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SPECIAL ECONOMIC AND DISASTER RELIEF ASSISTANCE

Assistance to the drought-stricken areas in the Sudan

Report of the Secretary-General

1. In its resolution 1980/70 of 25 July 1980, entitled Assistance to the drought-stricken areas in Djibouti, Somalia, the Sudan and Uganda, the Economic and Social Council, inter alia, requested the Secretary-General, taking into account Council resolutions 1980/44 and 1980/45 of 23 July 1980 and 1980/53 of 24 July 1980, (a) to send, as a matter of urgency, a multiagency mission to the countries in question, to assess the extent of the problem and the magnitude of the assistance required and (b) to mobilize humanitarian assistance from the international community for the people displaced as a result of the drought and other natural disasters. The Secretary-General was also requested to report to the General Assembly at its thirty-fifth session on the progress achieved in the implementation of the resolution.
2. The Secretary-General designated the United Nations Disaster Relief Co-ordinator to lead the multiagency mission. The mission visited the Sudan from 23 September to 1 October 1980. The report of the interagency mission to the Sudan is annexed to the present report.

ANNEX

Report of the interagency mission to the Sudan
 (23 September to 1 October 1980)

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I. INTRODUCTION

1. At the second regular session in 1980 of the Economic and Social Council, during the discussion on international co-operation and co-ordination within the United Nations system, representatives of the Governments of Somalia, Sudan, Djibouti and Uganda made statements concerning the widespread, deleterious effects that the prevailing drought was having on their respective countries. They stressed the considerable loss of human life as well as the great number of deaths among the livestock and emphasized also the lack of sufficient food and water, which resulted in deteriorating health conditions. These conditions have exacerbated an already difficult economic situation.

2. As a consequence of the plight of the affected victims, the Council adopted resolution 1980/70, in which it requested the Secretary-General, while taking into account resolutions 1980/44, 1980/45 and 1980/53:

(a) To send, as a matter of urgency, a multiagency mission to the countries referred to (Sudan, Somalia, Djibouti and Uganda) to assess the extent of the problem and the magnitude of the assistance required;

(b) To mobilize humanitarian assistance from the international community for the people displaced as a result of the drought and other natural disasters.

3. The Secretary-General designated the United Nations Disaster Relief Co-ordinator to lead the multiagency mission. The mission visited Djibouti from 31 August to 8 September 1980, Somalia from 9 to 22 September, and the Sudan from 23 September to 1 October. The mission in the Sudan was comprised of representatives of the United Nations, the United Nations Development Programme, the International Labour Organisation, the United Nations Children's Fund, the Office of the High Commissioner for Refugees, and the World Health Organization whose member represented also the Food and Agriculture Organization of the United Nations. A list of mission members is shown in appendix I.

4. The terms of reference of the mission under resolution 1980/70, as concurred in by the Secretary-General, were as follows:

(a) Visit, to the extent possible, the areas seriously affected by drought and other natural disasters and assess the damage caused and its effects on the population;

(b) Estimate the immediate relief needs (for the period up to 6 months following this mission) of those persons who have been displaced by drought and other natural disasters;

(c) Estimate their follow-on relief needs (for the period from 6 to 12 months following this mission);

(d) Estimate the immediate and follow-on relief needs of the resident populations affected;

(e) Determine the scope and magnitude of the relief measures undertaken by the Government as well as its estimated resource availability to meet assessed requirements;

(f) Determine the degree of humanitarian assistance from the international community that is required to augment the Government's capability to respond to the situation.

5. The mission was received by His Excellency Abu Bakr Mohammed Salih, Minister of the Council of Ministers' Affairs, and His Excellency Mohammed Mirgani, Minister of State for Foreign Affairs. The mission also met with His Excellency Mirgani Mohammed Ahamed, State Minister of National Planning; His Excellency Dr. Mohammed Hassan El Jack, Minister of State for Agriculture, Food and Natural Resources; His Excellency Dr. Khalid Hassan Abas, Minister of Health; and His Excellency Dr. Sherif El Tohani, Minister of Energy and Mining. Mission members had group and individual meetings with ministers, their officials and technical staff. A visit was also made to drought areas in the southern region of the country.

6. The mission wishes to express its appreciation for the assistance received from all concerned in the Sudanese Government, as well as to the Resident Representative of the United Nations Development Programme and his staff for their whole-hearted co-operation and support.

II. SUMMARY OF PRINCIPAL RECOMMENDATIONS

7. The large influx of refugees from adjacent countries and the deleterious effects of several natural disasters in the past two years have placed a financial burden on the economy of the Sudan that it cannot bear alone. Consequently, the following recommendations for assistance from the international community are considered to be fully supportable:

(a) Provision of food aid to the southern region most seriously affected by drought. This aid involves supplying 9,282 metric tons of food commodities for 80,000 people over a 10-month period (November 1980-August 1981) at a cost of \$5,100,000.

(b) Improvement of water supply in the southern region and in North Darfur and North and South Kordofan Provinces through the supply of drilling rigs, heavy duty transport, pumps, generators and ancillary equipment and material. Financial requirements for the first six months are \$5,165,000; and for the follow-on emergency period, \$1,625,000.

(c) Supply of transportation to assist in distributing food in the southern sector and facilitate the well-drilling programme in South Kordofan Province. The cost of vehicles, plus essential spare parts (at the request of the Health Services of the southern region of Sudan) and maintenance for two years, totals \$1,270,000.

(d) Financial assistance of \$50,000 to purchase drugs against the additional burden of malnutrition and infectious disease precipitated or aggravated by the drought.

(e) Closer co-ordination of the health authorities with other ministries and departments who would first become aware of natural disasters (droughts, floods or fires). Alternatively, health outposts should assume a greater reporting role in warning of impending disasters. They should do this by monitoring the occurrence of certain diseases and malnutrition, and reporting such incidents promptly. The Primary Health Care system is ideally suited for this purpose, and its strengthening and expansion are heartily endorsed.

(f) Support of the Ministry of Agriculture and Natural Resources efforts to detect and control effects of drought and fires throughout the Sudan.

(g) Assistance in creating and extending firebreaks in critically affected provinces, to preserve grazing and agriculture land. The financial cost to provide a transport fleet, limited quantities of herbicides and food for workers is approximately \$1,688,000 for a one-year operation.

(h) Provision of \$1,000,000 as a one-year cost for veterinary vaccines and chemoprophylactic drugs as well as limited transport. However, it is suggested that joint use of some of the vehicles used in the firebreak programme could reduce the over-all costs involved.

(i) The provision of a utility vehicle (for patrol and service as a mobile veterinary clinic and laboratory) plus tranquilizer guns and ancillary equipment to assist the Wildlife Department in disease control for animals in game reserves and parks. Diseases among these animals have been aggravated not only from drought but also from inroads by herded animals into such reserves and parks. The total cost of the programme is not more than \$50,000.

(j) Examination by the appropriate United Nations agencies or by a follow-on mission which may be formed for this purpose, of the Government's requests for support of their medium-term and long-term development programmes to combat the effects of drought, flood, fire and insect infestation (which will in turn ensure that the country will be better prepared to respond to future natural disaster situations).

III. GENERAL BACKGROUND

8. The Sudan occupies 2,505,813 square kilometres in north-east Africa. It is the largest country in Africa, the tenth largest in the world, and covers a larger area than the countries of the European Common Market combined with Norway and Sweden. The latest population figure provided by the Government was 18,961,000 persons, approximately 80 per cent of whom live in rural areas. The average density of population is low.

9. Any description of Sudan should start with the Nile River, since it is so vital to the Republic. The Nile enters Sudan from Uganda in the south and is fed by a number of streams draining the south-west area of the country. The White Nile drains the Sudd Region northward, though half of the flow is lost by irrigation in the Sudd. The Blue Nile drains a large part of the Ethiopian highlands and joins the White Nile at Khartoum. The two rivers are very different. The Blue Nile floods in August, normally rising seven metres above its low level, and at that time produces nearly 90 per cent of the discharge at Khartoum. Normally, at low water, the White Nile produces 83 per cent of the discharge. North of Khartoum the Nile is the focus of most of the agricultural activity, and pump irrigation along its banks provides a fertile strip through the desert.

10. Sudan has a range of tropical, continental climates, with a marked climatic gradient from south to north and from the Ethiopian plateau northwestwards. In the south the rainy season lasts from five to eight months (April to November) producing from 750 to 1,800 mm of precipitation, while in the northern areas the rainy season lasts from one to three months (July to September) and the rainfall is less than 25 mm.

11. With its large area and scattered population, the Sudan has a poor communication and transportation infrastructure. There are few roads, many of which are passable only in the dry season. Railway lines are narrow gauge and are subject to flooding in the rainy season. Fuel shortages make the national airways unreliable. There is persistent congestion at Port Sudan and the country faces continual difficulties in transporting materials from the Port to the interior of the country.

12. Sudan has been classified by the United Nations as one of the "least-developed countries" and is included among those "most seriously affected" by the world economic crisis.

13. Agricultural products comprise by far the largest segment of Sudan's exports, which at present lag behind the value of imports. Appendix II shows the value of exports and imports for 1979-80; a summary of the balance of payments for 1979-80 and a projection for 1980-81 are given in appendix III.

14. Availability of water is the governing factor for agriculture in the Sudan. In most parts of the rainlands, drinking water for humans and animals is a crucial factor, especially before the rainy season, when land is prepared for cultivation, and during harvest time.

15. There is almost unlimited cultivatable land in the Sudan (200 million feddans: one feddan equaling 1,038 acres) but only 10 per cent is being utilized for agriculture, and about 4 million feddans are under irrigation.

16. Sudan's main cereal crop is sorghum (durra). It is the staple food in the country and is grown mainly in the rainlands. Sudan normally produces sufficient durra to satisfy its domestic requirements.

17. Economic constraints continue to hamper Sudan's ambitious development programme. Financing oil imports and servicing a \$US 2.5 billion external debt are expected to consume an estimated 80 per cent of its export earnings.

18. Commodity shortages have been particularly severe in the southern region because of the disruption of normal supply lines from Mombasa and the sudden influx of thousands of refugees from Uganda.

19. The large influx of refugees (estimated at 441,000 as of January 1980) has severely taxed the Government's ability to provide social services not only to the refugees but also to the resident population.

20. In several meetings the Minister of State Planning emphasized that although the Sudan is not prone to sudden disasters, such as earthquakes and typhoons, it is by no means immune to such natural disasters as drought, floods, fire, infestation by pests and desertification. Emphasized also was the need for assistance in the construction and maintenance of roads, water reservoirs, boreholes, and drainage facilities for urban areas; assistance in repair and maintenance of irrigation systems, particularly in the co-operatives; the provision of seed, fertilizer and insecticides for farmers; assistance in combating locust invasions; and the provision of vaccines and drugs for livestock.

IV. RELIEF ASSISTANCE

A. General background

21. Much of the Sudan is in a state of precarious ecological equilibrium which is steadily becoming less favourable to man and other forms of life. There has been, since 1973 at least, a steady spread of desert conditions southwards affecting a number of provinces. For example, in the Kordofan area, increasing desertification has been manifested in a steady and very serious falling-off in the production of cash crops such as sesame and peanuts. Land devoted to pasture has also suffered, but partly as a result of overstocking. Recurrent drought and fires, particularly severe in 1979-80, have markedly aggravated the situation. At times of stress, additional factors come into play, such as movement of livestock, concentration of livestock and incursions from neighbouring areas, all of which contribute to the introduction and spread of animal diseases. Periodically, pests affecting crops also provide further scourge. In the recent past, locust invasions, which follow an irregular and not easily predicted pattern, have taken a heavy toll on vegetation and crops, with direct and indirect effects on the human economy and on primary industry (consumption crops, cash crops already mentioned and gum-arabic-yielding acacias and grazing land) thus aggravating starvation conditions for livestock.

22. As already indicated, 1979-80 was a particularly bad season, and a number of provinces were especially affected: these included North and part of South Kordofan, North and South Darfur, Khartoum, Kasala and the Red Sea. Moreover, much of the southern region was also affected.

23. Thus the total human population involved was about 6 million in the north, and perhaps 5 million in the south. The livestock population affected was of the order of 38 million head (according to the 1978 stock census) in all provinces (approximately 35 per cent cattle, 32 per cent sheep, 25 per cent goats and the remainder camels), including 6 to 7 million head (mostly bovines) in the south.

24. It is difficult to assess precisely the degree of affliction of the human population, but the authorities stressed that everybody in the stated northern provinces was more or less affected, and the same was said to be true in the south, where starker details were given of local communities particularly badly struck (e.g., 600 deaths attributable primarily to inanition from starvation in one locality, 27 in one village alone).

25. Again, the impact on the animal population is not easy to quantify precisely, but figures for losses incurred during the 1979-80 season were of the order of 5 to 10 per cent of the total herd in the north and 3 to 5 per cent of the herd in the south, though locally higher losses have been recorded. Fires greatly aggravated the situation, especially in the north. These arose from a variety of causes (accidental or deliberate in an effort to produce a fresh growth of stockfeed); but the point is that drought conditions caused these fires to get out of control, and it is estimated that up to 38 per cent of the grazing potential was affected.

26. Attempts to assess the extent of population displacement through drought and its complications were not successful: in this context it should be noted that over large tracts of land, notably in the south, there exist traditional barriers to movement beyond the normal grazing areas. There are well-defined and restricted pastoral rights; and where these are infringed (sometimes through force of circumstances) inter-ethnic strife is apt to occur, though this is usually concealed from the authorities. Hence, overt displacement is likely to be underestimated.

27. It should be noted that the mission visited the Sudan towards the end of the 1980 summer-autumn rains. The extent of these rains and the benefits and degree of recovery from the 1979-80 damage which the rains will bring about are again not easy to assess, especially in the north; however, in the south, the consensus of opinion was that, while useful rain had indeed fallen, there persisted some residual areas (normally more vulnerable to poor rainfall, faster drainage, etc.), where emergency, even disaster conditions prevailed. In particular, it was estimated that some 80,000 to 85,000 people lived in southern areas persistently affected and hence in danger until next year's rainy season.

B. Food

Eastern Equatoria, Jonglei and Upper Nile Provinces

28. As agriculture is the predominant economic activity, drought in the Sudan can be devastating and in the south, catastrophic due to the isolated nature

of the area, where all supplies must be either airlifted to the centre at Juba or brought down the rivers by barge. A road link between Juba and Mombasa in Kenya is now being upgraded in an attempt to improve access to this area.

29. The Government has indicated that a drought prevails in the southern region, particularly in the Eastern Equatoria, Jonglei and Upper Nile Provinces. The failure of rain in the recent agricultural planting season (July to August 1980) resulted in a very poor harvest of basic food-stuffs and an increasing scarcity of water due to a lowering of the water table.

30. The mission visited Juba in the south to assess firsthand the extent of the drought and the damage to the human and animal populations. Extensive consultations were held with senior government officials and local representatives of the international community, who made significant contributions in identifying both problem areas and the assistance required to provide immediate and follow-on relief.

31. The consultations confirmed, in the strongest possible terms, the existence of a significant drought in the areas adjacent to the Ugandan, Kenyan and Ethiopian borders which was affecting an estimated 80,000 people. It was also confirmed that this already serious situation would deteriorate further as existing food stocks were depleted and that a major disaster could occur if the rains failed during the 1981 season.

(a) Drought areas

32. The drought-affected areas of the southern region are shown in appendix IV. Essentially, the area is below the 1,000 metre contour in a belt stretching from Nimule on the Ugandan border to Torit and Kapoeta on the east bank of the Nile river in the Eastern Equatoria Province and northward to Pibor Post and Akobo in Jonglei Province and Nasir in Upper Nile Province. This belt extends both southward and eastward to the Ugandan, Kenyan and Ethiopian borders.

(b) Populations affected

33. In recent visits to the above-mentioned areas by government personnel and international staff from the World Food Programme and Norwegian Church Aid it was indicated that the human population currently affected by a shortage of basic food commodities is distributed as follows:

<u>Area</u>	<u>Number of persons</u>
Nimule	5,000
Chukudum (between Torit and Kapoeta)	25,000
Kapoeta	35,000
Pibor Post	5,000

<u>Area</u>	<u>Number of persons</u>
Akobo	5,000
Nasir	5,000
	<hr/>
Total	80,000
	<hr/>

34. Information from the Ministry of Agriculture in Juba confirmed the failure of dry-land farming in the southern region as a whole, and in the south-eastern areas in particular, as a result of both the failure of rains in June and July of this year and an increase in infestation by pests. The Ministry also advised that, of the total national cattle population of about 14 million, 6,250,000 were located in the southern region (35 per cent of the national total) and that about 750,000 cattle were usually located on the east bank of the Nile River, from Chukudum in the south to Akobo in the north. A substantial loss of cattle had occurred in this area as a result of the serious shortages of fodder and water. Actual losses were not quantified; however, a 50 per cent loss was estimated for those areas adjacent to the Kenyan and Ugandan borders. The losses had, in turn, caused livestock owners to migrate to areas in the north-west near Bor on the Nile River, placing added pressure on population residing adjacent to the Nile river. The drought in the common border areas of Uganda, Kenya and Ethiopia has led to a very high demand for cattle, and security to prevent cattle rustling has become a serious issue.

(c) Immediate assistance required

35. Because in the south there is only one agricultural planting season each Year (June to August), it must be assumed that local food commodities would be available at the earliest in August 1981. However, there are immediate needs, as identified by the Government, WFP and other concerned agencies working in the area, for food and funds to pay for sea and road transport and local distribution costs.

36. Those needs are based on the following ration scale:

<u>Commodity</u>	<u>Daily ration per person (kg)</u>
Durra	0.400
Dry skimmed milk	0.040
Beans	0.025
Oil	0.020

37. Also they take into account the current food stocks and cash available to purchase food held by WFP in Rank and Juba:

<u>Commodity</u>	<u>Metric tons</u>
Durra	1,450
Dry skimmed milk	100
Beans	300
Oil	118

38. Consequently, the immediate food requirements to support 80,000 people in the three affected provinces from November 1980 to August 1981 are as follows:

<u>Commodity</u>	<u>Metric tons/month</u>	<u>Metric tons for 10-month period</u>	<u>In stock (metric tons)</u>	<u>Remaining requirements (Metric tons)</u>	<u>Cost CIF Juba (\$US) a/</u>
Durra	960	9,600	1,450	8,150) 510,000 per month for 10 months, or 550 per metric tons
Dry skimmed milk	57	570	100	470	
Beans	60	600	300	300	
Oil/Fat	48	480	118	362	
Total	1,125	11,250	1,968	9,282	

a/ The \$US 550 per metric ton includes the cost of the commodities c.i.f. Mombasa, road transport via Kenya to Juba, and local distribution via the WFP field-supply organization already functioning in this area.

39. Access to Juba is very restricted. If assistance were to be directed through Port Sudan and Khartoum, long delays could be expected since goods would have to be transported by either airlift or river transport to the distribution centre in Juba. No road exists between Juba and Malakal, so that rapid access would be viable only over a recently improved access road through Kenya to the port facility in Mombasa. If there is full co-operation of the local and Kenyan government authorities, it will take approximately three weeks to traverse the route from Mombasa to Juba.

40. The existing facilities in Juba and the adjacent towns of Torit and Nimule are considered adequate for storing the required food commodities. Their capacity is as follows:

	<u>Metric tons</u>
Juba	16,300
Torit	8,100
Nimule	140

(d) Follow-on assistance required

41. If rains come during the 1981 agricultural season, no follow-on food needs will be required for these three provinces. However, if the rains are late or fail altogether, it is strongly recommended that government authorities provide early warning by June 1981, so that a potential disaster can be prepared for in a timely manner.

C. Water

1. Eastern Equatoria Province

42. Of the three southern provinces suffering from drought, only Eastern Equatoria Province suffers from a chronic shortage of water for human and animal consumption, because many of the few existing wells have dried up as a result of the lowering of the water-table.

(a) Population affected

43. During the visit to the southern region it was learned that approximately 25,000 persons in the Chukudum area and 35,000 in the Kapoeta area were suffering from severe shortages of water.

(b) Immediate assistance required

44. In the most seriously affected area of Eastern Equatoria Province, east of the Nile river, Norwegian Church Aid is at present operating two rigs, drilling deep bores (averaging 60 metres) at a rate of one well every five days. However, because the strata in the Equatoria area is soft and appropriate well-drilling machines are not available in the area, an immediate request has been made for two Atlas Copco percussion rigs. The Norwegian Church Aid expressed their willingness and ability to make full use of these two rigs and have both the operational staff and workshop facilities to operate, maintain and repair this type of equipment. As they are working in the area most affected by drought and are programmed to remain there until December 1982, it is logical to consider having them operate this equipment on behalf of the Government, in addition to the rigs they already operate. In addition to the two rigs, two Austin trucks of 7-ton capacity each would be needed as support vehicles for the rigs.

	<u>Unit cost</u> (\$ US)	<u>Total cost</u> (\$ US)
2 Atlas Copco percussion rigs, c.i.f. Mombasa, with two years' essential spare parts	350,000	700,000
2 Austin trucks (7-ton capacity) c.i.f. Mombasa, with two years' essential spare parts	35,000	<u>70,000</u>
Total		<u>770,000</u>

45. In addition to the above, government officials and WHO and UNICEF representatives in Juba have indicated that a substantial number of existing water-supply installations are not functioning because of incomplete or irregular repair and maintenance (the proportion is 40 to 50 per cent of both hand-pump and motor installations on bore-water supplies).

46. A number of schemes are being undertaken by the National Water Administration in conjunction with other Governments and international organizations, all of which are attempting to expand and accelerate the development of water resources to counter the drought.

47. A need was expressed for water trucks to provide emergency supplies for small communities in dire need (these have been included in the transportation section) and pump sets to bring into operation 500 hand-pumped wells as part of the rehabilitation and expansion programme. The requirement for pumps is detailed below:

	<u>Unit cost</u> (\$ US)	<u>Total cost</u> (\$ US)
500 Indian MK II Hand pumps c.i.f. Mombasa, with two years' spare parts	300	150,000

(c) Follow-on assistance required

48. No follow-on assistance was requested as the Norwegian Church Aid and local government staff believed the above-mentioned immediate inputs would be sufficient at this time.

2. North Darfur Province

49. The persistent drought which has affected the entire province since 1974 has involved approximately 250,000 people in one way or another and shows no sign of abating. Most of these people have moved southward with their cattle to find pasture and water, causing a tremendous strain on the infrastructure of existing communities.

50. One of the most significant signs of this extra strain on the settled southern communities is a serious shortage of water, which is not so much a result of too few wells, but more one of running the pump sets for extended periods to provide for the increased demand. The longer running time then causes mechanical failures of ever-increasing frequency and a reduced output as a result of lowering the water-table throughout the province.

(a) Immediate assistance required

51. To alleviate the water-supply problem in this province, the National Water Administration, which is responsible for national rural water supply, has identified the need to bring back into operation 100 wells out of a total of 600 in the area. To fulfil this plan, the National Water Administration requires urgently the following items:

<u>Item</u>	<u>Unit cost</u> <u>(\$ US) a/</u>	<u>Total cost</u> <u>(\$ US)</u>
100 Edeco 100 m.head submersible pumps	3,000	300,000
100 Lister 10-12 HP generators	4,500	<u>450,000</u>
	Total	750,000

a/ Unit costs are c.i.f. Port Sudan and include two years' essential spare parts.

(b) Follow-on assistance required

52. No follow-on assistance was requested by the National Water Administration as it was considered sufficient to provide the above-mentioned pump sets on an emergency basis.

3. North Kordofan Province

53. The same drought that occurred in North Darfur Province has had even more devastating effects in the Province of North Kordofan. Since it first began in early 1975, approximately 500,000 people have migrated into and around Khartoum.

54. To alleviate stress on the capital, the Sudanese Government is currently preparing land and digging shallow wells in North Kordofan Province to provide irrigation to farming settlements as an attractive alternative to the city way of life. The Government is creating these settlements from its own resources but cannot meet the costs of the pumping units required to draw water from shallow wells and make it available for both human consumption and irrigated farming. The National Water Administration is convinced that, if pumps could be made available, many residents who have migrated south would return to North Kordofan Province to take up an economically useful life in agriculture.

(a) Immediate assistance required

55. To assist the Government in this essential resettlement endeavour, the 50 solar pumps of 500 watt each, at a total cost of \$US 575,000 c.i.f. Port Sudan, are required to supply 50 small settlements with sufficient water for both human consumption and agriculture.

(b) Follow-on assistance required

56. Again, the National Water Administration indicated that no follow-on assistance was required so long as the above-mentioned pumping sets were supplied as a matter of urgency.

4. South Kordofan Province

57. Approximately 1.1 million people live in South Kordofan Province, 80 per cent of whom are located in vast isolated rural areas. Fifteen per cent of the population is nomadic. The inadequate and potable water supply has had a severe effect on the population over the past nine months. Schools have been closed, health centres abandoned, and entire village populations forced to move long distances to marginally adequate alternate water points.

58. The province is dependent on four main types of water-supply systems:

(a) Hafirs: Manmade reservoirs in which surface water is normally collected during the short rainy season and distributed throughout the year. In South Kordofan there are 244 hafirs the first having been built in 1948.

(b) Water yards: Deep-bore wells with diesel-engine pumps and large, overhead storage tanks supplying a central distribution yard. There are only 112 operating water yards throughout the province.

(c) Hand pumps: Small-diameter bore wells mounted with hand pumps and provided with cement aprons. There are now 55 operating hand pumps in the province.

(d) Exposed, seasonal surface water sources: Rivers and open shallow wells.

The rural population normally relies on the sources given in (a) and (b) for the bulk of their water supply; but both these sources are extremely unreliable and become totally inoperative during extended drought, and contribute to a lowering of the water-table. Further, neither source, even when functioning, has any provision for purifying the silt-laden, polluted surface water before human consumption.

(a) Water quantity

59. There are three approaches to increase rapidly the over-all quantity of water and help ensure its future availability:

(a) Rectify hafirs: Since hafirs rapidly accumulate silt from stored surface water their holding capacities are gradually reduced during each season. Consequently, most old hafirs are now incapable of storing a single year's water supply. The Government has no programme for desilting hafirs and only a limited one for their construction. Also, many old hafirs need major repairs to their embankments, or inlet-outlet and distribution systems. The re-excavation and rectification of 120 of the most seriously affected hafirs would increase the amount of water for both human and livestock consumption by approximately 1.2 million cubic metres.

(b) Borehole drilling/hand-pump installation: Small-diameter borehole drilling has only recently been introduced into the rural areas of South Kordofan. An average of one borehole with hand pump can be installed every two days, each one providing populations of 400 to 800 villagers with a reliable and potable water source. Following the first hand-pump installation in 1979, over 1,500 requests for similar installations have been received from rural councils by the provincial government. Only one air-hammer drilling rig is operating in the province; its maximum output is approximately 150 boreholes per year.

(c) Creation of new water yards: Thirty large-diameter boreholes have been drilled but have not been provided with diesel pumps, engines and support facilities. The provision of 30 such units would create 30 new water yards, each capable of supporting a population of 3,000 to 6,000.

(b) Existing organization

60. A government project, under the direction of the National Water Administration and assisted by the United Nations Children's Fund, is at present attempting to alleviate the critical water-supply problems of South Kordofan Province. The project is based in Kadugli, the provincial capital, and has an operational staff of over 200, including managers, engineers and skilled and semi-skilled field crews. A strong management, logistics and procurement network functions with UNICEF assistance.

61. The feasibility of the above-mentioned approaches for a rapid increase in rural water supply has been demonstrated either through National Water Administration/UNICEF field tests or engineering design studies. All of the approaches, however, suffer major constraints on implementation because of a lack of funds.

62. The following summarizes inputs needed for immediate (6-month) and long-term (12-month) implementation. Specific equipment, transport, manufacture and models are considered highly desirable for standardization with ongoing project operations, and it is recommended that all procurements be co-ordinated through National Water Administration/UNICEF in Khartoum:

Immediate assistance required

<u>Description</u>	<u>Quantity</u>	<u>Approximate value a/ (United States \$)</u>
Atlas Copco air-hammer drilling rigs, compressors and accessories	3	360 000
Drill rig mounting and support trucks	9	480 000
Hafir de-silting (slack line) equipment	1	495 000
Low-level tractor/trailer	1	150 000
Bucket loaders	2	90 000
Diesel pumps and engines	30	120 000
Overhead tanks	30	360 000
Casing tubes	15 000 metres	165 000
Hand pumps, complete	500	150 000
Cement and construction equipment	--	150 000
Fuel and lubricants	--	100 000
Single Side Band radio communication equipment	8	40 000
Staff salaries	--	200 000
Office/administration equipment	--	20 000
Camping and field equipment	--	40 000
	Total	<u>2 920 000</u>

a/ C.i.f. Port Sudan.

Follow-on assistance required

<u>Description</u>	<u>Quantity</u>	<u>Approximate value a/ (United States \$)</u>
Hand pumps	500	150,000
Casing tubes	15,000	165,000
Spare parts (all transport)	-	450,000
Cement and construction equipment	-	150,000
Fuel and lubricants	-	100,000
Tires and tubes	-	50,000
Staff salaries	-	200,000
Mobile workshop	1	150,000
Cable tool drilling rigs with accessories (Bucyrus Erie 22W)	2	70,000
Mounting/support trucks	4	140,000
	Total	<u>1,625,000</u>

a/ C.i.f. Port Sudan.

(c) Water and irrigation

63. In a discussion, the Minister of Irrigation revealed that frequent flooding along the Nile river basins had caused much damage to the irrigation system, including canals, drainage systems, pumping stations, head works, control structures and villages adjacent to the rivers. He indicated the requirements necessary to strengthen the infrastructure, in particular drainage works and protection canals in lowlands and resettlement areas as well as an improvement of flood protection works adjacent to major irrigation schemes.

64. The Minister understood that these requirements are in the area of medium-term and long-term development; however, he wished to state them, with the hope that they would be considered by appropriate international agencies, other Governments or be the subject of a possible follow-on mission to consider medium-term and long-term development needs.

(d) National water programme

65. The National Water Administration has indicated that its current well-drilling programme throughout the Sudan is hampered by a shortage of spare parts for drilling rigs and support transport. A list of spare parts the National Water

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Administration deems essential is given in appendix V. It should be noted that some of these parts were ordered in 1977, 1978 and 1979, but because of a lack of foreign reserves the Central Bank has refused to endorse these purchases. The mission has addressed emergency requests for support of the water programme connected with the drought and other recent natural disasters in other sections of the present report and suggests that they be examined within the medium-term development needs of the country.

(e) Programme for co-operation

66. The Director-General of the Co-operative Sector in the Ministry of Co-operation, Commerce and Supply presented a request to replace engines and water pumps owned by several agricultural co-operatives, which were destroyed in the floods of 1979 and 1980. The request is shown in appendix VI. It was agreed that this request was for medium-term assistance and should be addressed by appropriate United Nations bodies or a follow-on mission that might be formed to examine the medium-term and long-term development needs of the Sudan.

D. Transport

67. The Government stated that transport was required to:

- (a) Assist with food and water distribution in the Eastern Equatoria, Jonglei and Upper Nile Provinces through the WFP organization in Juba;
- (b) Assist the well-drilling programme in South Kordofan Province through the UNICEF project based in Kadugli; and,
- (c) Renew the firebreak programme.

1. Southern region

68. Reasonable standard roads exist between Juba and Nimule, between Juba and Bor and on to Pibor Post, and between Juba and Torit and on to Kapoeta. Road transport is required for local distribution of food-stuffs and water to drought areas.

(a) Immediate assistance required

69. To strengthen the capacity of local authorities and international relief agencies to handle the situation in the southern region, 10 Austin 7-ton-capacity trucks are required for food distribution to drought areas.

Description	Unit cost <u>a/</u> (United States \$)	Total cost (United States \$)
10 Austin trucks (7-ton-capacity) including two years' essential spare parts	35,000	350,000

In addition, 10 Austin water tank trucks are urgently required to supply water to these same drought areas.

Description	Unit cost <u>a/</u> (United States \$)	Total cost (United States \$)
10 Austin water trucks (5,000-litre capacity) including two years' spare parts	35,000	350,000
	Total	700,000

a/ C.i.f. Mombasa.

(b) Follow-on assistance required

70. No follow-on needs in this sector were identified for the southern region.

2. South Kordofan Province

71. To provide the essential mobility for implementation of the well-drilling and hafir-rehabilitation programmes in this province, the National Water Administration and UNICEF have identified the following transport needs:

Immediate assistance required

Description	Unit cost <u>a/</u> (United States \$)	Total cost (United States \$)
12 Austin supply trucks (7-ton-capacity) including two years' spare parts	35,000	420,000
10 Land Rover (diesel) pickup trucks including two years' spare parts	15,000	150,000
	Total	570,000

a/ C.i.f. Port Sudan.

Follow-on assistance required

72. No follow-on needs in this sector were identified for the South Kordofan Province.

Firebreak programme

73. To provide essential mobility for the construction of fire lines to protect scarce and valuable grazing land, the Ministry of Agriculture, Food and Natural Resources has identified the following needs:

Immediate assistance required

<u>Transport machinery</u>	<u>Unit cost a/ (United States \$)</u>	<u>Total cost (United States \$)</u>
12 7-ton trucks	35,000	420,000
12 Commer 7-ton	35,000	420,000
8 Toyota pickups	13,000	104,000
4 Toyota station wagons	15,000	60,000
10 Land Rovers	15,000	150,000
20 Tractors	14,000	280,000
20 5-ton trailers	6,000	120,000
12 Mowers	2,000	24,000
	Total	<u>1,578,000</u>

a/ C.i.f. Mombasa plus two years' essential spare parts.

E. Health

General

74. As detailed statements about government resources and their deployment were not available or could not be collected, it was all the more difficult to assess what additional efforts had been put into operation.

75. Thus it is evident that, even at the best of times, government resources are inadequate to render services covering the whole population of a vast and, for the most part, sparsely populated country. Over the years, the position has deteriorated; as populations have increased, capital equipment has deteriorated, maintenance difficulties have increased and transport costs in particular have soared.

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76. Thus services such as those dealing with health and water supplies are at best tenuous, and often insufficient. Decentralization of some services, laudable though this is in many ways, has led to increased maintenance and replacement problems, and sometimes, as in the case of land-conservation services, to virtual loss of all transport for specific purposes.

77. It is not surprising then that the extra burden imposed by drought, fires, malnutrition and disease (human, animal and crop infestations) has proved too much. It is perhaps not surprising even that certain services such as the rudimentary Primary Health Care system have not functioned as early warning devices, as screeners of the degree of affliction and as effective remedial agencies.

78. The emergency situation has highlighted the need for rehabilitation, as soon as possible, of a number of services, utilities and installations, as well as a crying need for accelerated development. Some of the most urgent and critical needs have been well recognized by the authorities and confirmed by the mission. They provide the basis for descriptions and recommendations with respect to gaps and deficiencies which could be remedied by prompt international action.

Request for international assistance

79. For a variety of reasons (the main one of which is probably the poor coverage of rural populations - especially in terms of preventive and promotive services) the central health authorities have not hitherto been much involved in the control and alleviation of the results of droughts, fires and other natural disasters, though they concurred that the main, likely sequel of drought would be malnutrition and its complications. However, they had not been aware of any excessive morbidity along the lines of more and more severe malnutrition, epidemics of diseases such as gastro-enteritis, measles or respiratory infections with higher-than-usual fatality rates. Paradoxically, their main concern in the line of emergency relief was with the effects of a heavy downpour of rain in Khartoum in July 1980, when many cesspits and septic tanks overflowed. On the other hand, the authorities in the southern region were aware of excessive morbidity and mortality along the lines indicated above. This condition was widespread in 1979, but was now more localized in areas of persistent drought. These authorities were concerned that malnutrition or threatened malnutrition be averted, primarily by large-scale distribution of family rations to affected population groups. It was agreed that such distribution would not take place through health channels, but the authorities believed that it would be useful if health units could carry stocks of high-protein foods such as powdered milk for use as supplementary rations to needy children.

80. The health authorities in the south are desperately short of drugs. It was stated that centrally supplied drugs are equivalent to five piasters per person per year, a very small sum indeed, and the mission believed that a supplement is amply justified, at least for excessive morbidity in drought victims. It should be noted that UNICEF is supplying Primary Health Care units with essential drugs from a carefully selected list: the average needs of about 4,000 people for one year amounting to the equivalent of \$750 to \$1,000. The mission concluded that supplementary stocks from a more limited list of items valued at \$50,000 (for the 80,000 people in the southern region) should cover the emergency needs and contingencies.

81. The needs for 1,000 people for one year have been estimated in terms of cost and relative quantities (but not all unit costs were available). Using a figure of \$500 as the total cost for 1,000 people for one year, the quantities of items within a ceiling of \$50,000, at 1980 UNIPAC prices, are as follows:

Chloroquine	25 kg
Phthalylsulphathalazole	100 kg
Bensyl bensoate	100 lt
Sulphadimidine	200 kg
Bephenium	50 kg
Piperazine	10 kg
Metrifonate	N.A.
Oxaminiquine	16 kg
Ferrous sulphate	60 kg
Tetanus toxoid	20,000 doses
Antitetanic serum	1.5 MU
Chloramphenicol	2 kg
Procaine penicillin (G)	40,000 MU
Oral penicillin (V)	50 kg
Oral rehydration solutes	100,000 sachets
Tetracyclines	25 kg

The supply of the above quantities, which provide a 20 per cent safety margin, is recommended.

82. It was clear from extensive discussions in Khartoum that there was a need for a sustained expansion and strengthening of health services, with an emphasis on primary health care, mass disease control (e.g., malaria) and especially on improved environmental sanitation, particularly in over-crowded urban and suburban areas. It was agreed, however, that these measures hardly qualified as short-term, emergency action but should certainly be considered as part of a major development programme stimulated by recent events. Even though an earlier request for a fleet of garbage-removal trucks was withdrawn by the Government, the Ministry of Health still hoped that a request for insecticides (mainly DDT) for residual anti-anopheline spraying could be met. After the mission's departure, an expanded request dealing mainly with support for control of vector-borne diseases was received. The nexus between this request and emergency relief (for either drought or flood) is by no means clear; however, in the opinion of mission members, the use of such insecticides was contingent on development of infrastructure which was not likely to be achieved outside areas of economic importance such as the Gezira and Blue Nile provinces within the next six to 12 months, and the needs of the latter areas are already being catered for. As in

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other situations, the mission viewed this request sympathetically, though outside its own mandate, and would recommend that it be considered in the context of support for a general development of neglected or underprivileged areas.

F. Agriculture and natural resources

83. The Ministry responsible for agriculture, livestock and forestry products as well as wildlife put forward a well-reasoned and carefully thought-out programme of immediate measures designed to prevent damage to agricultural and grazing land and minimize the effects of drought, fires and pests, which, as seen earlier, often reinforce each other's impact. In its submission the Ministry mentioned also other measures, which are to be started now but which require a more gradual build-up and cannot be expected to reap immediate benefits.

84. The measures considered are:

(a) Elimination, or at least major reduction, of fire hazards and containment of fire damage;

(b) Control, by prevention and prophylaxis, of diseases to livestock;

(c) Preventive action against locusts which destroy crops, pastures and the trees yielding gum arabic;

(d) Sand-dune fixation and control.

85. The Government considered the first three of immediate importance and application, but the mission preferred to treat only the first two in this category, and the latter two as part of a development programme as distinct from emergency relief operations. The mission also considered that fire prevention measures were more urgent and important than disease control, though both are commended for external assistance. Details of the action envisaged by the Government are given in appendix VII, but the highlights are as follows:

1. Grazing conservation and abatement of fire risk

86. The strategy of cutting up large tracts of grazing and other economically valuable land with a network of firebreaks joining up water points is not new. However, it is now intended that the network be greatly expanded. Moreover, it is imperative not only to establish the network, but also to maintain it as an annual operation.

87. At present, because of poor recent maintenance due to a loss of transport and support mechanisms at provincial level, a virtually fresh start has to be made in areas both previously protected and new ones, or in areas where smaller blocks are envisaged.

88. The strategy consists of the annual renewal of firebreaks (fire lines), criss-crossing vulnerable areas into separate blocks by furrows 85 metres wide (two hoed border strips 2.5 metres wide enclosing an 80-metre patch cleared by controlled burning or chemical control of vegetation). The Government intends to extend the current firebreak network from 7,500 to 15,000 linear miles as a national project, since serious deterioration of fire control occurred while it was a provincial activity.

89. This programme applies entirely to selected northern areas. Hence the government request, as revised, recosted and endorsed by the mission, concentrates on a new fleet of transport vehicles, limited quantities of herbicides for trials, and the extension of a WFP food-for-work programme covering 1,000 people for seasonal work (three months each year).

90. The total cost estimate is of about \$1,688 million, and a marked reduction in fire risk, plus containment of fire damage within blocks thus protected, is anticipated.

United States \$

(a) Transport and equipment

(see para. 73 for detailed breakout of transport requirements)

(b) Chemicals and spraying equipment

Non-selective herbicides	10,000
Two-metre-wide sprayers, tractor mounted	35,000
Other spraying equipment	5,000
	<hr/>
	50,000

(c) Food

(sugar, flour, cooking oil and dry rations for 1,000 people for seasonal work of three months) 60,000

(d) Government obligations

Technical staff, labourers, and driver expenses
Operating and maintenance costs of vehicles
and equipment surveying

2. Livestock disease control

91. The strategy involves prevention and control in vulnerable areas, or areas in the north and south of the country which are already known to be affected by specific diseases of economic importance. Some of these diseases (rinderpest, bovine pleuropneumonia, trypanosomiasis) have been known in Sudan before but had been under control prior to massive livestock movement due to drought within and outside the country. Others are entirely new (e.g., lumpy skin disease) and their introduction is attributed to entry of infected stock from neighbouring countries. It is difficult to assess the number of animals to be protected, but 60 to 80 per cent of herds in affected or proclaimed areas are to be covered by immunization or by chemoprophylaxis. Authorities in the southern region estimated their needs as:

<u>Disease</u>	<u>Cattle to be protected</u>
Lumpy skin disease	2 million head
Trypanosomiasis	2.5 " "
Helminthic infestations	0.8 " "
Tick control	0.7 " "

Unfortunately, the unit costs of drugs and vaccines required are not known.

92. The government request was estimated at \$1 million and was to be distributed more or less evenly among drugs, vaccines and transport. This sum may not cover the southern needs quantitatively, though qualitatively there was good accord between the two lists. The mission considered that separate transport needs for this programme are far less than stated, especially if transport needed seasonally for grazing and fire protection is used also for disease control. However the mission tentatively endorses and supports a total allocation of \$1 million for drugs, vaccines and limited transport in the first six months, increasing by \$0.5 million, if necessary, in the second six months. This amount would take care of both southern and northern needs.

93. An indication of the types of drugs and vaccines as well as ancillary equipment needed for the first and second six-month periods is given in appendix VIII. Of the ancillary equipment requested, the following is recommended:

Cold chain equipment:

2 deep freezers to control vaccine storage (one for the north, and one for the south)

3 static refrigerators) one for each of the three southern areas
3 portable refrigerators	

Camping equipment:

10 tents

40 beds

20 tables

20 chairs

(total cost for above items would probably not exceed \$100,000)

3. Locust control and sand-dune control

94. It is recognized that, while locusts have not actually invaded the Sudan in the last year or two, there is constant risk of such a plague; and preventive control, including a stock of insecticides, is desirable. The problem is that since malathion deteriorates in storage, prolonged stocking is not possible.

95. As stated above, neither the locust control nor sand-dune control programme is endorsed for immediate external assistance.

4. Wildlife protection

96. Wildlife also is threatened by drought, fire and disease and is likely to be overlooked in favour of economically productive elements such as crops and livestock. At present there is virtually no tourist revenue associated with wildlife preservation.

97. The Wildlife Department is struggling for recognition and more resources. Wild game reserves and parks are subject to drought, aggravated by inroads into such reserves by herded animals. Hence, more supervision and patrolling of parks and reserves is needed. The request is endorsed for international support and consists of:

- 1 utility-type vehicle (usable as a patrol car) fitted out as a mobile veterinary clinic and laboratory as well as with capturing equipment (tranquilizer guns, pistols and ancillary equipment) for use in animal census work and ecological studies.

Total cost: probably well below \$50,000.

APPENDIX I

Mission participants

Mr. Faruk N. Berkol	Under-Secretary-General United Nations Disaster Relief Co-ordinator Head of Mission
Mr. Earl E. Anderson	Consultant, Office of the United Nations Disaster Relief Organization
Mr. Garth ap Rees	Resident Representative, UNDP, Sudan
Mr. Steven Allen	UNICEF, Sudan
Mr. Gaston Eyben	WFP/FAO, Sudan
Mr. Raouf Galal el Din	UNDP, Sudan
Mr. Michael Knowles	ILO, Somalia
Mr. Uffe Koenig	UNICEF, Sudan
Dr. René Manning	WHO Regional Bureau for Eastern Mediterranean, Alexandria
Mr. Emmanuel Owusu	Deputy Representative, UNHCR, Sudan
Mr. Ghazi Sabbah	ILO, Sudan

APPENDIX II

Exports and imports in 1979-1980
(in millions of United States dollars)

<u>Exports</u>	<u>Actual 1979-1980</u>
Cotton	331
Sorghum (durra)	67
Gum arabic	47
Sesame	45
Livestock and meat	22
Ground-nuts	21
Hides/skins	13
Other	51
Total	<u>597</u>
<u>Imports</u>	
Capital goods	360
Petroleum	280
Manufactured goods	230
Sugar	125
Chemical and pharmaceutical products	120
Wheat	88
Textiles	66
Other food-stuffs	60
Others	11
Total	<u>1 340</u>

Source: Bank of Sudan.

APPENDIX III

Summary of balance of payments for 1979-1980 and 1980-1981
 (in millions of United States dollars)

	<u>Actual</u> <u>1978-79</u>	<u>Actual</u> <u>1979-80</u>	<u>Project</u> <u>1980-81</u>
<u>Exports</u>	<u>527</u>	<u>597</u>	<u>500</u>
Cotton	321	331	180
Others	206	266	320
<u>Imports</u>	<u>-1 138</u>	<u>-1 340</u>	<u>-1 500</u>
Petroleum	-178	-280	-390
Others	-960	-1 060	-1 110
Trade balance	-611	-743	-1 000
<u>Services</u>	<u>-104</u>	<u>-80</u>	<u>-201</u>
Receipts	181	248	250
Payments	-207	-260	-275
Interest	-78	-68	-176
<u>Transfers</u>	<u>257</u>	<u>319</u>	<u>447</u>
<u>Current account</u>	<u>-458</u>	<u>-504</u>	<u>-754</u>
<u>Capital</u>	<u>348</u>	<u>420</u>	<u>446</u>
Receipts	405	509	586
Payments	-57	-89	-140 <u>b/</u>
<u>Allocation of Special Drawing Rights</u>	<u>-</u>	<u>13</u>	<u>13</u>
Errors and omissions	116 <u>a/</u>	121 <u>a/</u>	...
Monetary movements			
(- increase)	-6	-50	...
Unfinanced gap	(-)	(-)	(-295)

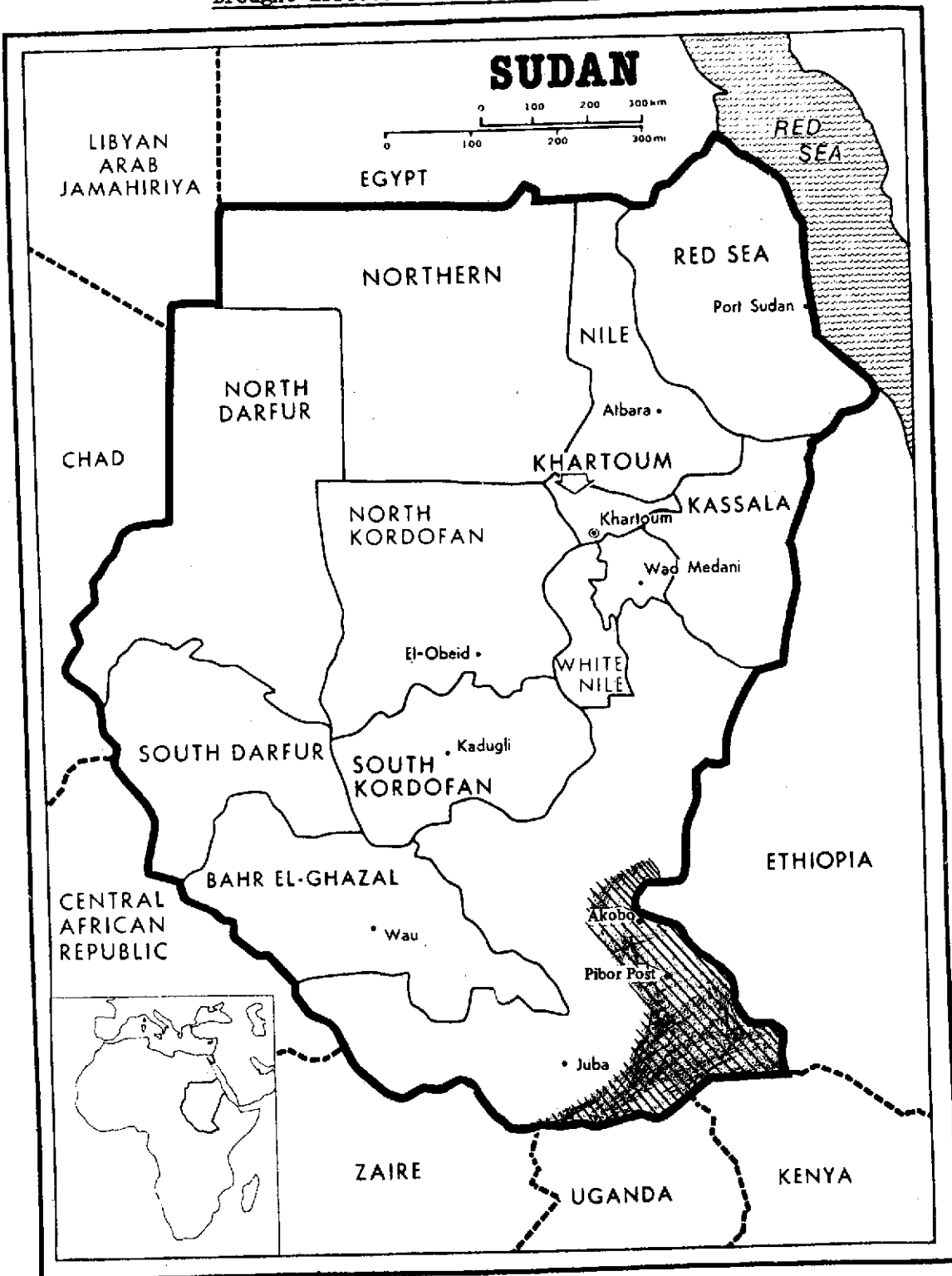
Source: Bank of Sudan.

a/ Including accumulation of arrears.

b/ Assumes successful debt rescheduling with commercial banks by December 1980.

APPENDIX IV

Drought-affected southern region



The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

APPENDIX V

Request of the National Water Administration for spare parts for
 trucks, machinery and pumping units

<u>Item</u>	<u>Description</u>	<u>Order number</u>
1	Bukh G-105	496/78/79
2	Scania	135/79/80
3 A	Wabce scraper	134/79/80
3 B	Allison transmission	145/79/80
4	G.M. engine	157/79/80
5 A	Grundfos BP 125	688/77/78
5 B	Grundfos 105	272/79/80
6	Lister 6/1	368/77/78
7 A	Commer V.C.	148/79/80
7 B	Commer F/100	149/79/80
8	P and H Crane T 220	120/79/80
9	Caterpillar D 7 E	152/79/80
10	Torpedo 7-11	9-A/77/78
11	Ballerini	11-A/78/79
12 A	Edeco MK III	58/79/80
12 B	Reciprocating pumps	95/79/80
13 A	I.H. E 200 scraper	156/79/80
13 B	I.H. TD 20 scraper	155/79/80
14	22 RW rigs	153/79/80
15	Deutz MAH 916	26/76/77
16	Rising Main 4"	24/76/77
17	Centrifugal clutches	289/76/77
18	Lister LRI	22-A/77/78
19	Cyl. boring machine AC 750/A	126/79/80
20	Water level recorder	10-A/78/79
21	Grinding machines	19-A/77/78
22	Allison transmission	297/78/79

Total value in \$US 4 250 000

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APPENDIX VI

Government request for assistance to agriculture co-operatives

Nature and extent of damage caused by floods in 1980

1. Northern Province

In the North Province, districts affected are Marui (33 Co-ops.), Dongola (34 Co-ops.) and Abri (9 Co-ops.). Main crops grown by these co-operatives are wheat, beans and vegetables. The area is dry and depends mainly on lift irrigation from the river Nile.

The natural disasters which affected these co-operatives during the last season, from July to September 1980, were mainly the floods in the river Nile which carried away the engines and the water-pumps and completely destroyed the buildings and installations. The Nile also changes its water course resulting in damage to all such installations in the changed course. This happened in the season from February to June 1980.

There are 292 sets of engines and water-pumps owned by the agricultural co-operatives in this province out of which 131 sets were completely damaged.

The engines used are Blackstone, Lister and Ruston and some other makes normally of 47 H.P. with 12" water-pumps. The lack of spare parts is also a serious problem and as such supply of spare parts may mean an additional cost of 10 per cent over and above the total amount of losses of £S. 288,614.

The estimated cultivated area, covered by the damaged sets of engines and water-pumps, is approximately 28,000 feddans. The membership of the co-operatives affected is 22,690 members or 113,450 family members.

2. Nile Province

In the Nile Province, the same conditions of natural disasters prevailed except the number of co-operatives which is only six with the membership of 1,013 or 5,065 family members.

There are 48 sets of engines and water-pumps of the same kind as used in Northern Province, of which 22 sets were damaged. The total amount of losses is £S. 20,500.

3. Kassala Province

In the Kassala Province, 9 agricultural and 7 multipurpose co-operatives out of 109 co-operatives were affected. The membership of the affected co-operatives is 6,165 farmers or 36,990 family members.

The Gash river flooded the area from June to September 1980 and damaged 16 sets of engines and water-pumps. The engines used were of the makes of Blackstone, Lister and Ruston of 24 H.P. each and the water-pumps of 4¹/₅" size. It may be mentioned that engines in all cases are diesel. The total amount of losses is £S. 59,161.

4. Khartoum Province

In Khartoum, there are 28 agricultural co-operatives, of which 12 co-operatives were affected. The total membership of affected co-operatives is 819 farmers or 4,914 family members. The activities of these co-operatives is mainly growing of vegetables along the White Nile, Blue Nile and Nile conjunction.

During the season, from July to September 1980, the Nile flooded the area and drowned the sets of engines and pumps and the installations. Thus, 16 sets with installations were damaged.

The damaged engines were of Blackstone and Lister (diesel) 60 H.P. with 24" pumps. The total losses amount to £S. 122,664.

5. White Nile Province

In this Province there are 17 agricultural co-operatives, of which four were affected. The total membership of affected co-operatives is 110 or 660 family members. The main activity of these co-operatives is growing of cotton, ground-nuts, durra, vegetables and fruit.

During the season, from July to September 1980, the White Nile flooded the area and drowned the sets of engines, pumps and their installations. The number of sets damaged was eight.

The damaged engines were of the makes of DOIS, Lister, Ruston of 24 H.P. with 4¹/₅" pumps. The total losses amount to £S. 176,126.

6. Red Sea Province

In the Red Sea Province (Khor Arbaat area) all the six agricultural co-operatives were affected with a total membership of 608 or approximately 3,040 family members. The main activity of these co-operatives is growing of cattle feed and vegetables.

During the rainy season from November 1979 to February 1980, the heavy rains flooded the area and damaged the pumping wells and their installations. Thus six sets of engines with pumps were damaged. The engines were diesel of Lister make, 25 H.P. with 8" pumps. The total losses amount to £S. 3,197.

Ali Khairi
Director General
Co-operative Sector
Ministry of Co-operation
Commerce and Supply
Khartoum

APPENDIX VII

Ministry of Agriculture, Food and Natural Resources estimates
of magnitude of emergency drought situation

Situation of drought since 1973 up to 79/80 is mainly attributed to shortage of rainfall which is considered the most important climatic factor influencing agriculture production in the affected area in the Sudan. Within this area, rainfall is characterized by marked seasonality, large variability and it is generally very unreliable. Also large water deficits characterize the entire area except perhaps for extreme southern region where a balance may be achieved between water supply in the form of rainfall and water loss in the form of potential evapotranspiration.

1. Total area affected by drought in the Sudan

Total area affected by drought lies mainly between latitude 12° and 18°N, and traverses the Sudan beginning at the Nile on the east and ending at the Chad border on the west. This area consists approximately of 650,000 km² which include North Kordofan, Khartoum, N. Darfur, Kassala, Red Sea, and the northern portions of southern Kordofan, and southern Darfur provinces. The second area affected is the southern region.

The affected area had witnessed severe drought since 1971, extending to 1979/80 where rainfall was mostly below the average. Drought, together with land misuses, such as over-grazing, seasonal fires, wood cutting and over-cultivation of marginal land, have accelerated soil deterioration. Sand dune movement, from the affected area, is now expanding over vast areas in the south, threatening agricultural land and grazing resources in the Sudan.

2. Estimated effects of drought

Some of the effects of the drought can be summarized in the following:

Decline in food crop and meat: Food crop production has declined and is declining on cultivated lands within the area affected by drought. This is illustrated in table 1:

Table 1 - Decline in groundnut and sesame production in Kordofan

<u>Year</u>	<u>Sesame average yield (ton/fedd)</u>	<u>Groundnut average yield (ton/fedd)</u>
1961	0.339	0.400
1964	0.102	0.297
1967	0.083	0.216
1970	0.097	0.232
1973	0.019	0.090

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Data in table 1 indicate that production of groundnuts declined during 1961-1973 from 0.4 ton/fedd., to 0.09 ton/fedd. Sesame average yield declined during the same period from 0.3 ton/fedd., to 0.019 ton/fedd.

Durra (sorghum) production declined from 424 kg/fedd. in 1961 to 191 kg/fedd. in 1973. Maize and dukhm (millet) yield have declined from 333 kg/fedd., and 542 kg/fedd., to 154 kg and 71 kg/fedd. respectively during the same period.

Since food crop production is so quickly decreasing, the affected area is on the verge of disaster and there are signs of progressive abandonment of agriculture in many areas.

Meat and milk are only a fraction of the area's potential. While recent off-take is higher for sheep (about 5 per cent), it is only about 6-8 per cent for cattle. Total seasonal off-take is not comparable to total livestock population (40 million head) and is hardly meeting local and national demands. Low production is mainly attributed to inadequate forage production caused by insufficient soil moisture.

Total number of livestock within the affected areas according to the 1978/79 census is shown in the following table 2:

	<u>Cattle</u>	<u>Sheep</u>	<u>Goat</u>	<u>Camel</u>	<u>Total</u>
Red Sea	41,076	236,638	482,217	102,082	862,013
Kassala	723,707	1,679,792	1,002,415	607,227	4,013,141
Kordofan	2,706,789	3,488,082	2,578,810	912,402	9,686,056
Darfur	4,100,372	2,791,554	2,504,206	393,649	9,789,781
Khartoum	64,021	313,828	465,949	14,690	858,488
Southern region	6,257,967	3,370,656	2,173,162	35,650	11,837,443
	<u>13,993,932</u>	<u>11,880,550</u>	<u>9,206,759</u>	<u>2,065,658</u>	<u>37,046,922</u>

Source: Animal Resources Economics Administration - 1980.

Estimated value of livestock within the affected area:

	<u>Population</u>	<u>Unit price £S.</u>	<u>Value £S.</u>
Cattle	13,893,932	100	1,389,393,200
Sheep	11,880,550	40	475,222,000
Goat	9,206,759	25	230,168,975
Camel	2,065,658	100	205,658,000
		<u>Total value</u>	<u>2,115,349,975</u>

The problem of shortage of grazing is aggravated by flow of a large number of livestock from neighbouring countries which are suffering from drought and infectious diseases of high mortality. The over-all loss of stock because of drought was estimated at 5 to 10 per cent of total population in the affected area.

Declining wood and gum production: Sudan is the world's major producer of gum arabic, which is extracted from acacia senegal. The production amounts to 8-9 per cent of the value of the country's total exports. Due to drought 10 years ago, the acacia tree started to die out over vast areas within the gum belt. This not only affected Sudan's foreign exchange balance, but also reduced the supply for world-wide use by almost 47 per cent.

Danger of sand dune movements: Since 1971, UNESCO/Sudanese mission reported a striking piece of evidence of the southward drift of sand on a large scale, the disappearance of the soil's natural vegetative cover due to drought has subjected the subsoil in the north to be removed by wind action southward. By now dune movement is expanding over a vast area threatening all Nile irrigation schemes - 2.5 million feddans of pump irrigation, 7 million feddans of mechanized crop farming, 75 per cent of the world's gum arabic production, pasturage for nearly about 15 million animal unit of livestock and vast areas of woodlands.

These short-term effects of drought are equally as serious as the long-term ones. The latter will ultimately lead to the complete disappearance of life in the affected areas. The former implies the hard task of maintaining the delicate balance between the effect of changes caused by drought and the requirements of local communities to be able to continue living in the area affected.

Total population affected by drought: total number of inhabitants affected by drought are the following:

	<u>Urban</u>	<u>Rural</u>	<u>Nomadic</u>	<u>Total</u>
Red Sea	169,083	129,722	166,238	465,043
Kassala	235,319	639,050	294,018	1,123,387
Kordofan	262,005	1,534,067	406,274	2,202,346
Darfur	210,420	1,566,174	404,567	2,181,161
Total	876,827	3,869,013	1,226,097	5,971,937

The Government is now faced with the dual problem of arranging adequate food supplies at reasonable prices for the local population living in the area affected and the immigrants from neighbouring countries who have virtually no means.

3. Analysis of work and financial requirements

Fire-line building for grazing conservation: Uncontrolled fires remove 35 per cent of the natural grazing resources, what is left is below the carrying capacity. Low productivity of the range lands is mainly attributed to failure of rainfall together with loss due to destruction by fire. Fire lining is an essential practice to protect available grazing resources from fire.

The total length of the existing fire-lines in the 12 northern provinces equals 7,478 linear miles.

Proposed extension of fire-lines = 15,000 linear miles.

The requirements for the coming six months following the end of the rainy season to augment and strengthen the work in range resources conservation against uncontrolled fires are:

<u>Item</u>	<u>Transport and machinery</u>	<u>Cost in</u> <u>United States dollars</u>	
12	5-ton trucks	480,000	
12	Commer 5-tons	432,000	
8	Toyota pick-up	304,000	
4	Toyota station wagons	200,000	
10	Land Rover	360,000	
20	Tractors	720,000	
20	5-ton trailers	300,000	
12	Movers	154,000	
	Total	2,950,000	2,950,000
	<u>Chemicals and spraying equipment</u>		
	Non-selective herbicides	10,000	
	2-metre wide sprayers tractor mount	35,000	
	Other spraying equipment	5,000	
	Total	50,000	50,000
	<u>Food supply (WFP)</u>		
	Sugar, flour, cooking oil, dry rations	60,000	60,000
	Grand total cost		3,060,000

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Sudan government obligations: the Government will afford the following:

- Technical staff, labour and drivers' expenses;
- Running costs and maintenance of vehicles and machinery;
- Provision of housing;
- Surveying and execution of fire-lining constructions.

Livestock disease control: The drought that struck parts of the Sudan and neighbouring countries has upset the movements of nomads along their traditional routes. Areas which have formed seasonal grazing land for the livestock of nomadic tribes in the previous years could not support these herds because of the scarcity or complete failure of a new pasture crop. This induced a shift in the normal migratory routes to other areas in search of native forage and water, which could mean concentration of large numbers of animals in a relatively small area. This situation was intensified by nomadic tribes from neighbouring countries affected by drought that moved into the Sudan with their animals, and shared the already over-populated range. This caused additional disturbances to migratory routes and seasonal grazing areas. The collective outcome of these factors was the spread of diseases to new areas by local herds and introduction of new diseases by livestock coming from neighbouring countries. The veterinary service and animal health care facilities available in these areas are not sufficient to handle this burden. Consequently, more vaccines, drugs and reliable vehicles are required to treat all animals in the affected areas and prevent the outbreak of devastating diseases and their spread into adjacent regions. In order to strengthen and increase the efficiency of veterinary services in affected areas, financial support of the order of \$950,000 is required as indicated below:

Drugs, vaccines, hygienic equipment	\$500,000
Vehicles	\$450,000
Total	<u>\$950,000</u>

Locust control: The Sudan is affected by the threat of different species of locusts mainly the desert locust, tree locust, African migratory locust and various grasshoppers.

The first one is the most dangerous of all species as it can cover an area of over 1 million square kilometres. Again the Sudan is faced with the danger of two invasions, a summer invasion that affects the eastern, central and western parts of the country during the period from May to October yearly and the winter invasion which is continued to the Red Sea coastal area. Different crops can be damaged by the desert locust.

The tree locust threatens to a great extent the production of gum arabic trees.

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The African migratory locust threatens the main sugar cane plantations and hence the sugar industry.

Grasshoppers can inflict great damage to cereal crops, mainly durra which is the staple food for the majority of the population.

The desert locust, the tree locust and the African migratory locust habitually migrate from area to area, and that can be from neighbouring countries and, in the case of the desert locust, from areas far from the Sudan. Such migratory behaviour no doubt complicates the control operations. It happened in many cases that excellent control operations were carried out in the Sudan where the infested areas were nearly clear, then suddenly invading swarms reinfested the areas again.

There is also the problem of areas infested by desert locusts that can be the source of invasion to the Sudan but for one reason or another are inaccessible to the survey and control teams. A good example is the Eritrean coast in Northern Ethiopia. Because of the politically unsettled situation, no control teams can conduct any control operations against the desert locust. Another area is the Ogaden area of Ethiopia where also because of the political disputes over that area no control operations can be fulfilled. Hence, there is always the danger of the desert locust from that area invading the Sudan. On the other hand, the fighting in Chad created the problem of tree locust and African migratory locust swarms from that area to invade western parts of the Sudan.

Requirements for survey and control operations

Vehicles:	20 load carriers 20 Land Rover/Toyota pick-up
Pesticides:	500 tons BHC dust 15,000 gallons 96 per cent malathion 15,000 gallons 57 per cent malathion
R/T sets:	10 R/T sets (\$500 each)
Spare parts:	Enough spare parts for the load carrier, pick-ups and R/T sets.
Spraying equipment:	500 knap sack sprayers (motorized) 1,000 knap sack sprayers (by hand) 20 exhaust nozzle sprayers Also enough spare parts for the above.
Food:	For the people working in the control operations.

APPENDIX VIII

Veterinary population and veterinary needs in southern Sudan

Livestock population in the southern region

1. Eastern Equatoria Province	897,787 cap H/C
2. Western Equatoria Province	429 "
3. Jonglei Province	1,604,456 "
4. Upper Nile Province	1,828,092 "
5. Lakes Province	900,719 "
6. Bahr El Ghaza Province	<u>1,427,707</u> "
Total	<u>6,669,276</u>

Loss of livestock due to drought

1. Eastern Equatoria Province	4 per cent
2. Jonglei	3 per cent

Requirements for veterinary services

1. <u>Vaccines</u>	
Lumpy skin disease vaccine	2,000,000 doses
2. <u>Drugs</u> trypanocidal drugs	
(a) Ethidium Bromide	1,000,000 grams
(b) Bernil	500,000 "
3. <u>Anthelminthics</u>	
(a) Ranide	10,000 gallons
(b) Hexachloroethane (7 lb tin)	5,000 tins
(c) Phenofort (7 lb tin)	4,000 tins
4. <u>Antibiotics</u>	
(a) Broad spectrum solulin (terramycine-geomyline-tetracycline) 100 ml/bottle	500,000 bottles
(b) Broad spectrum powder (terracycline-geomyline-tetracycline) 7 lb/tin 1 course = 7 lbs	250,000 tins
5. <u>Acaricides</u>	
(a) Gamatox powder (envelope)	400,000 envelopes
(b) Gemalox solution (gallon)	100,000 gallons
(c) Barcotox solution (gallon)	200,000 gallons

Source: Regional Ministry of Agriculture, Southern Region.

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Unit

Cold chain equipment

Spraying hand pump	40
Deep freezer (kerosene)	6
Refrigerator (portable, kerosene)	20
Deep freezer (kerosene)	6
Refrigerator (electric)	6
Refrigerator (kerosene)	6

Camping equipment

Staff tent	30
Officer tent	15
Beds	200
Portable table	30
Portable chair	30
