossbreeding policy with high yielding European dairy cattle depends on a corresponding improvement in feeding and management practices which cannot easily be brought about in nomadic herds. Sedentary farmers in the Afgoi/Balad area who grow crops and who are used to selling hay and forage to municipal cattle farmers in Mogadishu, should have less difficulty in providing the appropriate feeding and management conditions for crossbred dairy cattle. But the continued upgrading with the Friesian could spell disaster even for these farmers and for the Government farms in the long term. Purebred Friesians are the highest yielding animals under optimum feeding management and climatic conditions, but it is doubtful that these conditions will prevail in Somalia for some time to come. It would, therefore, appear to be more appropriate to follow a breeding policy such as criss-crossing with Sahiwal to retain a fair proportion of zebu blood.

VII. PROPOSALS FOR DEVELOPMENT

A. Objectives and Time Frame

7.01 The objectives of Somalia's livestock and wildlife development strategy should be to:

(a) increase foreign exchange earnings from the export of livestock and livestock products (which constitute three-quarters of total exports);

(b) increase the incomes of nomadic pastoralists (60% of the population) and livestock producing sedentary farmers (20%);

(c) provide animal protein to subsistence farmers and urban consumers who are increasing by 2.6% per year;

(d) develop and exploit underutilized resources; and

(e) increase the productivity and economic returns of past investments.

7.02 The time frame in which operational changes and new investments can bear fruit dictates development strategies for the short, medium and long term, all of which must be put into motion now. The short-term should concentrate on measures to increase production and improve resource allocation quickly. Improvement of the animal health and livestock marketing

services should have priority, followed by interventions in the meat industry. Other measures should include better hide and skin handling and marketing; the timely provision of chemicals for tanning and better artificial insemination and feed supply services to private dairy and poultry producers in the peri-urban areas. Better management, possibly through technical assistance and sound commercial practices must be introduced quickly on State Farms and in Government production enterprises, to improve their efficiency.

7.03 In the medium-term, the development strategy should focus on improving the information base through surveys, studies, research and pilot projects. Manpower resources should be developed through formal, non-formal and in-service training at all levels, and services to the subsector should be developed either through the strengthening of existing institutions or by creating new ones.

7.04 The long-term strategy should include the broad application of lessons learned and the information gathered in implementing medium-term measures and should focus on:

(a) continuation of range development programs countrywide, drawing on experience gained with the Northern and Central Rangelands Projects and supported by survey, study and experimental information;

(b) integration of livestock and crops development on smallholder rainfed and irrigated farms drawing on experience gained from the Bay Region and other agriculture projects and supported by research;

(c) development of feeding techniques for the fattening of sheep, goats and cattle for export and for urban consumption with locally produced feeds;

(d) expansion of the dairy and poultry industries to meet local demand; particular emphasis should be given to smallholder dairying;

(e) development of forest resources to provide national firewood requirements and to maximize foreign exchange earnings from the export of frankincense; and

(f) sustained exploitation of the wildlife resource through conservation and development of sport hunting.

B. Specific Recommendations

7.05 Veterinary Services. Any form of livestock development depends on efficient veterinary services. Shortage of vehicles and veterinary drugs is

one problem to be overcome, management of the field service is another. The poor professional standards of many field staff must be raised through application of more clearly defined work programs and effective control. Vaccinations should be carried out in a campaign approach. If timed appropriately this could cover the national herd quickly and systematically and would probably save costs. The availability of veterinary drugs in field offices should be monitored more carefully so that farmers can receive efficient services and be persuaded not to obtain drugs illegally. It is high time that a district-by-district disease survey was carried out to formulate an appropriate vaccination and treatment policy now that there are three established veterinary laboratories. In addition, veterinary control of market livestock is not satisfactory; it is essential to control the movement of livestock from their point of entry into the marketing system to avoid disruptions in the market flow of slaughter stock for local and export markets.

7.06 Livestock Marketing. Some measures are required to improve the effectiveness of the livestock marketing services. Livestock movements should be facilitated through provision of stock water supplies and transport facilities; the management of quarantine and handling facilities should be improved. It is essential to supply feed for market livestock especially during the voyage. Market information should be made readily available to livestock traders and producers, and the communications infrastructure generally should be expanded.

7.07 Meat Processing. The Government should keep a small meat processing industry operational, even if it has to be subsidized, in order to meet the possible (but unlikely) event that live animal exports would be interrupted and for periods of severe drought when large numbers of starving livestock must leave the ranges quickly to avoid complete loss. The existing slaughterhouse capacity (KMF, SOPRAL, Municipal slaughterhouses) should be assessed with this in mind. Some reduction in their scope is regarded to be necessary.

7.08 Hides and Skins. HASA will require assistance to improve overseas marketing and the management of its affairs. The drying shed development program (para. 3.07) should be completed.

7.09 Dairy Extension. Reasonable benefits would be likely to accrue quickly from an efficient dairy extension service in and around Mogadishu and in the Shebelli Valley. The package should include farmer extension in dairy cattle husbandry, feed supply services, artificial insemination and good veterinary care. The pricing policy of the Mogadishu dairy plant would have to become more flexible if it is intended to handle a bigger share of the market. As a first step, the private dairy industry in and around Mogadishu should be studied carefully, and suitable approaches tried in a pilot project.

7.10 Large-Scale Government Farms. The existing state dairy farms are uneconomic and public funds are wasted on them. The Afgoi Dairy Farm, the poultry farms and the feedlots, are all unlikely to produce financial surpluses

with the present standard of management. There is an urgent need for improved management practices which may have to be supported by Technical Assistance, and for improved accounting and reporting procedures.

7.11 Surveys, Studies and Research. Speculative investments, such as are frequently made in Somalia, will be costly in the long term. More data are required to produce a technical and economic basis for future investment projects. Several areas in the subsector should be studied and researched in greater depth. In particular, the following studies are required:

- the results from pasture and fodder production under rainfed conditions and under irrigation;
- the response of local cattle at different ages and weights to intensive feedlot feeding with different rations, and to pasture fattening supplemented with concentrates;
- the performance of sheep and goats in the feedlot under different feeding regimes;
- the incidence of parasites in sheep and goats and their effect on performance;
- the feeding regimes for dairy cattle including calf rearing;
- the milk production performance of different genotypes of cattle;
- the integration of livestock and crops on smallholdings with emphasis on the role of work oxen;
- the effect of the introduction of a system of range management on range productivity and animal performance; and
- a survey of the existing forestry and wildlife resources.

7.12 Some institutions would have to be created and others strengthened to cope with this work program. Livestock technology should be developed through an appropriate research service. An experimental unit would be required to study intensive animal production (beef, sheep and goat feeding, dairying, fodder production). The integration of livestock with crops in the rainfed areas should be studied in a systems approach at research centers in the main crop producing areas at Bonka (Bay Region) and Aburein (North-West). Range studies could be carried out by the Department of Research, Training and Planning of the NRA under the Central Rangelands Project and

NRA should also be enabled to carry out forestry and wildlife studies. A Land Use Planning and Control Unit should be established in the State Planning Commission to study the ecological potential of the country and prepare land use plans on a district by district basis. A land use register (cadaster) should be established and maintained to keep track of the land use rights of different Government departments and of individuals. An animal production extension service should be developed for livestock producers in peri-urban and irrigated areas; but livestock and crop extension should be integrated under rainfed conditions. Range extension, and forestry and wildlife extension should be organized as specialized services within the National Range Agency.

7.13 Training. Manpower development at all levels is essential for the implementation of this development program. University and Assistant-level graduates must be given a better understanding of practical problems than the training institutions presently provide. Training of animal production extension staff and managers and foremen of state farms should be practical. Either a special course should be offered at the Farm Management and Extension Training Center being developed under the IDA-supported Extension and Training Project, or a special training institution should be set up in conjunction with the experimental unit proposed (para. 7.12). Appropriate dispositions are required in all services (veterinary, animal production, range management, forestry and wildlife, livestock marketing, hides and skins, meat processing) to organize in-service training to upgrade the qualifications of Government officers whose basic educational standard is lower than in other developing countries.

C. Conclusion

7.14 The mission considers the emphasis on poultry production, feed plant investments and development of an additional meat factory under the TYDP inappropriate, and the rapid expansion of the sheep and cattle feedlot capacity premature. An export oriented poultry industry could be envisaged only when Somalia has sustained surpluses of feed grain (para. 6.08). As the main demand for concentrate feed would be from producers of poultry and as other classes of livestock are not as dependent on industrially produced concentrates, there would be less need to set up feed mills. The mission considers that the supply projections for feed ingredients are over-optimistic anyway and that the new feed mills would operate only part-time for lack of feed.

7.15 The rapid expansion of the feedlot capacity under the TYDP, from one small feedlot for 200 head of cattle to an annual capacity of about 50,000 head and from zero to 90,000 sheep, involves undue risks. The first results of the two commercial scale feedlot operations that are currently being developed in Trans Juba and at Balad should be awaited before further large-scale investment is undertaken. Several problems will have to be

resolved experimentally. Stall fattening of cattle, sheep and goats may also be of interest to smallholders and might be left as an appropriate investment opportunity for them rather than for state farms.

7.16 Proposals for specific development projects are attached in the Appendix.

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Proposals for Specific Development Projects

1. Livestock Services Project

This project, currently estimated to cost about US$15 million, was identified by the Sector Review Mission; its objective would be to strengthen animal health and production services through staff training, institution building, experimentation and technical assistance, activities which are prerequisites for development of the livestock subsector. Due to its complexity, and overlap with other activities, it may have to be restructured or subdivided into separate projects. The Project would have six components.

A. Veterinary field services: parts of this component are already covered by NRDP and CRDP. The project would pull together the diverse efforts of these and other projects, and provide logistical and other support. The veterinary field service would be reequipped with vehicles, camping and veterinary equipment, and with veterinary drugs. The services would be reoriented towards a "campaign" approach in carrying out vaccinations; the supply of veterinary drugs would be improved and appropriate accounting and reporting procedures would be introduced. Livestock movement control and meat inspection would be improved. Services in the northern export staging area (Hargeisa - Burao - Berbera triangle) would be strengthened to reduce disease risks for trade stock. Trade stock movements would be licensed and made along routes which would be provided with watering points.

B. Disease survey: the three veterinary laboratories would be made fully operational, and a systematic disease survey undertaken on a district by district basis. New field survey teams would be established as required and attached to one of the three laboratories.

C. Management training: for regional and district level veterinary officers to improve their management and operational skills.

D. Afgoi Livestock Extension Training and Research Center (LETRC). The Afgoi dairy farm would be converted into an extension and research center for intensive animal production. Modeled on the Farm Management and Extension Training Center, university and livestock school graduates selected to become extension officers, farm managers and foremen would receive practical training in animal husbandry and farm management; some classroom work would also be included. Existing animal production staff would be brought back for refresher courses. The animal production extension service for the

peri-urban areas and for the river valleys would be centered here, serving both the private producer and State Farms. Dairy farmers in and around Mogadishu would have access to an extension service comprising animal health and hygiene, artificial insemination, animal husbandry and feed supplies. The farm would be developed for research into fodder production; dairy cattle production; beef cattle fattening on pasture and in the feedlot; sheep and goat fattening. A nutritional laboratory and work oxen would also be provided. A suitable poultry unit, (probably the one at km 7) would be added to the Center for poultry work. Integrated research teams would be formed to coordinate the activities of the Center and the Research Station on the use of crop residues, agro-industrial by-products and fodder crops, and the appropriate management and feeding of work oxen.

E. The HASA hides and skins drying shed investment program would be completed.

F. Technical Assistance would be made available for the strengthening of veterinary services, disease survey, management training, training and research at the LETRC, and HASA.

G. Project costs over a five-year period are tentatively estimated at So.Sh. 90 million (US$15.0 million equivalent) of which 80% would be provided by foreign assistance. The next step would be discussions between Government and interested donor agencies to identify the project in further detail and to reach agreement on project preparation.

2. Second Northern Rangelands Development Project

This would be a follow-up project to the ongoing First Northern Rangelands Project financed with a loan from the Kuwait Fund. The first Project had a slow start but is now making satisfactory progress. Funds will be exhausted by mid-1981. It would be very desirable to extend project activities to additional farmers and pastoralists and to keep the momentum going towards creation of associations of pastoralists who will increasingly take over the management of the pasture resources for maximum sustained productivity. It would be preferable to strengthen the services of NRA in this area rather than diffusing its efforts in new areas which are not yet covered by range development projects (e.g. Southern Rangelands). The project would contribute to the long term development strategy in the subsector, which lists range development as its priority. The project would be implemented through services established under the first project. The emphasis would be on the development and operation of grazing reserves, and range and livestock associations. Project costs would be on the order of So.Sh. 120.0 million (US$20.0 million equivalent) over a five-year period. Project identification has now reached a point of urgency, if a funding gap is to be avoided in 1981. The Government should discuss Project ideas with potential donors and get Project preparation underway without delay.

3. Wildlife Utilization Project

The TYDP provides for the strengthening of the Forestry and Wildlife Departments of NRA, for a ten-year Forestry Development Plan, establishment of the Lag Badano National Park and for charcoal production. Wildlife utilization activities are omitted. The mission believes that the wildlife resource should contribute to the national economy and that in the absence of tourist facilities the best approach would be to license and control sport hunting in areas of high game density. Provided that the Wildlife Department of NRA were able to administer and control this operation, sport hunters could be invited to shoot surplus game under the supervision of professional hunters. The latter would be contracted from abroad and thus the administrative burden would be small but foreign exchange earnings could be substantial. No Project cost estimates are available at this time.

4. Livestock Marketing Activities

Objectives are to develop and operate better marketing facilities and services specifically for the export of livestock. Private traders would carry out the main trading function while the government and other appropriate departments, would offer better services against fees. Activities would include:

(a) strengthened veterinary services in the northern export staging area (Hargeisa-Berbera triangle) in order to improve veterinary control over all livestock in the area and thus reduce disease risks for trade stock (e.g. assistance to the Northern Region Laboratory);

(b) improvement of marshalling and inspection yards at the Berbera and Kismayo ports;

(c) stock route water in the northern trade areas;

(d) track maintenance for off-main road livestock transport;

(e) livestock transport equipment;

(f) livestock market intelligence unit;

(g) improved telecommunications with Middle Eastern and local markets; and

(h) technical assistance for project implementation.

5. Agricultural Research Project

The Sector Review Mission has identified the need for more technical data on which to base project planning. Specialized livestock research and extension activities are being proposed under the Livestock Services Project. In addition, integrated farming systems are scheduled to be studied, in particular, at the Bonka research station under the Bay Region Project and also in small-scale irrigation areas. Under the guidance of the Afgoi Agricultural Research Station and the Afgoi Livestock Extension Training and Research Center, three farming areas warrant further study:

- the Northwest would be served by Aburein Research Center;
- an investigation center to study crop/livestock integration in the Erigavo area; for livestock, emphasis would be laid on high-value fodder production under stream irrigation (alfalfa) and development of a fattening system for exportable sheep and goats;
- an investigation center in the Lower Juba, possibly under the Juba Valley Development Authority, or Lower Shebelli area to study fodder production with flood irrigation for smallholder livestock production, principally cattle.

This research, especially that involving integrated crop/livestock systems, will lay the groundwork for the expansion of rainfed farming which could involve as much as 1 million ha over the next 20 years assuming the trained manpower can be found to extend the results of the research to farmers. The Extension and Farm Management Training Project will be important in this regard.

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AGRICUTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

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Human and Livestock Populations by Regions, 1975 Census

	Region	Area '000 km^2	Human population ('000)	Cattle	Sheep	Goats	Camel	Animal Units 1/ ('000)	Animal Units per sq. km
				'000 head					
I.	North-West								
	1. W. Galbeed	45	440	145	2,242	2,161	606	1,162	25.8
	2. Toghdeer	41	258	44	917	852	320	532	13.0
	Sub-total	86	698	189	3,159	3,013	926	1,694	19.7
II.	North-East								
	3. Sanaag	54	145	74	1,521	664	205	483	8.9
	4. Bari	70	154	15	1,388	2,095	240	600	8.6
	5. Nugal	50	87	12	223	611	155	248	5.0
	Sub-total	174	386	101	3,132	3,370	600	1,331	7.6
III.	Central								
	6. Mudug	70	215	340	1,136	2,744	751	1,411	20.2
	7. Galgadud	43	182	218	588	1,734	395	802	18.7
	Sub-total	113	397	558	1,724	4,478	1,146	2,213	19.6
IV.	Shebelli River								
	8. Hiran	34	147	170	287	1,159	461	742	21.8
	9. Middle Shebelli	22	263	382	325	720	205	615	28.0
	10. Lower Shebelli	25	398	419	90	200	293	657	26.3
	11. Benadir	1	380	22	6	19	1	21	21.0
	Sub-total	82	1,188	993	708	2,098	960	2,035	24.8
V.	Juba River								
	12. Gedo	32	212	528	500	725	784	1,329	41.5
	13. Middle Juba	23	216	366	25	720	236	603	26.2
	14. Lower Juba	61	223	861	70	127	222	933	15.3
	Sub-total	116	651	1,755	595	1,572	1,242	2,865	24.7
VI.	Inter-Riverine								
	15. Bakool	27	100	100	79	274	192	307	11.4
	16. Bay	39	302	255	55	192	362	591	15.2
	Sub-total	66	402	355	143	466	554	898	13.6
	Total	637	3,722	3,951	9,461	14,997	5,428	11,036	17.3

Source: Ministry of Livestock, Forestry & Range; corrected for camels and cattle in Middle Shebelli on basis of Three Year Development Programme, 1979-81, First Draft.

1/ Cattle 0.8; camels 1.0; sheep and goats 0.1.

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Table 2

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Historic Livestock Population Estimates

Source	Year	Camels	Cattle	Sheep	Goats
		'000 Head			
Halilovic	1964	2,970	1,490	10,530	
Hartley	1966	2,000	1,756	7,000	
Walker	1966	1,874	1,756	5,724	
Van Hoorn	1968	2,000	2,000	7,000	
Pillai	1968	2,500	2,500	9,000	
Hartley	1968	2,500	2,500	15,000	
German Planning & Advisory Group	1973	3,000	3,000	15,000	
IDA	1974	2,500	3,000	14,000	
Government Census	1975	5,270	3,950	24,730	

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Livestock per Head of Human Population

Region	Cattle	Sheep	Goats	Camel	Animal Units per capita
	head per capita				
I. North-West					
1. W Galbeed	0.3	5.1	7.0	1.4	2.8
2. Togdheer	0.2	3.6	3.5	1.2	2.1
Sub-total	0.3	4.5	5.7	1.3	2.6
II. North-East					
3. Sanaag	0.5	10.5	4.6	1.4	3.3
4. Bari	0.1	9.0	13.6	1.6	3.9
5. Nugal	0.1	2.6	7.0	1.8	2.9
Sub-total	0.3	8.1	8.7	1.6	3.4
III. Central					
6. Mudug	1.6	5.3	12.8	3.5	6.6
7. Galgadud	1.2	3.2	9.5	2.2	4.4
Sub-total	1.4	4.3	11.3	2.9	5.6
IV. Shebelli River					
8. Hiran	1.2	2.0	7.9	3.1	5.0
9. Middle Shebelli	1.5	1.2	2.7	0.8	2.3
10. Lower Shebelli	1.1	0.2	0.5	0.7	1.7
11. Benadir	0.1	-	0.1	-	0.1
Sub-total	0.8	0.6	1.8	0.8	1.7
V. Juba River					
12. Gedo	2.5	2.4	3.4	3.7	6.3
13. Middle Juba)	2.4	0.2	0.4	0.7	2.6
14. Lower Juba)					
Sub-total	2.4	0.9	1.4	1.7	3.8
VI. Interriverine					
15. Bakool	1.0	0.8	2.7	1.9	3.1
16. Bay	0.8	0.2	0.6	1.2	2.0
Sub-total	0.9	0.3	1.2	1.4	2.2
Total	1.0	2.5	4.1	1.4	2.9

Source: Mission Calculations.

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The Livestock and Wildlife Subsector

Importance of Domestic Animal Species
(Expressed as Percentage of Animal Units)

		Animal Units ('000)	Cattle	Sheep	Goats	Camel
			%			
I.	Northwest	1,791	8	18	22	52
II.	Northeast	1,331	6	24	25	45
III.	Central	2,213	20	8	20	52
IV.	Shebelli River	2,035	39	4	10	47
V.	Juba River	2,481	50	2	4	44
VI.	Interriverine	898	32	1	5	62
	Total	10,749	28	9	14	49
	Shebelli River without Hiran	1,293	51	3	7	39
	Juba River without Gedo	1,152	72	1	2	25

Source: Mission calculations.

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The Livestock and Wildlife Subsector

Nomad Livestock Holdings

Combination of type of livestock	Households by combination of type of livestock					
	Northern Somalia		Juba Area - Southern Somalia			
	Burao		Afmadow		Bardere	
	Number	%	Number	%	Number	%
Camels	271	5.9	137	13.4	230	27.0
Cattle	9	0.2	566	55.5	429	50.0
Sheep and Goats	1,540	33.4	5	0.5	-	-
Camel and Cattle	-	-	182	17.9	141	17.0
Camel and Sheep/Goats	2.406	52.3	58	5.7	-	-
Cattle and Sheep/Goats	88	1.9	15	1.5	41	5.0
Camel, Cattle, Sheep and Goats	290	6.3	56	5.5	6	1.0
Total	4,604	100.0	1,019	100.0	847	100.0

Notes: Afmadow Survey was conducted in March 1974 after the first gu rains and so is likely to understate the number of camels. Burao Survey was made in February 1974, and Bardere Survey was in August 1973.

Source: Central Statistical Department, Pilot Survey of nomadic households in Burao district, 1974; Pilot Survey of nomadic population using Hiloes as a source of water, Barlera district, 1973; Pilot Survey of nomadic households in Afmadu district, 1974.

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Table 6

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Livestock Numbers in Nomadic, Rural and Urban Households in the Middle Shebelli Region and in Mogadishu

Animal Species and size of Holding	Household					
	Northern Somalia		Juba Area - Southern Somalia			
	Burao		Afmadow		Bardere	
	Number	%	Number	%	Number	%
Camels						
0	1,637	35.5	586	57.5	470	55.0
1 - 5	856	18.6	158	15.5	119	
6 - 10	818	17.8	60	5.9	48	6.0
11 - 20	480	10.4	91	8.9	59	7.0
21 - 20	519	11.3	90	8.8	124	15.0
51 +	294	6.4	34	3.4	27	3.0
Sub-total	4,604	100.0	1,019	100.0	847	100.0
Cattle						
0	4,217	91.6	200	10.6	229	27.0
1 - 5	156	3.4	36	3.5	94	11.0
6 - 10	127	2.7	88	8.6	158	18.0
11 - 20	104	2.3	104	19.1	142	17.0
21 - 50	-	-	332	32.6	166	20.0
51 +	-	-	169	16.6	58	7.0
Sub-total	4,604	100.0	1,019	100.0	847	100.0
Sheep & Goats						
0	280	6.1	885	86.8	800	94.5
1 - 5	343	7.5	27	2.6	5	0.6
6 - 10	172	3.7	21	2.1	8	1.0
11-- 20	107	2.3	23	2.3	14	1.6
21 - 50	545	11.8	38	3.9	6	9.7
51 +	3,157	68.6	23	2.3	14	1.6
Sub-total	4,604	100.0	1,019	100.0	847	100.0

Source: Central Statistical Department, Pilot Surveys .....op.cit.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Livestock Numbers in Nomadic, Rural and Urban Households in the Middle Shebelli Region and in Mogadishu

	Middle Shebelli 1/			Mogadishu
	Nomad	Rural	Urban	Urban
No. of Persons	1,299	476	272	758
No. of Households	248	104	52	120
Persons per Household	5.2	4.6	5.2	6.3
Livestock (head per household)				
Camels	2.4	0.1	-	-
Cattle	8.6	3.0	0.3	0.7
Goats	19.9	4.3	0.2	0.2
Sheep	13.0	0.7	0.4	0.1
Donkeys	0.4	0.1	-	-
Chickens	-	2.3	3.4	0.4

Sources: 1/ Ministry of National Planning, Central Statistical Department: Multipurpose Household Pilot Survey, Middle Shebelli Region, November 1975.

2/ Ministry of National Planning, Central Statistical Department: Multipurpose Household Pilot Survey, Bondere District, December 1976.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Percentage of Females in Livestock Sample Surveys in Somalia

	Nomadic Herds			Rural Herds		Urban Herds	
	Middle Shebelli		Lower Shebelli	Middle Shebelli	Lower Shebelli	Middle Shebelli	Mogadishu
	1	2*		1		1	
Camel	68	67	n.a.	-	n.a.	-	-
Cattle	84	81	74**	79	79	69	72
Goat	86	79	76	78	76	89	75
Sheep	87	79	n.a.	75	n.a.	86	67

* Including rural and urban herds

** Assumming Calf sex ratio 1:1

Sources: - Middle Shebelli 1: Central Statistical Department, Multipupose Household Pilot Survey, Middle Shebelli Region, First Round December 1975

- Middle Shebelli 2:bid. Second Round, June - July 1976.

- Lower Shebelli: Genale - Bulo Marerta Project, Volume 6 Draft Annex 5, Livestock, Sir M. MacDonald & Partners, July 1978

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Estimated Herd Offtake, 1977-78 from Livestock Export and Hides and Skins Figures

	1977	1978
Cattle		
Live exports	64,956	76,982
Hides (sold to Hides & Skins Agency)	114,926	72,217
Contingency (10%)	11,493	7,222
Total	191,375	156,421
Estimated offtake rate, %	5	4
Sheep		
Live exports	465,005	738,843
Skins (to Hides & Skins Agency)	795,711	1,014,901
Contingency (20%)	159,142	202,980
Total	1,419,858	1,956,724
Estimated offtake rate, %	15	20
Goats		
Live exports	461,268	714,771
Skins (to Hides & Skins Agency)	994,825	1,289,158
Contingency (20%)	198,965	257,832
Total	1,655,058	2,261,861
Estimated offtake rate, %	11	15
Camels		
Live exports	33,296	21,580
Hides (to Hides & Skins Agency)	20,162	15,128
Contingency (5%)	1,008	756
Total	54,466	37,464
Estimated offtake rate, %	1	1

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Existing and Proposed Game Reserves

No.	Name	Region	Present Situation
A.	Existing Reserves		
1	Mandera Game Reserve	W. Galbeed	Consultant proposal to enlarge reserve.
2	Bush Bush Game Reserve	Lower Juba	Consultant proposal to establish a National Park in District and inclusion of Bajuni Islands in Reserve.
3	Geedhabehleh Game Reserve	W. Galbeed	About 10,000 ha, scenic beauty, encroachment by man, replanning required.
4	Mogadishu Game Reserve	Benadir, Middle Shebelli	Boundaries of reserve encompass agricultural, military and otherwise settled areas, and must be resurveyed; useful for preservation of rare coastal and riverine species.
5	Borama District Controlled Area	W. Galbeed	Established for the protection of northern oryx and Pelzelns gazelle, too large for effective control.
6	Bush Bush Controlled Area	Lower Juba, Middle Juba	Consultant proposal to establish National Park in the Afmadu area, present area too large for effective control.
7	Juba Left Bank Controlled Area	Lower Juba, Middle Juba	Important wildlife area, proposed National Park reduction in size to exclude settled areas.
8	Hoddur Partial Game Reserve	Hiran, Bakool	Originally created for protection of rhino, grevy's zebra, and giraffe. Rhino and grevy's zebra probably extinct, present boundaries probably unsuitable but information scanty.
9	Jowhar Partial Game Reserve	Lower Shebelli, Middle Shebelli, Hiran	Present boundaries should be amended, part of it proposed for National Park.
10	Belet Uen Partial Game Reserve	Middle Shebelli, Hiran	Dibatag, oryx, Soemmering's and Speke's gazelle, oryx, reserve too large for effective control.
11	Bulo Burti Partial Game Reserve	Middle Shebelli, Hiran	Dibatag, oryx, Soemmering's and Speke's gazelle too large for effective control.
B.	Proposed Game Reserves, National Parks and Reserves		
1	Las Anod	Nugal	Largest concentration of wild ass, northern Speke's gazelle; possible reintroduction of Soemmering's gazelle and oryx.
2	Afmadu	Lower Juba	For conservation of Hunter's hartebeest, grant's gazelle, oryx, reticulated giraffe.
3	Juba River	Middle Juba	Conservation of sample of riverine forest, wildlife species; red duiker, greater galago, and fish Pardiglanis tarabinii.
4 & 5	El Hamurre - Garad and Hobbya Reserves	Mudug	Preservation of dibatag, northern oryx Soemmering's gazelle, cheetah, Piacentini's dikdik.
6	Juniperus Forest	Sanaag	Existing Forest Reserve for which better protection required.
7	150th km	Middle Shebelli	Great variety of wildlife species and habitats: elephant, dibatag, Soemmering's gazelle, 4 species of dikdik lesser kudu, waterbuck, bushbuck, lion.
8	Lower Shebelli	Lower Shebelli	Rich game area: buffalo, elephant.
9	Dhul Medow Hills	Nugal	Preservation of beira and wild ass.
10	Bender Beila	Bari	Desert fauna and flora, Somali leopard; remote and of low priority.
11	Audegle	Lower Shebelli	Rich fauna including elephant and bushbuck; 70 km from Mogadishu.
12	Bugda Acable	Hiran	Grevy's zeba and rhino, little current information.
C.	Special Reserves		
1	Galgalo		Rehabilitation of habitat with native palms and dracaenas urgent.
2	Wells and Springs at Budhud, Wagit, Baidoa, Manas, Mahas, El Gambole, Taleh, Callis, Scimbirale		To be protected from pollution and introduction of foreign species.
3	Lower Juba desheks	Lower Juba	Dry branches of Juba River to be preserved for studies.
4	El Berdale		Forest Reserve proposed.

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The Livestock and Wildlife Subsector

Ministry of Livestock, Forestry and Range

Staff Budget

		1977		1978		1979	
		No.	Total	No.	Total	No.	Total
I. Salary Levels							
A. Permanent Staff							
Civil Service scale	Position Title						
-	Minister	1	35,520	1	35,500	1	35,500
A/2	Director-General	1	13,320	1	13,300	1	13,300
A/3	Director	4	42,912	4	43,000	4	43,000
A/4	( )	1	10,908				
A/7	Head of Service	1	10,248				
A/8	Executive Officers	-		5	42,000)		
A	Secretaries	42	275,640	29	192,500)	57	477,000
B/7 - B/8	Senior Officers	11	95,664	18	156,600	62	580,000
B	Junior Officers Technical Staff I & II	203	1,154,778	168	955,700	510	3,300,000
C/8 - C/9	Clerks	10	70,192	29	203,600	177	1,200,000
C	Assist. Clerks	802	3,656.691	811	3,684,000	460	2,100,000
D	Messengers	637	1,352,636	344	730,500	198	500,000
B	Technical Staff (To be hired 12/78)					120	700,000
B. Temporary Staff							
Position Title		No.	Total	No.	Total	No.	Total
Crash prog. workers		800	584,000	800	584,000	800	584,000
Veterinarians (foreign)		10	608,000	10	608,000	10	608,000
II. Allowances							
Position Title	Allowance	No.	Total	No.	Total	No.	Total
Minister	House	1	10,140	1	10,140	1	10,140
	Servant		3,060		3,060		3,060
Director General	Responsibility	1	5,460	1	5,460	1	5,460
	House		5,460		5,460		5,460
Director	Responsibility	4	17,616	4	17,616	4	17,616
	House		13,584		13,584		13,584
Graduates	Responsibility	45	331,020	38	319,200	38	319,200
( )	Responsibility	1	5,460				
Cashier	Responsibility	22	39,600	22	39,600	22	39,600
Regional	Responsibility			16	36,400	16	36,400
Coordinators	House				36,400		36,400
Accountants	Responsibility					1	2,400
	House						1,200
Assist Accountant	Responsibility					1	2,400

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Staffing of the Ministry of Livestock, Forestry and Range

	Minister	Director General	Director	Director	Head of Service	Executive Officers	Secretaries	Senior Officers	Junior 1/ Officers	Technical 2/ Staff I + II	Clerks	Asst. 3/ Clerks	Intermediate School Leavers	Messengers	
Scale	-	A2	A3	A4	A7	A8	A	B7/B8	B9	B10	C8/C9	C10	C11	D	
Ministry HQ	1	1	4	1	1	30	-	25	3	26	88	223	82	9	
W. Galbeed	-	-	-	-	-	-	-	-	9	2	16	10	10	21	
Toghdeer	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sanaag	-	-	-	-	-	-	-	2	-	-	15	15	1	1	
Bari	-	-	-	-	-	-	-	1	-	-	16	9	-	4	
Nugal	-	-	-	-	-	-	-	-	14	-	8	9	-	3	
Mudug	-	-	-	-	-	-	-	1	8	1	8	10	-	2	
Galgadud	-	-	-	-	-	-	-	2	7	1	17	9	1	-	
Hiran	-	-	-	-	-	1	-	3	13	2	10	18	2	4	
Middle Shebelli	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lower Shebelli	-	-	-	-	-	-	-	-	29	1	19	31	3	1	
Benadir	-	-	-	-	-	13	9	24	160	9	-	-	-	-	
Gedo	-	-	-	-	-	-	-	-	10	1	11	11	2	5	
Middle Juba	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lower Juba	-	-	-	-	-	3	-	-	10	15	17	14	3	-	
Bahool	-	-	-	-	-	-	-	-	8	-	12	4	4	-	
Bay	-	-	-	-	-	-	-	3	5	3	13	12	2	-	
TOTAL:	1	1	4	1	2	47	9	61	276	61	250	375	110	50	1248

Source: Ministry of Livestock Forestry and Range.

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Table 13

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Vaccine Production by
Serum and Vaccine Institute, Mogadishu (doses)

	1976	1977	1978
1. Anthrax Spare Vaccine	648,000	512,250	
2. Black Quarter	261,877	130,140	12,604
3. HS Vaccine	210,750	255,200	165,000
4. Bovine Paratyphoid		11,133	183
5. CBPP	1,000,200	150,050	537,500
6. CCPP		200,000	
7. Enterotoxemia Sheep			60,875
8. Fowl Typhoid			20,000
9. Rinderpest			1,000,000
10. Sheep Pox			Under preparation
11. New Castle Disease	75,000	72,000	
12. Fowl Pox			

Source: MLFR.

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Table 14

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Livestock Vaccination and Treatment Records, 1974-78

	1974	1975	1976	1977	1978
A. Vaccinations					
1. Cattle					
Rinderpest	1,021,599	1,992,797	1,131,543	468,013	482,819
CBPP	385,852	40,864	816,946	241,857	569,321
Anthrax	442,707	529,358	469,628	293,222	439,487
Black quarter	540,338	120,110	295,616	203,691	378,486
HS			141,900	408,709	
Foot & Mouth disease			30,196	2,767	
2. Sheep					
Sheep pox			321,012	-	300
CCPP			321,093	-	
B. Treatment					
Trypanosomiasis	1,430,137	1,697,994	1,822,363	932,994	885,172
Ectoparasites	12,174,127	13,794,727	9,277,057	7,864,735	11,640,981
Endoparasites	732,775	721,053	449,459	348,928	365,003
Non-specific	-	-	1,228,957	594,104	656,668
Total	14,337,039	16,204,774	12,777,836	9,740,761	13,547,824

Sources: 1974-75 Ministry of National Planning, Statistical Department
1976-78 Ministry of Livestock, Forestry & Range

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Table 15

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Issues of Some Veterinary Drugs

	1974	1975	1976	1977	1978
Pfizertox (tick control) gall.	4,695	4,454	2,983	3,560	9,279
Asuntol (tick control) kg	64	74	1	n.a.	395
BacDip (tick control) kg	-	-	-	-	2,032
Naganol (trypanosomiasis in camels) kg	653	405	827	283	561

Source: Ministry of Livestock, Forestry and Range.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Output of the Training School of Animal Science, Mogadishu

1969-1978

	69	70	71	72	73	74	75	76	77	78	Total
2-year Assistant-level Courses											
Animal Health	24	20	20	14	23	-	48	27	32	31	239
Animal Production	-	-	-	-	-	-	47	29	28	12	116
Meat Inspection	-	-	-	-	-	-	20	18	15	10	63
Laboratory Technician	-	-	-	--	-	-	22	15	10	11	58
Range Management	-	-	-	-	-	-	13	-	-	-	13
											489
1-year Junior Assistant-level Courses											
Laboratory Technicians	-	-	-	-	11	-	-	-	n.a.	n.a.	11
Range Management	-	-	-	-	73	-	-	-	n.a.	n.a.	73
Hides and Skins	-	-	-	47	-	-	-	-	n.a.	n.a.	47
											131
4-months Courses											
In-service Training	-	-	27	39	39	-	2	-	n.a.	n.a.	107
Practical Poultry Keeping	-	-	-	-	-	-	34	-	n.a.	n.a.	34
Laymen Training in Poultry and Animal Health	-	-	-	-	-	130	-	-	n.a.	n.a.	130
											271

Source: Ministry of Livestock, Forestry and Range.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Livestock Export
(000 head)

Year	Sheep		Goats		Cattle		Camel	
	Total	Saudi Arabia	Total	Saudi Arabia	Total	Saudi Arabia	Total	Saudi Arabia
1970	546	462	605	441	45	42	26	25
1971	608	513	576	451	56	44	24	23
1972	789	691	828	664	77	66	21	21
1973	709	604	675	547	68	49	29	29
1974	635	520	623	496	25	22	24	24
1975	793	623	743	615	40	39	34	34
1976	385	329	381	330	58	55	34	34
1977	461	421	442	401	54	53	35	35
1978	739	n.a.	715	n.a.	77	n.a.	22	n.a.

Source: Ministry of National Planning
LDA

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Livestock Exports
('000 So.Sh.)

Year	Sheep		Goats		Cattle		Camel		TOTAL	
	Total	Saudi Arabia	Total	Saudi Arabia	Total	Saudi Arabia	Total	Saudi Arabia	Total	Saudi Arabia
1970	43.0	37.8	41.9	33.1	15.5	14.3	19.0	19.0	119.3	104.2
1971	46.8	40.8	41.4	34.9	18.5	13.2	16.6	16.4	123.4	105.3
1972	63.0	56.6	60.5	51.1	22.3	17.6	14.7	14.7	160.5	140.0
1973	72.7	60.3	65.6	55.0	35.1	32.5	23.3	23.0	196.7	170.7
1974	92.5	82.3	78.1	72.9	21.6	21.2	30.2	30.2	222.4	206.6
1975	154.3	137.2	146.8	133.5	33.5	28.5	47.4	44.2	382.0	343.4
1976	80.9	70.7	79.0	70.3	71.9	65.3	49.4	49.3	281.2	256.1
1977	95.5	86.8	94.1	85.1	41.7	39.9	48.2	48.2	279.5	260.1
1978										

Source: Ministry of National Planning
Statistical Department

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Hides and Skins Exports

	Unit	1974		1975		1976		1977	
		Quantity	Value So.Sh.	Quantity	Value So.Sh.	Quantity	Value So.Sh.	Quantity	Value So.Sh.
Cattle	kg	414,042	2,629,911	1,000,030	6,560,979	702,558	6,615,000	18	80
Goats	no.	233,252	4,605,362	586,765	12,054,114	1,611,467	32,087,000	234,814	3,258,100
Sheep	no.	347,236	6,366,736	578,717	7,366,433	704,498	12,235,000	498,731	6,209,634
Camel	kg	-	-	11	10	20	17,418,000	-	-
Total			13,602,009		25,981,536		50,954,000		9,467,814

Source: Ministry of National Planning
Statistical Department

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Intake and Production of Kismayo Meat Factory, 1971-78

	Unit	71	72	73	74	75	76	77	78
Purchase of Cattle	'000 head	38	35	28	50	46	41	34	3
Average Liveweight	kg/head	255	242	246	216	244	242	225	n.a.
Meat Output	tons	4,076	5,560	3,127	4,766	4,923	4,455	3,217	n.a.
Tinned Products									
- Stewed Steaks	'000 tins	11,922	16,584	5,733	9,934	13,363	10,648	6,636	n.a.
- Corned Beef	'000 tins	360	207	44	1,695	1,069	508	237	n.a.
- Frozen Meat	tons	-	-	1,291	-	-	-	-	n.a.
- Meat in Gelatine	tins	-	-	-	748	-	-	28	n.a.
Sausages	tons	2.0	0.7	0.2	0.3	0.1	-	-	n.a.
Renderfat/Tallow	tons	77	153	73	94	125	77	17	n.a.
Hides	tons	379	557	336	531	420	366	256	n.a.
Meat and Bone Meal	tons	74	90	45	107	139	109	60	n.a.

Source: Kismayo Meat Factory 1978 quoted by the Arab Organization for Agric. Development report: "Rational Development of Livestock Sector in Somali Democratic Republic." Mogadishu, August 1978. 1978: Ministry of Industry.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Intake and Production of SOPRAL Meat Factory, 1971-76

	Unit	71	72	73	74	75-76
Purchases of Cattle	'000 head	56	33	19	34	13
Liveweight Purchased	tons	10,264	6,626	4,473	6,348	2,304
Average Liveweight	kg/head	185	198	234	187	183
Deboned Meat	tons	2,771	1,789	1,207	1,650	693
Cans	'000	11,235	6,657	5,072	5,439	2,053

Source: SOPRAL Meat Factory Mogadishu quoted by the Arab Organization for Agricultural Development Report: "Rational Development of Livestock Sector in Somali Democratic Republic." Mogadishu, August 1978.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

Prices for Feed Ingredients and Concentrate Feeds at the km7 Feed Plant

	1975	1977	1979
	So.Sh./100 kg		
A. Ingredients			
Maize	120	125	120
Maize Bran	75	75	75
Wheat Bran	45	45	62.50
Sesame Cake	100	130	130
Cotton Seed Cake	80	120	120
Bone & Meat Meal	100	100	150
Bone Meal	70	90	150
Blood Meal	80	80	190
Fish Meal	100	160	200
Lime ($CaCO_3$)	150	300	525
Table Salt	500	550	550
Vitaminerals	n.k.	n.k.	n.k.
B. Compound Rations			
Dairy	85	85	95
Poultry Starter	130	130	140
Poultry Layer	125	125	130
Poultry Broiler	135	135	160

Source: Ministry of Livestock, Forestry and Range 1979.

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AGRICULTURAL SECTOR REVIEW

The Livestock and Wildlife Subsector

List of Projects under the Three Year Development Plan

	Total Cost	----Financing----- Govt.	External
		---'000 So.Sh.----	
A. Ministry of Livestock, Forestry and Range			
1. Animal Health			
- Veterinary Laboratories	28	13	15
- Quarantine Stations	6	6	-
- Diagnostic Centers	5	5	-
- Parasite Treatment Centers	1	1	-
- Rinderpest Eradication	8	8	-
- Tsetse Survey and Control	40	3	37
- Animal Health Training School	6	6	-
Sub-total	94	42	52
2. Animal Production			
- Artificial Insemination	3	3	-
- Afgoi Dairy Farm	11	11	-
- Warmahan Ranch	5	5	-
- Hargeysa Dairy Farm	7	7	-
- Assura Sheep Farm	2	2	-
- Dairy and Poultry Extension	3	3	-
- Feed mill and Feedlots	3	3	-
- Feed mill	9	1	8
- Beef Fattening Complex	36	1	35
- Sheep Fattening Complex	22	1	21
Sub-total	101	37	64
3. Poultry Production			
- Poultry Farm Mogadishu km 13	3	3	-
- Broiler Complex	73	1	72
- Development of Poultry Industry	21	10	11
- Poultry Farm Hargeysa	4	4	-
- Egg Production	25	1	24
Sub-total	126	19	107
4. Livestock Marketing			
- Trans-Juba Livestock Project	30	4	26
- Hargeysa Cold Store and Abattoir	7	7	-
- Jelib Holding Ground	3	3	-
- Northern Holding Grounds	4	4	-
- Warmahan Holding Ground	7	7	-
Sub-total	51	25	26

		Total Cost	----Financing--- Govt.	External
			---'000 So.Sh.--	
5.	Range			
	- Northern Rangelands	106	32	74
	- Central Rangelands	128	42	86
	- WFP 719	17	-	17
	Sub-total	251	74	177
6.	Infrastructure			
	- Strengthening of Planning Dept.	3	1	2
	- Extension Training and Education Unit	6	6	-
	Sub-total	9	7	2
B.	Forestry (NRA)			
	- Strengthening of Forestry and Wildlife Department	3	-	3
	- 10 year Forestry Development Program	7	-	7
	- Lag Badano National Park	5	1	4
	- Charcoal Production	180	-	150
	Sub-total	195	1	194
C.	Education			
	- Livestock and Range School, Afgoi	9	3	6
	Sub-total	9	3	6
D.	Commerce			
	- Stores and Offices, Hargeysa	2	2	-
	- Hides and Skins Improvement	4	4	-
	Sub-total	6	6	-
E.	Industry			
	- Milk Plant, Mogadishu	14	14	-
	- Shoe Plant	15	15	-
	- Tannery, Mogadishu km 7	25	5	20
	- Kismayo Tannery	2	2	-
	- Animal Feed Plant	15	51	20
	Sub-total	71	51	20
	Grand Total	913	267	646

Source: Somali Democratic Republic, Three Year Development Plan, 1979-81.

ANNEX 2

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AGRICULTURAL SECTOR REVIEW

Water Resources Development

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AGRICULTURAL SECTOR REVIEW

Water Resources Development

I. INTRODUCTION

1.01 The climate of Somalia is tropical arid to semi-arid. Droughts occur frequently. Only a small part of the country has perennial sources of rface water and even the main rivers dry out at times of extreme drought. Most of the people, and the large livestock herds, depend therefore on wells and water catchments, the traditional Somali water development.

1.02 Although the data on the subject are deficient, an overall assessment of water resources and requirements indicates that Somalia is not, in fact, seriously water-short; it has adequate resources to supply its population and to sustain its major economic activities. However, water development in Somalia is expensive and must, therefore, be carefully planned and implemented.

1.03 Major water development projects started in the 1920's with irrigation schemes along the lower reaches of the Shebelli river. Recently, ambitious plans have been developed to increase the irrigated areas. However, an overall strategy for the water sector has not yet been developed. This annex attempts to review the sector and concludes with recommendations for a water development program.

II. WATER RESOURCES

A. Resources and Potential

Precipitation

2.01 Data Base. A detailed analysis and complete understanding of the rainfall pattern depends on an adequate network of rainfall stations. Unfortunately, the existing gauging stations are too few 1/ to permit such an analysis. Although some of the stations were established early this century and have been in operation almost without interruption, many others have been operating only over a relatively short time. Publications which attempt to analyze the precipitation use data collected before Independence almost exclusively since more recent records have not been published systematically. Conclusions from the older data can, futhermore, be misleading because of wide variations which have been observed. During the mission, more recent

---

1/ The UN Meteorological Organization recommends four to ten stations per 1,000 km^2, while in Somalia the density is less than one station per 10,000 km^2.

field data kept by the Meterological Service of the Civil Aviation Department were checked but they were, unfortunately, irregular and often illegible. It is not surprising, therefore, that quite different data for one and the same station are presented in various recent reports.

2.02 While it would be desirable to have more rainfall gauging stations (and meteorological stations recording additional essential data), the most urgent task should be to improve the data collection and evaluation systems themselves. Without such an improvement doubts will remain about the validity of any information collected.

2.03 Rainfall Distribution. Somalia is arid to semi-arid. Areas in the south between the Juba and Shebelli rivers and in the mountainous region of the north have relatively high rainfall, receiving just slightly more than 500 mm annually. The lowest rainfall occurs along the narrow northern coastal plain with a recorded annual average of less than 100 mm. Most of the country receives between 200 and 400 mm annually.

2.04 Seasonal Pattern. The rainfall data show clearly two seasonal peaks: the Gu season from April to June and the Der season from September to November. In the coastal region the two rainy seasons are linked by the minor "Hagi" rains which fall in July and August. Further inland, for example at the Baidoa and Belet Uen stations, the two rainy seasons are clearly separated by the dry months during which there is usually no precipitation at all. In most southern stations the rainfall during the Gu season yields more than 50% of the total annual precipitation while the northern stations record a more balanced rainfall during the two seasons. Available rainfall data do not reflect recent droughts nor do they indicate any general probability of drought occurence. Table 1.1 shows that during the main recent drought years 1973-75, the annual rainfall in Baidoa, Hargeysa, Mogadishu, Kismayo and Belet Uen was below the mean annual rainfall, but in Obbia and Galcaio, the station closest to the main drought region in the north, rainfall in 1973 was above the mean. Galcaio and Belet Uen recorded rainfall for 1974 and for the following years much lower, while stations like Hargeysa and Kismayo recorded above average rainfall in 1975.

2.05 Rainfall in Somalia can be generally characterized as very erratic. Tremendous variations occur from month to month (Tables 1.3 to 1.5), from year to year, and from place to place. Parts of the country may be hit by drought while others receive above average rainfall. For rainfed agriculture, the erratic pattern of precipitation is critical since a short Gu season leads to crop failures, while well distributed Hagi rains will increase the chances of an above average crop.

Surface Water

2.06 Data Base. Since 1951, water levels in the Shebelli and Juba rivers have been recorded continuously at eleven locations within Somali territory. However, gaps exist for some periods and stations, affecting the validity of the records and are, unfortunately, most frequent in recent years. As in the

case of rainfall records, the quality of these records is not satisfactory. There are references to earlier records but no data are available in the Hydrology Department of the Ministry of Agriculture. There is a complete absence of data on the small permanent and non-permanent rivers in the northern mountain range but numerous small perennial streams are said to exist in some areas 1/. The Hydrology Department of the Ministry of Agriculture has no records on these streams.

2.07 Stream flow measurements on the Shebelli and Juba rivers were begun in 1965. Rating curves have been established for several stations along the Shebelli and four stations along the Juba. Flow measurements for the Shebelli river stations have been carried out over the full range of water levels including flood stage. Some checks were made in 1972 and 1973 and showed only minor rating shifts. For the Juba river, the situation is different. Flow measurements have been carried out only up to a flow of about 300 m^3/s, corresponding to less than half the peak annual flow. Since the flow rating curves had to be extrapolated for planning water development on the Juba river, different assumptions were made, but unfortunately no further measurements were taken to back them up. Measurements over the full range of water levels are considered essential for the future development of the Juba river, and they are especially important for evaluating and designing the proposed Bardera dam.

2.08 The Shebelli River. About two-thirds of the catchment basin of the Shebelli river is in Ethiopia; the catchment area above Belet Uen near the Somali-Ethiopian border is about 212,000 km^2, the total amounts to about 300,000 km^2. However, the catchment area within Somalia, along the river's 1,000 km course does not contribute any significant flow. The Shebelli river flow shows two flood periods, during the Gu and during the Der. The Gu floods begin towards the latter part of April peaking in May at the time of the heaviest rains in the upper catchment area. The floods recede in June and are followed by low flow in July. The Der season floods start in August, peaking in September and October after which the flow falls off to lows in February and March.

2.09 The flow of the Shebelli river decreases along its course in Somalia as shown in the following annual flow records 2/:

1/ During the mission, residents in the Erigavo area reported that there existed about 40 perennial streams in their region.

2/ See detailed data, in Appendix 2.

Mean Annual Flow 1951-78
(billion m^3)

Station	Catchment Area (km^2)	Maximum	Minimum	Mean
Belet Uen	212,000	3.20	1.09	2.09
Afgoi	278,000	2.00	0.75	1.46

The losses between Belet Uen and Afgoi are due to seepage, flood spills, evaporation and consumption for irrigation. No measurement has been made which would allow any reasonably accurate estimate of the abstraction of river water.

2.10 Flood spillage occurs frequently along the upper course of the Shebelli in Somalia. In wet years there are also floods along the lower reaches of the river, connecting it occasionally to the lower Juba river. Normally, however, the Shebelli ends in a marshy area just north of the lower Juba flood plains. Droughts affect the river flow strongly. During extremely dry years the Shebelli river has been known to dry up in certain reaches at the end of the Der season. The 1974 drought also led to a significant flow reduction, but not as much as in previous years (1952 and 1955), although it was one of the most serious droughts recorded over large parts of Africa. It is interesting to note that the Belet Uen records show practically no difference in mean flow for the periods 1951-72 and 1951-78, while the Afgoi records show a higher mean flow for the period up to 1978.

Mean Annual Flow

Station	1951-72	1951-78
	m^3/s	
Belet Uen	68.6	68.3
Afgoi	44.5	46.1

These data tend to confirm the overall validity of the long term records.

2.11 There is an estimated 120,000 ha of irrigable land along the Shebelli, but such a large area could only be irrigated if the highly variable river flow were regulated.

2.12 Water balances have been calculated for the Somalia reach of the Shebelli river. However, these calculations cannot be taken as accurate since they were based on estimates of the extent of the irrigated areas, the abstraction rate of irrigation water and the irrigation efficiency and there is no agreed base for such estimates as yet.

2.13 Juba River. There are many similarities between the Juba and the Shebelli rivers. As in the case of the Shebelli, the larger part of the Juba river basin, about 180,000 km^2, is in Ethiopia upstream of Lugh Genana, the Somalian station closest to the Ethiopia border; the catchment area within Somalia does not contribute any significant flow. The annual peak flows occur during the Gu and Der seasons and in extremely dry years the Juba river also dries out, although less frequently than the Shebelli river. The annual flow at Lugh Genana has been established as follows:

Station	Annual Flow 1951-78		
	Minimum	Maximum	Mean
	---------m^3 billion-------		
Lugh Genana	3.5	8.5	6.1

Peak floods have been estimated from the very limited data by various consultants. They are of critical importance to the design and the cost estimation of the proposed Bardera dam project. The unusual range of the estimates can be seen in the following Table:

Consultants	Year	Project	Design Flood	Return Period Assumed
			----m^3/s----	
Selchozprom-Export	1973	Bardera	1,900	100 years
Technical	1977/79	Bardera	2,550	1,000 years
		Bardera	3,100	10,000 years
MMP	1978	Saakow	4,000-12,000	10,000 years

Precise data are urgently needed for a project of the magnitude of the Bardera dam and instead of further attempts to refine or adjust these estimates, actual flows measurements should be made.

2.14 Floods occur frequently; on average the river spills over its banks every five years since the channel capacity is limited to about 700 m^3/s, and flows of 1,200 m^3/s have a probability of 20%. The most serious damage usually occurs in the flood plains of the lower reaches where most banana plantations are located, but there are no data available on the precise extent of the floods or the losses they cause. Droughts are reflected in low flows. The annual flow during the 1974 drought dropped to 3.7 billion m^3 (vs. a mean flow of 6.1 billion m^3). But comparison of the 1951-73 and 1951-78 flow records shows, as in the case of the Shebelli river, that there was no significant change in the mean long-range data.

Station	Mean Annual Flow 1951-73	1951-78
	---m^3 billion---	
Lugh Genana	6.25	6.07

However, the records of the Lugh Genana station show a five-year period of low flows from 1962-1966. The duration of this low flow period is of importance for the long-range water development plans and must be taken into consideration during the preparation of any new project. Water quality is higher for the Juba than for the Shebelli. Salinity values increase after the lowest flow periods, but rarely exceed 800 mmhos for periods of more than a few weeks.

2.15 The net irrigable area in the Juba basin has been estimated at about 221,500 ha. While this figure has been questioned, it is not as important as the difference of opinion about the extent of class I and II soils (para. 5.12). More precise investigation of the land resource is especially needed; the extent of irrigable land may be the major constraint on future development and not the availability of water as in the case of the Shebelli river.

Groundwater

2.16 Data Base. In most regions of Somalia both humans and livestock depend on supplies of groundwater. Information on this resource is, however, very limited. The United Nations published an inventory of groundwater resources in 1973 which provides a global survey of the groundwater conditions in Somalia generally. Local studies have been carried out by various consulting firms and in 1978 James H. Johnson, a consultant hydrogeologist, carried out a conceptual review of Somalia's groundwater resources for FAO. The very limited nature of information on groundwater is illustrated by the fact that soil and water conditions are known for only about 60 to 70 boreholes in a territory of 640,000 km^2, or one borehole per million ha. Existing studies of Somalia's groundwater resources are basically conceptual, reflecting professional opinions and judgements. They do not provide adequate information for planning purposes.

2.17 General Geology. The northern mountain range of Somalia consists of metamorphic crystalline rocks, basalt and, in the central third of the mountain range, of sediments. Numerous valleys and alluvial plains exist within this mountainous area. The remainder of Somalia consists of a broad basin complex. The northern sector is called the northern Ogaden sub-basin, and the southern sector the Baidoa sub-basin. A small sub-basin also exists in the Wadi Giohel area, called the Darror depression sub-basin. The Baidoa sub-basin has a distinct hydrogeological regime, but is part of the same sedimentary sequence. The major geological structure is a long coastal fault which affects not only the underflow regimes of the basin but also the underflow regimes of the alluvial deposits which cross it.

2.18 Hydrogeological Regions. The country has been divided into five hydrogeological regions corresponding to geological structure.

(a) The northern mountains with their alluvial valleys including the coastal plain and the sloping southern plain area;

(b) The Ogaden basin, the northern Ogaden sub-basin, the Darror depression sub-basin and the Baidoa sub-basin;

(c) The Bur area;

(d) The unconsolidated sediments and alluvial systems;

(e) The areas which could contain structural aquifers.

The location, characteristics and groundwater potential of these hydrogeological regions is presented in the Appendix. In a recent review of the potential aquifers 1/ the possibilities of the main regions were summarized as follows:

The Mountainous Area: Good aquifer potential is expected in the accessible areas of the lower slopes of the consolidated sediments where the aquifers should be unconfined but deep (yields should be high especially from the structurally affected limestone or dolomite areas) and in the Sloping Plain and the isolated inter-mountain alluvial areas. The potential is considered poor in the crystalline rock area and along the coastal plain, although there could be some local potential near zones of major runoff. The Northern Ogaden Sub-Basin and the Darror Depression Sub-Basin: excellent aquifer potential is expected in (i) the intake or recharge beds which encompass the unconfined aquifers in the upper Tub Der alluvials of Burao region and in the sediments of the Erigavo region, (ii) the intake beds which form the perimetre of the Darror Depression Sub-Basin; and (iii) the Jessoma sandstones near Bulo Burti and Belet Uen, or in those localities where recharge could be drawn from the Shebelli river. The potential for irrigation water from the consolidated subartesian aquifers is considered poor. In these zones the aquifer is confined and transmissivities are low, giving relatively small yields with significant pumping drawdowns. For stock and domestic purposes the potential is good, but boreholes would have to be highly efficient to obtain the necessary yields with an acceptable pumping drawdown. The Baidoa Basin: good aquifer potential is expected in the basin's intake beds. Water levels will be shallow, of the order of 3m, and pumping drawdowns acceptable, 1.5m at 12-15 l/sec. This is an attrative development proposition since the producing aquifer could be developed by hand dug wells. Although the remainder of the basin has good stock and domestic water supply potential, irrigation would be restricted by the deep water levels

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1/ Johnson, FAO, 1978.

and the expected drawdowns in the basin's artesian aquifer. Further to the west, a shallow saline aquifer occurs and high pumping rates would certainly cause aquifer leakage and a deterioration of water quality. The Bur Area: like the crystalline rocks of the mountainous zone, this basement complex has little potential either for irrigation, stock or domestic purposes. However, the numerous broad sandy stream beds have a high storage potential and hold a considerable volume of water. Being situated in one of the highest and most reliable rainfall areas, yearly recharge to these stream bed sands is assured. An imaginative scheme could well put these waters to use. Its quality is good and development of the sands by installation of screened well points would be a simple matter. The Alluvial System: these systems have been recognized on images produced by satellite but they are otherwise uninvestigated and, except for the Shebelli alluvials, undeveloped. Opinions of their potential are based on the lithology of the catchment rocks, the potential for recharge and fragmentary evidence gathered from the literature, past reports and discussion with drillers and geologists. Excellent potential could exist in the Uadi Giohel system, (but this is simply a professional judgement -- there is no hard evidence) and in the upper Tug Der system. In this case data from Burao and, indirectly, results from the Hargeysa region, support the opinion. High yields have yet to be established, but the aquifer transmissivity will increase higher up the catchment. Good, possibly excellent, potential may exist in: (i) the Erigavo-Gardo system - again there is no quantitative evidence, and qualitative evidence is not strong but if general observations are correct, the system could have a good, though localized, potential; (ii) the lower Tug Der-Nogal valley system. Data is almost entirely lacking, but observations of upstream potential and downstream potable water springs suggests a downstream extension of the upper Tug Der potential; and (iii) the upper Galcaio area where there is an obvious reduction in the contamination from surface gypsum. This appears to be the major ancestral alluvial system of the region and some early reconnaisance is warranted. Poor potential is expected in: (i) the lower Galcaio system (although the central Galcaio system could have water suitable for irrigation, but high in sulphate); (ii) the Dusa Mareb system; (iii) the Juba River alluvials. In areas with Structural Aquifers, geological structures look promising, particularly in zones where water could accumulate under favorable hydro-geological conditions.

2.19 Conclusions and Recommendations. Groundwater surveys have been carried out which indicate that some regions of the country have a good potential for groundwater development even for irrigation. Unfortunately, no detailed investigations have been conducted in these areas. Very few wells exist, and in most cases, no data are available on installation, soil strata, water quantity and quality, or the long-term behavior of the ground-water aquifer. The first action which is necessary, therefore, to assure economic exploitation of groundwater resources, is an exploratory drilling program for the areas defined as having an excellent or good potential.

2.20 Major efforts in well drilling have so far been devoted to constructing wells in areas where the need for water supply was most pressing. While the desirability of this goal is not disputed, some funds should be made available for more detailed field work in the most promising hydrogeological regions, i.e., the alluvial sub-regions of the Wadi Giohel system, the Erigavo-Gardo system, and Tug Der - Wadi Nogal system. Unless this work is done, the groundwater potential for irrigation will remain uncertain. Government agrees with this recommendation, but has been unable to follow-up due to lack of professional staff. It is hoped that current bilateral and multilateral aid programs (German and French) will alleviate this constraint. If detailed groundwater exploration is carried out with a view to possible irrigation, the soils should also be investigated. Although the alluvial soils do appear to be generally suitable for irrigated agriculture, salinity or water logging may pose local problems and prevent an economically sound exploitation of groundwater.

2.21 The Shebelli river alluvials are already being developed at what could be considered an alarming rate, in view of the lack of knowledge about the system and the potential quality hazards. A properly planned investigation is overdue; rational development and good management could make these alluvials the most important aquifer in the country. Unplanned development and bad management could destroy it, the greatest danger being invasion of inferior marginal waters, waters from deeper strata and possibly even sea water intrusion in certain areas. The coastal dune sands are an important stock and domestic water source, though flouride content is high for the latter purpose. Nitrates could also be high due to surface contamination. The coastal sands at Mogadishu warrant some study, and reconnaissance for other sandbeds is suggested.

2.22 It is recommended that the overall groundwater development program for Somalia be planned in the light of what are the most urgent needs as well as where the most promising potential exists. While most funds will undoubtedly continue to be needed for well drilling to satisfy human and livestock water requirements, some funds should be devoted to careful exploration of the aquifers in regions with good potential. In practice, it should be possible to carry out some drilling in the above-mentioned areas for a few months a year between drilling for water supply. Careful supervision of the drilling operation by qualified hydrogeologists or groundwater engineers would be vital. Such professional supervision is frequently lacking; expensise exploration work is undertaken, and the information resulting from it, which is needed for a rational large-scale water development program, goes unrecorded and is lost.

B. Water Availability and Requirements

2.23 The average annual surface water flow and the average annual precipitation in the main region are summarized in the following table:

Region	Area	Population	Precipitation	Precipitation	Flow
	-km^2-	---'000---	-----mm------	--------m^3 millions---------	
Northwest	86,000	698	300	25,800	-
Northeast	174,000	386	150	26,100	-
Central	113,000	397	150	16,950	-
Shebelli River	82,000	1,188	350	28,700	2,090
Juba River	116,000	651	350	40,600	6,066
Inter-riverine	66,000	402	400	26,400	-
TOTAL	637,000	3,722	250	164,550	8,156

2.24 Unfortunately, there are no data on surface runoff, infiltration of rainfall or recharge of groundwater over larger regions. The information available is too limited to yield a reasonable estimate of the percentage of precipitation which goes to runoff or groundwater recharge. As shown above, precipitation is lowest in the Central Region, while the Juba Region is the most favored area. An estimate of the actual water availability in various regions, however, can only be made when the water requirements are known.

2.25 Water Requirements. The water requirements of the urban and rural populations are not known. Even the most recent WHO/IBRD Water Supply and Sewereage Sector Study of 1977 does not give any information on this. In order to establish the water availability in the main regions and to identify the areas of greatest needs, working estimates have been made and are summarized in the Table on page 11.

2.26 Assuming that the flows of the Shebelli and Juba rivers were reserved for irrigation, water supply for human and livestock consumption would have to come from groundwater. In reality, most settlements depend on groundwater wells, while water for livestock is often provided by surface catchments. Comparison of the annual volume of rainfall with human and

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1/ Rough estimates based on incomplete data.

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Water Requirements

Region	Area (km^2)	Population			Livestock Water Requirements ($1,000\ m^3$/year)	Irrigation Water Requirements ($1,000\ m^3$/year)	Total Water Requirements ($1,000\ m^3$/year)
		Number	Water 1cd[1/]	Requirements ($1,000\ m^3$/year)			
Northwest	86,000	698,000	30	7,643	12,375	--	20,018
Northeast	174,000	386,000	20	2,643	8,356	--	11,174
Central	113,000	397,000	15	2,174	13,820	--	15,994
Shebelle	82,000	1,188,000	40	17,345	18,189	757,130	792,664
Juba River	116,000	651,000	30	4,752	18,197	209,400	232,349
Interriverine	66,000	402,000	20	2,935	7,270	--	10,205
TOTAL	637,000	3,722,000		37,492	78,207	966,530	1,082,604

1/ Liters per capita and day; rough estimate based on overall water availability and percentage of population urbanized.

livestock water requirements shows that not more than 0.05 to 0.1% of the rainfall volume is required. It can safely be assumed that groundwater recharge and the possible catchment of surface water run-off amounts to a considerably higher percentage, so that even increased future demands should be satisfied without major difficulty. The uneven distribution of groundwater is likely to cause local water shortages, but there is not reason to think that Somalia should resort to such solutions as large-scale water desalination efforts despite the general aridity of the country. On the contrary, all the data indicate that there are adequate supplies of groundwater to satisfy both human and livestock requirements for the foreseeable future.

III. INSTITUTIONAL FRAMEWORK AND MANPOWER

A. Government Institutions for Water Development

3.01 The Ministries of Mineral and Water Resources, and of Agriculture share principal responsibility for water development activities. At the same time, the Ministry of Industry is also involved in water development through the irrigated sugar plantations, and the Ministry of Livestock through well-drilling programs for livestock water supply. The Water Development Agency is in charge of groundwater development for domestic water supply, and, independent Water Supply Agencies have been created for the cities of Mogadishu and Kismayo and others will be created as soon as municipal systems have been constructed in other towns. These agencies supply and distribute water coming almost exclusively from groundwater exploitation. The Livestock Development Agency and the National Range Agency are both committed to well drilling programs for human and livestock water supply. Finally, the Settlement Agency and the Banana Board also deal with some irrigation projects.

3.02 The Hydrogeological Department of the Ministry of Mineral and Water Resources was established in 1978 and is responsible for hydrogeological studies, data collection and research in the field of groundwater development, formulation and implementation of groundwater exploration projects, and preparation of legislation. The department is still in its infancy; of 57 positions allocated, only four have been filled. Although other Government institutions are also seriously understaffed, this is one of the most striking cases.

3.03 The Water Development Agency (WDA) was established in 1971 as an independent agency under the supervision of the Minister of Mineral and Water Resources. Its main responsibilities are to investigate water resources, construct water supply and distribution systems, to conduct research and studies of water resources, prepare plans and programs and to execute projects relating to water resources. The overlapping responsibilities of the Hydrogeological Department of the Ministry and WDA are obvious. In practice, WDA devotes its resources exclusively to well-drilling and the construction

of water supply systems, while the very limited resources of the Hydrogeological Department of the Ministry are used for the exploration of groundwater aquifers. While this exploration is a very urgent task, the formulation and supervision of a national groundwater development program is even more so, and at present, completely lacking. While WDA or the Ministry of National Planning could assume responsibility for this, it would be more logical for the Ministry to do so. At present, the specialized technical agencies dealing with groundwater development plan and implement their own projects and there is, consequently, no single institution directing or supervising groundwater development. Monitoring and evaluation of projects and even of individual wells is practically non-existent.

3.04 Surface water development activities are in a similar situation. The Department of Land and Water Resources of the Ministry of Agriculture is responsible for investigation, project preparation and supervision; it is seriously under staffed. The multiplicity of institutions involved in water development generally leads to a waste of planning effort, as evidenced by the numerous projects which overlap each other, and the construction of irrigation schemes that make unrealistic demands on available flows.

3.05 The Ministry of National Planning has been mentioned as an institution which could possibly coordinate and direct the various ongoing activities. While this may be adequate for directing and supervising projects, the specific problems of water development projects, especially the allocation of water resources, could hardly be handled by a Ministry responsible for planning the whole economy, and which is seriously understaffed.

3.06 Because of the problems which exist and which will surely become more serious in the future, an agency should be established or an existing agency should be designated which would have the exclusive authority to allocate water, to coordinate and supervise the planning and implementation of water related projects, and to monitor water use. Naturally, such an agency would have to operate in close collaboration with the implementing agencies; one practical solution would be the creation of an advisory committee representing all interested ministries and agencies.

B. Manpower and Training

3.07 Until recently no engineering faculty existed in Somalia; all engineers were educated abroad. In 1973, the Engineering Faculty of the University of Mogadishu was created 1/ and the first 30 students were enrolled. Over the following years, 60 students were admitted annually to the Faculty, and in

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1/ Supported by an Italian Aid project which supplies almost all professors; courses are given exclusively in Italian.

1978, the first group of students graduated from the University. There are two main problems which deserve attention. Firstly, the number of students trained appears to be grossly inadequate for the needs of the country. The demand for engineers, and possible actions such as enlargement of the Faculty or provision of more training abroad to meet it, should be evaluated as soon as possible. Secondly, half of the students are trained in industrial engineering; the other half in civil engineering. Considering the country's need for infrastructural development, a greater proportion of civil engineering students would seem more appropriate. This question, which highlights the more general need for manpower planning could be dealt with under the proposed study of training needs. Neither the university nor any government agency provides specialized training in hydrology, hydraulics, irrigation or water supply although sme is provided under bilateral aid projects. The main emphasis, however, has so far been on groundwater development and the need for further assistance is great.

3.08 The training of drillers, pump operators, irrigation technicians and mechanics is inadequate. Although several aid projects have been devoted to vocational training, all sources in Somalia confirmed that the lack of trained manpower is hampering the implementation of all water resource development projects. The migration of trained people to the oil producing neighboring countries aggravates the situation. Remedial measures are urgently needed; they should include wider training programs, larger training components in water development projects and a determined effort to reduce migration.

C. Support Institutions

3.09 The general weakness of the main institutions dealing with water resource development is unfortunately also noticeable in the Geological Department of the Ministry of Mineral and Water Resources and the Meteorological Service of the Civil Aviation Agency which could, theoretically, lend valuable support to water development efforts. They are plagued by a shortage of qualified personnel, however, and are unable to meet their primary responsibilities adequately. Similarly, the Agricultural Research Institute and the Department of Production and Extension of the Ministry of Agriculture, which should be able to provide assistance for the development and management of irrigation schemes, have devoted no resources at all to these activities and have no staff with relevant experience. Equally, the official credit institution, the Somali Development Bank, is not geared to offer any assistance to irrigation development.

IV. GOVERNMENT POLICY AND REGULATIONS

A. Development Objectives

4.01 In the Three Year Development Plan (TYDP) 1979-1981, the Government spelled out its main objectives for the development of the agricultural sector. They are:

(i) to increase farm productivity and incomes so as to raise the rural standard of living;

(ii) to accelerate the drive towards self-sufficiency in basic foodstuffs, and increase production of other crops in order to reduce imports of agricultural produce;

(iii) to improve rural nutritional standards through increased production and consumption of pulses, vegetables and fruits;

(iv) to diversify the agricultural economy through increased production for domestic consumption, import substitution, and the development of agro-industry.

4.02 Continuing heavy investment in major irrigation works is seen as indispensible in the TYDP, since low and erratic rainfall is considered to be the greatest natural limiting factor on higher and more regular production. The TYDP states that this investment must be accompanied by other investments to ensure intensive cultivation leading to the highest possible economic yields and returns. Specifically, the TYDP states that irrigation projects are to be given high priority, though some of them will not be completed in the Plan period; that implementation of the Bardera Reservoir, Sakow Agricultural Development and Fanole Multi-Purpose Projects, all capital-intensive, will start in this period; they are prerequisites to long-term agricultural development. The Bardera Reservoir Project is scheduled to be implemented only partially during the plan period; major works are scheduled for the next medium-term plan. The Sakow Agricultural Development Project is intended to be implemented on an area of about 5,000 ha during the period; the total area at full development will be 31,000 ha. And, finally, the Fanole Multi-Purpose Project will be intensified and production benefits may be expected in the Program period.

4.03 Although the general objectives for agricultural development are uncontentious, the emphasis on heavy capital investment in new irrigation projects is not consistent with the general objectives. The new projects will need a long implementation period and benefits cannot be expected in the near future. The existing projects show low yields, are far rom offering reasonable economic returns and farmers and state corporations are unable or unwilling to maintain them. It can hardly be expected, therefore, that the new schemes, cultivated by less experienced farmers, will produce better returns.

Consequently, the main emphasis should be placed on rehabilitation of existing schemes in order to obtain higher returns from the available irrigation infrastructure. Farmers and state corporations should receive technical assistance and the necessary inputs to utilize the existing irrigation schemes fully. When these goals have been achieved, or when reasonable progress has been made in this direction, horizontal expansion of irrigation would be justified and feasible. Only this sequence - rehabilitation, studies and new investment - can result in fulfillment of the Plan's objectives in an economical way.

B. Water Laws and Regulations

4.05 Until Independence the legal system of Somalia including water legislation derived from Italian and the British legislation. At the same time, Islamic and Somali customary water law also applied, particularly in rural areas. After Independence, a new and consolidated water law was enacted 1/ which repealed all former Italian and British legislation. This law was in turn repealed in February 1971 in favor of a new law establishing a Water Development Agency to replace the Mogadishu Water Agency and the administration created under the Law of 1966. As a result, there is no longer any legislation specifically concerning water. Some attempts have been made since to enact a water law 2/ but at present only the following are in force: (i) the first charter of the Constitution (1969); (ii) the law of 1971 establishing the Water Development Agency; and (iii) a decree of April 20, 1963, containing provisions for a better use of cultivable lands and irrigation waters.

4.06 State law is based on Islamic law which prohibits private ownership of large bodies of water, rivers and streams. Rain water collected on private property, however, and water from springs and wells can be appropriated by individuals but its use is governed by Islamic and Somali customary law, according to which the right to use water is acquired with the land where it is found or through Government permit, authorization or concession. The Water Law of 1966 stated that a water use permit had to be obtained and a water rate had to be paid for any use of water exceeding a certain amount, to be determined by the competent authority. 3/ For occasional water use, such as animal watering, no permit is required but a fee may be charged (para 4.08).

4.07 The enactment of a water law deserves high priority. The lack of such a law is not in itself an impediment to orderly water development provided the Government implements and controls all water development investments, but if it does not, then private activities and investments may

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1/ Law No. 13 of August 1, 1966.

2/ See Draft Water Law. Appendix IV.

3/ No regulation appears to have been issued.

proceed without regard to the common interest in the absence of legislation. If the Government intends to encourage private investment in the irrigation sector, the acquisition of water rights, limits to the use of water, and obligations to pay adequate fees must be defined. Furthermore, Government agencies representing different interests often compete openly for the use of natural resources such as water. Without legislation, disorderly water development and disregard of the common interest is a much greater danger, especially in a country where water is so scarce.

C. Water Charges

4.08 Islamic and Somali customary water laws accord not only the right to use water on land where it is found or collected but, traditionally, the further right to sell the water. Water catchments, wells and cisterns have been built all over the country to supply water for human and animal consumption. Fees charged vary from region to region and depend on the type of water supply system (wells or rain water catchments). For the watering of animals, fees are usually determined per watering and vary according to the type of animal. They range roughly between So.Sh. 0.50 for the watering of a camel and So.Sh. 0.05 for the watering of a sheep or goat.

4.09 Water supply systems built by WDA are handed over to the appropriate municipal administrations but the Agency can determine the cost of the water facilities, charge these costs to the local administration and promote the reimbursement of loans obtained from the State, Public Agencies and national and foreign credit institutions. 1/ A national water tariff policy has not been established. The existing water tariffs are determined by the communities which own the water supply facilities.

4.10 No direct water charges are levied on the use of water for irrigation. However, the land tax on irrigated land is about twice the amount levied on rainfed agricultural land.

4.11 Based on the traditional system of water charges for livestock watering, attempts have been made to recover the full cost of public investments in water supply systems (e.g. IDA Credit for Bay Region Agricultural Development Project). Government appears to support this objective which has to be seen in connection with the objective of providing an adequate number of watering poins to avoid overstocking of certain areas.

4.12 Many farmers who depend on the two major rivers face frequent shortages of water, making a more rational distribution and better use of irrigation water necessary. One of the measures which should be seriously

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1/ Law No. 28 of February 20, 1971, establishing the Water Development Agency.

considered is the introduction of water tariffs. In the long run, volumetric water charges appear to be one of the most effective ways to achieve better water utilization practices consistent with Government development goals for irrigated agriculture.

V. EXISTING AND PROPOSED WATER DEVELOPMENT

A. Surface Water Development

Background

5.01 Flood irrigation is a tradition along the major rivers and wadis (tugs). Flood water spilling over the river banks provides one thorough irrigation allowing successful cultivation of deep rooting annual crops. The main crops presently grown under these conditions are sesame, maize, sorghum, cotton and legumes.

5.02 Controlled irrigation was introduced in Somalia around 1920 through the establishment of major plantations. In 1926 the Genale barrage on the Shebelli river was completed, dominating about 30,000 ha. The area was originally used for cotton cultivation, but later, when pests could not be controlled, it was turned into banana plantations. A second barrage was built later further upstream at Jowhar, mainly for sugar cultivation. The original area of 10,000 ha has gradually decreased to about 6,000 ha due to increasing salinity. In addition to these major projects, many pump schemes have been constructed along the Shebelli, and further projects are planned, overcommitting the flow of the river. Controlled irrigation in the Juba basin started later and still covers a much smaller area, mainly in the lower flood plains. The Juba could support a much larger irrigated area but it would require expensive regulation works.

5.03 Numerous small irrigated schemes exist in the northern part of the country where farmers built diversions on small streams, often irrigating not more than a few hectares. Vegetables and fruits for local markets are predominantly grown in these areas.

Shebelli River Development

5.04 Although the flow of the Shebelli is almost exclusively used for irrigation, the precise extent of the irrigated area in the river basin is not known, since a detailed survey has never been carried out. The irrigated area has been variously estimated in several reports, the latest (MMP 1978) showing a total 38,675 ha. Because of the wide variations in the quantity and the quality of water available from the Shebelli, the extent to which the irrigated areas could be expanded has been disputed. Many projects have been proposed and a number are presently under construction but a review of the irrigation requirements of present and proposed projects in relation to the available river flow is urgently called for.

5.05 Both the Shebelli and the Juba rivers originate in Ethiopia and any major development in Somalia must consider what the development potential is there. In the case of the Shebelli river, Ethiopia could withdraw water in the higher reaches for irrigation development which would reduce the flow presently available in Somalia. Although no firm plans are known for such a development in Ethiopia, this possibility is a reason for caution when drawing up major plans in the lower part of the river basin.

5.06 Irrigation Projects. Present and proposed irrigation areas along the Shebelli as presented in the latest consultant report (MMP 1978) are shown in Table 5.1.

(a) Jalalagsi Reach

A sisal project has been proposed on an area of 400 ha.

(b) Jowhar Reach

The Jowhar Sugar Estate presently covers an area of 6,200 ha, but only 4,850 ha are cultivated because of drainage problems. Rehabilitation and expansion to a total area of 7,800 ha have been proposed. Besides the Jowhar Sugar Estate, some smaller projects exist in the Jowhar reach: a 100 ha Rice Farm, an Egyptian/Somali Farm upstream of Mahadday Uen (100 ha) and the Jowhar Crash Program (120 ha). A previously reported expansion to a total of 1,250 ha has been assumed in Table 5.1.

(c) Balad - Audegle

The Balad Cotton Scheme, supported by North Korea and presently irrigating 1,000 ha, is to be expanded first to 4,000 ha, and finally to 10,000 ha gross. It will be irrigated by a barrage, currently under construction. In the Afgoi - Mordile Pump Scheme, 1,500 ha are presently irrigated. An increase of the area which includes the adjacent Crash Program Farm (Libsoma) to a total of 4,000 ha has been proposed. Along this reach of the river there are many small pump schemes, for which only rough estimates are available. MMP assumes that the present 6,630 ha under irrigation could be increased to 8,900 ha with the existing installed pumping capacity.

(d) Genale - Bulo Mererta

About 21,000 ha are irrigated in this area; the main crops are maize, sesame and bananas. It has been proposed to expand this area to about 25,000 ha to include a Grapefruit Production Project (1,385 ha) and the Qoryoley Project (4,000 ha).

Table 5.1 Present and Proposed Irrigated Areas on the Shebelle Flood Plain

		Present (ha)				Proposed (ha)			
Area	Crop	Gu	Der	Perennial	Total	Gu	Der	Perennial	Total
Jalalagsi	Sisal							400	400
Jowhar	Maize	210	50			625			
	Groundnuts	100				425			
	Cotton		100				425		
	Paddy Rice		50				415		
	Sesame		120				410		
	Pulses					200			
					320				1,250
Jowhar Sugar	Sugarcane			6,150				7,750	
	Citrus			50				50	
					6,200				7,800
Total above Jowhar		310	320	6,200	6,520	1,250	1,250	8,200	9,450
Balad Cotton	Maize	360				2,380			
	Cotton		700				5,600		
	Sesame		300				2,400		
					1,000				8,000
Balad to Audegle	Maize	3,500	1,000			4,500	1,250		
	Sesame		3,500				4,500		
	Pulses/Vegetables	1,500	500			2,000	750		
	Cotton		1,200				1,500		
	Bananas			350				350	
	Citrus			80				150	
	Miscellaneous							400	
					6,630				8,900
Afgoi/Mordille	Maize	804				2,140			
	Groundnuts	536				1,430			
	Upland Rice	160	320			430	860		
	Sesame		320				860		
					1,500				4,000
Genale/Bulo Mererta	Maize	16,090	6,640			15,357	6,823		
	Sesame		9,450				9,524		
	Upland Rice	500				1,293	793		
	Bananas			4,065				4,650	
	Citrus			200				1,585	
	Miscellaneous			105				105	
	Cotton						1,387		
	Forage					793			
					20,960				24,867
Kurten Waareg	Maize	340				1,800	600		
	Upland Rice	30	185				1,200		
	Pulses					600			
	Sesame		185				600		
	Bananas			30					
	Miscellaneous			165					
					565				2,400
Sablaale	Maize	320				1,800	600		
	Pulses	220	150			600			
	Paddy Rice	50	220				1,200		
	Sesame		440				600		
	Sorghum	220							
	Bananas			30					
	Miscellaneous			160					
					1,000				2,400
Haaway	Maize	200				2,500			
	Paddy Rice		500				5,000		
					500				5,000
Total below Jowhar		24,830	25,510	5,185	32,135	38,123	46,047	7,240	55,567
GRAND TOTAL		25,140	25,930	11,385	38,675	39,373	47,297	15,440	65,017

SOURCE: MMP 1978

(e) Falkerow - Haaway

The Kurten Waarey and Sablaale Settlement Projects presently irrigate 1,565 ha. The original plan of irrigating 20,000 ha was cut back to 6,000 ha gross because of limited water availability. The Haaway Paddy Rice Project on 500 ha is planned ultimately to cover 5,000 ha.

5.07 Water requirements for present and proposed projects along the Shebelli were estimated by MMP (1978). Assuming evapotranspiration according to the Penman method, crop coefficients according to FAO (1975), effective rainfall according to the U.S.S.R. method, and an irrigation efficiency of 45% (60% field efficiency and 75% distribution system efficiency), the present total water requirements amount to 757.1 million m^3 per year, and the proposed water requirements to 1,175.9 million m^3 per year. The mean annual flow of 1,854 million m^3 and the 75% reliability flow of 1,400 million m^3 (at Mahaddei Uen station), appear, therefore, to be sufficient. However, month-to-month comparison of requirements and flows shows that deficits occur at present for flows of 75% reliability from January through April and in June, July and December (see Table 5.2) but adequate storage could surmount this difficulty. Within the Somali reach of the Shebelli river, however, no on-stream reservoir site and only two off-stream storage sites, at Duduble, near Mahaddei and at Jowhar have been identified.

5.08 The requirements for the reaches upstream and downstream of Jowhar are shown separately in Table 5.2 since the Jowhar off-stream reservoir, with a storage volume of 200 million m^3, has just been completed and started operating in 1979. The Jowhar Reservoir is situated below the Jowhar Sugar Scheme which could, therefore, draw water from the reservoir only by pumping. Because of the present water requirements in the Jowhar reach and the proposed expansion of the scheme, backpumping would be needed to secure an adequate water supply. Table 5.2 also shows that deficits would occur upstream in January, February and March if requirements had to be satisfied from the unregulated flow. Downstream of the reservoir, the regulated flow would just satisfy the present water requirements, but under the proposed development, deficits would appear in February, March, June, July and December. Back-pumping from the reservoir would satisfy the Jowhar Scheme requirements but would increase the deficits in the downstream reach; deficits there would be especially large in June and July and only about 50% of requirements could be satisfied.

5.09 Comparison of present water requirements and the river flow regulated by the Jowhar Reservoir shows that the areas downstream of the reservoir could be irrigated with 75% reliability assuming an irrigation efficiency of 45%; this has not yet been achieved and at present is likely to be only about 20% (MMP, 1978). In the Jowhar reach, deficits will continue; only the requirements of the Jowhar Sugar Estate can be satisfied by back-pumping from the

SOMALIA

AGRICULTURAL SECTOR REVIEW

Shebelle River Development

Water Demand and Supply

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Present Development													
Demand Upstream (Jowhar Reach)	27.37	22.66	27.17	17.41	18.05	21.11	20.21	22.37	25.91	13.35	20.09	25.11	266.92
Downstream	30.41	18.56	20.64	13.47	37.31	59.70	57.91	20.87	31.07	64.86	72.80	62.66	490.21
Total	57.18	41.22	48.35	30.88	55.39	80.81	78.12	43.74	56.98	93.21	92.89	87.77	757.13
Flow (75% reliability)													
No Regulation	19 2/	8 2/	11 2/	24 2/	152	52 2/	38 2/	155	282	239	153	52 2/	1,400 1/
With Jowhar Reservoir (for downstream reach)	31	19	21	31	53	63	60	75	136	179	139	66	
Proposed Development													
Demand: Upstream	36.08	29.74	36.25	22.67	24.26	29.41	27.70	30.62	36.09	26.08	28.11	33.95	361.00
Downstream	48.24	23.79	26.40	16.85	51.34	88.90	82.36	38.32	92.81	125.90	129.06	101.41	814.94
Total	84.32	53.49	62.65	39.52	76.20	118.31	110.06	69.54	117.30	151.98	157.17	135.36	1,175.94
Flow (75% Reliability)													
Upstream	19 2/	8 2/	11 2/	24	152	52	38	155	282	239	153	52	1,185
Downstream (with Jowhar Reservoir, no backpumping to Jowhar Sugar Estate)	51	17 2/	6 2/	31	64	63 2/	61 2/	54	92	177	148	101 2/	931
Downstream (with Jowhar Reservoir, with backpumping to Jowhar Sugar Estate)	51	12 2/	3 2/	31	64	55 2/	61 2/	54	92	174	148	101 2/	920

1/ Not the sum of individual months

2/ Water Supply deficits

SOURCE: MMP

reservoir. Requirements for perennial crops in the downstream areas may be satisfied by pumping groundwater as at present but the low quality of the groundwater prohibits large scale adoption of this solution. Moreover, infiltration and evaporation losses at the Jowhar Reservoir may be larger than presently assumed and this would lead to reduced water availability. The high water use efficiency assumed (45%) is unlikely to be achieved and it is expected that frequent shortages will continue to interrupt irrigation in the lower reaches.

5.10 If the proposed water development were carried out, severe shortages would appear in years of normal streamflow. Most probably the deficits would be much larger than forecast under the assumption of a relatively high irrigation efficiency. If the total area proposed were, in fact, irrigated, radical innovations would be needed to satisfy the water requirements. Additional storage would be needed; higher irrigation efficiencies would have to be obtained; a different cropping pattern with emphasis on lower water consumption would have to be enforced; reuse of drainage water (which may be of questionable quality - it is presently drained away from the river) would possibly have to be introduced and groundwater might have to be used on a much larger scale to supplement surface supplies.

5.11 Considering the large deficits which appear likely, the low level of the present development, and the possibility of upstream water development in Ethiopia, any further horizontal expansion of the irrigated areas should be stopped and all efforts should be devoted to increasing production and raising irrigation efficiency on existing schemes. Only if it is proven that progress can be achieved along these lines should a cautious horizontal expansion be considered.

Juba River Development

5.12 Like the Shebelli, the Juba river originates in Ethiopia. But while there are possibilities for irrigation development in the upper Shebelli basin, the Juba valley within Ethiopia is too narrow for any major irrigation scheme. The Juba plain is relatively narrow in its lower reaches also and is intersected by low hills. Furthermore, there are flood problems and widespread salinity which requires a thorough drainage survey before more extensive development. The total net irrigable area has been estimated at 221,500 ha (para 2.15). However, the extent of soils assumed to be irrigable has been recently questioned; a detailed survey of a limited area revealed that a relatively high percentage of the area could not be classified as Class I or II soils.

5.13 The crop water requirements for the irrigated areas have been determined recently by three consultant groups (Technital 1977, HTS 1977, and MMP 1978) and reviewed by an FAO consultant (Henry, 1979), who questioned several assumptions made by the others. Evapotranspiration was determined according to the Blaney Criddle methods (Technital) and according to the Penman method. The consultants assumed lower crop irrigation coefficients

for maize, rice and cotton in the Juba area than in the Shebelli region. The constraint in this area is not availability of water but the lack of high class irrigable soils. The irrigation efficency was assumed by Technital at 54% overall; MMP used the same figure (although they adopted 45% for the Shebelli region). This assumption appears over-optimistic given present performance which is commonly around 20%.

5.14 At present, about 12,200 ha are irrigated in the Juba basin, mainly in the lower flood plain on both banks of the river. An ambitious development project has been prepared consisting of a major dam at Bardera which would dominate the total irrigable area of 221,500 ha. Presently, 73,210 ha are already committed, and more is under preparation (Juba Sugar with 6,000 ha, and Fanole with 8,200 ha initially). The water requirements of the eleven districts totalling 231,500 ha in area and the requirements of the committed projects, based on the consultants' original assumptions, are presented in Table 5.3, which also shows the unregulated flow of the Juba river. The month-to-month comparison reveals that flow regulation would be necessary to compensate for deficits occurring in January, February and March, if the already committed projects were fully implemented. The deficits would be larger if the estimated water requirements were revised as appears to be necessary. Even under the present situation with only 12,200 ha being intermittently irrigated, water shortages appear.

5.15 A preliminary revision of the projected water requirements, as suggested recently (FAO 1979), results in considerably higher estimates (Table 5.4) with requirements going from 2,864 to 3,801 million m^3 annually. Although the irrigation requirements would still be below the mean annual stream flow, allowances have to be made for other uses which include a minimum base flow (assumed at 3 m^3/s), urban and industrial water requirements (about 5 m^3/s) evaporation and infiltration losses of the proposed Bardera reservoir (600 million m^3/year) and a possible consumptive use of water in Ethiopia. MMP estimated that the latter could possibly account for 2,400 m^3 annually; this figure appears high and it is unlikely that this volume would be required in such a remote area. Dam construction for hydropower in Ethiopia would, on the other hand, have beneficial effects downstream since it would regulate flow and retain sediments.

5.16 The maximum total requirements in Somalia would, therefore, amount to:

	Million m^3 per year
Irrigation requirements (revised)	3,801
Base flow	95
Urban and industrial water	158
Reservoir losses	600
Total	4,654
The possible requirements in Ethiopia could reach	2,400
and thus add up to a total of:	7,054

Table 5.3 Gross Irrigation Requirements Downstream of Dolo in Mm^3

Technical Irrigation District	Net Irrigated Area ha	J	F	M	A	M	J	J	A	S	O	N	D	Year
Lugh Ganana - Dolo	16,400	4.16	0.00	0.00	2.04	27.14	37.37	33.28	7.57	8.66	23.12	22.57	27.07	192.98
Bardera - Saakow 1/	47,350	16.19	1.23	1.39	4.35	36.52	55.48	48.93	8.80	15.21	64.01	66.40	80.80	399.31
Downstream of Saakow	26,600	1.99	0.00	0.00	0.89	8.33	12.79	27.84	110.20	123.40	83.49	19.27	10.35	398.55
Dujuma	11,100	3.43	0.00	0.00	0.65	8.23	15.66	14.18	3.22	3.17	12.19	15.68	15.95	92.36
Dufalach - Afmadou 1/	7,800	4.30	0.00	0.00	0.42	5.20	9.86	8.96	2.06	3.96	15.35	19.58	20.08	89.76
Fanole - Gelib	26,400	4.96	0.10	0.11	0.97	12.11	23.07	25.81	51.65	58.92	46.61	29.61	23.19	277.11
Touta Island	13,300	2.87	0.00	0.00	0.54	7.02	13.35	12.36	5.31	6.51	12.76	15.68	13.98	90.38
Bardera Jonte	32,200	47.67	39.36	42.94	31.23	34.66	41.43	44.41	39.84	40.01	67.78	81.21	75.83	586.37
Jamaame 1/	20,050	40.94	35.89	39.15	26.50	21.71	25.06	28.19	36.34	35.54	48.72	56.66	52.90	447.62
State Farms	10,300	2.49	0.00	0.00	0.44	5.58	10.62	10.44	9.57	10.59	13.78	16.14	12.39	91.97
Deseek Uamo	10,000	20.91	18.10	19.98	3.94	9.90	17.09	17.06	19.56	19.26	14.89	17.40	19.49	197.69
TOTAL	221,500	149.90	94.70	103.60	72.30	176.40	261.00	271.50	294.10	325.20	402.70	360.20	352.00	2,864.00
Total for Schemes already committed 2/	73,210	132.10	98.90	111.20	50.90	87.30	150.30	129.70	115.30	162.90	173.20	185.90	159.50	1,557.10
Juba River Streamflow		111.00	76.00	106.00	261.00	576.00	428.00	469.00	752.00	785.00	1,224.00	920.00	358.00	6,066.00

Note: Requirements for the Technital Irrigation Districts include a 10 percent allowance for distribution losses and a 60 percent field application efficiency.

1/ Rice farms on land reclassified Class IV by HTS, 1977

2/ HTS, 1978

Table 5.4 Revised Water Requirements for All Irrigation Districts Downstream of Dolo

No.	Irrigation District	Net Irrigated Area ha	Total Water Demand (Mm^3)	
			MMP (1978c)	Revised 1/
1	Dolo - Lugh Ganana	16,400	192.98	264
2	Bardera - Saakow	47,350	399.31	635
3	Downstream Saakow	26,600	398.55	507
4	Dujuma	11,100	92.36	118
5	Dufalach - Afmadou	7,800	89.76	143
6	Fanole - Gelib	26,400	277.11	353
7	Touta Island	13,300	90.38	115
8	Bardere - Jonte	32,200	586.37	746
9	Jamaame	20,050	447.62	570
10	State Farms	10,300	91.97	117
11	Deseek Uamo	10,000	197.59	251
	TOTAL	221,500	2,864.00	3,819

1/ J.C. Henry, FAO, 1979

This compares to a natural mean flow for the Juba river slightly more than 6,000 million m^3 per year, corresponding to roughly 4,550 million m^3 per year at 75% reliability. It is clear that total requirements in Somalia are about equal to the 75% reliable stream flow.

5.17 The water requirements of the proposed major irrigation development appear to be underestimated. But even revised/increased water requirements could be satisfied if a major regulating structure such as the proposed Bardera reservoir were built. Consumptive water use in Ethiopia, however, could reduce the available streamflow and would thus require a reduction of water use in Somalia through a reduction of the irrigated area, changed cropping patterns, water saving techniques and the like.

5.18 Considering the low level of water efficiency and the present low yields in the Juba and Shebelli basins the construction of the Bardera dam which would more than triple the presently irrigated area in Somalia, needs careful evaluation. All projections are based on very optimistic assumptions regarding water efficiency and water use, conditions that Somalia is unlikely to meet in the near future. Consequently, as in the case of the Shebelli basin development, any major horizontal expansion of the irrigated area should be preceded by improved utilization of areas presently irrigated. Furthermore, the Bardera development scheme would be implemented over a period of about ten years, during which time demand for irrigated crops will still have to be met from existing irrigated areas. There is also the danger that such an ambitious new scheme would attract the few qualified Somali professionals in water development, leaving the more crucial task of rehabilitation and improvement of existing schemes to other less qualified staff and making achievement of the optimistic targets that have been set for the Bardera scheme even more unlikely. Implementation of the Bardera scheme as presently proposed is inadvisable; although the development is regarded a necessity in the long term because of the potential of the Juba basin, the implementation schedule should be revised in view of the pressing need to increase irrigation efficiency elsewhere and the low probability of quick returns from the massive investment.

B. Groundwater Development

Well Construction

5.19 Deep Wells. The only existing large-scale exploitation of groundwater is in the Shebelli river basin where development of the groundwater resources started in the early 1960's. Until that time, groundwater was generally drawn from hand dug wells for drinking. Initially most irrigation wells in the Shebelli basin were drilled to supply water for the banana farms. They are used for irrigation water supply when the flow of the river is very low or dries up. After the success of the first wells, which were drilled by a consortium of Italian farmers, other farmers joined the consortium. This consortium was nationalized in 1970 and became the National Banana Board.

5.20 A UNDP Groundwater Survey, completed in 1973, listed about 120 boreholes in the Shebelli Valley. The number has increased considerably; it is not known exactly how much, but the total exceeds 200. Most wells are about 60-70 m deep and yield 40-50 l/s with an average specific capacity of 15 m^3/h/m. They are equipped with turbine pumps driven by surface diesel engines. The wells are currently operated by individual farmers on their own holdings. Pumped water is discharged into the canal network; no interchange of water between farms takes place. At present, the farmers carry out little or no regular maintenance of the pumping plants. Pumps are only removed from the wells when they break down or when the wells are abandoned. The present average life of a well is reportedly 15 years; the pumps have an average life of 10 years, engines about five.

5.21 The main constraint on development of groundwater in the Shebelli area is its quality. The water is only marginally suitable for irrigation (1,000-4,000 ppm) and quality deteriorates in the older consolidated areas of the plain. It is assumed that continuous pumping would cause intrusion of inferior water from marginal areas. Because of the relatively advanced state of development of irrigation in the Shebelli basin and because of the necessity for supplementary irrigation water at times of low flow, more detailed investigations should be carried out to determine the extent of the aquifer, and to prevent overexploitation and deterioration of this resource.

5.22 Shallow wells. Shallow wells are in use in many parts of the country; they are most widely used for irrigation purposes in the northern region to supply small horticultural gardens growing citrus, melon, mangoes, gat and vegetables which are mostly consumed locally. Most of these irrigated gardens have been recently built. Almost all of them are located in alluvial valleys near stream banks. Water is pumped from hand dug wells by diesel-driven pumps, and often supplemented by water from springs or surface water catchment systems. A typical well consists of a large excavation, often up to 10 m in diameter and 9 m deep; water is led to the fields through unlined or primitively lined channels. The size of the holdings ranges from a few hundred m^2 to 100 and 200 ha with the majority covering not more than 20 to 25 ha. Most of the small irrigated gardens have been developed without Government assistance. The financial returns appear to be attractive, although water management and horticultural practices are generally poor; this is not unusual for spontaneous developments of recent origin in an area without a tradition of irrigation. The potential for additional small-scale horticultural development undoubtedly exists, especially in the northwestern and north-central parts of Somalia. The local market is expanding, and there are possibilities for exports to the neighboring Arab countries. Large-scale farms based on groundwater development should not be considered before detailed field investigations have confirmed that water of satisfactory quality is available in sufficient quantity. Government controls would be required to protect existing small farms from over-exploitation of aquifers by the larger operations.

Domestic and Livestock Groundwater Supply 1/

5.23 Groundwater is the main source of water supply in rural areas. Wells and springs together represent about 53% of the water points country wide as shown in the following table:

Water Points in Rural Areas a/

Area	Wells	Natural Depressions Collecting Rain Water	Springs	Rainwater Cisterns	Shallow Wells in River Beds	Uars	Hillos	Total
Northern Regions	351	33	152	109	-	-	-	645
Basaso Region	124	13	92	36	58	-	-	323
Mudugh Region	347	33	-	35	43	8	-	466
Interriverine Area	317	31	-	50	-	391	397	1,186
Total	1,139	110	244	230	101	399	397	2,620
Percent	43.5	4.2	9.3	8.8	3.9	15.2	15.1	100.0

a/ Excluding Acaba and Benadir Districts.

Source: Hendrikson, 1973.

5.24 It has been estimated 2/ that only 33% of the total population is served by public water supplies. In the rural areas, only 20% have access to public standpipes and well site deliveries. The rest of the population must obtain water from unprotected sources. The following table details the density of water points in the main regions. At the time of the survey, there were, on average, 47 water points per per 10,000 km^2; 24.5 springs and wells per 10,000 km^2. Uars and hillos (water points at river banks) are concentrated in the interriverine area, while springs, cisterns and river bed wells dominate in the northern, Bosaso and Mudugh regions.

1/ In rural areas human and livestock consumption is usually from the same supply and they are reviewed here together; urban water supply is excluded. Rainwater catchments and watering points on the rivers are dealt with elsewhere but are included here in the Table since they are an important source.

2/ WHO/IBRD Water Supply Sector Study, 1977.

Water Points per 10,000 km^2

Area	Deep Wells	Shallow Wells	Balleh b/	Springs	Berked c/	Las d/	Uars	Hillos e/	Total
Northern Regions	2.2	19.5	2.0	9.3	6.7	—	—	—	39.7
Bosaso Region	1.3	10.8	1.8	9.1	2.5	5.5	—	—	31.0
Mudugh Region	4.9	20.0	3.2	2.7	-	4.0	0.8	—	35.6
Interriverine Area	3.7	12.4	1.6	-	2.5	-	19.9	20.1	60.2
Somalia Average a/	2.7	17.5	2.1	4.3	3.9	1.9	7.5	7.1	47.0

a/ Size of Area covered 551,360 km^2.
b/ Depressions collecting rainwater.
c/ Cisterns.
d Wells in river beds.
e/ Water points at river banks.

Source: Hendrikson, 1973.

5.25 The seasonal availability of water in the various water points is shown in the following Table:

	Total Number	Permanent No.	Permanent %	Seasonal No.	Seasonal %
Deep wells	110	103	94	7	6
Shallow wells	240	195	81	45	19
Uars	93	4	4	89	96
Ballehs	128	-	-	128	100
Berkeds	30	4	13	26	87
Springs	57	51	90	6	10

Of the total number of groundwater sources, 87% of the wells and 96% of the springs carry water throughout the year, while Ballehs, Berkeds and Uars are almost exclusively seasonal.

5.26 The intensity of nomadic seasonal movements varies from area to area and is reflected in the proportion of water places primarily for livestock, which can be gauged by comparing the number of waterpoints located outside settlements in a given area with the total in that area (see following Table). Nationally, 56% of waterpoints are wells located outside settlements, 73% of them primarily for livestock use; the proportion is lowest (35%) in the interriverine area reflecting the predominantly settled agriculture, and highest in the Bosaso and Mudugh Regions about (80%). The two Northern Regions are in between (63%), which may be explained by the fact that nomadism in the Northern Regions extends to seasonal grazing area outside the national boundaries.

Waterpoints Outside Settlements

Area	Number	%
Northern Regions	401	63
Bosaso Region	263	80
Mudugh Region	357	79
Interriverine	417	35
Total	1,438	56

Institutional Arrangements

5.27 Administration, operation and maintenance of water supplies is the responsibility of the local community which has considerable autonomy in this area. WDA assists with design and construction in all areas except the main cities. The water supply sector is generally handicapped by the limited technical and administrative capability at all levels but most noticeably at the local level. Data are needed for evaluation of progress and performance, priorities have to be determined, and funds have to be allocated accordingly; serious deficiencies are apparent in all fields.

Investment Program

5.28 The National Development Plan 1979-81 states that water shortages are acute in the areas that support the bulk of the country's livestock population. The Government views investment in rural water development, therefore, as a necessity. A groundwater exploration program is to be carried out with the support of USAID, based on the FAO Survey of 1973. In a second phase of the program groundwater development will be carried out in areas of greatest need. At present, these are considered to be the areas covered by the Northern Rangelands Project, Central Rangeland Project, Bay Region Agricultural Development Project, and the Trans-Juba Livestock Project.

5.29 WDA is presently constructing 60 wells annually and it is expected that the USAID assistance would double this output. In addition, 30 wells are expected to be constructed with assistance from the People's Republic of China.

5.30 During the period of the 1979-81 Plan, revision of the existing 1:1,000,000 hydrological map was proposed, as were studies of the water potential in the coastal area of the Nupal and Bakol regions, and support for the well drilling program through research, collection and analysis of data, and aquifer studies.

Recommendations

5.31 The National Development Plan has determined that groundwater development will take place in the areas of greatest need. The projects mentioned as priority projects cover almost the whole national territory and it is therefore not surprising that drilling rigs are directed on an ad hoc basis to construct wells here and there where necessary. While this procedure is an acceptable way of getting urgent works carried out, a long-term construction program should be drawn up and adhered to, or the planning effort will be wasted. Such a long-range program should define areas of greatest need according to socio-economic criteria, and it should be backed up by technical data showing the groundwater potential and the results of previous well construction. Unfortunately, information on the latter is almost completely absent and precious resources are wasted and costly errors repeated in the push for more well drilling regardless of previous results.

5.32 An adequate program for groundwater development can probably be established only with outside assistance. Without effective coordination there is little chance that the goals of the Development Plan can be reached. The supervision of drilling work and training of drillers and supervisors must also receive top priority. Without adequate drilling procedures, and sufficient data on subsoil and water conditions, wells cannot be equipped properly or operate at their optimum.

C. Rainwater Harvesting

5.33 Rainwater is harvested in traditional water catchments and in recent decades, earth bunds or dikes have been used for water conservation on farmland in the north. In the long dry periods between the rainy seasons people collect rainwater wherever feasible. Water is collected from roofs and channeled into masonry or concrete basins; small dams are built across wadis. The most characteristic traditional form is a system of two low earth dikes which funnel water into a basin or tug. The dikes are often several hundred meters long with a channel running along the upstream side. The dikes direct the runoff from small catchment areas into a masonry reservoir covered with wooden boards, branches or corrugated iron sheets. Protective fences are erected around the reservoir. These tugs are individually owned and maintained. Water is sold for human and livestock consumption. The tugs, built with local materials, usually seem to be well located but improvements could be made: optical survey instruments could detect possible enlargements of the catchment areas; the catchment dikes could often be better maintained and protected; the catchment area could be treated, by bush clearance or even complete

impermeabilization, to increase the water yield. The reduction in evaporation loss, which can be as much as 2 m annually, would probably be the most effective improvement; flexible or rigid plastic covers or floating sheets of plastic foam could be used. The variety of materials offered by the plastics industry is so great that research appears necessary to determine the most appropriate solutions for local conditions.

5.34 Field bunding serves a dual purpose of soil and water conservation. The rains which follow the long dry periods appear as local storms whose intensity often leads to massive soil erosion. Since arable lands are often overgrazed, the sparse surface vegetation is insufficient to protect against erosion or to hold water long enough for penetration of the soil. In the late 1940's, the Agricultural Department of the colonial government (of Northern Somalia) started investigating possible soil and water conservation measures. A system for collecting and holding as much water as possible, while allowing large storms to pass with the least possible damage was eventually developed. Earth bunds, up to 120 m long and 1 m high on a 2 m base were built along contour lines. To hold as much water as possible each bund is turned uphill at its tail end for a vertical distance of 30 cm above the base contour. Water is thus trapped to a depth of 30 cm. Space between the bunds is determined by vertical intervals, not by horizontal measurements. Each bund is set 60 cm higher than the bund below. The slope of the fields where bunding can be established varies from 1% to 6%. Land with a slope of 2% would thus receive bunds 30 m apart; and about 300 m of bunds would be needed per ha.

5.35 In 1954 a bunding hire service was set up with pairs of oxen pulling scraper boards. The scheme offered bunding services free of charge provided they were matched by a similar number of teams operated by the farmers. The scheme proved to be very popular. When a new bund construction program was undertaken by USAID in 1963, it was decided to replace the oxen by tractors since it was impossible to assemble enough oxen to carry out a construction program commensurate with the size of the conservation program. A project appraisal by IBRD in 1975 (Appraisal Report of May 1976) also specified bund construction by tractors and recommended increasing the horsepower from 75 to 125. This program is continuing with Government support.

5.36 While the basic program, as it has been developed, is considered sound, some improvements could be introduced. The building of 1 m high dikes to collect water which is ponded to not more than 30 cm seems excessive. There could be good reasons to build 1 cm bunds situated immediately below a catchment basin and exposed to onrushing water, but the bunds further downhill, which do not have to withstand such forces, could probably be reduced in height and width. Construction is exclusively by tractor at present but in view of the rising costs of oil and of foreign exchange, the complementary use of oxen could be supported by favorable credit terms to farmers who opted for it.

D. Flood Control

5.37 Despite low rainfall and frequent droughts, Somalia suffers floods which cause considerable damage. The Juba and Shebelli rivers are poorly controlled. High flows frequently innundate villages and agricultural lands, especially in the lower reaches of the rivers. Following heavy rainfall, wadis turn into streams causing damage which is often serious because the irregular occurrence of the floods leads people to accept the risk or to underestimate its magnitude.

5.38 Shebelli Basin. Floods occur not only along the lower reaches of the Shebelli but also within the Ethiopian part of the basin. Frequent floods are reported there along the section of the river just upstream of the Somali border. These floods are beneficial to Somalia since they reduce the peak flows which cause most of the damage. If dikes were built along the Ethiopian reach of the Shebelli river prone to flooding, the hazard would be increased downstream in Somalia. The first victim of such flood control measures would be the Somali town of Belet Uen situated close to the border. Belet Uen is already endangered by high flows which would increase if overbank spillage were prevented in Ethiopia. High siltation, probably caused by deforestation upstream in Ethiopia has been observed and is an additional danger to the river regime. Whatever the cause of higher sediment loads is, the increasing silt deposits reduce the river channel capacity which leads to more frequent overbank spillage.

5.39 The most serious flood problems along the Shebelli river have been observed along the Jowhar reach and below the town of Afgoi. Along the Jowhar reach, the river channel capacity of 140 m^3/s is reduced to about 70 m^3/s. Embankments have been built in connection with the Genale barrage, raising the natural levees, but these are poorly maintained and frequently break at high flow stages. Between Afgoi and Genale, farmers regularly open minor breaches in the embankments to irrigate crops and grazing lands. These breaches are difficult to control because the numerous hippopotami reopen them during their nocturnal foraging. Scouring widens such breaks quickly during floods when the water enters depressions and old river courses lower than the present channel. The largest areas flooded along the lower Shebelli are below Falcheiro, where several hundred km^2 were inundated during the most serious floods of the past decade. Dikes, relief canals and off-stream reservoirs have all been proposed. The most urgent need is to protect towns and villages along the Shebelli; the construction of new dikes and the repair and proper maintenance of existing ones would probably provide adequate protection. Complete control of flooding on the Shebelli does not appear to be technically feasible because of the lack of adequate storage sites. Relief channels have therefore been proposed to protect the middle reach of the river. Suitable large depressions, which could retain flood water, have been identified near Mahaddei Uen. Diversion channels would take flood water away from the river and spread it over large plains and depressions on both sides of the river. Apart from the technical and economic considerations, these proposals require the establishment of

flood zones, areas which would receive and retain the flood waters and would thus be rendered unavailable for other uses. The most difficult task appears to be the control of the river banks which farmers and herdsmen continually break to irrigate crops and grazing lands. Since an effective control mechanism probably could not be established in the near future, technical solutions should be developed that would allow access to the river water without breaching dikes completely. Simple siphons or small pumps could be provided, gates serving larger areas could be installed, and bank protection through rip-rap or pavements could prevent serious scouring.

5.40 Juba Basin. In contrast to the Shebelli, the valley of the Juba river is well defined, and the river channel is generally quite stable. From the Ethiopian border to the town of Lugh Ganana, the Juba flows through a valley bordered by hills. Below Lugh Ganana, the valley narrows and the river bed and banks are of hard limestone, assuring a very stable channel. During the flood season overbank spillage occurs probably infiltrating the limestone formations and reappearing further downstream. Below the town of Saco, the channel slope gradually decreases, and at Dujuma, the river enters a wide floodplain before reaching the ocean. The most serious floods occur in this floodplain, where the main agricultural activities, especially sugar and banana production, are concentrated. Because of the flat terrain, breaches of the river banks lead to widespread inundation and serious damage.

5.41 Solutions for the flood problems along the Juba river differ substantially from the solutions described for the Shebelli valley. The middle section of the Juba flows in a relatively narrow valley which does not allow the construction of relief channels but, because of its stable hydraulic characteristics, appears to be well suited for the construction of flood control dikes. The major reservoir which would be created by the proposed Bardera dam project would be able to retain floods with a high degree of probability. For the lower flood plains of the Juba, where flooding is more serious than further upstream, dikes should be built (they could also serve as road embankments) and certain zones should be designated as flood plains. Even if the construction of the Bardera dam started soon, the long construction period, and the need to build roads and a drainage system, require an adequate plan for the lower floodplain. This plan could be flexible enough to provide the most urgent flood control measures as well as complementary investments if the Bardera dam project goes ahead.

5.42 Wadis. The flood control measures for wadis in the arid and semi-arid parts of the country require a highly selective approach because of the very irregular occurrence of floods there. Flash floods in wadis often lead to the destruction of buildings, crops and roads. During the recent construction of the main North-South Highway, attempts have been made to protect the highway embankment from erosion caused by localized flooding, but damage along the highway is obvious. In the absence of data on flows and precipitation, the design of structures has to be empirical, and funds for repair, alterations and improvements to structures have to be included in the original project estimates. Adequate design standards should be

developed and the local population should always be consulted before any major investments are made in or near wadis threatened by floods. A knowledge of local flood dangers can assist the designer to assess the potential floods. Generally, a minimum disturbance of flood paths is preferable to major control measures that would divert floods and possibly cause problems in areas which had not been affected earlier.

VI. ISSUES AND CONCLUDING REMARKS

A. Juba and Shebelli River Basin Development

6.01 There are major irrigation schemes along the Shebelli and Juba rivers and considerable expansion of the existing schemes has been proposed. Along the Shebelli river, the present flow regime could meet the water requirements of the existing schemes if an irrigation efficiency of 45% were achieved but under the proposed developments, water requirements would exceed the available flow during five months every year. Along the Juba river an even more ambitious expansion program has been proposed. The water requirements of the proposed projects could be met only if an expensive major storage dam is built. Without this storage, water deficits will still occur in any case if all irrigation projects that are under construction and committed are implemented.

6.02 Because of the existing and impending shortages of irrigation water, the Government must revise the existing commitments, or face more serious water shortages than during the past years. Options the Government may consider include the following:

- to halt the ongoing horizontal expansion of irrigation schemes, or reduce the proposed expansion drastically;
- to intensify rehabilitation of existing irrigation projects to increase irrigation water efficiency and introduce water saving techniques;
- to change the cropping pattern in view of the seasonal fluctuation of the available flow; the water requirements of perennial crops are more difficult to meet than those of annual crops which occur mostly when water is available;
- eventually to provide water storage where technically and economically feasible.

6.03 In view of the seriousness of the present water shortages along the Shebelli river, it is recommended that all major expansion of irrigation schemes be stopped immediately. The actual irrigation water efficiency is so

low (about 20%) that all efforts should be concentrated on raising the efficiency at least to levels at which the water requirements of the existing schemes could be satisfied (45%). As water efficiency is improved and water savings are achieved, a gradual horizontal expansion could be carried out. At the same time, measures should be taken to reduce flood damage and studies should be carried out to investigate any further storage development and the utilization of excess water accumulating in the depressions and swamps along the lower Shebelli.

6.04 While there are no serious water shortages along the Juba at present, the water requirements of already committed schemes exceed the unregulated river flow. The proposed Bardera dam project would provide sufficient storage to satisfy these, but the high cost of the project, the doubt over the extent of suitable soils and the low productivity of existing schemes argue against a hasty start of the Bardera project. The low productivity of existing schemes also casts doubt on the optimistic assumptions made for the new development. The Government must reevaluate its capacity to carry out the Bardera project and the urgently needed rehabilitation program simultaneously. Given the financial and manpower constraints, first priority should be accorded to rehabilitation which would yield higher returns and provide a better basis for the Bardera project.

B. Groundwater Development

6.05 The Government is committed to a rapid expansion of groundwater development and has mobilized international and bilateral assistance for its implementation. However, the capacity of the agencies involved in groundwater development and well drilling is inadequate. The work carried out in recent years does not meet the needs of the country. A high percentage of wells did not yield water or became inoperative. Drilling equipment, pumps and engines are not adequately operated and maintained. The decisions on where to drill new water wells appears to be frequently made on questionable criteria. While there can be no argument about the need for an ambitious groundwater development program, the Government should develop an adequate strategy first. Some possible options are:

- continuation of the present program giving priority to an acceleration of well drilling, thereby accepting a relatively high rate of failure;

- a more modest well drilling program and much more effort to investigate the groundwater potential, thus enabling the Government to establish a more solid groundwater development program and assuring greater success in well drilling while improving the quality of the technical operations of the executing agencies at the same time;

- a program of monitoring existing wells and of collecting data on wells being drilled, within the framework of the existing program.

6.06 Although the present groundwater development program appears ambitious, perhaps over-ambitious considering the capability of the Government agencies concerned, the need for an even larger program is obvious in a drought prone country so dependent on groundwater. Reduction of the present development program cannot be justified. However, the executing agencies need much more technical assistance to improve their operations. Highest priority should be given to the introduction of a monitoring system. Selected wells in operation should be carefully monitored to obtain data on yields, drawdown, water levels and water quality. Data should be collected on wells being drilled. Such information is a prerequisite for improving the groundwater development program, and the data obtained would provide a base for technical decisions regarding the location of additional wells, determination of yields and finally the management of aquifers.

6.07 Traditionally, priority has been given to supplying water for the human and livestock populations. More recently, wells have been built for irrigation in areas where the surface water supply has become inadequate. In the absence of a clearly defined policy, any new well development should be used according to the traditional priorities, and only surplus well water used for irrigation. In view of the low productivity in areas already irrigated with surface water, it would be premature to develop new irrigation areas dependent on groundwater and requiring costly energy for their operation.

6.08 Reconnaissance studies of the groundwater potential of Somalia identified several promising areas and any countrywide development program should allocate investments to these areas. Experience in other arid countries indicates that the most practical solution would be the construction of small-diameter production wells in such areas. Based on the experience gained from the initial wells, additional wells could be drilled if a promising aquifer is encountered. Under favorable circumstances, groundwater development for irrigated agriculture could then be considered.

C. Small-Scale Surface Water Development

6.09 The Somalis have developed various systems for collecting rainwater and surface water runoff. More recently, small streams have also been diverted for irrigation. Projects that support these traditional works have been implemented by the Government with support from several donor agencies. While support for these activities cannot be questioned, Government should consider how such investments could be made more effective and economic.

6.10 Research has been conducted in other countries on various methods of constructing water catchments, the results of which may be applicable in Somalia although certain modifications would be needed to adjust them to local

conditions. Furthermore, monitoring of existing works should be carried out to obtain data on the most effective and economic types. Surveys of the flow small streams and wadis are practically nonexistent. Self-help works have been carried out without supporting data, based simply on the experience of the local population. Any substantial investment program should be preceded by such investigations. Investigation and investment are not, of course, mutually exclusive; on the contrary, a balance has to be established between support of traditional works, mobilizing self-help actions of the local population, and monitoring and surveys needed to improve the efficiency of the structures and to determine the most appropriate locations.

D. Irrigated Crop Production

6.11 The first irrigated schemes were large-scale plantations established by foreign investors. Today, numerous small farms exist side by side with some private plantations and the newly created state farms. Productivity is low under all forms of land tenure. In recent years extensive irrigated areas have been turned into state farms for settling nomads and producing foodcrops. Although sedentarization was one of the main objectives of the state farm highly mechanized methods tend to be used. The departure of the nomads who often returned to their traditional grazing areas left the state farms with too few people and led their managers to conclude that an even higher degree of mechanization was called for. However, the high cost of imported equipment and fuel would justify mechanization only if high yields could be obtained, and if large areas were devoted to high value crops; unfortunately, neither case obtains.

6.12 Comparing the more labor intensive operation of small farms with the mechanized operations of large state farms, it appears that small farms fulfill the objectives of employing more people and producing foodstuff at relatively low prices, much better than state farms. The Government should therefore reassess its strategy of expanding state farms and only undertake such activities as sugar and cotton production which require larger-scale organization. The production of foodgrains appears to be better carried out by small farmers using labor intensive methods.

6.13 The frequently discussed choice between food and export crops, mainly bananas, seems academic since an expansion of banana production would not be feasible in the Shebelli basin due to lack of irrigation water during critical growing periods. The only real alternative would be an expansion of banana plantations in the Juba valley where more irrigation water is still available.

E. Institutional Framework

6.14 Several Government agencies are presently involved in water development project; the Ministry of Mineral and Water Resources, the Ministry of Agriculture, and the Water Development Agency are the most important. Unfortunately, no clear division of functions and responsibilities has evolved and projects are consequently being prepared and implemented without proper regard to other existing or committed schemes which depend on the same source of water. The Government could consider the following options:

- define responsibilities and obligations of all agencies in such a way as to avoid overlapping interests and activities;
- empower one agency to plan and implement water development projects; or
- establish a regulating agency, responsible for overall planning, including the allocation of water for projects that depend on the same source.

6.15 In some countries the third option has been introduced, but besides the problems which come with a new powerful agency, Somalia presently lacks the manpower to staff and operate such an organization. It is recommended, therefore, that Government opt for establishing a regulating agency or empowering one of the existing agencies to carry out overall water planning including water allocation.

6.16 Since the Water Law of 1966 was revoked in 1971, Somalia has been without a basic legal framwork for its water sector. This situation certainly contributed to some of the present organizational problems. Without adequate legislation, disorderly water development are serious threats to society, especially in a country where water is as scarce as in Somalia. The enactment of a Water Law defining the responsibilities, obligations and powers of the various agencies deserves high priority.

F. Water Charges

6.17 Landowners have traditionally charged fees for water, for human and livestock consumption. The municipalities which operate water supply systems also charge their customers for their services. Although the amounts may not be considered sufficiently high in many cases, the traditional system appears to be well suited to the local conditions.

6.18 On the irrigation schemes, the situation is quite different. No direct water charges are levied. The only charge imposed by the Government is a tax on irrigated land which is much higher than the land tax for rainfed

agricultural production. This taxation system, while simple and relatively easy to enforce and to control, is inadequate in areas where many farmers face frequent water shortages. The numerous systems of charging for water which have developed in other countries do not offer any easy solutions or examples which could be widely recommended without a thorough study of particular circumstances. However, given the scarcity of water for irrigation, the water charges should at least be enough to induce the farmers to save water in any area. The present system does nothing in this respect. The introduction of volumetric water charges is considered most appropriate where water is scarce and although this may not be immediately feasible, the Government should seriously consider revising the present system. Several options should be considered taking into account their costs and benefits under present and future conditions when rehabilitation works may have been carried out. This would allow the Government to establish a program for a gradual introduction of adequate tariffs in accordance with the technical capabilities of the executing agencies, and to see that the benefits of the new system were sufficiently higher than costs.

G. Development Objectives and Strategy

6.19 The main objective of water resource development in Somalia is the provision of water for human consumption, commercial and industrial activities and for livestock and crop production. Since the agricultural sector in arid countries requires far more water than the other sectors, the overriding objective for water development in the agricultural sector should be the most economic utilization of the water resources. The objectives of the Three Year Development Plan 1979-81 for the agricultural sector can be seen as meeting these criteria. Substantial investments in civil works, on-farm development, and equipment will be needed to intensify production on existing irrigation schemes. The crucial task will be the improvement of farming techniques and water management through training and agricultural extension. Cautious horizontal expansion of irrigation schemes could take place where rehabilitation of existing schemes leads to water savings, and where investigations identified new schemes with high economic returns.

6.20 Since the present organizational framework for water development is not considered conducive to efficient implementation of development projects, a better structure should be developed. An authority should be designated responsibility for decisions regarding priorities among water development projects, water allocation between sectors and projects, and regulations concerning the use of water, especially water charges. A basic legal framework for the water sector if urgently needed.

ANNEX 2

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AGRICULTURAL SECTOR REVIEW

Water Resources Development

Appendices

4. Engineering Faculty of the University of Mogadishu

   Organization, Enrollment

5. Draft Water Law

V. Project List

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Appendix 1
Table 1.1

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AGRICULTURAL SECTOR REVIEW

Water Resources Development

Annual Rainfall at Selected Stations 1967-1977
(mm)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Mean
Afgoi	905	559	661	-	404	732	407	576	423	488	-	573 (467)
Baidoa	718	433	522	639	386	691	379	219	-	-	-	498 (585)
	593	509	409	311	398	359	236	384	726	708	703	485 (416)
Mogadishu	1,308	436	269	281	245	645	377	259	382	399	390	453 (402)
Kismayo	549	317	100	456	311	517	216	179	483	207	258	328 (327)
Belet Uen	508	543	103	405	194	505	305	59	151	220	441	312 (306)
Obbio	449	227	98	175	255	257	252	123	-	-	-	230 (199)
Galcaio	175	113	167	148	122	163	220	101	75	64	-	135 (149)

Sources: Statistical Abstracts
Meteorological Service, Field Records

Data based on longer term observation but excluding data of last 10 years.
Source: FAO

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Mean Annual Rainfall Data at Selected Stations

Station	Period	No. of Years With Full Records	Mean Annual Rainfall (mm)	Percent Probability That Rain Each Year Will Exceed	
				75% of Mean	50% of Mean
Bosoco	1934-57, 1964-72	20	17.3	45	55
Berbera	1906-50	43	58.0	56	67
Gardo	1939-58, 1964-75	26	99.4	54	69
Galcaio	1935-58, 1964-75	26	149.0	65	81
Hobio	1924-58, 1964-75	29	191.8	52	90
Burao	1921-50, 1967-75	34	207.3	65	94
Belet Uen	1926-58, 1964-75	31	246.6	61	87
Ganana	1922-60	26	316.4	54	92
Bardera	1915-60, 1964-72	42	374.7	62	88
Mogadishu	1910-59	44	402.7	68	93
Hargeysa	1922-50, 1966-75	35	425.4	77	100
Jowhar	1921-60	38	496.9	74	97
Borama	1921-50, 1967-75	25	511.3	96	100
Afmadu	1926-58	9	563.4	78	100
Baidoa	1922-60	29	584.7	72	100

Source: Jeremy Swift; Pastoral Development in Somalia, in: Desertification: Environmental Degradation in and around Arid Lands, edited by M.H. Glartz, Westview Press, Boulder, Colorado, 1977.

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Mogadishu Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1930	0	0	0	76	18	12	40	9	0	51	20	16	242
1931	0	0	0	0	44	0	1	0	3	110		6	(164)
1932	0	0	9	36	35	83	45	20	13	12	15	0	268
1933	2	0	0	107	15	81	48	18	15	13	47	29	375
1934	0	0	0	22	70	99	120	264	48	31	0	4	653
1935	0	0	0	77	136	118	46	18	17	27	8	0	447
1936	0	0	0	87	16	103	133	69	20	22	7	76	533
1937	0	0	0	89	62	83	39	17	73	35	25	0	423
1938	9	0	0	40	63	83	41	53	21	66	27	3	406
1939	1	0	1	43	5	91	3	15	1	2	2	0	164
1940	0	0	7	52	91	102	46	56	5	3	7	0	369
1941	1	0	1	52	5	79	52	15	73	5	133	20	437
1942	0	0	0	40	81	13	50	32	2	85	12	0	315
1943	0	0	0	45	16	96	56	19	17	10	25	0	284
1944	0	0	0	39	23	155	35	64	5	5	0	12	338
1945	0	0	0	4	35	33	37	15	4	25	59	3	215
1946	0	0	0	1	35	154	77	20	6	15	6	0	314
1947	0	0	0	77	115	64	30	111	14	4	5	0	420
1948	0	1	0	8	7	137	45	21	12	3	94	7	335
1949	0	0	4	8	31	72	65	14	6	17	15	0	232
1950	0	0	2	36	107	87	34	47	72	3	0	0	388
1951	0	0	95	125	246	65	80	63	14	8	179	33	908
1952	0	0	0	98	3	28	18	10	3	28	61	1	250
1953	4	0	0	137	13	66	60	42	9	33	59	14	437
1954	0	0	1	106	27	55	21	30	9	38	37	0	324

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Mogadishu Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1955	2	0	0	32	21	36	16	16	8	0	23	3	157
1956	0	0	12	156	30	47	83	8	5	15	56	0	412
1957	1	0	0	27	85	115	105	41	33	12	31	34	484
1958	7	0	0	82	135	211	27	35	2	0	0	28	527
1959	0	0	0	21	18	45	176	13	17	0	9	2	301
1960	0	0	3	257	43	51	0	0	5	44	0	0	403
1961	0	0	6	11	79	26	305	304	90	57	229	1	1,108
1962	0	2	0	93	145	63	97	39	77	1	0	0	447
1963	0	0	0	154	11	119	53	22	85	32	81	63	620
1964	0	0	0	91	212	40	38	55	15	1	0	0	452
1965	0	0	0	1	39	49	80	10	33	153	133	0	498
1966	0	0	0	89	7	70	35	16	13	81	59	0	370
1967	0	0	0	39	146	560	122	99	53	172	126	0	1,317
1968	0	0	32	110	50	103	87	21	0	17	0	16	436
1969	0	0	0	0	120	82	8	6	0	26	27	0	269
1970	0	0	3	54	10	105	57	43	9	0	0	0	281
1971	0	0	0	47	41	96	28	5	20	1	7	0	245
1972	0	0	0	0	120	70	122	58	17	138	120	0	645
1973	0	0	0	0	78	133	100	16	2	15	33	0	377
1974	0	0	29	17	102	13	49	10	3	0	36	0	259
1975	0	0	0	11	18	81	203	57	0	0	12	0	382
1976	0	2	0	90	153	30	28	29	6	0	9	52	399
1977	1	0	0	55	11	7	171	51	0	94	0	0	390

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Kismayo Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1930	0	0	17	18	85	40	0	0	0	0	22	0	182
1931	0	0	0	0	117	50							(227)
1933	6	0	0	93	58	189	138	68	58	11			(621)
1934	0	0	0	29	83	206	59	19	5	1	0	1	403
1935	0	15	1	5	24	58	31	40	13	24	0	1	211
1936	2	0	0	31	43	243	134						(453)
1938				38	80	231	104						(453)
1939		0	0	47	35	35	0	0					(117)
1943	0	0	0	34	18	125	30	2	0	1	2	0	(212)
1944	0	0	0	12	156	47	27	10	11	106	6	3	378
1945	0	0	0	0	336	64	30	19	2	0	0	0	451
1946	0	0	0	3	122	225	34	14	24	9	1	0	432
1947	0	0	0	92	155	152	17	71	9	14	17	0	527
1948	0	0	6	0	26	72	25	19	1	17	0	22	188
1949	0	0	0	10	10	26	29	12	14	166	0	3	270
1950	0	0	0	4	35	16	12	0	4	18	0	0	89
1951	0	0	0	16	323	38	54	10	0	16	9	31	497
1952	0	0	0	1	1	133	23	15	51	19	38	0	281
1953	4	0	0	2	104	72	94	17	8	27	11	0	339
1954	0	0	0	31	28	80	25	18	3	1	22	0	208
1955	0	0	0	9	201	40	73	7	0	7	0	0	337
1956	0	0	0	14	84	139	8	0	0	0	0	8	253

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Kismayo Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1957	0	0	0	1	0	1	52	0	0	0		0	(54)
1958	0	0	0	39	69	65	2	5	0	0	0	0	180
1959	0	0	0	48	57	61	255	15	10	1	5	0	452
1960	0	0	2	61	150	168	44	21	8	10	0	0	464
1961	0	0	0	0	8	29	255	114	259	86	113	6	970
1962	0	0	0	88	123	47	39	14	14	2	0	0	327
1963	0	0	0	179	122	80	70	13	79	0	1	0	544
1964	1	13	13	183	389	90	38	49	16	0	0	0	732
1965	0	0	0	0	33	116	35	23	0	103	0	0	310
1966	0	0	0	100	6	125	26	5	8	19	34	0	343
1967	0	0	0	20	215	188	0	0	46	36	52	0	557
1968	0	0	0	73	108	109	22	0	5	0	0	0	317
1969	0	0	0	0	21	38	14	16	4	0	7	0	100
1970	0	0	72	53	67	158	72	13	17	4	0	0	456
1971	0	0	0	47	111	156	6	2	9	0	0	0	331
1972	0	0	0	0	216	111	73	5	4	96	12	0	517
1973	0	0	0	12	22	134	42	2	0	0	4	0	216
1974	0	0	6	12	44	42	61	3	1	0	0	0	179
1975	0	0	0	100	0	222	143	11	7	0	0	0	483
1976	0	0	0	34	11	85	26	0	32	0	19	0	207
1977	0	0	0	78	17	74	6	73	10	0	0	0	258

ANNEX 2
Appendix 1
Table 1.5

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development
Monthly Rainfall

Hargeisa Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total(mm)
1959	4	0	0	35	32	66	83	45	106	15	0	0	386
1960	0	1	224	8	225	11	15	55	64	7	0	8	618
1961	0	0	10	17	108	32	34	80	129	21	28	0	459
1962	5	0	0	73	18	3	30	35	31	14	0	0	209
1963	0	9	0	182	15	46	16	57	52	7	0	0	384
1964	0	0	0	123	38	57	55	36	68	7	0	0	384
1965	0	0	0	53	9	11	25	5	35	19	0	0	157
1966	0	0	0	43	29	13	5	141	21	56	0	0	308
1967	0	0	48	79	99	24	44	87	95	28	88	0	592
1968	0	123	0	105	71	62	31	34	71	0	8	4	509
1969	0	62	40	16	37	3	79	54	63	12	43	0	409
1970	0	7	7	53	35	12	1	87	59	41	9	0	311
1971	0	0	17	60	97	81	38	62	30	2	11	0	398
1972	0	0	17	89	5	31	78	39	84	16	0	0	359
1973	0	0	0	46	40	13	26	47	55	1	0	8	236
1974	0	0	102	1	50	20	78	62	71	0	0	0	384
1975	0	0	0	166	42	47	319	64	88	0	0	0	726
1976	0	0	0	114	190	83	77	25	157	59	3	0	708
1977	0	0	0	176	156	25	0	180	111	55	0	0	703

ANNEX 2
Appendix 1
Table 1.6

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Baidoa Station

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1963	13	2	3	290	92	10	0	0	54	42	167	49	721
1964	2	4	11	231	143	0	34	19	6	32	3	56	541
1965	3	0	3	98	11	59	29	9	0	45	276	0	533
1966	0	4	59	214	3	0	9	0	0	239	19	0	547
1967	0	0	77	90	191	34	0	0	0	77	249	0	718
1968	0	0	50	17	105	44	37	0	0	180	0	-	433
1969	6	4	0	87	207	27	4	-	1	177	0	9	522
1970	17	0	8	338	121	19	15	0	9	112	0	0	639
1971	0	0	0	105	24	2	0	0	24	177	53	0	586
1972	0	3	0	137	193	18	29	0	17	242	52	0	691
1973	3	1	23	74	114	24	13	0	5	298	48	1	605
1974	0	0	0	149	52	0	0	0	0	18	0	-	(219)
1975	0	0	-	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-	4	23	187	-	-	(214)

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Monthly Rainfall

Belet Uen Station

	J	F	M	A	M	J	J	A	S	O	N	D	Total (mm)
1963													
1964	0.0	0.0	0.0	72.0	148.0	0.0	0.0	10.0	0.0	32.0	2.0	2.0	266.0
1965	0.0	0.0	0.0	76.0	43.0	0.0	0.0	0.0	0.0	182.0	50.0	0.0	351.0
1966	0.0	0.0	0.0	49.0	32.0	6.0	0.0	0.0	1.0	79.0	0.0	0.0	167.0
1967	0.0	0.0	4.3	103.5	147.7	1.0	0.0	0.0	1.2	114.1	136.4	0.0	508.2
1968	0.0	0.0	18.0	129.2	13.8	145.3	0.0	0.0	0.0	100.7	118.2	18.0	543.2
1969	0.0	1.0	0.0	1.5	18.1	3.5	1.5	0.0	9.0	37.6	30.8	0.0	103.0
1970	0.0	(1.0)	0.0	100.8	122.3	(3.5)	(3.5)	(1.5)	0.8	0	133.8	(35.6)	405.1
1971	0.0	0.0	0.0	11.4	111.0	0.0	0.0	0.0	0.0	50.0	21.7	0.0	194.1
1972	0.0	0.0	0.0	104.5	171.4	12.6	1.6	0.0	47.1	27.7	40.6	0.0	505.5
1973	0.0	0.1	3.3	74.0	90.1	42.2	10.0	0.0	17.6	84.4	43.4	2.2	305.3
1974	0.0	0.0	0.0	17.6	39.5	0.0	0.0	0.0	0.0	1.4	0.0	0.0	58.5
1975	3.0	0.0	0.0	58.3	37.9	1.0	1.4	0.0	0.0	33.3	16.5	0.0	151.4
1976	0.0	0.0	23.0	116.8	-	0.0	1.6	0.0	0.5	30.6	42.5	4.5	219.5
1977	0.0	0.0	10.5	198.9	47.7	72.3	0.0	0.0	11.8	24.2	60.7	15.0	441.1

ANNEX 2
Appendix 2
Table 2.1

Shebelli River

At Belen Uen

SOMALIA

AGRICULTURAL SECTOR REVIEW
Water Resources Development
Streamflow in m^3/s

Year	Months												Ann. Ave.
	1 Jan.	2 Feb.	3 Mar.	4 Apr.	5 May	6 June	7 July	8 Aug.	9 Sept.	10 Oct.	11 Nov.	12 Dec.	
1951				171.00	229.00	193.0	24.60	62.00	81.30	72.30	191.00	92.70	(124.10)
1952	8.20	4.97	4.65	5.02	87.50	39.70	7.48	38.80	125.30	84.30	42.10	4.12	37.90
1953													
1954	8.58	11.20	8.60	88.80	59.00	25.50	6.73	102.30	153.50	209.50	7.73	34.7	65.80
1955	7.84	7.45	8.97	9.65	44.00	12.73	7.47	29.80	97.50	135.80	42.50	8.60	34.50
1956	7.84	7.45	9.35	33.20	247.00	29.30	25.30	99.00	151.20	145.00	218.00	29.40	83.80
1957	11.20	8.28	20.10	59.80	200.00	106.30	51.90	124.20	130.00	52.60	56.30	42.20	72.40
1958	9.70	18.20	44.80	20.40	63.10	10.80	13.80	117.20	161.20	169.50	82.00	16.70	61.00
1959	8.97	8.28	7.48	7.34	73.70	21.98	11.92	76.90	143.00	122.80	112.00	22.40	51.60
1960	67.00	25.20	8.97	19.65	65.70	38.60	16.40	41.10	88.00				(41.18)
1961	10.42	10.30	7.83	9.28	52.60	15.00	46.30	122.90	235.00	214.00	215.00	260.00	100.40
1962	15.30	7.86	7.10	13.50	59.10	17.40	8.60	31.00	75.70	88.70	157.00	75.20	46.50
1963	22.65	19.00	8.23	60.70	301.00	139.00	62.00	108.00	158.00	99.30	54.80	79.50	93.50
1964	39.20	14.80	6.72	23.20	32.40	16.20	23.10	122.60	158.60	156.00	97.20	29.50	60.40
1965	53.40	14.05	5.60	8.12	46.00	10.80	3.73	31.00	70.70	85.00	94.30	(8.97)	43.00
1966	1.12	5.38	24.90	35.50	89.20	38.60	38.00	74.00	126.00	101.00	60.50	8.97	50.70
1967	1.87	2.07	1.49	47.10	124.63	54.05	31.72	113.43	182.24	220.90	147.88	183.95	92.61
1968	25.37	12.80	66.42	95.37	278.36	135.90	87.69	127.99	143.24	117.16	60.23	60.07	100.88
1969	20.16	24.28	116.70	106.60	131.90	45.85	61.90	128.00	174.00	82.60	40.90	14.00	78.90
1970	7.51	20.72	65.70	103.19	162.02	27.80	25.29	124.12	218.06	172.30	95.76	15.59	86.50
1971	8.65	5.70	4.50	50.18	90.50	45.58	80.80	103.80	151.98	104.65	74.80	32.20	62.79
1972	10.1	22.87	15.00	53.59	173.6	67.13	83.1	117.9	144.4	111.4	71.6	17.9	74.0
1973	17.9	4.5	3.0	6.7	58.1	24.1	27.7	90.1	127.2	100.4	25.9	4.6	39.4
1974	(0)	(2)	(0)	69.7	62.1	70.2	75.3	106.1	131.7	78.5	19.0	5.5	(51.7)
1975					79.0	43.3	64.7	127.0	208.7	126.0	33.7	8.0	
1976					83.0	52.6	38.0						
1977				14.4	187.5	63.0	78.7	139.8	147.2	165.0	248.3	129.8	
1978	27.0	11.4	82.8	49.3	86.7	30.8	64.5	137.5	194.3	158.8	110.3	28.2	81.8
1979	19.7	65.7	51.4										
Mean	17.3	13.5	24.5	46.2	117.3	50.3	39.5	96.0	145.3	126.9	94.3	48.5	
Mean of monthly means 68.3 m^3/s													

ANNEX 2
Appendix 2
Table 2.2

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Streamflow m^3/s

Shebelli River

At Afgoi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann. Ave
1951				91.12	92.91	81.08	17.91	49.25	72.59	42.54	93.05	75.00	(68.38)
1952	5.22	1.20	1.12	1.16	70.15	20.08	3.73	17.91	84.56	70.90	37.45	1.49	26.25
1953													
1954	4.85	4.96	5.22	73.36	53.73	21.24	1.12	55.22	93.05	89.93	60.23	28.73	40.97
1955	1.87	0.83	2.24	2.70	38.81	8.11	1.12	16.42	80.31	92.91	34.75	2.61	23.56
1956	1.49	1.20	4.10	6.18	88.43	23.17	19.03	81.34	93.05	88.81	89.58	25.75	43.51
1957	6.72	1.65	1.12	47.10	91.79	87.64	42.16	84.33	92.66	44.40	48.65	32.46	48.39
1958	3.36	11.16	47.39	11.58	56.72	5.02	7.84	82.09	93.05	92.91	61.00	13.43	40.46
1959	3.36	2.07	1.12	1.16	61.57	16.60	7.84	65.30	87.64	91.42	81.08	16.79	36.33
1960	57.09	18.00	4.85	14.29	55.97	33.98	11.94	32.46	75.29				(33.76)
1961	5.22	5.37	1.87	3.47	32.09	15.06	35.82	89.55	93.05	92.91	96.14	92.91	47.97
1962	10.07	1.24	1.12	7.34	46.27	12.36	4.10	21.64	65.25	74.63	92.66	64.18	33.41
1963	2.99	0.83	1.12	39.77	92.16	76.45	47.76	81.34	94.21	83.96	45.95	77.99	53.71
1964	38.06	14.80	3.36	15.06	32.84	16.60	23.13	33.58	91.89	91.04	80.31	66.42	42.26
1965	46.64	14.46	2.61	2.70	45.52	9.27	1.49	2.24	55.98	63.43	84.56	48.88	31.48
1966	8.21	0.83	22.76	23.94	68.66	36.29	32.09	48.88	80.31	74.25	63.32	13.81	39.45
1967	1.49	1.24	0	26.64	77.61	69.88	27.61	81.34	96.14	92.91	91.51	89.93	54.69
1968	29.48	9.20	52.99	56.76	91.79	86.49	70.90	83.96	91.51	88.81	62.16	64.18	65.69
1969	24.60	18.60	72.90	94.90	89.04	63.00	46.40	83.50	95.10	85.08	52.07	16.60	61.82
1970	4.75	15.04	31.50	87.20	96.90	49.90	18.80	79.40	97.80	97.00	86.20	25.90	57.53
1971	10.13	2.33	0	23.39	74.89	52.35	70.88	87.70	97.81	88.18	69.00	45.11	51.81
1972	9.65	5.12	19.58	17.64	92.60	74.70	60.60	97.70	102.10	96.10	82.10	30.40	57.40
1973	0	0	0	0		36.40				83.80	45.70	16.70	(22.83)
1974	0	0	0	0	59.60	57.60	82.00	82.00	90.70	73.50	29.10		(43.14)
1975					59.40	46.80	37.40	92.50	96.70	85.20	29.50	5.10	(56.58)
1976					86.20	90.90	62.10	90.40	98.40	73.40	63.70	40.10	(75.65)
1977	12.30	11.60		54.10	101.20	66.20	55.40		93.90	94.80	98.70		(65.36)
1978	56.20	9.80		53.50	74.60	44.10	37.00	93.30	42.20	112.10	94.20	44.00	(60.09)
1979	22.80	58.90											(40.85)
Mean	14.80	8.50	12.90	30.70	70.40	41.40	31.80	65.30	86.70	83.30	68.00	39.10	46.08
Mean of monthly means 46.1 m^3/s													

ANNEX 2
Appendix 2
Table 2.3

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Streamflow in m^3/s

Juba River

At Lugh Ganana - (Selchuzpromexport, 1973)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann. Ave.
1951	76.5	39.3	28.4	303.9	583.2	221.1	142.9	313.9	217.9	582.1	473.0	240.8	270.3
1952	64.2	20.3	12.7	61.3	221.0	78.7	97.0	228.1	378.8	601.9	302.9	43.7	176.9
1953	19.8	12.4	11.6	31.6	152.0	67.1	238.9	436.0	158.2	224.0	329.1	57.5	146.8
1954	25.4	12.4	10.8	211.0	193.0	140.0	268.8	489.1	510.0	589.2	133.9	81.0	223.5
1955	26.5	24.4	12.7	52.4	87.0	22.8	50.8	188.9	265.8	418.2	182.1	46.7	113.8
1956	35.5	24.4	12.7	87.2	237.0	98.8	135.1	315.1	341.8	785.9	280.9	61.9	202.5
1957	28.4	19.8	56.0	57.8	371.9	268.9	220.0	253.8	147.0	194.8	261.2	163.9	171.4
1958	36.2	41.7	28.4	27.8	119.1	669.0	325.9	476.0	452.2	462.9	315.9	231.1	266.2
1959	61.9	19.8	15.3	39.4	206.8	204.1	190.0	210.9	454.9	560.0	528.9	99.0	216.5
1960	38.5	181.1	430.1	39.7	15.3	175.9	240.8	169.9	224.2	281.1	381.9	222.9	200.2
1961	29.9	24.8	24.3	226.1	225.1	162.8	225.1	514.8	405.9	633.9	807.8	468.9	313.9
1962	78.8	29.3	22.8	55.9	188.9	46.3	72.1	172.9	234.9	508.1	280.9	115.0	151.4
1963	18.5	16.1	20.9	283.2	501.0	175.2	126.9	145.8	121.9	181.8	189.0	259.9	171.0
1964	81.0	38.4	24.2	57.5	75.8	96.8	99.3	253.1	244.9	510.0	314.8	140.0	162.2
1965	126.9	37.6	8.6	10.8	30.2	73.9	24.6	49.3	90.7	623.9	494.9	196.0	143.0
1966	50.8	31.0	32.5	75.2	209.8	150.8	125.8	185.2	346.8	258.0	275.8	97.1	153.7
1967	29.5	23.6	26.1	81.8	253.1	50.9	166.9	380.8	334.9	690.0	785.1	381.8	263.2
1968													
1969											165.9	57.9	(110.9)
1970	60.9	56.6	104.9	243.1	188.1	329.9	170.9	246.0	373.8	645.9	521.9	73.2	251.6
1971	36.2	27.7	27.6	60.2	194.9	162.8	228.1	212.1	246.1	595.9	405.9	122.8	194.5
1972	51.5	48.8	53.8	113.0	306.9	216.8	219.2	256.1	229.9	328.9	410.9	136.2	198.3
1973	53.8	31.8	19.4		27.6	15.8	22.8	286.7		452.9	260.8	7.5	(130.6)
1974	1.1	0	0	15.8	79.5	182.9	160.5	227.0	380.8	230.4	169.4	20.9	122.6
1975	4.5	7.4	5.2	28.5	67.9	35.5	208.3	421.9	378.1	391.7	250.0	32.9	153.6
1976	15.7	6.2	8.2	22.8	415.9	275.1	213.9	185.9	214.9	219.2	363.8	52.6	135.2
1977	21.7	27.3	14.2	239.9	330.4	358.0	210.9	318.1	483.4				(223.3)
1978	24.6	13.2	21.3	110.7	297.9	67.5	370.0	368.9	334.1		337.9	128.4	(189.9)
1979	29.1												(29.1)
Mean	41.4	31.4	39.6	100.7	215.1	165.1	175.1	280.8	302.9	456.9	354.9	133.7	
Mean of Monthly Means: 191.5 m^3/s													

Source: MMP 1978-1 to March 1973; Ministry of Agriculture (Hydrology) from April 1973

ANNEX 2
Appendix 2
Table 2.4

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Sediment and Salinity of the Shebelli River at Jowhar

	Flow m^3/s	Sediment load g/m^3	Total Sediment load ton x 10^3	NaCl g/m^3	Total NaCl Tons x 10^3
J	19.2	714.0	36.8	82.0	4.21
F	9.9	784.0	18.8	163.0	3.92
M	14.6	1,010.0	39.6	270.0	10.60
A	34.0	1,770.0	156.2	710.0	62.50
M	81.5	1,318.0	287.0	50.3	11.00
J	45.7	682.0	80.5	66.4	7.86
J	26.2	306.0	21.5	49.8	3.50
A	69.7	373.0	69.7	83.0	15.45
S	109.0	392.0	110.5	16.6	4.69
O	102.8	251.0	69.4	33.4	9.10
N	87.6	494.0	112.1	62.9	14.28
D	50.7	495.0	67.2	16.4	2.22
Mean Annual	54.0	629.0	1,069.3	88.0	149.33

Source: Tractionel (1972)

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Summary Description of Potential Aquifers 1/

The following is a summary of the potentially good groundwater areas. These areas are indicated on Map 6.2.

The Mountainous Area

Good aquifer potential is expected in:

- the accessible areas of the lower slopes of the consolidated sediments where the aquifers should be unconfined but deep; yields should be high especially from the structurally affected limestone or dolomite areas;

- the Sloping Plain and the isolated inter-mountain alluvial areas.

The potential is considered poor in the crystalline rock area and along the coastal plain, although there could be some local potential near zones of major runoff.

The Northern Ogaden Sub-Basin and the Darror Depression Sub-Basin

Excellent aquifer potential is expected in:

- the intake or recharge beds which encompass the unconfined aquifers in the upper Tug Der alluvials in the Burao region, and in the sediments of the Erigavo region;

- the intake beds which form the perimeter of the Darror Depression Sub-Basin;

- the Jessoma sandstones near Bulo Burti and Belet Uen, or in those localities where recharge could be drawn from the Shebelli river.

The potential is considered poor for irrigation water from the consolidated sub-artesian aquifers. In these zones the aquifer is confined and transmissivities low, such that relatively small yields will be pumped with significant drawdowns. For stock and domestic purposes the potential is good, but boreholes must be constructed with high efficiency to obtain a desired yield with an acceptable pumping drawdown level.

1/ Johnson, FAO, 1978.

The Baidoa Basin

Good aquifer potential is expected in the basin's intake beds. Water levels will be shallow, i.e. of the order of 3 m, and pumping drawdowns acceptable, i.e. 1.5 m at 12-15 l/sec. This is an attractive development proposition since the producing aquifer can be developed by hand dug wells.

Although the remainder of the basin has good stock and domestic water supply potential, the irrigation potential will be restricted by the deep water levels and the expected drawdowns in the basin's artesian aquifer. Further to the west a shallow saline aquifer occurs and high pumping rates would certainly cause aquifer leakage and water of inferior quality.

The Bur Area

Like the crystalline rocks of the mountainous zone, this basement complex has little potential either for irrigation, stock or domestic purposes. However, the numerous broad sandy stream beds have a high storage potential and store a very considerable volume of water. Being situated in one of the highest and most reliable rainfall areas, yearly recharge to these stream bed sands is assured. An imaginative scheme could well put these waters to use. Its quality is good and development of the sands by installation of screened well points would be a simple matter.

The Alluvial System

Apart from being recognized on satellite imagery, these systems are uninvestigated and, except for the Shebelli alluvials, undeveloped. Opinions expressed as to their potential are based on the lithology of the catchment rocks, the potential for recharge and fragmentary evidence gathered from literature, past reports and discussion with drillers and geologists.

Excellent potential could exist in:

- the Uadi Giohel system - however, there is no supporting evidence, and this is purely a professional opinion;

- the upper Tug Der system - this is supported by data from Burao, and indirectly, by results from the Hargeisa region. High yields have yet to be established, but the aquifer transmissivities will increase higher up the catchment.

Good potential, possibly even excellent potential, could exist in:

- the Erigavo-Gardo system - again there is no quantitative evidence, and qualitative evidence is not strong. However, if the general observations prove to be correct, the system could have a good, though localized potential;

- the lower Tug Der - Nogal valley system. Data is almost entirely lacking, but observations of upstream potential and downstream water springs suggests a downstream extension of the upper Tug Der potential;

- the upper Galcaio area where there is an obvious reduction in the contamination from surface gypsum. This appears to be the major ancestral alluvial system of the region and some early reconnaissance is warranted.

Poor potential is expected in:

- the lower Galcaio system (although the central Galcaio system could have water suitable for irrigation, but high in sulphate);

- the Dusa Mareb system;

- the Juba river alluvials.

The Shebelli river alluvials are already being developed at what could be considered an alarming rate, in view of the lack of knowledge of the system and the potential quality hazards. A properly planned investigation is overdue for this system. Rational development and good management of the system could make these alluvials the most important aquifer in the country. Lack of planned development and good management could destroy it, particularly by the invasion of inferior marginal waters, waters from depth and possibly even sea water intrusion in certain areas.

The coastal dune sands are an important stock and domestic water source, though for the latter purpose the fluorides are high. Nitrates could also be high due to surface contamination. Nitrate analyses are not available.

The coastal sands at Mogadishu warrant some study, and reconnaissance for other sandbeds is suggested.

Geological structures look particularly attractive as zones where water could accumulate under ideal hydrogeological conditions. The structures are broad and the rocks affected are sufficiently incompetent to produce significant zones of storage and transmissivity. Reconnaissance studies along the coastal fault line, along the synclinal/anticlinal structures in the north, and at the intersection of these with the dolomites in the north and coastal fault are clearly warranted. The fault line in the vicinity of the Bur Area also merits some reconnaissance.

The preliminary reconnaissance studies recommended for these potential aquifers include:

- closer inspection of satellite imagery;

- study of air photographs followed by ground reconnaissance, and more purposeful water sampling with hydrochemical studies;

- geophysical reconnaissance, followed by drilling and test pumping in a restricted area considered to be representative of the system being investigated.

From these studies preliminary estimates of the potential could be made, also terms of reference and specifications for ensuing investigations formulated.

CONCLUDING COMMENTS

Considering the availability of potential aquifers in conjunctions with the overall population of the country, its distribution and the distribution of its primary industry, Somalia does not appear to be short of water. What Somalia is short of is any meaningful investigation to bring these resources into production. The majority of the towns, with the notable exception of Galcaio and Dusa Merab, appear to be well located for the development of economic and reliable water supplies, and good aquifers are indicated in a number of the areas where the surface soils are considered suitable for irrigation.

In other areas, particularly the rangeland areas, stock water is available either from the unconsolidated sands on the surface, river bed springs or drilled boreholes. However, throughout the country the method of development is a major problems.

Most water points are merely hand dug structures in unconfined aquifer areas, where the water table is subject to a significant seasonal fluctuation. In these cases, probably 70-80% of Somalia's stock water will fail in drought periods. For example, of all the wells on which data is available, almost 65% are less than 4 m deep with about 50 cm of water said to be in them. Of the remaining deeper 5%, the majority were in the Shebelli alluvials where water supplies are not a problem.

With an average 1-2 m seasonal water table fluctuation, almost all the stock wells can be expected to go dry at some time of the year. In prolonged droughts, the water table in many wells will not return to pre-drought levels and these will remain dry. Thus, despite the opinion stated above that Somalia is not short of water, its present susceptibility to drought is alarming.

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Hydrolgeological Regions

Region	Sub-Region	Location	Characteristics	Groundwater Potential
Northern Mountains	Hard Rock Area	Mountain range along northern coast	Shallow overburden, little deep weathering	Poor potential, only localized promising aquifers
	Adjacent and Alluvial areas	Narrow coastal strip	Sand, gravel, clay deposits	Poor potential, danger of seawater intrusion
		North-eastern sloping plain	Thick alluvial deposits	Apparently significant potential
Ogaden Basin	Northern Sub-Basin	Central Somalia from Northern Mountains to Belet Uen/Bulo Burti	Complex geology: Limestones, dolomites, sandstones; sand, dunes	Good potential in limited areas; Northern intake beds, upper Tug Der region, Karstic formations near Erigavo, area near Shebelli river
	Darror Depression	Extreme northeastern part of basin	Sediment-filled graben structure	Good potential around peripheral intake beds only
	Baidoa Sub-Basin	Southern Somalia	Limestones, dolomites, sandstones, complex faults	Poor potential in general; some potential in intake area with high rainfall
Bur Area		Southern part of interriverine area, west of Mogadishu	Basement rock, gneiss, granite etc., not deeply weathered	generally poor potential in rock strata; promising potential in overlaying sand beds
Unconsolidated Alluvial sequences	Shebelli Valley	See Map	Extent of Alluvial deposits not known	Limited potential; continuation of present pumping could cause intrusion of low quality water
	Lower Juba Valley		Thin strata of marine sands, warfs, clays, limestones, gravel	Very low potential; thin upper good quality aquifer above saline aquifer
	Wadi Giohel System		25,000 km^2 catchment basin; sedimentary deposits	Good potential
	Erigavo-Gardo System		60,000 km^2 catchment basin; many separate and parallel channels	Good, though localized potential
	Tug Der-Wadi Nogal System		Over 100,000 km^2; thick alluvial deposits	Good to excellent potential
	Galcaio System		Closed basin	Poor potential, unsuitable water quality
	Duse-Mareb System		Stagment ancestral drainage system	Poor potential, unsuitable water quality
	Sand Dunes and Coastal Sands	Coastal Regions	Wide, shifting sand beds	Poor potential, some localized potential
Structural Aquifers		Fault along Indian Ocean	Broad complex of faults, intersects main groundwater system	Complex system allows no general conclusion; localized potential could be good

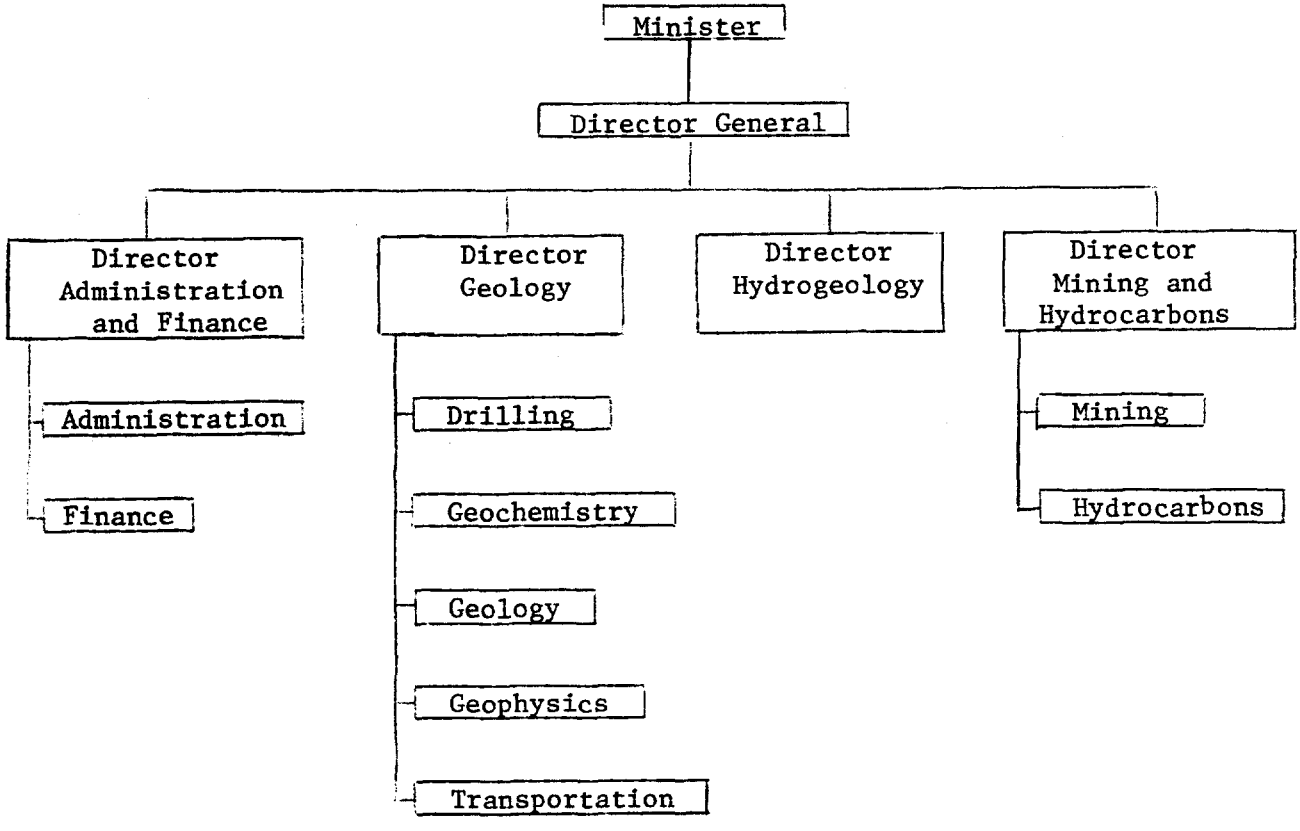
SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Ministry of Mineral and Water Resources

Organization Chart



SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Ministry of Mineral and Water Resources

Departments Concerned with Water Development

Geology Department

1. Established in 1974 following The UNDP Mineral and Groundwater Survey, the main functions of this Department are geological mapping, location and investigation of mineral deposits, mineralogical and chemical studies of ore deposits. Geophysical investigations and drilling are scheduled to form part of the feasibility studies.

2. Hydrogeology. Established in February 1978, following Ministerial directive in 1977. Functions:

(i) To make hydrogeological studies of the whole country;

(ii) To collect hydrometeorological data and conduct necessary computations and their subsequent interpretations;

(iii) To carry out research on specific areas;

(iv) To formulate and implement groundwater exploration projects;

(v) To work towards the enactment of water legislation.

Staffing

Organization and Post	Classification	Established	In Post
Director General	Administrative	1	1
Personal Secretary to Secretary of State	Administrative	1	1
Personal Secretary to Director General	Clerical	1	-
Clerk/Typist	Clerical	1	-

Organization and Post	Classification	Established	In Post
Geology Department			
Director	Professional	1	1
Assistant Director	Professional	1	1
-Geophysical Unit-			
Geologists/Geochemists	Professional	34	14
Assistant Geologist/Geochemists	Higher Techical	12	2
Operators, Assistants, et al	Technical	49	13
Cooks, Fieldmen, et al	Unclassified	25	7
-Geological Unit-			
Chief Geophysicists	Professional	9	2
Senior Assistant Geophysicists	Higher Technical	3	-
Assistant Geophysicists	Technical	6	1
-Laboratory Unit-			
Chemists/Mineralogists	Professional	7	2
Senior laboratory Tech/Senior Assistant Chemists	Higher Technical	4	13
Technicians/Assistants	Technical	18	13
Laboratory Attendants	Unclassified	6	4
-Topographical Unit-			
Topographical Engineers	Professional	2	-
Assistant/Topographical Engineer	Higher Technical	1	-
-Mechanical Unit-			
Chief Drilling/Mech. Engineer	Professional	1	-
-Drilling Section-			
Drilling Engineers	Professional	2	-
Drilling Superintendent	Higher Technical	1	-
Assistant Drilling Superintendents	Higher Technical	2	1
Drillers/Rig Hands	Technical	20	13
-Transport and Workshop Section			
Mechanical Superintendent	Higher Technical	1	1
Mechanics, Electricians et al.	Technical	65	45
Workshop Attendants	Unclassified	4	4

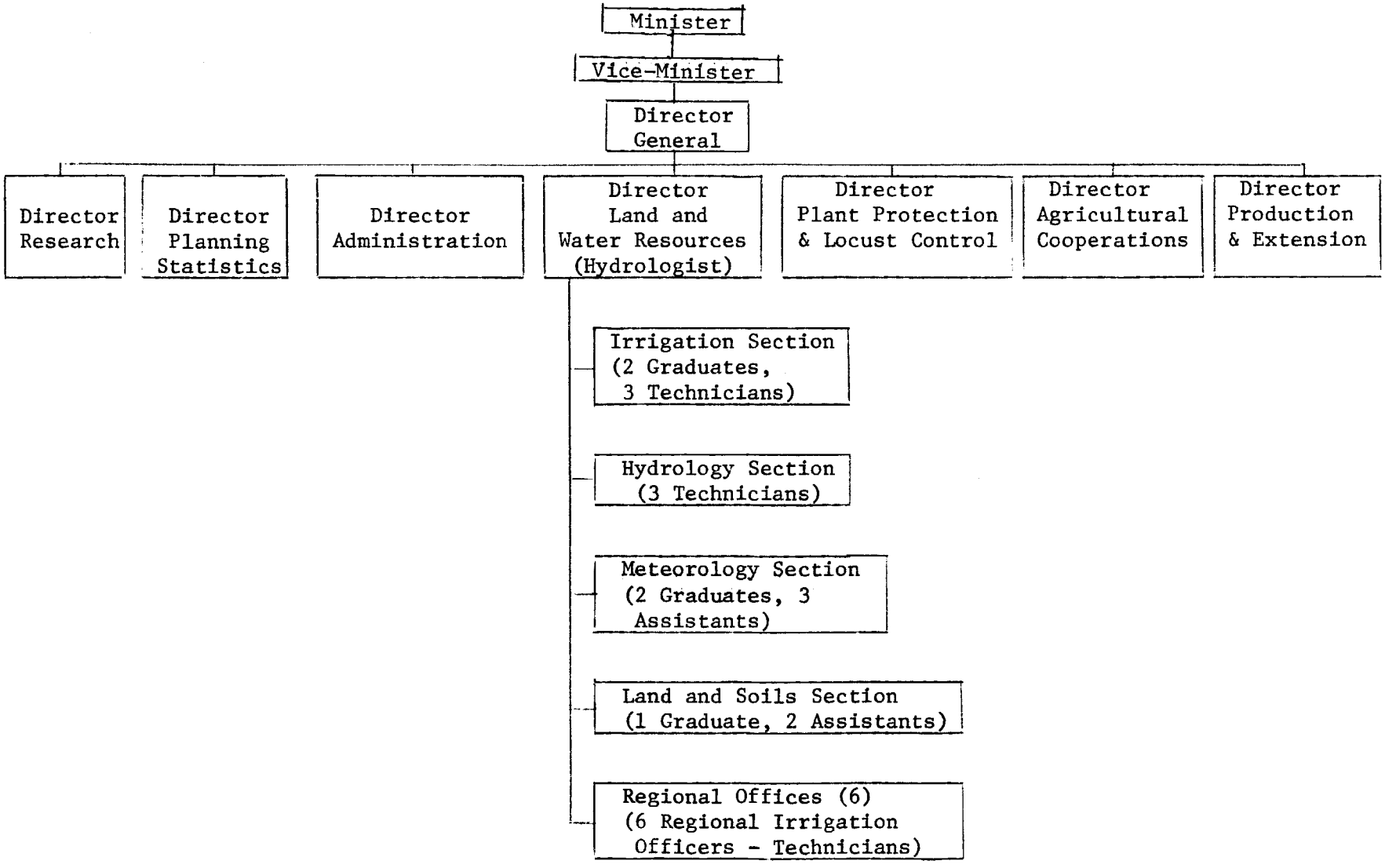
Organization and Post	Classification	Established	In Post
Hydrogeology Department			
Director	Professional	1	1
Clerk/Typist	Clerical	1	-
Messenger	Unclassified	1	-
-Regional Hydrogeolocial Unit-			
Hydrogeologists and Hydrometeorologists	Professional	6	-
Geologist	Professional	1	1
Assistant Hydrogeologists/ Hydrometeorologists	Higher Technical	5	-
Operators	Technical	10	2
Clerk/Typist	Clerical	1	-
Messenger	Unclassified	1	-
-Special Project Unit-			
Chief Hydrogeologist	Professional	1	-
Assistants/Operators	Technical	5	-
Clerk/Typist	Clerical	1	-
Mines and Hydrocarbons Department			
Director	Professional	1	1
Clerk/Typist	Clerical	1	-
Messenger	Unclassified	1	-
-Mining Unit-			
Mining Engineers/Geologists	Professional	5	2
Assistant Engineers	Higher Technical	4	-
Operators (secondary Level)	Technical	5	4
Clerk/Typist	Clerical	1	-
Messenger	Unclassified	1	-
-Hydrocarbons Unit-			
Geologists	Professional	7	2
Assistant Geologists	Higher Technical	4	-
Operators (secondary level)	Technical	5	-
Clerk/Typist	Clerical	1	-
Messenger	Unclassified	1	-
-Special Project Unit-			
Geologists	Professional	6	-
Operators	Technical	3	-

Organization and Post	Classification	Established	In Post
Administration Department			
Director	Administrative	1	1
Head of Service	Administrative	1	-
Chief Accountant	Administrative	1	-
-Finance and Accounting Section-			
Head of Section	Administrative	1	-
Accounts Officers	Executive	7	5
Clerk/Typists	Clerical	5	1
-Procurement and Store Section-			
Head of Section	Administrative	1	-
Stores Officers et al	Executive	6	2
Duplicating and Photo-machine Operator	Technical	1	1
Telephone Operator	Technical	1	1
Mason	Technical	1	1
-Personnel and Registry Section-			
Head of Section	Administrative	1	-
Senior Personnel Officer	Executive	1	-
Senior Registry Officer	Executive	1	-
Executive Officers	Executive	4	4
Clerk/Typists	Clerical	5	-
Messengers, Watchmen, et al	Unclassified	29	18

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Ministry of Agriculture - Organization Chart



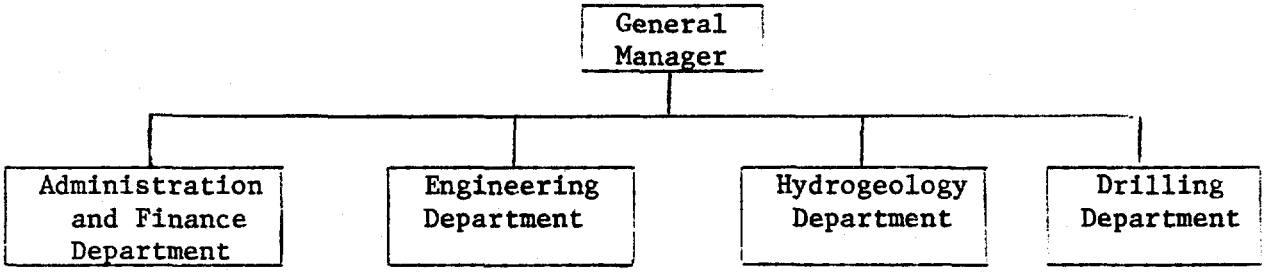
SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

Water Development Agency

Organization Chart



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AGRICULTURAL SECTOR REVIEW

Water Resources Development

Water Development Agency (WDA) Functions

The legal position of WDA is laid down in Law No. 28 which came into force on May 1, 1971. It functions under the supervision of the Minister of Ministry of Mineral and Water Resources who "may give the Agency directives". The main purpose of WDA is the development of water resources. In furthering this aim WDA is instructed to promote:

(i) research on water resources;

(ii) construction of aqueducts, water networks and distribution facilities;

(iii) collection and evaluation of all data relating to water resources and their potential;

(iv) development of research and studies in the field of water resources;

(v) preparation of comprehensive plans of the proper use of water resources;

(vi) preparation, programing and execution of projects relating to water resources in order to coordinate the use of water within Somalia.

WDA has 22 rigs - eight rotary and 14 cable-tool. Most are very old and rarely are more than 12 rigs in operation at any one time. Bore-hole site selection is usually done by the driller and there is minimum supervision by geological staff.

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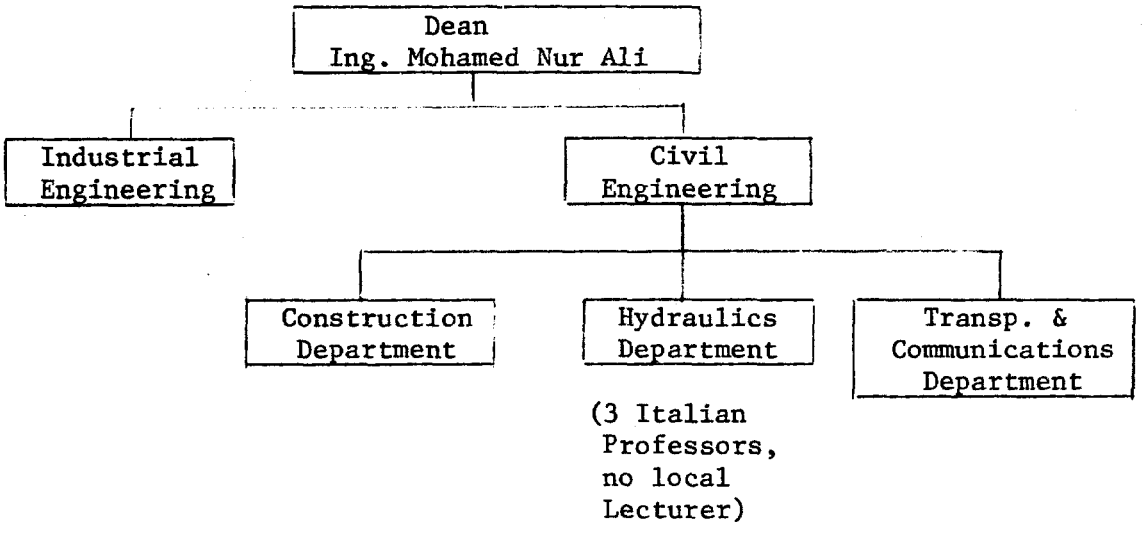
AGRICULTURAL SECTOR REVIEW

Water Resources Development

Engineering Faculty of University Mogadishu

Organization Chart



Enrollment		1973	1974	1975	1976	1977	1978	1979
Students Entering	(50% Civil, 50% Industr. Eng. after 2nd year)	30	60	60	60	60	80	60
Graduatating	Civil	-	-	-	-	-	4	8
	Industr.	-	-	-	-	-	12	19

8 Semester (4 Years) Curriculum
4 Semesters basic studies for all Engineering Students
4 Semesters specialized courses: Industrial or Civil Engineering; no further specialization

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources and Development

Draft Water Use Law

THE PRESIDENT OF THE SOMALI DEMOCRATIC REPUBLIC

HAVING SEEN:	The First and Second Charters of the Revolution,
HAVING SEEN:	Law No. 26 of the 20th February 1971 governing the Water Development Agency
HAVING HEARD	The proposal of the Minister of Agriculture;
TAKING NOTE	Of the Approval of the Council of Ministers.

HEREBY PROMULGATES
THE FOLLOWING LAW:-

CHAPTER I

GENERAL PROVISIONS

Article 1

Subject to the Law

All water in the territory of the Somali Democratic Republic is the property of the State and is subject to control by the competent authority, in accordance with this law.

Article 2

Private Use of Water

1. Everybody has the right to utilize water from natural lakes, streams, springs, public wells, reservoir tanks, canals and other public hydro-installations, in observance of the provisions outlined in article 4 of this law.

2. Everybody has the right to let livestock drink the above mentioned water, provided that he does not cause damage or defilement to the stream, wells, reservoir, canals and their banks. Livestock owners are required to observe the provision of article 4 of this law, and to pay for any eventual damage caused by their livestock.

3. No one shall draw water from canals or hydro-installations without the owner's authorization, in accordance with the provision of civil laws on private properties.

4. The use of water from rivers or canals which the government has not improved with new work is exempt from the usage fees prescribed under article 4 of this law.

Article 3

Rights of the Land Users

1. The land user who makes use of the water in accordance with the preceeding paragraph shall not damage adjacent lands, nor lessen or limit the rights that other land users have on the water.

2. The land user who shall wish to devote for agricultural use part of or all the water from seasonal rivers (Tugs, Wadies, Bohol) or swamps whether crossing or border his property or not shall have to get the authorization of the Ministry of Agriculture, according to the provisions of the regulations issued under this law.

3. In any case the quantity of water which is to be utilized permanently by the land water user shall not exceed that which shall be established by the regulations issued under this law and the authorization issued by the Minister of Agriculture.

4. Previous to any step for digging of permanent or temporary new canals, drainages, aqueducts or other water ways, official agreement must exist between the canal owner and users of the land it would cross and compensation for land occupied shall be paid according to the rates fixed as per the regulations.

Article 4

Restrictions on Usage

1. Anyone wishing to utilize continuously a quantity of water above the maximum established by the regulations issued under the present law, shall obtain official authorization from the Minister for Agriculture and pay relative fees in accordance with the above mentioned regulations.

2. Anyone utilizing, at intervals, more water than the maximum established in the preceeding paragraph, either for watering livestock or for any other purpose shall pay an established amount in compliance with the preceeding paragraph.

3. Transitorily, anyone utilizing permanently more water than the maximum limit fixed by this law shall comply with this law within one year of its coming into force.

4. The use of water coming from artificial basins dug by the public administration shall be charged according to the maintenance and the administration costs incurred. In special cases, the Ministry of Agriculture shall issue an official authorization for the free use of such water.

Article 5

Authorization for Hydraulic Work

1. No diversion work, water outlet from river, (tugs, wadi, bohol, lack), swamp or establishment of canal network for irrigation purpose shall be made without written authorization from the Ministry for Agriculture granted in accordance with the regulations issued under this law.

2. No outlet for drainage water, including drainage canal network, shall be done without written authorization from the Minister for Agriculture granted in accordance with the Regulations.

3. No pumping station for water lifting and irrigation purpose including irrigation canal network can be built without written agreement by the Minister for Agriculture granted in accordance with the regulations.

4. No pumping station or water diversion head work, including waterways for industrial purpose can be constructed without written authorization by the Minister for Agriculture granted in accordance with regulations issued under the law.

5. Transitorily, anyone utilizing any water work as above described shall comply with this law within one year of its coming into force.

Article 6

Registry of Users

1. The Irrigation Department of the Ministry of Agriculture shall keep a registry of users, in the manner proscribed by Regulation No. 11 issued under this law.

2. The Registry shall indicate the nature and the limit of the rights of usage, achnowledged or granted in accordance with Articles 4-5 of the present law, and a short description of the characteristics of the hydraulic work and its location.

3. All wells, basin canals and other traditional water installations shall be registered within the objects of national water resources, their use, recording and management.

Article 7

Growth of Associations

1. Permits of usage, etc. shall not be transferred without authorization of the appropriate authority, in accordance with the regulations.

2. Transfer of permits of usage, etc. must be inscribed on the register of users kept by the Irrigation Department of the Ministry of Agriculture in accordance with Article 7 of this law.

Article 8

Revocation of Official Authorization

1. The Minister for Agriculture on the written proposal of the Director of the Irrigation Department, may revoke any authorization issued under this law:

(a) if the user does not use the water for a period of one year;

(b) if the user misuses or wastes water in the judgement of the competent authority;

(c) if the user according to the Health Authorities endangers public health;

(d) if the user does not maintain and repair his own hydraulic works and this endangers public health, private or public properties;

(e) if the user does not comply with the conditions set forth in the official agreement;

(f) if the user transfers his official agreement to a third person without authorization and registration by the Minister for Agriculture;

(g) if the user does not pay the water fees within six months from the date he received the order to pay from the appropriate authorities;

(h) if the user refuses the routine inspection of his hydraulic works by the water use inspector of the Irrigation Department or to implement suggested maintenance or repairs.

2. The revocation order shall be notified to the user in writing.

Article 9

Financial Provisions

Regulations issued under this law shall establish the rates of fees, and other payment for use of water, occupation of public property, rental of water meters, granting of official authorization as well as reimbursement charges or expenses in connection with work done by the Irrigation Department and for checking or testing design works and water installation.

The fees mentioned above will be collected and used for the development of agricultural water in agreement with the Ministry of Finance.

Article 10

Guarantees of Administrative Justice

1. Anyone aggrieved by an administrative action of the Irrigation Department of the Ministry of Agriculture may petition the Minister for Agriculture within three months of the date of notice.

2. Anyone aggrieved by administrative action of the Minister for Agriculture may appeal to the Supreme Court in the manner established by law.

CHAPTER III

ADMINISTRATION ORGANIZATION

Article 11

Authority of Minister for Agriculture

All functions in connection with the collection, conveyance, maintenance, repair and distribution of the hydro-resources for agricultural purposes, are within the competence of the Minister for Agriculture except that the Health Authorities shall have competence in all matters concerning hygiene and public health.

Article 12

National Committee for Water Development

1. (1) The National Committee for Water Development is an advisory unit of the Ministry of Agriculture;

(2) The National Committee above mentioned shall advise the Minister for Agriculture in all matters in connection with agricultural water development in accordance with the law establishing the Water Development Committee.

2. (1) The Regional Sub-Committee for Water Development is an advisory unit of the Presidency of the Regional Council;

(2) The Regional Sub-Committee for Water Development is the corresponding unit at the Regional level of the National Committee for Water Development;

(3) The Regional Sub-Committee for Water Development shall act in accordance with the law establishing the Water Development Committee.

Article 13

The Irrigation Department

1. Under the responsibility of the Minister for Agriculture, the Director of the Irrigation Department has the authority to issue official authorization to carry on any hydraulic work in connection with water use and water development.

2. The terms and conditions for the issuance of such official authorization are established under the regulation under this law or by the Minister for Agriculture.

3. The Director of the Irrigation Department of the Ministry of Agriculture is responsible for the proper application of the water regulations, the implementation of the official agreement and the ascertaining of any breach of the law.

Article 14

Prohibitions

1. For protection of the 100/50 meter wide band of land included in the borders of the water courses except by special authorization of the Minister for Agriculture, it is prohibited:

(i) to stop or modify the free course of any water ways of the public property by any kind of temporary or permanent construction;

(ii) to modify, by excavation, deposits, building any kind of structure, deforestation, debushing, the natural condition of the free board of the water courses;

(iii) to fit permanently and or temporarily pumping stations for agricultural water use.

2. For protection of national water potentialities or resources, except by special authorization of the Minister for Agriculture it is prohibited:

(i) to store by means of a storage (imponding river bed) or off-stream storage, for agricultrual hydraulic purpose;

(ii) to divert or pump water from water course, lakes or swamps, for the same reason as 2.2 above mentioned.

(iii) to carry back to any water course, lakes, or swamps and to ground surface, any natural, agricultural water.

(iv) to dig or drill tube wells for agricultural purpose.

3. Maintenance of Hydro-Installation:

(1) Public properties: The maintenance of any hydro-installation of public use fitted as public properties are under the financial and technical responsibility of concerned Government authorities.

(2) Private Properties:

(a) The maintenance of private hydraulic works fitted on public property is under the financial responsibility of their owners but under the technical control of the responsible Government authorities;

(b) The maintenance of private hydraulic works fitted on a private property are under the financial and technical responsibility of their owner.

(3) Classification of Hydraulic Structures:

First Cateegory

(i) Traditional water work: Not equipped with permanent hydraulic device in hard material (masonary, concrete, wood, steel, etc.). Not using hand working or mechanical waterlift equipment, providing less than 2 liters per second discharge.

(ii) Traditional hydraulic work: fitted with permanent hydraulic installation built with hand material which divert or lift less than 2 liters per second discharge or 200 cubic meters per 24 hours.

(iii) lined borewell or tubewell sunk at 50 meters maximum depth, equipped or built with mechanical water lift device which provides less than 2 liters per second permanent discharge or 200 c.m. per 24 hours.

(iv) pumping station fitted on water course, lakes, or swamps, providing less than 2 liters per second discharge.

Second Category

Traditional Water Work:

(i) fitted on spring well, temporary or permanent water course, swamps. Not equipped with permanent structure built of hard material (masonary, concrete, wood, steel), using or not hand mechanical water lift device.

(ii) diversion work (headwork and canal).

- fitted on permanent or temporary water course, lake or swamp.
- built of hard material, inside the water course bed and free board.
- catching or not all the stream flow.
- with less than 50 liters per second discharge.

(iii) Pumping Station and Canal:

- fitted on the free board of a permanent or temporary water course, lake, swamp, etc.
- temporary or permanently working.
- catching or not all the water available.
- with less than 50 liters per second discharge.

Third Category

All the hydraulic structures, diversion work and canal, pumping station, artesian well, etc. permanently or temporarily utilized of which discharge is over 50 liters per second, and less than 100 liters per second.

Fourth Category

The water storage for irrigation for hydro-electric power shall be devided into three classes:

Class 1: water storage for normal farm management, less than 50,000 cubic meters of capacity.

Class 2: water storage for normal requirement, irrigation purpose, made by impondment or river bed, or of stream storage whose capacity is more than 50,000 c.m. and less than 1,000,000 cubic meters.

Class 3: Any kind of water reservoir for various purposes whose capacity is larger than 1,000,000 c.m.

Fifth Category

All the inlet works to rivers, swamps, lakes, or depressions for drainage or sewage water from agricultural, municipal industrial or natural origin.

CHAPTER III

FINANCIAL PROVISIONS

Article 15

Area of Limited Usage

1. The Minister for Agriculture may declare certain districts or areas of limited usage in case of drought or any reason of public interest, through decree published in the official bulletin.

2. In such case, the Director of Irrigation Department of the Ministry of Agriculture may impose special limitation on the area, regarding: search, extraction, diversion, storage, utilization and distribution of water for agricultural development.

Article 16

Penal Provisions

1. (a) Any one utilizing agricultural water without the required official authorization prescribed by the law shall be fined up to So.Sh. 5,000 and also pay So.Sh. 30/= for every day of violation after the date of ascertainment.

   (b) The user utilizing water for irrigation purposes, without official authorization required in accordance with Articles 4 and 5 of this law shall pay a fine of Sh. 1,500/=.

   (c) The user utilizing the water in a bad manner or wasting it shall be fined up to Sh. 1,000/=.

   (d) The user who transfers his official authorization to use the water to a third person without obtaining the necessary authorization shall be fined up to Sh. 3,000/=.

   (e) Anyone who violates the provisions of Article 15 (2) of the present law shall be punished by six months imprisonment or with a fine of Sh. 1,500/=.

   (f) Anyone who undertakes search, digs a canal, diverts river water, or floods an area, with drainage water, without the necessary official authorization shall be fined up to So.Sh. 7,000/=.

(g) The owner of any hydraulic work established on public property who does not pay rent on the land within sixty days from the date he recovers the order to pay from the appropriate authority shall be fined according to the regulations issued under this law.

In case 1(a), 1(b), 1(e) above, the Court may also order foreiture of machines and equipment used for violation, and also order, when necessary, the restoration of the area at the expense of the transgressor.

Article 17

Regulations

The President of the Somali Democratic Republic on the proposal of the Minister for Agriculture may issue regulations for proper implementation of this law.

Article 18

Repeal

Any law or provision contrary to or inconsistent with this law is hereby repealed.

Article 19

Entry into Force

This law shall come into force immediately and shall be published in the Offical Bulletin of the Somali Democratic Republic.

(Mohamed Siyaad Barre)
Mogadishu _____ PRESIDENT, SOMALI DEMOCRATIC REPUBLIC

SOMALIA

AGRICULTURAL SECTOR REVIEW

Water Resources Development

PROJECTS

1. Banana Rehabilitation

Location: Lower Juba, Lower Shebelli river basin

Components: Rehabilitation of irrigation infrastructure; improvement of marketing system, extension services, etc.

Agency: Banana Board

Status: Identification only; preparation by FAO/CP or consultants needed.

2. Irrigation Rehabilitation

Location: Countrywide, but mainly in Shebelli valley

Components: Rehabilitation of irrigation works; technical assistance in water management - extension services; research

Agencies: Ministries of Mineral and Water Resources, and Agriculture

Status: Identification only; preparation by FAO/CP or consultants needed.

3. Groundwater Development

Location: Countrywide

Components: Exploration drilling in areas identified as having good groundwater potential; exploitation of wells for water supply as needed; use of "surplus" water for irrigation if economically justified; technical assistance to executing agencies;

Agencies: WDA, Ministry of Mineral and Water Resources, and Ministry of Agriculture

Status: Identification only; preparation by FAO/CP or consultants needed.

4. Drainage/Rice Development

Location: Lower Shebelli valley swamps

Components: Construction of polders, road embankments, drains (controlled drainage); provision of low-lift pumps; technical assistance.

Agency: Ministry of Agriculture;

Status: Location and size of area to be determined; preparation by FAO/CP or consultants needed.

5. Flood Control Project

Location: Shebelli valley and Lower Juba valley

Components: Dikes for protection of towns and villages in flood plains; dikes along rivers to protect agricultural production; relief channels; technical assistance to executing agency responsible for maintenance of flood control works;

Agencies: Ministry of Mineral and Water Resources; Ministry of Agriculture

Status: Identification only; topographical surveys and preparation by FAO/CP or consultants needed.

6. Land and Water Survey

Location: Countrywide

Components: Land, soils surveys;
water survey: collection and evaluation of data on rainfall; runoff and stream flows (especially small streams and wadis), and groundwater, including research on most appropriate methods of rain water harvesting (impermeabilization of catchment areas vs. yield and cost of various methods).

Agencies: Ministry of Mineral and Water Resources, Ministry of Planning;

Status: Identification only; preparation with Bank and FAO/CP or consultants needed.

7. Technical Assistance in Water Development

Proposed as component of any of the above water development projects

Location: Countrywide

Components: Training of engineers, economists, administrators in water development, technical assistance for preparation of a Water Law including provisions for regulatory (control) agency and reorganization of agencies dealing with water development; establishment of a Water Planning Office.

Agency: Ministry of Planning, Ministry of Mineral and Water Resources;

Status: Identification only; preparation with Bank and FAO/CP or assistance needed.

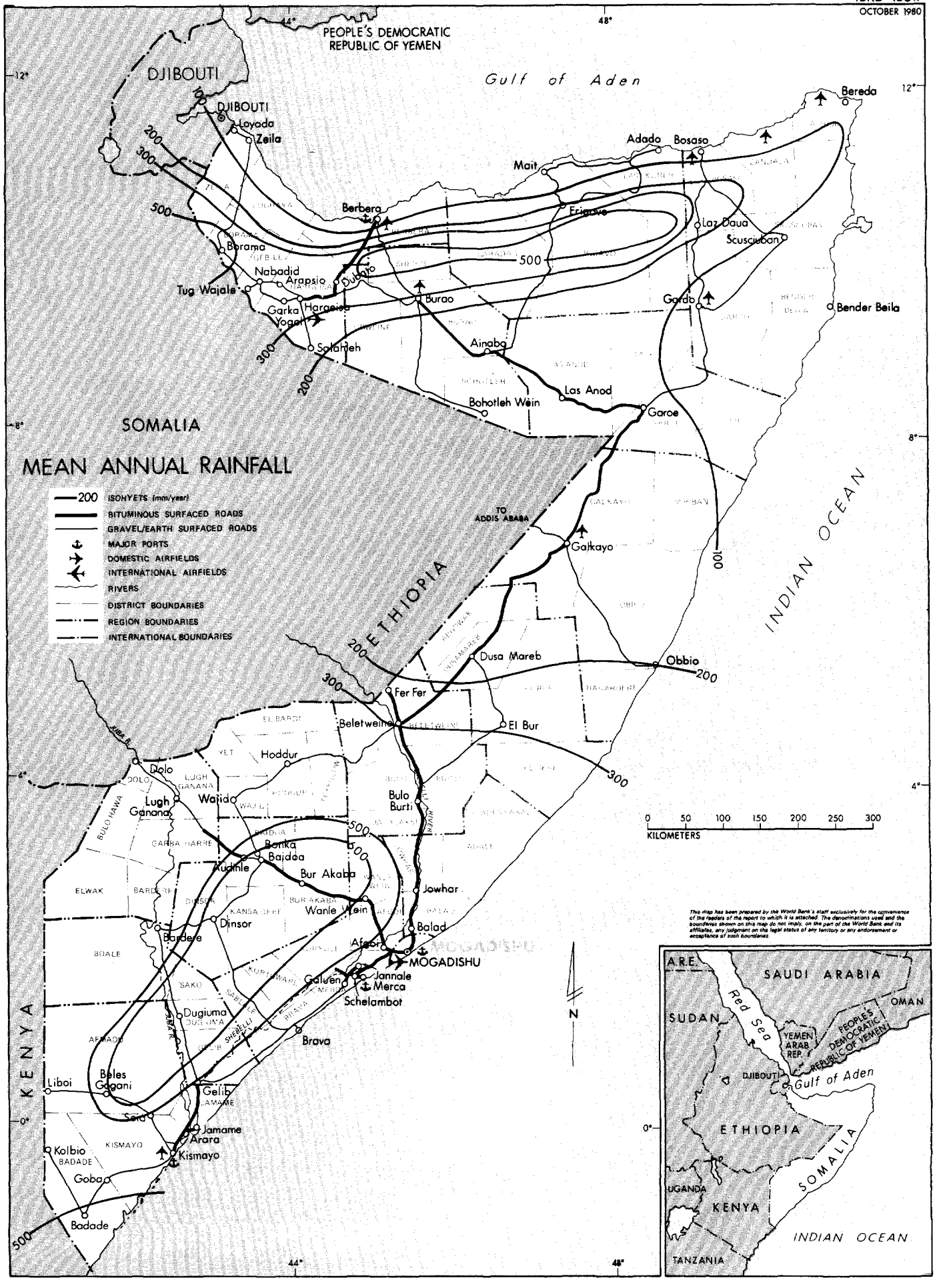
8. Bardere Dam Project

Location: Juba Valley

Components: Construction of major dam near Bardere, irrigation and agricultural development; hydro-power generation;

Agency: Not yet identified

Status: Feasibility Study prepared; review by EEC appointed consultants underway.



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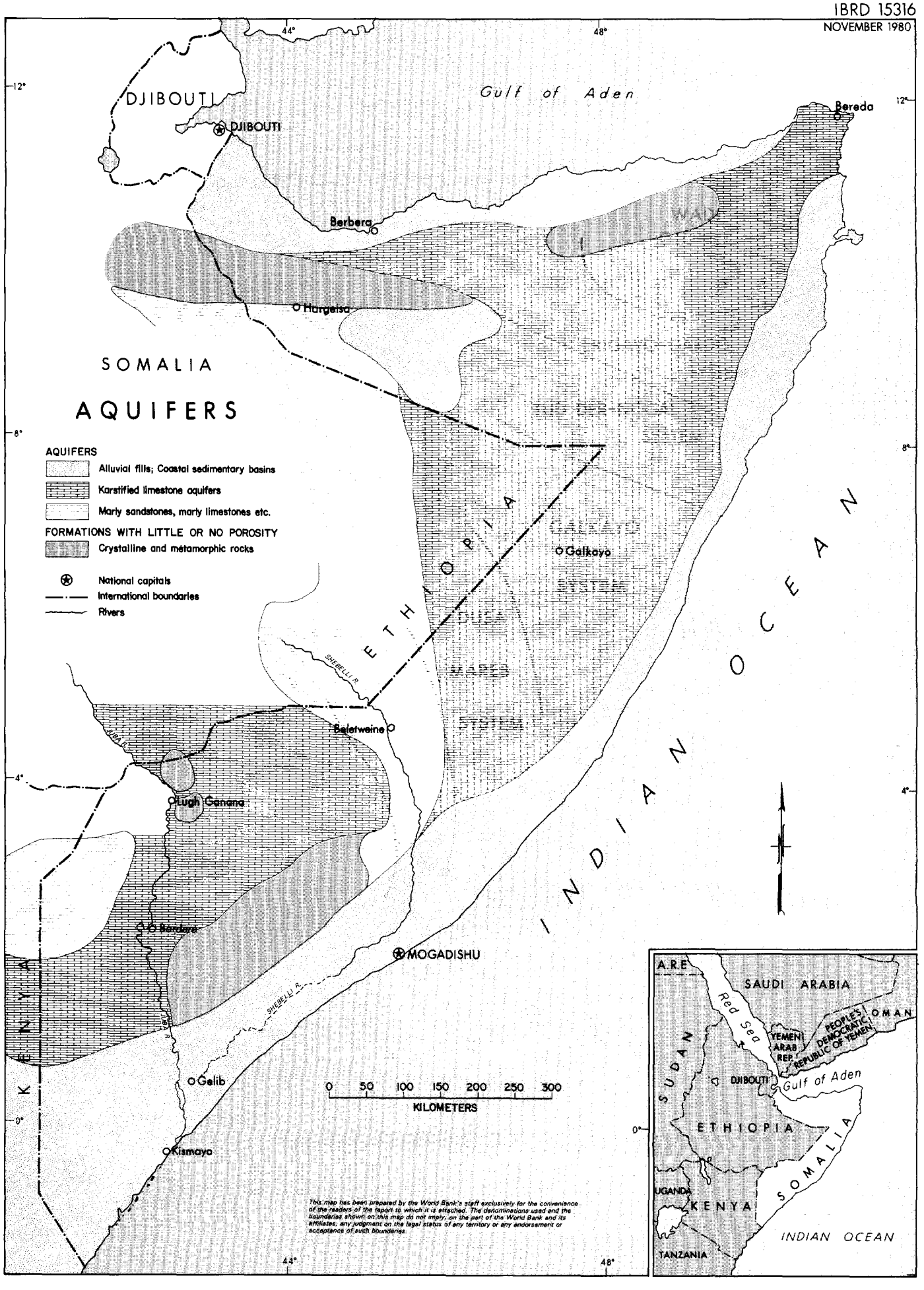

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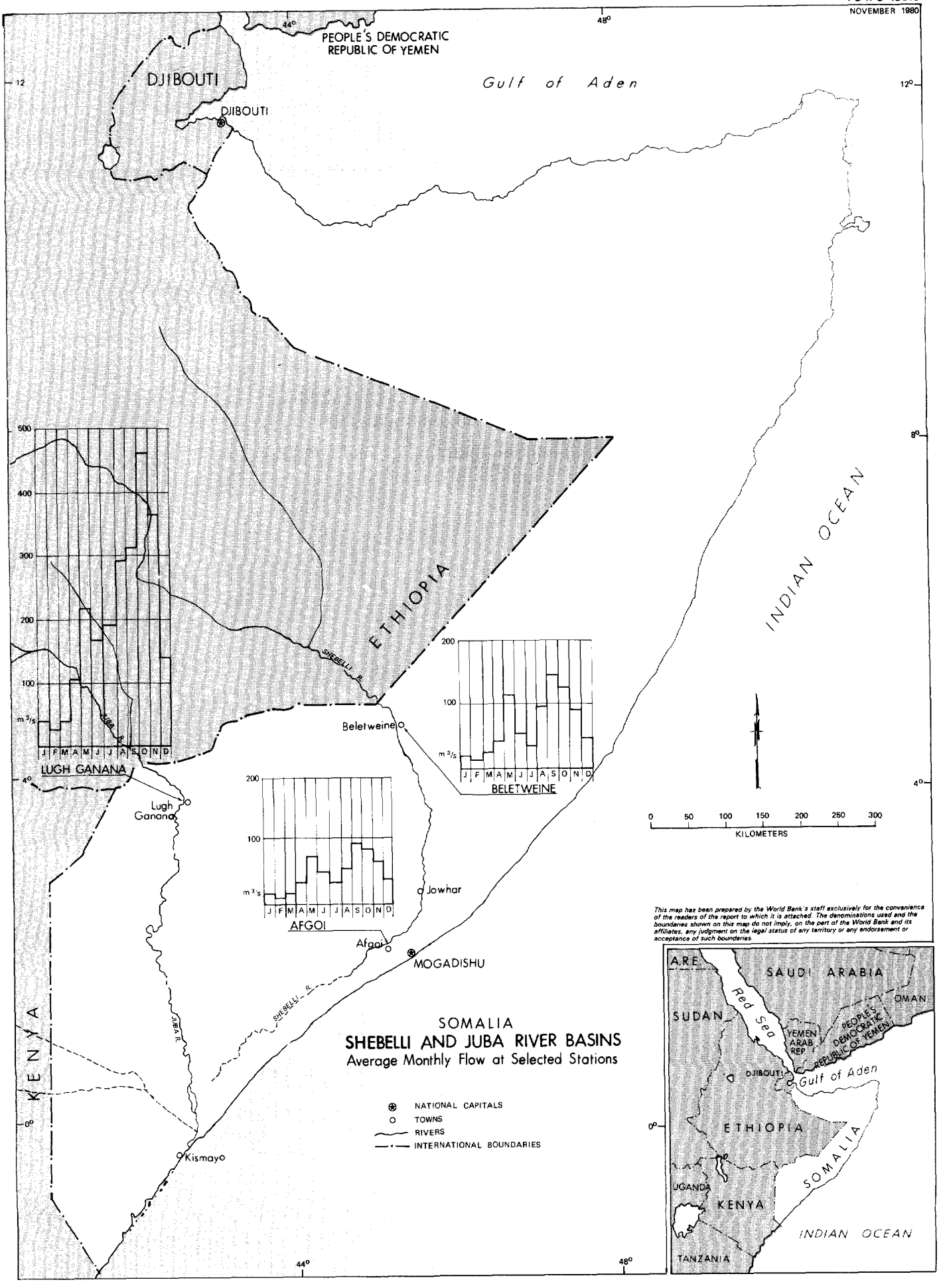

ANNEX 3

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

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SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

INTRODUCTION

A. General Characteristics

Physical Characteristics

1. The Somali coastline divides into a northern section bordering the Gulf of Aden, which extends for about 1,000 km from the Djibouti border to Ras Asir (Cape Guardafui) and an eastern coastline facing the Indian Ocean, which extends some 2,000 km from Ras Asir in the north to the Kenya border at Ras Chiamboni in the south.

2. The coast consists typically of long stretches of sandy beach interrupted at intervals by rocky outcrops and cliffs, some of which project out to sea as headlands. However, few of these promontories are large enough to provide much shelter from prevailing winds and the coastline is therefore, generally lacking in natural sheltered harbors.

3. The continental shelf is narrow and rarely exceeds 15 km in width except in the vicinity of Ras Asir and Ras Hafun where the shelf extends to about 50 km offshore, and in the areas between Berbera to Zeila and to the northeast of Alula where it is about 30 km wide. The total area of continental shelf off Somalia, bounded by the 200 meters depth contour is estimated at between 35,000 to 40,000 km^2.

4. Much of the sea bed is rocky, uneven and steeply sloping, but a fairly extensive trawlable area has been located off the northeast coast between Ras Asir and Eil ($8^{o}N$ lat.), and there are a few more limited pockets off the north coast, between Eil and Obbio in the Mogadishu-Brava area and south of Kismayo. From the Equator to $2^{o}S$ lat., the coastline is characterized by an offshore chain of islands, inter-linked by coral reefs and this part of the coast is also influenced by the outflow of Somalia's only permanent river.

5. The climate in the coastal region is hot and humid, with average temperatures ranging from 27^{o} to $32^{o}C$ along the east coast and rising to above $40^{o}C$ at time on the north coast. The seasons are governed by the southwest monsoon which blows during June to September and the northeast monsoon during November to March, with two short inter-monsoon periods during April-May and October. During the southwest monsoon, the Somali current flows northward along the coast from south of the Equator, and surface current flow in the Gulf of Aden is eastwards from the Gulf into the Arabian sea. Current flows reverse with the onset of the northeast monsoon, flowing westward into the Gulf of Aden and southward along the Somali east coast. The timing of the

monsoon changes can vary from one year to another, affecting the timing of the surface current reversals. These characteristics cause fish abundance, particularly of pelagic species, to be very seasonal and difficult to predict.

6. An important area of oceanic "upwelling" occurs off the north-eastern Somali coast, caused by sub-surface currents reaching the landmass and causing nutrients to be swept up from the sea bed and carried into the upper layers to re-enter the surface food chain. Fish concentrations are often associated with such upwellings.

Biological Productivity

7. The nutrients mentioned in relation to the upwelling form the first item in the food chain of fish, which also includes phytoplankton and zooplankton, the distribution of which, therefore, provides some indication of the likely distribution and density of fish resources. In the case of phytoplankton, studies have shown that abundance levels in the Gulf of Aden and along part of the northeastern (Indian Ocean) Somali coastline, are among the highest in the world and are comparable to the levels in other major fishing grounds such as the North Sea, and the waters off northwestern Africa and western South America. In the case of zooplankton, only the Gulf of Aden shows levels similar to those major fishing grounds. Consequently, it would appear that at least moderate concentrations of fish and shellfish should occur along the Somali coast and that the greatest abundance should be found in the Gulf of Aden.

Abundance and Distribution of the Major Fish Resources

8. The production potentials of the fishery resources around Somalia are still poorly known because of the lack of statistics on catches from both the artisanal and industrial fisheries. However, research data gathered during a number of cruises by fishery research vessels in the area, the most recent being that of the I.O.P./NORAD survey vessel: Dr. Fridtjof Nansen has compiled the best available estimates of stock abundance levels, by species, providing at least "orders of magnitude" in the case of some pelagic stocks and estimates, possibly on the low side, in the case of demersal stocks. 1/ Species living on the sea bed, or in and around coral reefs are not readily detectable by acoustic counting techniques.

9. The results of various relevant research reports, including that by Dr. Fridtjof Nansen have been summarized in Section 2 of the 1979 White Fish Authority, Fishing Sector Planning Study, Interim Report to the Somali Government, which concludes that the best estimates of potential annual catches for the major fish groups are as follows:

1/ Pelagic fish hire at the surface or mid water and include species such as sardines, herring, anchovies, tunas, etc.

Demersal fish are bottom living species such as grouper, snappers, flounders, pourgies etc.

Large Pelagic Species	8,000 tons
Small Pelagic Species	100,000 tons
Large Demersal Species	40,000 tons
Sharks and Rays	30,000 tons
Spiny Lobsters (deep water)	1,500 tons
(shallow water)	500 tons
Shrimps	400 tons
Turtles	not known
Cephalopods	not known
Mesopelagic Species	not known but large

10. The major resources of the Somali coastline are clearly the small pelagic and mesopelagic species which have been located off the northeast coast in shallow and deeper water respectively, and which could form the basis of a future fish-meal industry. It is noted however that the effect and timing of current reversals in this area are likely to result in marked seasonal and perhaps annual variations in distribution and density.

11. The main fishing area for large pelagic fish, tuna and mackerel, lies in the Gulf of Aden, subject again to seasonal and annual fluctuations in abundance. The main concentration of large demersal fish on the other hand appears to lie along the east coast. This group which includes snappers (Lutjanidae), emperors (Lethrinidae), groupers (Serranidae), breams (Pentapodidae) and pourgies (Sparidae) have been, as yet, only lightly exploited by both artisanal and industrial fishing. The estimated division of available stocks by areas is:

North Coast	5,000 tons
East Coast (12^{o}N - 2^{o}N)	31,000 tons
East Coast (2^{o}N - 2^{o}S)	4,000 tons

Demersal species in the tropics tend to undertake only limited migration and therefore can support a year-round fishery. The first nine months record of landings by the Italian freezer trawler ANTONIETTA MADRE indicate catch rates of marketable demersal fish averaging over 4 tons per day.

12. Spiny lobsters (Palinuridae) are found along the entire east coast in shallow water, while two species of the genus Puerulus are taken by trawl in deep water along the continental slope. There is said to be a discernable increase in catch rate going from Ras Chiamboni in the south to Eil and Bender Beila in the north.

13. Three species of Penaeid shrimp are found near the mangrove area south of the Juba River mouth to the Kenya border, and based upon yields in Kenya, a shrimp catch in Somali waters of about 400 tons per year is considered feasible.

14. High frequencies of feeding turtle have been observed between Bosaso and Habo on the north coast, off Ras Hafun and from Jesira southward to Kulmis, but the overall status of the marine turtle resource remains unknown.

15. Quantities of squid, cuttlefish and octopus are also known to exist along the coast but again nothing is known about the size of the standing stocks or sustainable yields. Oysters, clams, beche-de-mer and sponges are also capable of exploitation, subject to more scientific data being obtained in time to prevent overfishing.

Relative Importance in the Economy

16. Hitherto fishing has not figured prominently in the economy of Somalia. Production has ranged from about 4,000 to perhaps 11,000 tons (see Tables 1, 2) per annum and its value has been less than 2 percent of GNP. Only about 3 percent of the total population are estimated to derive at least part of their livelihood and sustenance from fishing and related activities. The remote and dispersed locations of many of the fishing villages, added to organizational, access, transportation and marketing difficulties have inhibited development hitherto. Despite its present modest position, fishing has potential, social and economic values of great importance. Export earnings could be greatly increased and a considerable number of new employment opportunities created in the process.

17. In addition to the four main coastal towns, Mogadishu, Berbera, Kismayo and Merca, with their large urban populations, there are 28 smaller coastal towns and fishing villages along the Somali shore, with an estimated total population of 90,000, many of whom depend upon fishing as their main source of income. Consequently during the 1973-75 prolonged drought, emergency measures were taken to resettle destitute ex-nomads, 15,000 of whom were relocated in new coastal settlements established at Eil, Adale, El Hamed and Brava. Under the administration of the Coastal Development Project (CDP), and with initial Russian assistance, efforts have been made to retrain the ex-nomads and members of their families to become fishermen, boat repairers and mechanics, fish processing operators and the like. Current CDP figures indicate a total population of about 13,700 in the four settlements. This indicates that a number of people have left them since first established (see Table 10).

B. Production Systems

Coastal (Artisanal) Fishing

18. Fishing communities have existed along both coastlines for many years and probably involved more people 15-20 years ago than they do now. Traditionally the fishermen used small (3-4 meters) paddle-driven dugout canoes, called "houris" which were imported by dhow from India, and a few slightly larger plank-build sailing craft ("bedens" and "mashuas") which were locally made in the Kismayo area by the Bajuni fishing community. The fishermen employed simple fishing techniques, mainly handlines and a few small fishing nets and nearly all the fish would have been salted and sun-dried.

19. An essential feature of the traditional artisanal fishery was the dhow traffic which, in the then almost total absence of internal roads, provided virtually the only means of communication for these remote and isolated communities. The dhow traders would call at each village regularly about twice a year, to deliver replacement houris, fishing gear and other supplies, taking the accumulated dried fish catch in payment. Other trade from the adjacent hinterland was channelled through these coastal centers, adding to their general prosperity.

20. In the last 10 years or so, the dhow trade has for various reasons greatly decreased and the consequent decline in general trade and prosperity of the coastal townships has caused many people to move to other inland centers. It is one of the aims of the government, and of the Ministry of Fisheries in particular, to arrest this decline and to recreate coastal prosperity based on the development of Somalia's fish resources.

21. Fishermen's Cooperatives. The Law on Cooperative Development (Law No. 40 of 1973) provides for the establishment of cooperatives in all sectors of the economy and most especially those concerned with primary production. Virtually all types of cooperative organization are contemplated, ranging from basic marketing cooperatives to full-scale producer collectives, but the stated aim is to progress towards collectivization in all sectors. The registration procedure requires that a number of fishermen request that a cooperative be established. Subject to endorsement by the local administration and the Ministry of Fisheries, legal registration follows and the new cooperative then qualifies for certain assistance from the ministry, in the following forms:

(i) Legal power in the form of a monopoly and in the first purchase and resale at fixed prices of all marketable fish in its area of jurisdiction.

(ii) A grant from the ministry covering the cost of buildings for storing and in some cases for processing fish and for office accommodation. The Ministry also subsidizes the cost of administration by paying the salaries of the elected chairman, secretary and driver.

(iii) An allocation of a truck, a number of boats and fishing gear, for which no charge is levied.

(iv) A loan to assist with working capital and operating costs, which is repayable either directly or by deductions from the value of dried fish delivered to Somalfish.

22. The administration of this program is the responsibility of a separate Cooperative Development Department in the Ministry of Fisheries which has

only a few staff for the purpose. The main deficiency at present is that there are no arrangements for training the officials of a new cooperative, once elected, and in consequence the standards of management are very low.

23. As a result of this government initiative, a total of eighteen fishing cooperatives, excluding the four ex-nomad resettlement centers, have now been established. These eighteen cooperatives are meant to be organizations for fish marketing in which the fishermen in membership join together for cooperative handling and marketing of their catches and for the joint acquisition of fishing gear in bulk, new boats, salt and other requirements. In practice, however, these cooperatives have no financial responsibility for the boats and other equipment and gear government is furnishing them. This has caused a low level of accountability and considerable waste of scarce resources.

24. In contrast to cooperatives, the ex-nomad resettlement centers are organized quite differently. They are administered by the Coastal Development Project which is an autonomous governmental agency under, but not part of, the Minister for Fisheries. The settlements are organized as producer collectives.

25. In the cooperatives, the ownership of traditional boats and their operation remains under the control of the individual, although the 500 larger 6-10 meter motor boats which the Government has been provided are collectively owned. These larger boats have the theoretical advantage of being able to carry more fishing gear, larger nets and long-lines; they can, therefore, catch more fish. In practice these benefits have been diminished by the lack of harbors, the lack of maintenance facilities and well trained and experienced mechanics, and lack of spare parts. As a result a high proportion (75 percent) are now out of operation, after only about 2-1/2 years service.

26. There are seven cooperatives operating along the north coast, of which the Berbera cooperative has the advantage of large urban markets nearby where most fish can be sold fresh. Three others, Las Koreh, Candala and Alula have the benefit of adjacent fish factories which provide an outlet for at least part of their catches. The remaining fish has to be salted and sundried for sale through the cooperative to the Government monopoly fish marketing company Somalfish in Mogadishu, which has the sole right to sell such fish to overseas buyers.

27. The northeast coast (Ras Hafun to Eil) has three cooperatives and one nomad settlement; all fish caught here has to be salted and sundried for sale to Somalfish.

28. The central east coast (Garad to Brava) has five cooperatives and three nomad settlements, of which the Mogadishu and Merca cooperatives can sell all fish in fresh condition, while two of the nomad settlements at El Hamed and Brava can sell at least part of their catch fresh.

29. Finally the southeast coast (Kismayo to Ras Chiamboni) has three cooperatives which sell their catches partly fresh and partly dried. When the Kismayo fish factory reopens later this year, it will enable most of the fish from this area to be marketed fresh or frozen.

Deep-Sea Fishing

30. Commercial deep-sea trawling off Somalia started in 1974 when the Somali/Soviet joint venture company Somalfish was first established. Fishing was carried out by a fleet of 10 Russian freezer trawlers until late 1977 when the partnership was dissolved. The total catch of the Russian fleet over some 3-3/4 years was 9,670 tons of fish and 3,730 tons of lobsters; unfortunately no detailed records of catch per vessel/day by fishing area, season and by catch or any other details of the vessels, or types of gear used are available. It would seem that Somali counterpart involvement was kept at a minimum by the Soviet authorities and that little useful knowledge or technology was passed over during this period.

31. Since the Russian departure, efforts have been made to re-establish a Somali offshore fishing capability in various ways. Somalfish has acquired two Australian built 28 meter prawn trawlers, under an initial management contract with an Australian company. In the meantime, seven Italian owned stern freezer trawlers were licensed to trawl in Somali waters on an exploratory basis, of which three are left. The terms of the license provide that half of the crew, i.e. about 12-15 people per vessel, should be Somali nationals for on-the-job training, that 20 percent of the gross value of the catch be paid to Somalia as a royalty and that full details of each day's catch, position and other relevant information be submitted to the Somali authorities. A summary of the Italian catch data from August 1978 to May 1979 is shown in Table 3.

32. Under a further agreement with Yugoslavia, Somali has acquired nine 23 meter wet fish trawlers, which are intended to be operated by Somalfish. However, early indications are that these trawlers are unsuitable to Somalia's rough coastal waters and are not being used. Under a longstanding Iraqi-Somali joint venture agreement, SIADCO is to operate two ex-Russian SRTM class 55 meter freezer trawlers and four Spanish built 31 meter shrimp trawlers in Somali waters. Three more stern freezer trawlers of about 70 meters in length, to be financed by an Italian Government loan and added to the Somalfish fleet, have been ordered from Italy and are due to arrive by mid-1981.

33. All told therefore, by the end of the next two years up to 20 modern trawlers could be operating in Somali waters and there are a number of problems consequent upon this very rapid development:

(i) Although the stocks of demersal fish should be ample to support such a fleet of trawlers, the estimated annual sustainable yield of deep-water lobster is only 1,500 tons. On the basis of the catch rate of about 1-1/4 tons of lobster per day, already achieved, it would require only six vessels each fishing 200 days

per year to catch the full quantity. All twenty vessels would quickly overfish the lobster stocks unless, as an alternative, each was allocated a quota for the year of only 75 tons, which would be difficult to enforce.

(ii) The eight large freezer trawlers would probably not require port berthing facilities to bunker and tranship more frequently than once every sixty days, but the six smaller shrimp trawlers would almost certainly need to berth at least every 30 days and the nine wet fish trawlers would each need to offload at about ten day intervals. This means that there could be about 280 occasions each year when a trawler would require entry and berthing space at one of Somalia's three ports, a prospect which the port authorities view with considerable alarm. Assuming three days in port on each occasion to offload, re-provision, bunker and carry out minor repairs, the fishing fleet would thus utilize 840 ship/days in port each year; this would mean that, at any one time, there would be between two to three trawlers in port occupying berthing space. None of Somalia's ports have this spare capacity at present.

(iii) In addition to the shortage of berthing facilities, there is also at present, an almost total lack in Mogadishu and Berbera of other essential shore infrastructure such as freezing, cold storage and ice-making capacity, marine workshops and slipways; there is only one small cold store of about 150 tons capacity at the National Fish Factory in Kismayo. Experienced shore staff, trawler managers and maintenance engineers are also lacking at present.

Present Performance and Prospects

34. In terms of fish production, as can be seen from Table 1, there has been a marked decline in fish production during 1978. This arises from two reasons. First, the dissolution of the Russian partnership and departure of the Russian fishing fleet in late 1977 caused a sharp drop in offshore catches which did not resume until August 1978 when the first Italian licensed trawler started fishing. Second, although only estimated figures are available, inshore artisanal catches increased rapidly in 1975 and 1976 with the introduction of motorized boats, but then declined once more when the general lack of proper maintenance facilities resulted in more and more of these boats becoming unserviceable. Approximately 500 motor boats were supplied, at a cost which is not recorded but which could not have been less than So.Sh. 25 million (US$4 million), of which less than 25 percent are now in operation; the majority went out of service after only about 18 months to 2 years; instead,

if properly used and looked after they should have given at least ten years of service.

35. Many fishermen have therefore had to revert to using their old traditional "houris;" but since no new replacements have been imported during the past ten years, much of the houri fleet, estimated to number some 2,000 boats, is now at or beyond the end of its useful working life and cannot be relied on to fill the gap.

36. Prospects for the immediate future do therefore look bleak but can be rapidly improved if a sensible development strategy can now be activated, incorporating the lessons learned from past failures. Markets offering favorable prices exist in nearby countries for many of the fish products which Somalia can supply:

Dried Salted Shark: Kenya, Tanzania, Saudi Arabia, Nigeria.
Sharks Fins: Southeast Asia.
Frozen Demersal Fish: Saudi Arabia, Egypt, UAE, Italy.
Canned Tuna and Mackerel: Saudi Arabia, Jordan, Egypt, Italy.
Frozen Lobster: Middle East, Europe, USA, Kenya.

There seems no reason why fish production and export values cannot be boosted to at least US$25 million per year at current prices, over the next four to five years. This would require that the development be planned to provide for all the necessary infrastructural and manpower requirements needed to support the investment that has already been committed and that the means to catch the fish be provided.

37. Fish Processing Factory Performance. The performance of the five fish processing factories in Somalia has been generally disappointing for a number of reasons:

(i) The Kismayo factory was built in 1968 by US interests to process and export lobster and shrimp, but was not operated since it was closed down in 1969. It is currently being recommissioned with FAO assistance. The factory comprises a freezing chamber, 250 ton capacity cold store and a small flake ice plant. Fish and lobster would be transported to the factory from the Chiamboni and Kulmis cooperatives by a regular launch service. It is also intended that some of the trawler fleet would land catches at Kismayo, but for this purpose the cold storage capacity would have to be increased.

(ii) The largest of the four north coast fish factories is the Government-owned Las Koreh tuna cannery, which was built between 1966-1970 with Soviet assistance. The factory is supplied by a fleet of local houris and small diesel powered open motor boats. Its processing

line includes two freezer tunnels, an 800 ton capacity cold store, three canning lines with an associated can making plant, a fish meal and oil extraction plant, boilers and diesel electric power supply. With the exception of the fish meal plant which is currently out of order, the factory has operated throughout each fishing season since 1970, but rarely at more than 25 percent capacity because of the inability of the small fishing boats to range sufficiently far afield as to ensure adequate raw material supplies. The adjacent shore is an open sandy beach with a shallow slope into deeper water. The existing short jetty would therefore require about 400 meters extension to reach water of sufficient depth to enable 25-30 meter fishing vessels and a shallow draft coastal ferry to discharge alongside. Moreover, because most of the plant is of Russian origin, spares are not available and it is, therefore, likely that major plant renewal will have to be undertaken within the next few years. Nevertheless, assuming that the supply of fish can be improved, and this remains to be proved, it is believed that the factory can become profitable. It is also suggested that profitability can be enhanced if, during the course of plant replacement, the canning capacity is reduced and the capacity for freezing and cold storage substantially increased. This would provide the factory with two exportable products, namely canned and frozen fish, thereby utilizing the range of species in the fish catch more flexibly and more efficiently.

(iii) The fish canneries at Candala and Habo date from before the Second World War and are jointly owned by the Government and Italian interests. In both factories the processing system has been made as simple as possible, consistent with their remote location, but without sacrificing their ability to produce canned fish of high quality. All machine operations in the canning line can be duplicated by hand if necessary so that a mechanical breakdown does not prevent continued working. Each factory has a capacity to process about 30 tons of fish per day and can also hold up to 15 tons in chilled storage from one day to the next. Reliance upon imported fuel is reduced by the use of locally gathered firewood for the cooking and autoclaving processes. In common with Las Koreh, both factories rely on local canoes and small motor boats for their raw material supply, and in recent years, within the range of operation of such craft, the fish catch has been inadequate for capacity working. In consequence neither factory worked during the 1977/78 season and only Habo worked during 1978/79. A jetty 600 meters in length would be needed at Candala to enable the larger

fishing vessels to land their catches. Considering the factory's limited capacity and lack of freezing and cold storage facilities, it seems doubtful if the cost of such a jetty could be justified. On the other hand, the Habo factory is located quite close to the fish freezing factory at Bolimog where there is sheltered deep water much closer in, so that a jetty at Bolimog could service both factories, with fish suitable for canning being taken to Habo by lorry.

(iv) The Bolimog fish freezing and cold storage factory dates back to about 1966 when it was built with US Government financial aid. It is now wholly owned by the Somali Development Bank after several years of fluctuating fortunes, and was closed down in 1978 for major overhaul and rehabilitation of all plant and machinery as a result of studies by the Egyptian and Dutch consultants, FINTECS and Berenschot-Mores-Bosboom. Like all the others, the factory has relied on small boats for raw material supply and this has proved inadequate. The factory comprises four blast freezer tunnels, each with a capacity of 12.5 tons of fish per day, a 2,500 ton capacity cold store, a fish meal plant to utilize up to 25 tons of trash fish and offal per day and a centrifugal type fish oil recovery plant. In theory therefore the factory could handle up to 10,000 tons of frozen fish and produce about 1,000 tons of fish meal and oil annually, but in practice yearly production of frozen fish has not exceeded 1,000 tons since 1971. A 250 meter jetty at Bolimog to enable 30 meter motor vessels to land fish for the Bolimog and Habo factories could improve the situation. A 12 month trial fishing survey would be necessary to confirm that the fish can be caught.

38. To sum up, all four north coast factories face a common problem of raw material supplies. Provided that this can be resolved, the prospects for Las Korch, Habo and Bolimog should considerably improve. On the other hand, Candala's small size and isolation from the others may well have to result in final closure.

C. Services and Input Supply

Administration of the Fisheries Subsector

39. The Ministry of Fisheries, with its headquarters in Mogadishu, has overall responsibility for the servicing, management and development of the fisheries subsector. The Ministry has a total establishment of about 320

posts (Table 11), although many remain vacant for lack of suitably qualified personnel. The organization of the Ministry shows five departments, namely:

Cooperative Development
Fish Industrialization
Planning
Financial Administration
Manpower and Training

Each department contains between two and four services, each service in turn responsible for two to four sections. In addition to its HQ staff, the Ministry pays the salaries and allowances of three officials for each fishery cooperative (chairman, secretary/accountant and driver) as part of the cooperative support program.

40. Extension Work. The Ministry of Fisheries does not currently operate any form of extension service except that the ongoing FAO Fisheries Development Project with its staff of about 10 expatriate and local personnel does function primarily in an extension role in the limited geographical area (Mogadishu to Ras Chiamboni) which is all that can be managed with the existing limited staff. It is necessary, however, that the FAO assistance be accompanied by the establishment of a regular MOF Field Advisory/Inspection/Extension service to take over full responsibility. The Somali fishery development project which is supported by FAO has provided assistance to the Somali Government for fisheries development in the form of a team of technical assistance staff continuously since 1968. The project has been reviewed periodically. It was originally titled the Somali Fishery Survey Project. During the course of a review in 1974, the title was changed to become the Somali Fishery Development Project. In a current review it is proposed that it be changed again to the Somali Fishery Development and Training Project to reflect the emphasis that the project proposes to place on training fishermen during the period 1979-1981.

41. The existing project is limited by available staff and finance to the east coast artisanal fishery at Ras Chiamboni, Kulmis, Kismayo, Brava, El Hamed, Third Well, Jesira, Mogadishu, Warsciek, Adale and Eil. Proposals are being prepared for the project team, which currently comprises five technical assistance staff, including the project manager, together with a number of Somali staff, to be given the capability to assume the following functions in the future:

(i) assisting in the planning and advising on construction of fish centers;

(ii) assisting in the organization, operation and management of the fishermen's cooperatives at each of the above centers;

(iii) conducting pilot experimental demonstration fishing and fish processing with a view to developing and introducing technology appropriate to local conditions;

(iv) training fishermen in the use of such technology;

(v) advising the Ministry of Fisheries on the transfer of pilot project experience to other fishery development centers;

(vi) designing and establishing small boat and engine repair and maintenance facilities and training maintenance staff;

(vii) advising Government in the management and technical requirements to re-establish the National Fish Factory at Kismayo;

(viii) assisting in the repair of all equipment currently inoperable because of lack of spare parts;

(ix) advising Government in the procurement of spare parts and other maintenance needs; and

(x) upon request, to assist Government in the planning and development of industrial fishing activities.

42. Proposals are also currently under negotiation with potential FAO Trust Fund donors for a similar project to cover the hitherto neglected north coast artisanal fishery. The aims of the north coast proposals are essentially the same as for the east coast project. The reason for the two being separated is simply because of the long distances and communication difficulties which isolate the two areas from each other.

43. Coastal Development Project. The Coastal Development Project (CDP) is an autonomous governmental agency responsible to the Minister of Fisheries, but with its own separate HQ in Mogadishu. It was set up to provide a formal administrative basis for the massive emergency task of settling some 15,000 nomads rendered destitute by the 1975 drought, and giving them a new sedentary means of livelihood on the coast based on fishing. The CDP is headed by a General Manager and has five departments:

Financial/Administration
Fisheries
Construction (houses, schools, dispensaries, fish processing)
Transport/Equipment
Social (education, medical)

The CDP oversees resettlement centers at Eil, Adale, El Hamed and Brava. Its responsibilities go beyond fisheries and encompass those of other Ministries such as Education and Health. There are no provisions for returning these responsibilities to the ministries of fisheries, education and health once the settlements are established.

44. Input Supply. The main inputs, so far as the artisanal sector is concerned are boats and fishing gear (gill nets and long-lines), fuel, spare parts and facilities for fish processing, storage, transportation and for the maintenance of vehicles and boats. Virtually all of these inputs during the past few years have been obtained from bilateral sources of aid and distributed to the fishing cooperatives by the Ministry of Fisheries or through the CDP to the resettlement centers. Unfortunately, the supply of maintenance facilities and spare parts has failed to keep pace with the numbers and distribution of motorized boats, with the result that the majority are now unserviceable.

45. As regards the offshore fishery, which catches and processes fish and deepwater lobsters primarily for export, the main inputs required are shore facilities and port infrastructure for the fishing fleet, all of which have yet to be provided even though some trawlers are already operating.

Port Facilities and Infrastructure

46. Somalia possesses three ports having deepwater quays for ocean-going cargo traffic; at Mogadishu, which has four berths; Kismayo, which also has four berths; and Berbera, which has two berths only. A former lighterage port at Merca has been disused since the opening of the new deepwater port at Mogadishu. Mogadishu Old Port, which was useable only for lighterage, is also now disused and badly silted up.

47. Kismayo Port is said still to have some spare capacity and therefore may be useable by the trawler fleet for some time, but Mogadishu and Berbera especially are both being used to capacity and there are already advanced plans for further expansion at both ports. However, these plans appear to take no account of the rapid increase in trawler traffic which is already in progress and therefore, despite the proposed expansion at Mogadishu and Berbera ports, the regular use of these ports by the fishing fleet will continue to pose problems both for the port authorities and the trawler management unless and until special berths can be provided to serve the needs of the fishing industry.

48. Over and above the berthage problem, the offshore fishing fleet will require shore based cold storage, freezing and ice making facilities, none of which exist at present, and a slipway-workshops complex for vessel maintenance.

49. With regard to the inshore sector, little has been provided so far in the way of infrastructure or habor facilities. Most of the cooperatives have been assisted to construct basic storage for dried fish and fishing gear, and most have some form of office accommodation, but very few as yet have the necessary workshops and trained staff to maintain boats and engines.

50. Most of the fishermen have to work off exposed sandy beaches where there is little or no possibility to construct sheltered harbors. However, there are a few locations along the east coast, which were surveyed some years ago, where offshore reefs could be built up to provide better shelter. The

Five Year Development Program, 1974-78, included proposals for such work. These ideas were not implemented and have been omitted from the current Three Year Development Program. They should, however, be re-introduced in due course.

Training

51. Currently the only technical school in Somalia having a direct connection with fisheries is the National Fisheries and Marine Institute (NFMI) in Mogadishu, which runs four-year courses for mechanics, navigation and fisheries staff. The first fisheries students graduated in 1980 and there are currently about 50 students in these fields. Entrants must have completed intermediate level education. Graduates are awarded an Institute Certificate and several have been recruited into posts connected with the Ministry of Fisheries. The Teachers Polytechnical College also leads to specialization in various related fields such as fisheries and navigation.

52. There is a TYDP project for the establishment of a new Maritime School at Kismayo which is to concentrate on a four year fisheries technology course with an output of 100 students per year. There appear to be numerous similarities in curricula with the NFMI course in Mogadishu and both purport to train personnel for sea-going duties, yet neither seemingly provides any facilities for sea-going experience during the course. The two courses should be reviewed with a view to a clearer distinction as regards course content and purpose.

D. Development Efforts

Ongoing Development

53. The main ongoing work by the Ministry of Fisheries and Coastal Development Project has been concentrated on the program for establishing and equipping the chain of fisheries cooperatives and settlements around the coast, with emphasis on the supply of motor boats, the main source of which is now the boat factory at Mogadishu. Two fish processing factories, at Kismayo in the south and Bolimog on the north coast are being rehabilitated. The FAO team has virtually completed its initial task of setting up the fishing centers at Ras Chiamboni, Kulmis and Kismayo in order that their combined production can be channelled to the Kismayo factory for processing.

54. Somalfish, in conjunction with the Ministry, has concentrated on rebuilding its offshore fishing capability with the acquisition of the two Australian trawlers and with the nine vessel Yugoslavian ship-building project.

Planned Developments

55. The 1979-81 TYDP has as its objectives the following:

(i) economic growth through utilization of all fishery resources;

(ii) the maximum increase in fish production and income consistent with sound fishery management principles;

(iii) increase in foreign exchange earnings through greater exports of fish products;

(iv) improving the socio-economic conditions of the people generally and particularly those in the fishing settlements;

(v) creating gainful employment for the greatest number of people sustainable by a viable fishing industry; and

(vi) increasing the domestic consumption of fish as food.

56. Most of the project content in the TYDP is a continuation of work started during the earlier five year development program. Highlights include:

(i) expansion of the technical service supported by FAO;

(ii) development of fish market facilities to aid the promotion of domestic fish consumption;

(iii) continued development of necessary facilities at cooperative centers and fish landings;

(iv) expansion of local motor boat building and conversion of an older wooden boat building yard for motor boat repair work;

(v) further purchases of offshore trawlers;

(vi) strengthening the organization of the Ministry of Fisheries;

(vii) funding certain pre-investment studies on particular aspects of fisheries development; and

(viii) developing facilities for training fisheries personnel.

57. Although all the foregoing activities are necessary for fisheries development, the program does not pay sufficient attention to the sequential nature of such work and makes no mention of some essential prerequisites,

such as providing for essential infrastructure before buying offshore trawlers and making adequate provision for maintenance before purchasing motor boats. These issues are detailed below.

E. Major Issues

Fish Resources

58. While it is acknowledged that Somalia has access to considerable natural fish resources, which, with the possible exception of lobster, are capable of greatly increased sustainable production, extreme care must be taken to guard against over exploitation. The projected very rapid growth in offshore fishing effort - from 3 to 20 vessels over the next two years should present no problems in relation to demersal or pelagic fish stocks, but is capable of exterminating the deepwater lobster stock. On the basis of known catch rates of about 1-1/4 tons of lobster per day, only six such vessels each working 200 days per year are needed to exhaust the current estimate of 1,500 tons total allowable catch. The government should, therefore, take action in good time, through a combination of licensing, surveillance and enforcement, to ensure against over exploitation.

Fisheries Administration

59. Ministry of Fisheries Headquarters. The Ministry of Fisheries is responsible for planning, monitoring and regulating fisheries development in Somalia, but is almost totally lacking in staff having formal qualifications or training and experience in relevant subjects. It is inconceivable that Somalia's ambitious targets for fisheries development can be achieved without a strong administration, soundly based on fisheries science and technology. It is believed that the only effective short term way to resolve this problem is to rely on technical assistance from abroad to support the Ministry of Fisheries. Simultaneously, Somali officials, who are substantive holders of Ministry posts should be sent to attend appropriate overseas training courses designed to qualify them to progressively resume their duties, as they acquire field experience upon their return to Somalia.

60. Ministry of Fisheries Field Representation. There is currently no effective ministerial representation at the various regional and district fishery centers and in consequence neither the fishermen nor other Government officers are properly informed about the Ministry's plans and intentions. They in turn lack an appropriate channel to convey their views and details of their problems and aspirations relative to the development of fisheries within their areas. It is essential to the development of the inshore artisanal sector that the Ministry of Fisheries be represented in the field by well trained fisheries field service officers whose duties would also include responsibility for regular data collection, for advisory and extension work, for inspection and enforcement of any necessary regulations and for the coordination of MOF work with that of other Government departments in the field stations.

61. Fisheries Cooperative Management. The performance of the fishermen's cooperatives has been very poor. Their operation does not appear consistent with their objective of assisting fishermen in increasing production. The supply of inputs is irregular. Bookkeeping is poor. Cooperative chairmen and accountants are usually local people elected by cooperative members, who must have had some education, but who apparently receive no specific training after appointment for their very responsible jobs. It has to be recognized that management of a cooperative is a particularly difficult task demanding very high managerial and accountancy standards and it cannot be expected that even minimal common standards of proficiency can be achieved unless such personnel are given the necessary training. The problem is no doubt compounded by the lack of MOF field officers who would be in a position to provide day-to-day assistance and who could periodically audit cooperative account books.

Incentives in the Fishing Industry

62. The question of incentives within the fishing industry deserves careful study and is not solely a question of money. Of equal importance is the fact that many fishermen do not appear motivated to retain their occupation and pass on their trade to their children. The Government is providing motor boats, fishing gear and other services and equipment to the cooperatives free of charge and without any obligation to include even depreciation costs in cooperative accounts or to debit individual fishermen with a reasonable share of the costs of goods and services which they enjoy. This gives a false sense of financial security and creates an attitude of dependence on government. Such free issues tend to result in misuse and waste of scarce resources and fails to stimulate self-reliance at either the individual, cooperative or artisanal sector levels. There are many contributory factors, including the general shortage of spare parts and the inability of the Government, thus far, to provide an adequate back-up maintenance service with properly trained and experienced mechanics; but the most important single factor is believed to be that communal ownership of the motor boats results in no individual being personally responsible and accountable for their correct use and proper upkeep. Thus, it was found that after less than three years use, very few motor boats remain operational, e.g. at Brava only 3 of 58, El Hamed 4 of 25, Merca 0 of 10, Kismayo 3 of 10 and Berbera 2 of 15 etc, and the unserviceable craft were pulled up on the beach in various stages of disrepair and disintegration.

63. Because of the lack of incentive, the attitude of the fishermen is to wait for the Government to provide them with yet more boats and fishing gear, whereas by such simple self-help measures as fitting a mast and sail, most of these boats could still be used to catch fish whilst awaiting the necessary spare parts etc. Replacement engines are being obtained for some 150 boats through UK aid, but given the lack of repair facilities in most of the fishing centers, there would seem to be little more assurance than before that the boats can produce an economic working life.

64. In most of the cooperatives, fishermen have reverted to using their traditional small canoes and houris, but because none of these has been replaced since about 1970, many are already beyond economic repair. Those in

operation can be expected to decrease progressively in number unless new and hopefully improved craft of similar design can be introduced.

65. A more effective strategy for helping fishermen would be to encourage an increase of individual ownership of modern but inexpensive boats capable of being sailed, rowed or paddled, and where repair facilities can be guaranteed, also capable of being fitted with an outboard motor. Such a fleet would supplement the existing motor boat fleet which should, however, be redistributed to only those centers where effective maintenance and repair facilities for inboard diesel engines can be provided. Other incentives to the fishermen and cooperatives related to prices and market outlets are discussed in a later section of this report.

Communications

66. A major problem confronting the artisanal fishing sector is the inadequacy of the existing road communication network. Only a few of the cooperatives are sited in the immediate vicinity of main urban centers, at Mogadishu, Kismayo, Berbera and Merca, where they have no basic communication problem. Brava and El Hamed, either have, or will shortly be provided with feeder roads of a reasonable all-weather standard, linking them to the main asphalted trunk road. The remaining 19 fishing cooperatives are virtually isolated to landward by up to several hundred kilometers of unmade dry weather tracks which make it difficult and very costly to transport their fish to market. At the same time, such roads automatically exclude them from any market other than for dry salted fish, except for those few which are close enough to one or other of the fish factory sites where at least a part of their catch can be sold in the fresh state.

67. It seems unlikely, in most cases, that the needs of a particular fishing cooperative can provide sufficient economic justification for the high cost of all-weather feeder road construction, although there may be one or two situations, e.g., Mait-Erigavo-El Dab, Bosaso-Fardo-Garoe and Ras Chiamboni-Kulnis-Kismayo, where the combined benefits to fisheries, crop and livestock production can perhaps provide such justification.

68. On the other hand, a linking coastal ferry service to seaward, for example between Berbera and Bolimog (Alula) calling at Karin, Mait, Las Korch, Bosaso and Candala enroute could provide a less costly and more reliable means of communication for the carriage of cargo and passengers along the north coast. A similar service from Mogadishu northwards, calling at Adale, Meregh, Obbia, Eil Marina, Bender Beila, Hafun and Bargal enroute and perhaps interconnecting with the north coast service at Bolimog, would serve the needs of all the most isolated coastal communities. South of Mogadishu the main trunk road parallels the coastline sufficiently close for feeder roads to be the most economic and simplest solution.

Fish Marketing

69. It is clear that those cooperatives which are fortunate enough to be able to sell their fish in the fresh state can be made to be viable because

they have a choice of outlet which enables them to derive the maximum benefit from the varieties of fish which they catch. Other cooperatives in the more remote areas are effectively limited to salting and drying their fish which they then have to sell to Somalfish at prices fixed by the Government which do not always reflect the very high cost of transport to Mogadishu.

70. Somalfish does not appear to find the dried fish trade profitable. Government should encourage a more relazed market in which outside traders from Arabia, Kenya and Tanzania can be encouraged to buy direct from fishermen. This should have a beneficial effect on fish quality because buyers will normally be prepared to pay fair prices for good quality products but very little for sub-standard fish.

71. The fixed price system which the Government currently imposes and which, it was noted, was being very largely ignored at the retail level in Mogadishu, could with advantage be modified to a minimum price scheme to safeguard producer interests, allowing retail prices the freedom to reflect market demand. The TYDP includes provisions for the improvement of fish marketing facilities in Mogadishu and elsewhere to ensure that regular supplies of fish of good quality can be made available. It also provides for fish promotional action to encourage the consumption of fish as a regular part of the Somali diet. This would commence in Mogadishu and based on this experience will be extended to other areas.

Industrial Fisheries Expansion and Infrastructure

72. The problems consequent on the rapid expansion of offshore fishing efforts which are projected for the next two years, have been fully described earlier in this report, and it is clear that very careful supervision will have to be exercised over the activities of the trawler fleet if serious overfishing and depletion of stocks such as the deep water lobster are to be avoided. It is therefore a matter of concern to note that the Fish Industrialization Department of the Ministry of Fisheries exists only on paper. It was not until after repeated visits by members of the World Bank team, that catch data from the Italian licensed fishing venture was made available, despite the fact that this had been in progress since August 1978 and that the license stipulated regular submission of such data daily by radio, to be confirmed in writing on each occasion when the vessels entered port. This section of the Ministry should be properly staffed and should establish its authority clearly and unequivocably.

F. Fisheries Development Strategy

73. The Somali Government's strategy for fisheries development during the TYDP can be summarized as follows:

(i) Maintenance of a balance of development between industrial and artisanal fishing by encouraging joint ventures between foreign and local interests,

whilst at the same time continuing to promote local fishermen's cooperatives.

(ii) Scientific management of fisheries resources through fish stock assessment studies, planning and feasibility studies, strengthening the technical and executive capacity of the fisheries administration in Somalia and taking powers to regulate fishing activity as may be necessary.

(iii) Promotion of training on the job both ashore and at sea and through overseas fellowhips to satisfy the increasing demand for skilled manpower in local institutions.

(iv) Promotion of local manufacture of materials and equipment needed for fisheries which currently have to be imported but which could reasonably be made in Somalia.

(v) Integration of fishing and fish processing especially in connection with the supply needs of the existing north coast fish factories and in planning the development of a new north east coast pelagic fishery for meal and fish oil production.

(vi) Improvement of marketing arrangements to take advantage of more profitable market outlets at home and abroad, by the provision of cold storage facilities at strategic coastal locations and by establishing a more effective local distribution and sales system linked with a fish promotion campaign to boost domestic consumption.

74. On examination, much of this strategy appears to be more appropriate to a much longer term development program than the current three year period, which is acknowledged to be of a stop-gap nature. Indeed the strategy is not really matched by the project content of the fisheries section of the TYDP. This includes some activities which might have been better left to later stages and either omits or provides insufficient detail on other activities and studies which are required at this time, either to resolve problems carried over from the earlier 1974/78 Five Year Plan or which set the scene and prepare for the development effort which will be needed from 1981 onwards.

75. Bearing in mind the limited domestic demand for fish relative to what is known about the much greater extent of available fish resources and sustainable yields, the basic objective for fisheries development in Somalia should be to generate as quickly as possible, the maximum sustainable foreign exchange earnings from export fish sales. This would contribute to the fulfillment of the country's objective of self-reliance and would help in providing gainful employment in an occupation which is not vulnerable as are livestock raising or rainfed farming, to fluctuations in annual rainfall.

76. Accordingly, a short-term strategy should concentrate on those activities which are necessary to achieve the primary objective of increased export earnings, plus those further activities needed to set the scene for future work. The strategy and program for the longer term should be separately identified for implementation at the appropriate time.

Proposed Short-Term Fisheries Development Strategy (1980-85)

77. The essential components of a strategy for the next five years are presented below.

Coastal Production

78. Encouraging the maximum possible output for the existing artisanal sector by appropriate actions and incentives including:

(i) concentrating the motorized fleet in those areas where maintenance can be guaranteed, e.g. Mogadishu, Kismayo, Habo/Bolimog, Candala and Las Koreh;

(ii) supplementing the motorized fleet, in all areas, by the introduction of less costly but modern non-motorized fishing canoes which fishermen can be encouraged to buy by installments;

(iii) reorganizing the arrangments for collection and export sales of dried fish to allow Somali entrepreneurs and foreign traders to purchase direct from the fishing centers. The Somalfish dried fish monopoly would thus be phased out or would remain in the market in competition with other buyers;

(iv) reviewing the role of cooperatives and assisting them with training (technical, accounting, management). Fishermen should be charged a fair price for the goods and services they receive, so enabling cooperatives to meet the cost of subsequent replacements from the own resources; and

(v) establishing a fisheries extension service.

Deep-Sea Fish Production

79. With the imminent arrival of up to 20 deep-sea trawlers during the next two years, the lack of port infrastructure, cold storage and ice plants, has to be resolved as a matter of urgency. The strategy should therefore be:

(i) to defer for the time being any negotiations for additional vessels, for which irrevocable commitments have not already been made, so as not to exacerbate the problem;

(ii) to organize, with the utmost urgency and in close consultation with the Ministry of Marine Transport and Port Authorities, the necessary studies to plan and cost the locations, design and capacities of all facilities required to service the trawler fleet. This includes: a freezing, cold storage and ice-making complex at Mogadishu, redesign of the proposed Mogadishu harbor slipway to accommodate fishing vessels up to 30 meters, a trawler berth and cold storage at Berbera and expansion of the factory cold storage at Kismayo. In addition, jetties of the simplest possible design should be constructed at Bolimog and Las Koreh to enable trawlers to land fish into these two north coast factories. A design study is needed for this work.

Services

80. The Ministry of Fisheries has an immediate and long term need for strengthening its administrative, executive and planning capacity to provide the services which a developing fishing industry will require. The short-term requirement to this end is the procurement of qualified technical assistance personnel to serve in the Ministry, filling certain key posts whilst the Somali officials are trained according to a well defined program. The personnel required would include:

(i) Fisheries Economist/Planner to organize the MOF Planning Department so as to undertake the essential functions of project preparation in consultation with the State Planning Commission, thereafter monitoring project implementation and reviewing project impact after completion.

(ii) Fisheries Statistician to organize a data collection and processing unit in conjunction with the MOF Planning, Industrialization, Research and Cooperative Development departments to provide the data base for monitoring progress in fisheries development.

(iii) Fisheries Resource Analyst to work with the statistician. Additional more specialized data to be provided by the Research Department are needed to monitor the progressive impact of increasing fishing on the fish stocks. Such data would serve as a basis for future fisheries management and regulatory policies.

(iv) Fisheries Cooperative Specialist to assist the Cooperative Development Department identify areas where cooperative action would be needed and feasible. This specialist

would also assist the Extension Service in organizing necessary training courses for Ministry cooperative officials and cooperative management staff.

(v) Fisheries Manpower and Training Specialist, to assist the Manpower and Training Department in determining manpower needs within each section of the industry over time and in organizing in conjunction with other Ministries, the necessary training.

(vi) Fisheries Development Officer, to assist in the establishment of a Field Extension Service.

(vii) Procurement Officer, to assist the Ministry in establishing a reliable system of supply for the inputs needed by the coastal fishing centers.

Recommended Overseas Training Courses

81. Technical assistance staff would be responsible for training junior staff within their various departments and sections, many of whom are likely to be graduates of the Mogadishu National Fisheries and Marine Institute. However, there is urgent need for selected senior officials, including some departmental directors, to attend more specialized courses overseas. A range of fisheries courses are available in the UK, USA and elsewhere, from which it should be possible to make selections to suit most individual needs and circumstances.

(i) The College of Fisheries and the Universities of Washington and Seattle offers undergraduate and graduate degree courses in most aspects of marine fisheries science and economics.

(ii) The Universities of Miami and Michigan have similar courses; although the latter is more freshwater oriented.

(iii) The Universities of Liverpool, Southampton and the University College of North Wales, Bangor, in the UK likewise have excellent marine science undergraduate and graduate courses.

(iv) A more practically oriented undergraduate course in fisheries science and management is offered by Plymouth Polytechnic in the UK.

Finally, for those officials who for various reasons are unable to devote as much time as the 2-4 years required for some of the foregoing degree courses, there are two shorter courses which can be recommended.

(i) an 11 month course in fisheries science and technology, specifically designed for overseas fishery staff and administered by the British Council, is held each year at the Grimsby College of Technology, UK.

(ii) a 12 week fisheries technology and management course is held twice annually at the White Fish Authority Training Center, Hull, UK.

One problem deserving mention is that many of the Somali officials who need these courses have inadequate English for the purpose. Whilst there is a language laboratory at the University in Mogadishu, it does not apparently offer an English course, and this seems to be a basic lack that urgently needs attention. It is clearly preferable for such staff to do these preparatory language studies in Somalia rather then elsewhere, provided that the necessary staff and facilities can be supplied. Poor english has already proved a constraint on getting several otherwise suitable MOF staff accepted on training courses at UK institutions.

Policy Framework

82. Government overall policy of expanding production, inshore and deep-sea, to the limits of sustainable yields is fully endorsed, and with the possible exception of deep-sea lobster, it seems unlikely that there will be any danger of over-exploitation within the next five years. In the short term, therefore, policy should be directed at creating the climate in which expanding fish production and exports can flourish, through price policies and other incentives which will stimulate the most positive response from the individual fishermen, domestic fishing and fish trading enterprises together with foreign joint venture partners, and foreign fish buyers, all of whom have a crucial role to fulfill if the policies are to produce the desired effect.

83. Incentives. So far as the artisanal sector is concerned, the incentives should be directed at all fishermen irrespective of whether or not they are cooperative members. As already outlined, it is believed that the best incentives would be the opportunity to work towards individual boat ownership, provided that a suitable low cost modern craft can be identified and built locally for distribution. This also implies establishing some form of loan scheme which can be administered through the operational cooperatives or preferably through the existing institution: The Somali Development Bank. With regard to crews of deep-sea trawlers, incentives can only be applied through their remuneration which should be on the basis of a small basic salary and a much larger bonus calculated on a combination of the number of days spent at sea and the gross value of catch produced.

84. Utilization of Foreign Exchange and Price Policies. In the absence thus far of any local manufacturing capacity for any of the inputs needed by the artisanal and deep-sea fishing sectors, other than relatively small numbers of locally built motor boats, maximum fish production will hinge very largely on ready supplies of imported fishing gear, engine spare parts and fuel.

The deep-sea fleet will have an especially high and complex need for spares and maintenance facilities not only for engines but also for all the other mechanical, hydraulic and electronic aids for fishing and navigation which these vessels carry. It is therefore essential that the Government owned or joint venture companies which are engaged in catching and/or processing fish for export, receive the necessary authorization under foreign exchange control regulations, to utilize a reasonable proportion of their foreign exchange earnings directly to pay for their essential import needs. The prices which they will receive for fish products are governed by the export markets, and direct Government intervention is not necessary, other than to ensure that exports of any given product are directed at the particular export outlet which offers the most advantageous return. Export prices should be kept competitive but also attractive to fishermen. This would be achieved through a favorable exchange rate policy.

85. In the case of the artisanal sector, the position is different, in that a comprehensive fixed price policy is currently in force (see Tables 4 to 9) determining the prices which can be paid to fishermen, the retail price to consumers for fresh fish and the price for dry salted fish intended for export via the Somalfish monopoly. It was noted that in Mogadishu at least, the fixed retail price was being quite blatantly ignored by itinerant fish sellers who demanded and received much higher prices. It was also noted that in no case does the fixed price system reflect the true cost of production, in terms of the costs of boats, nets and other services subsidized by the Government, although in the Mogadishu case, a recent increase in price was accompanied by fishermen being required to meet the cost of fuel used by their boats. The latter is a step in the right direction and it is hoped that further changes in price can take place and that fishermen be required to pay either regular installments towards the cost of a boat they will eventually gown, or alternatively a rental charge to amortize the cost of motorboats, plus th cost of fishing nets and fuel. Price control should be deleted to allow domestic fish prices freedom to adjust to normal market influence.

86. Organization and Management. In addition to strengthening the Ministry of Fisheries in the manner outlined earlier in this report, two other organizational changes appear to be necessary within the near future:

(i) To phase out the dried fish monopoly now being exercised by Somalfish by encouraging local entrepreneurs in conjunction with foreign fish buyers to participate in the purchase of dried fish from co-operatives for sale overseas. This will be difficult to achieve without improvements in transport and communications, especially along the north coast, and in the meantime, therefore, Somalfish should accelerate its plans to establish a dried fish depot at Bosaso, from where it can no doubt organize direct exports to Arabia, hence, avoiding the unnecessary cost of transport to Mogadishu;

(ii) to relieve the Coastal Development Project, as soon as is practicable of the responsibility for supervising the fishing "cooperatives" at Eil, Adale, El Hamed and Brava and placing these on the same footing as all other fishermen in the country, thereby eliminating the difficulties caused by two separate organizations - CDP and the Ministry - having an overlapping administrative role. This would restore to these fishermen their sense of self-reliance and responsibility more rapidly than seems likely under existing circumstances.

G. Proposed Development Projects

General

87. The inadequacy of the input supply system, the inaccessibility of coastal fishermen to local consumption and export markets, the general lack of fisheries infrastructure and the almost total lack of fisheries infrastructure and the almost total lack of skilled manpower for essential managerial, extension and regulatory roles, are at the root of the poor productivity and low production of the coastal fisheries. The development program should therefore aim at rectifying these problems and deficiencies. With regard to the development of deep-sea fisheries, the main constraints are the lack of qualified personnel for sea going and related onshore activities allied to the acute shortage of berthing space for trawlers and the almost total lack of onshore fish freezing, cold storage and ice plant to facilitate the transhipment of catches intended for export, plus the lack of vessel maintenance facilities.

88. Fishermen need a reliable system for the supply of boats and inputs and financial assistance in the form of credit to acquire them. Controlled distribution of fishing gear (nets, floats, cordage and hooks, etc.) should be supplemented by encouraging a revival of private trade at wholesale and retail levels. Urgent Government action is needed to improve marketing facilities at the various fishing centers and at the main domestic consumption areas (Mogadishu, Kismayo, Berbera and Hargeysa). Action is also needed to provide the essential linking communications and transportation infrastructure to serve the coastal fishing industry, including coastal seaborne transport as well as all-weather feeder roads and suitable vehicles.

Coastal Fisheries Services Project

89. A number of activities can be conveniently grouped together under the above common heading.

(a) Inputs and Small Boat Supply. Despite the importation and local manufacture of several hundred wooden and GRP (glass-reinforced plastic) motor boats, most of which are

now unserviceable from lack of maintenance, little has been done to find a cheap and simple non-motorized craft to replace the aging fleet of 2,000 individually owned small wooden canoes (houris) which were formerly imported by dhow from India, but which are now at or beyond the end of their economic working life, following the cessation of the dhow trade since about 1970. These craft are still the main means of production for the coastal fishing industry and there is urgent need for the local manufacture of at least 300 boats of this type annully, made from either wood, GRP or ferro-cement, for purchase by artisanal fishermen. This activity involves the design of a suitable boat, setting up the production line and establishing arrangements for a system of hire purchase to assist those fishermen who lack the finance for outright purchase. There is also need to provide for the local manufacture of simple inshore fishing gear (gillnets, twine, cord, floats and hooks, etc.) all of which now have to be imported as finished products, but which could be locally made up from imported raw material, so saving on foreign exchange. A distribution chain to local retailers in the fishing villages should be considered as an alternative to the present system whereby virtually all the fishing gear is imported by Government and distributed through fishing cooperatives, leading to recurrent shortages and other difficulties.

(b) Extension and Training. The MOF currently lacks any form of extension service except for the ongoing Fisheries Development Project which assumes a limited extension role in the area from Mogadishu to Ras Chiamboni. It is clearly essential that an Extension Service be established within the MOF structure to take over this responsibility for the whole country. A fishing industry manpower needs study should be undertaken as a matter of urgency before any further decisions are taken on course curricula, staff and training facilities for the fisheries subsector.

(c) Fisheries Research. The MOF already includes a small research division within its establishment, staffed by qualified Somali fisheries scientists, and there are TYDP proposals for the construction of a fisheries research institute allied to the new Faculty of Marine Science at the National University. The work program of this research institute should, for a number of years, be restricted to applied research into fish stocks and fishing effort, designed to provide the biological basis for conservation regulations and to work on fish utilization, product quality control and possibly simple forms of aquaculture. Work should also be done on exploratory fishing and stock assessment studies of the demersal fish and crustacean

resources on the Somali continental shelf, the small pelagic species stock off the Northeast coast and for offshore tuna along the north coast.

(d) Fishing Boat Maintenance. Past experience in Somalia has amply demonstrated the impossibility of keeping motorized fishing boats in working order in the absence of an efficient spare parts supply system, basic workshop facilities and properly trained mechanics at each of the main fishing centers. Workshop facilities would be built covering the coastline. In the meantime, motor boats should be concentrated at those centers where they can be properly maintained.

Infrastructure Development for Coastal Fisheries

90. The coastal fisheries lack virtually all the necessary infrastructure to facilitate development with the exception of limited processing facilities at a few centers, some which unfortunately proved to have been badly sited and are having to be replaced. Facilities needed are of four types:

(a) Processing and Marketing. Physical facilities for the hygienic distribution, wholesale and retail marketing of fish are urgently needed at all the main urban centers, coupled with an energetic local demonstration campaign to promote increased domestic consumption. Processing and handling facilities at the coastal fishing centers should also be upgraded to minimize spoilage and the production of poor quality processed fish. Consideration should be given to more active encouragement of Somali and foreign fish traders to buy direct from fishermen. The fixed price system should be modified to a minimum price scheme to safeguard producer interests, hence, allowing retail prices more freedom to reflect market conditions.

(b) Roads. Roads should be constructed to serve communities where the combined benefits to fisheries, livestock and crop production can provide sufficient economic justification for the high cost long distance feeder roads. Examples include Mait-Erigavo-El Dab, Bosaso-Garbo-Garoe, and Ras Chiamboni-Kulnis-Kismayo.

(c) Coastal Ferry Service. Coastal communities which cannot provide justification for roads can be better served, at lower cost, by a coastal ferry service to seaward. For example a service is needed between Berbera and Bolimog (Alula), calling at Karin, Mait, Las Koreh, Bosaso and Candala enroute, for the carriage of cargo and passengers along the north coast. A similar service from Mogadishu northwards, calling at Adale, Meregh, Obbia, Eil Marina,

Bender Beila, Hafun and Bargal enroute and perhaps interconnecting with the north coast service at Bolimog, would serve the needs of all the most isolated coastal communities and the inland population adjacent to each port of call. The necessary technical/feasibility studies for such services and for the landing jetties and/or landing craft to connect from ship to shore, should be undertaken.

(d) Ice Plants and Cold Storage. As part of the overall package, assuming that feeder roads and/or ferry services are provided to link with the main domestic and export market outlets, many fishing centers will require the provision of ice plants and chill stores, or freezing and cold storage plant to enable them to sell their fish most advantageously.

Rehabilitation of Existing Fish Processing Factories

91. This would include:

(a) Rehabilitation and recommissioning of the Kismayo fish freezing factory to its original design capacity was completed in 1979. The next stage would be a major expansion program to allow the factory to handle catches from part of the offshore deep sea fishing fleet. This work is scheduled for the period 1980-83. There seems to be little doubt that the increased capacity would be economically utilized and that subject to proper maintenance and to careful hygiene and fish quality standards, the project would be successful.

(b) The four north coast factories (3 canneries and one fish freezing plant) present a very different set of problems, the record of all four having been generally poor in recent years. The freezing factory at Bolimog is currently in the process of being rehabilitated to about 25 percent of original design capacity for a period of trial operation, whilst the Habo cannery has functioned for only short seasons recently and the Candala cannery has remained closed since 1976. The main reason in both cases has been a generally inadequate supply of tuna for canning from the small inshore fleet of motor boats.

(c) The Las Koreh factory is the largest of the four, and is a Russian built tuna cannery dating from 1966, with limited buffer cold storage capacity. Parts of the plant, half the cold storage and the fishmeal and oil recovery plant, are unserviceable and probably beyond repair even if the necessary spare parts could be obtained from the USSR. The factory has clearly reached the stage where a major rehabilitation exercise will be needed in the very near future. Before that happens, it is important to determine whether a change in the processing system and range of factory products could produce a more favorable commercial performance. A reduction in canning capacity and increase in freezing and

cold storage would reduce the factory's dependence on tuna and impart greater flexibility to utilize other kinds of fish which are unsuitable for canning but which could be sold profitably in Saudi Arabia, for example in the frozen state.

(d) To this end, a north coast fish processing capacity study, should be undertaken in conjunction with an offshore exploratory fishing survey in the Gulf of Aden to determine whether existing processing capacity is adequate or excessive in relation to potential fish supplies and what changes, if any, should be made to the processing systems to improve performance and profitability. The logistic and financial advantages, if any, to the factories of establishing a regularly scheduled coastal ferry service which could deliver supplies and take away factory produce for transhipment at Berbera, would also be studied. At present, all fuel, other supplies and factory products have to be trucked by land to and from Mogadishu at great expense over very long and very bad roads.

Deep-Sea Fisheries Development Project

92. In general it is considered that government could make more use of joint venture arrangements in setting up the Somali deep-sea fishing industry, to develop overseas marketing contracts, to acquire expertise to train Somali personnel in technical and managerial fields, and to fund and develop some of the necessary infrastructure to support the fishing fleet. Indeed the almost total lack of qualified Somali personnel to operate vessels and shore installations, virtually precludes any other approach during the initial formative years. Licensing foreign flag vessels and management contracts would be acceptable short term emergency measures to cover the interim whilst long term joint venture agreements are being carefully negotiated.

(a) Fish Freezing, Cold Storage and Ice Plant: Mogadishu Port Area. Given the investment that has already been incurred in fishing vessels, many of which lack of freezing capability and therefore cannot operate without a shore base, the most urgent need is for the provision of a shore complex adjacent to the existing port at which fish can be landed for freezing, and cold storage pending transhipment. Sufficient ice should be produced to enable the wet fish trawlers to remain at sea for several days at a time without loss of catch quality. Preparation of this activity should be given priority.

(b) Marine Slipway and Trawler Repair Workshops. The general area of the northwest Indian Ocean is not well served by ship repair facilities, the nearest to Mogadishu being at Mombasa, Kenya. The need for regular and timely maintenance

makes it essential that suitable facilities, including slipway and workshops, be established in the near future at Mogadishu, at least for the smaller classes of trawlers up to say 30 meters in length, of which there are likely to be some twenty vessels in operation by 1982. The lesser number of larger trawlers will have to use Mombasa for the foreseeable future. Several ministries, the Port Authority, and vessel operators are involved and there will be need for close collaboration in any such development.

(c) Fishing Port Facilities at Mogadishu, Kismayo and Berbera. The existing ports of Mogadishu and Berbera are already being fully utilized by mercantile traffic, whilst Kismayo is said still to have some spare capacity. Plans for port expansion appear to take no account of the rapid increase in trawler traffic and the regular use of these ports will pose increasing problems for the Port Authorities and trawler management unless and until special berths can be provided to serve the fishing industry. Urgent interministerial action is needed to commission the necessary civil engineering and feasibility studies to determine alternative courses of action.

(d) Design of Fishing Harbor at Ras Hafun. Large stock of small pelagic fish species occurs off the northeast coast, in the vicinity of Ras Hafun. This stock is believed capable of supporting sustainable catches of up to 100,000 tons per year. The fish are suitable for fishmeal and oil production rather than for human consumption. This necessitates consideration of a new fishing harbor and shore facilities at Ras Hafun because of the impracticability of basing such bulk fishing operations anywhere else. Feasibility studies should be undertaken. The matter is, however, not urgent at this stage.

ANNEX 3
Table 1

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Fish Production in Somalia
(Figures in tons, whole fresh landed weight, estimated figure in brackets)

	1974	1975	1976	1977	1978
1. North Coast					
Las Koreh	614	1,553	1,308	1,410	778
Bolimog	100	300	344	845	-
Habo	435	301	56	-	-
Candala	98	86	232	-	-
Curing & local	(700)	1,260	(1,200)	(1,100)	(1,000)
Total	1,947	3,500	3,040	3,355	1,778
2. East Coast					
Eil)				379	240
Adale)				306	217
Mogadishu)				(300)	430
Merca)				(80)	61
El Hamed)	(2,000)	4,400	(4,000)	-	72
Brava)				226	123
Kismayo)				(100)	100
Kulmis)				232	225
Ras Chiamboni)				(100)	102
Other centers)				(200)	(200)
Total	2,000	4,400	4,000	1,923	1,770
3. Offshore					
Fish	1,370	1,500	3,400	3,400	235
Lobsters	680	950	950	1,150	20
Total	2,050	2,450	4,350	4,550	255
Grand Total	5,997	10,350	11,390	9,828	3,803

Sources:
1. Somalfish Statistical Review to 1975.
2. FAO, Fish Marketing in Somalia, J.A. Ross 1975.
3. FINTECS, Las Koreh & Bolimog Studies 1978.
4. Central Bank Annual Report, 1977.
5. FAO/Somalia Fisheries Project, unpublished data.

ANNEX 3
Table 2

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Fish Export

1. Exports of Fish and Fish Preparations

Year	Quantity (tons)	Value ('000 So.Sh.)
1972	1,343	5,198
1973	1,796	13,461
1974	2,002	15,242
1975	2,392	11,583
1976	3,250	15,616
1977	5,072	24,478

2. Exports of Fish and Fish Preparations, 1976

Commodity	Quantity (tons)	Value ('000 So.Sh.)
Canned Tuna	324.9	3,284.9
Frozen Fish	138.6	1,374.9
Dried Fish	1,358.4	3,395.3
Frozen Lobsters	1,428.0	7,560.4
Total	3,249.9	15,615.5

Note: Additional information provided by Somalfish and others indicated major discrepancies with the above "official" figures.

3. Composition of Fish Exports, 1977 (Ministry of Fisheries data)

Commodity	Quantity (tons)	Value ('000 So.Sh.)
Frozen Fish	3,877.8	1,054.2
Frozen Lobsters	515.3	2,718.2
Dry Salted Fish	678.8	154.9
Total	5,071.9	3,927.3

Source: 1977 Statistical Abstract, Central Statistics Department, Ministry of National Planning.

ANNEX 3
Table 3

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Offshore Trawl Catches
(Italian Licensed Freezer Trawler Operations, Somali Waters)

1. ANTONIETTA MADRE (August - May 1978)

(a) Fish

1978	57 days	364 hauls	235.2 tons
1979	58 days	480 hauls	254.4 tons

(b) Lobster

1978	30 days	172 hauls	20.5 tons
1979	23 days	140 hauls	45.8 tons

2. AMOROSO 3° (April - June 1979)

(a) Fish

1979	23 days	139 hauls	99.9 tons

(b) Lobster

1979	41 days	296 hauls	13.4 tons

3. AMOROSO 6° (April - June 1979)

Fish only

1979	36 days	228 hauls	144.3 tons

ANNEX 3
Table 4

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Fixed Price Structure for Fish and Fish Products
(Prices in So.Sh. per kilogram)

	Grade A	Grade B	Grade C	Grade D	Lobster
1. Fresh Fish					
(a) Mogadishu Coop.					
(i) To fishermen	4.00	3.00	2.00	1.20	12.00
(ii) Retail	5.25	4.25	3.45	2.25	16.00
(b) Merca Coop.					
(i) To fishermen	2.70	2.00	1.50	1.00	10.00
(ii) Retail	3.90	3.20	2.70	2.20	14.00
(c) Kismayo Coop.					
(i) To fishermen	1.50	1.00	0.70	-	14.00
(ii) Retail	3.00	2.00	1.50	-	18.00
(d) El Hamed Settlement (Fishermen also receive rations and accommodation)					
(i) To fishermen	0.80	0.80	0.80	-	0.80
(ii) Retail	3.00	2.20	1.00	-	14.00
(e) Berbera Coop. (All supplies of fish except shark - currently not kept)					
(i) To fishermen	4.20	-	-	-	-
(ii) Retail	5.00	-	-	-	-

(f) Habo/Alula	Fresh Tuna	Dried Shark	Dried Sh. Fin.	Dried Mackerel
(i) To fishermen	0.95	1.55	7.50 - 8.50	1.50
(ii) From factory	1.00	-	-	-
(iii) From Somalfish	-	2.50	8.12 - 12.50	2.00

ANNEX 3
Table 5

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Mogadishu Fishermen's Cooperative:
7 Months Landings - November 78 to May 79
(tons)

Month/Year	Grade A	Grade B	Grade C	Grade D	Total Weight (ton)
November 1978	26.4	12.3	6.7	-	45.4
December 1978	5.8	4.2	18.7	0.6	29.3
January 1979	3.5	3.1	23.4	1.1	31.1
February 1979	6.7	4.8	12.2	1.1	24.8
March 1979	5.3	4.3	20.1	1.5	31.2
April 1979	17.6	6.9	0.9	1.1	26.5
May 1979	3.9	12.3	0.8	1.3	18.3
Total (tons)	69.2 (33.5%)	47.9 (23.2%)	82.8 (40.1%)	6.7 (3.2%)	206.6
Paid to Fishermen So. Sh.	@ 4.00 276,800	@ 3.00 143,000	@ 1.20 165,600	@ 1.20 8,040	594,140
Selling Price So.Sh.	@ 5.25 363,300	@ 4.25 203,575	@ 3.45 285,660	@ 2.25 15,075	867,610

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Merca Fishermens Cooperative: 12 Months Landings - June 1978 to May 1979

Month	Grade A	Grade B	Grade C	Grade D	Lobsters	Total Wt. (Kg)
June 1978	125.8	501.5	3,620.0	66.5	334.7	4,648.5
July 1978	303.0	608.0	6,092.5	19.5	283.5	7,306.5
August 1978	225.0	408.0	3,092.5	15.0	164.5	3,904.5
September 1978	178.0	317.7	6,759.4	57.4	400.6	7,713.1
October 1978	239.8	1,191.6	1,454.6	-	314.2	3,200.2
November 1978	683.5	1,670.2	2,601.8	-	627.9	5,583.4
December 1978	192.2	4,570.8	7,824.7	-	635.1	13,222.8
January 1979	669.5	21,050.6	4,276.4	-	823.6	26,820.0
February 1979	407.1	7,629.3	3,282.1	-	153.7	11,472.8
March 1979	990.5	6,883.5	960.5	-	448.0	9,282.5
April 1979	11,321.8	1,859.7	535.7	614.5	116.5	14,448.2
May 1979	3,445.3	2,075.4	74.0	287.5	277.7	6,159.9
Totals (Kg)	18,781.5	48,766.3	40,574.2	1,060.4	4,580.0	113,762.4
Paid to Fishermen Sh	@ 2.70 50,710.05	@ 2.00 97,532.6	@ 1.50 60,861.30	@ 1.00 1,060.4	@ 10.00 45,800.0	255,964.35
Selling Price Sh	@ 3.90 73,247.85	@ 3.20 156,052.16	@ 2.70 109,550.34	@ 2.20 2,332.88	@ 14.00 64,120.0	405,303.23
					Gross Profit Sh.	149,338.88

ANNEX 3
Table 7

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Merca Fishermen's Cooperative 1978 Balance Sheet

Income		
Sales of fish and membership fees		So.Sh. 222,005.30
Expenditure:		
Paid to fishermen, rent, wages, fuel, etc.	198,746.30	
	23,259.00	
Unpaid debts	11,063.70	
	12,195.30	
Capital and interest paid to Development Bank	4,020.00	
Balance in hand	8,175.30	

(Coop statement showed balance to be So.Sh. 8,235.40, a discrepancy of So.Sh. 60.10 which it was not possible to account for in the time available).

ANNEX 3
Table 8

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Berbera Fishermen's Cooperative: Five Months Landings: December 1978 to April 1979

Month	Fish	Shark
December 1978	895 kg	Nil
January 1979	1,300 kg	"
February 1979	1,270 kg	"
March 1979	1,240 kg	"
April 1979	1,905 kg	"
	6,510 kg	"

Paid to Fishermen	So.Sh. 277,62.00
Selling Price	So.Sh. 330,50.00

Cooperative receipts for 5/12	So.Sh. 5,288
Expenses @ Sh 1,600 pm for wages and 20 cts/kg processing cost	So.Sh. 9,322
Loss	So.Sh. 4,034
i.e. about So.Sh. 807 per month	

Note: Cooperative had So.Sh. 24,729 in deposit at end December 1978, earned during 1976-1978. This had reduced to So.Sh. 19,478 on June 24, 1979.

Note: No grading scheme, all fish except shark sell for So.Sh. 5 per kg, with So.Sh.-/80 deducted for the cooperative. Shark currently discarded for lack of salt.

ANNEX 3
Table 9

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

El Hamed Nomad Coastal Settlement: 5 Months Landings: January to May 1979

Month	Grade A	Grade B	Grade C	Grade D	Lobster	Turtle (No.)	Total Wt. (kg) (Excl. Turtle)
Jan.	289	16,649	351	-	70	11	17,359
Feb.	345	6,669	144	-	49	37	7,207
Mar.	437	6,260	455	-	61	47	7,214
Apr.	905	4,838	298	-	55	26	6,096
May	69	3,111	149	-	51	15	3,315
Total	2,045	37,527	1,397	-	286	-	41,255
Paid to Fishermen	So. Sh.1,636.00	30,021.60	1,117.60	-	222.80		So. @ 0.80 Sh. 33,004.00
Selling Price	So. @ 3.00 Sh.6,135.00	@ 2.20 82,559.40	@ 1.00 1,397.00	-	@ 14.00 4,004.00	@ 15.25 2,074.00	So. Sh. 96,169.00

ANNEX 3
Table 10

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Populations of the Coastal Nomad Resettlement Centers at Eil, Adale, El Hamed & Brava

Center		Brava		Adale		Eil		El Hamed	
Sex		Male	Female	Male	Female	Male	Female	Male	Female
Age:	0 - 6	373	295	214	211	229	219	-	-
"	7 - 14	1,288	976	1,372	994	625	490	-	12
"	15 - 50	1,118	1,307	850	621	450	790	214	16
"	50 plus	110	102	357	306	37	62	6	4
		2,889	2,680	2,793	2,132	1,341	1,561	220	32
		5,569		4,925		2,902		252	

Source: Coastal Development Project, June 1979.

ANNEX 3
Table 11

SOMALIA

AGRICULTURAL SECTOR REVIEW

The Fisheries Subsector

Staff Budget

		1977		1978		1979	
		No.	Total	No.	Total	No.	Total
I. Salary Levels							
A. Permanent Staff							
Civil Serv. Scale	Position Title						
-	Minister	1	35,520	1	35,520	1	35,520
A/2	Director-General	1	10,140	1	10,140	1	10,140
A/3	Director of Departments	4	46,704	6	58,764	6	60,300
A/	Head of Service	2	21,048	1	21,008	2	21,048
A/7	Head of Section	1	10,908		--		--
A/8	Head of Section		--	3	21,408	5	48,416
A/8	Senior Officers	1	8,376		--		--
A/9	Senior Officers	5	32,580		--		--
B/8-B/9	Senior Officers		--	6	21,408	14	111,699
B/8	Junior Officers	14	121,896		--		--
B	Junior Officers	112	476,323	83	490,620	85	340,956
C/8-C/10	Clerks, Skilled Laborers	4	27,302	145	769,224	188	1,100,000
C	Clerks, Skilled Laborers	146	625,215		--		--
D	Messengers	59	151,589	18	44,928	14	34,944
Military Ranks							
	Senior Officers	3	50,000	2	41,328	2	40,202
	Senior Officers	13	220,000	12	190,512	13	206,479
	Officers	7	100,000	7	116,544	8	114,268
	Deputies	4	28,000	4	28,000	10	78,548
	Officers	3	30,000	1	10,000	2	24,084
	Privates	27	140,000	27	140,000	29	152,419
II. Allowances							
Position Title	Allowance						
Minister	Servant	1	3,060	1	3,060	1	3,060
	House		10,140		10,140		10,140
Director Gen.	Responsibility	1	5,460	1	5,460	1	5,460
	House		5,460		5,460		5,460
Director of Departments	Responsibility	3	13,212	6	26,400	5	25,000
	House		10,188		20,400		20,000
Engineer	Professional	8	43,680	4	29,400	5	39,000
Accountants	Responsibility		--	1	2,280	1	2,280
	House		--		1,140		1,140
Asst. Accountant	Responsibility		--	1	1,140	1	1,140

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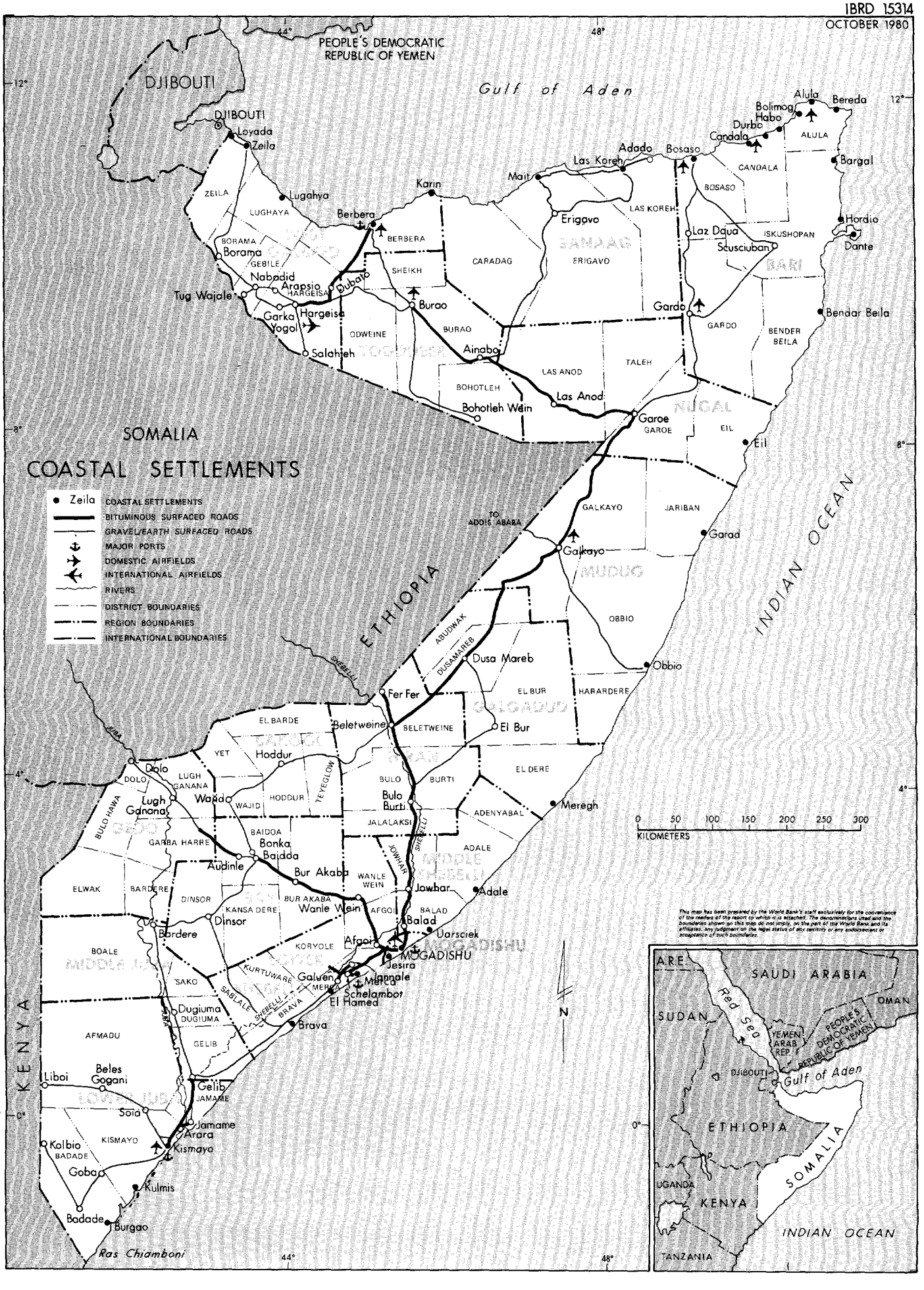

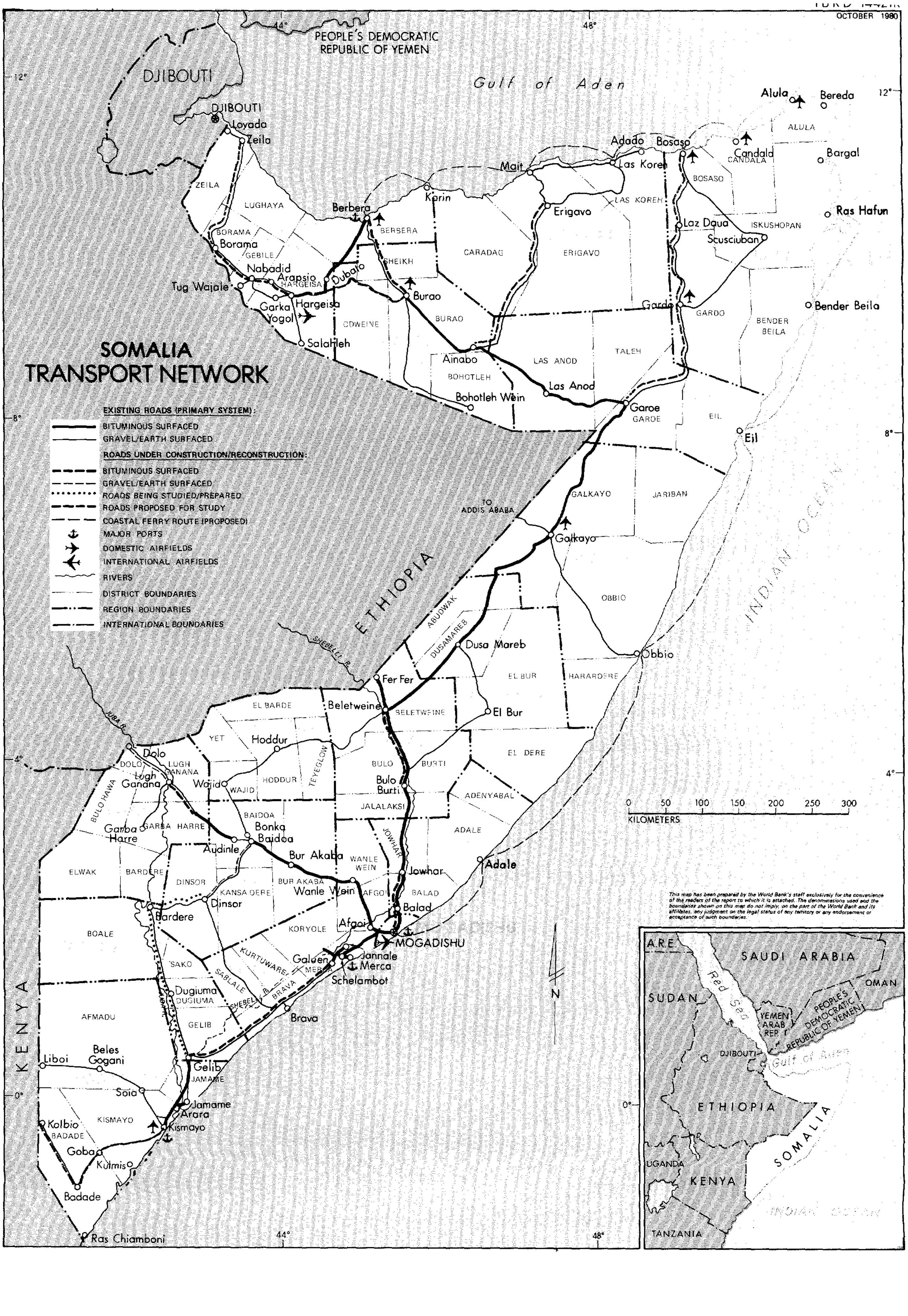
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SOMALIA
TRANSPORT NETWORK
EXISTING ROADS (PRIMARY SYSTEM):
BITUMINOUS SURFACED
GRAVEL/EARTH SURFACED
ROADS UNDER CONSTRUCTION/RECONSTRUCTION:
BITUMINOUS SURFACED
GRAVEL/EARTH SURFACED
ROADS BEING STUDIED/PREPARED
ROADS PROPOSED FOR STUDY
COASTAL FERRY ROUTE (PROPOSED)
MAJOR PORTS
DOMESTIC AIRFIELDS
INTERNATIONAL AIRFIELDS
RIVERS
DISTRICT BOUNDARIES
REGION BOUNDARIES
INTERNATIONAL BOUNDARIES
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN
Gulf of Aden
DJIBOUTI
ETHIOPIA
KENYA
INDIAN OCEAN
TO ADDIS ABABA
SHEBELLI R.
JUBA R.
Djibouti
Loyada
Zeila
Borama
Nabadid
Tug Wajale
Arapsio
Dubato
Hargeisa
Garka Yogol
Salahleh
Berbera
Karin
Mait
Adado
Bosaso
Las Koreh
Erigavo
Alula
Bereda
Candala
Bargal
Ras Hafun
Laz Dqua
Scusciuban
Burao
Gardo
Bender Beila
Ainabo
Las Anod
Bohotleh Wein
Garoe
Eil
Galkayo
Dusa Mareb
Obbio
Fer Fer
Beletweine
El Bur
Hoddur
Dolo
Lugh Ganana
Wajid
Bulo Burti
Garba Harre
Bonka
Baidoa
Audinle
Bur Akaba
Wanle Wein
Jowhar
Adale
Dinsor
Bardere
Balad
Afgoi
MOGADISHU
Jannale
Galuen
Merca
Schelambot
Dugiuma
Brava
Beles Gogani
Liboi
Gelib
Soia
Jamame
Arara
Kismayo
Kolbio
Goba
Kulmis
Badade
Ras Chiamboni
ZEILA
LUGHAYA
BORAMA
GEBILE
HARGEISA
BERBERA
SHEIKH
ODWEINE
BURAO
CARADAG
ERIGAVO
LAS KOREH
BOSASO
CANDALA
ALULA
ISKUSHOPAN
GARDO
BENDER BEILA
LAS ANOD
TALEH
BOHOTLEH
GAROE
EIL
GALKAYO
JARIBAN
OBBIO
ABUDWAK
DUSAMAREB
EL BUR
HARARDERE
EL BARDE
BELETWEINE
YET
HODDUR
TEYEGLOW
BULO BURTI
EL DERE
DOLO
LUGH GANANA
WAJID
BULO HAWA
GARBA HARRE
BAIDOA
JALALAKSI
ADENYABAL
ADALE
JOWHAR
WANLE WEIN
BUR AKABA
DINSOR
BARDERE
ELWAK
KANSA DERE
AFGOI
BALAD
KORYOLE
BOALE
SAKO
KURTUWAREI
MERCA
SABLALE
BRAVA
DUGIUMA
AFMADU
GELIB
JAMAME
KISMAYO
BADADE
44°
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0 50 100 150 200 250 300
KILOMETERS
N
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SAUDI ARABIA
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YEMEN ARAB REP.
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN
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