AN INTEGRATED APPROACH TO THE PROBLEM OF DROUGHT AND DESERTIFICATION IN KORDOFAN REGION

BY:

M. O. EL SAMMANI

H. O. ABD EL NOUR[2]

1. Dr. Mohommed Osman El Sammani is a lecturer at the Geography Dept., Faculty of Arts, University of Khartoum.

2. Dr. Hassan Osman Abd El Nour, is an associate professor of forestry at the Forestry Technicians Division, Khartoum Polytechnic, P. O. Box 6146 (TAKAMUL), Khartoum.

1. DEFINITIONS

The development of desert-like conditions, where none had existed before has generated two different terms to define : desertization and desertification. The distinction between these terms is primarily based on the location of the extension of desert-like conditions. Glantz (1977).

Le Houerou (1977), has defined desertization as the extension of typical desert landscapes and landforms to areas where they did not occur in the recent past. This process takes place in arid zones bordering the deserts under average annual rainfall of 100 to 200 mm, with outside limits of 50 to 300 mm. He used the term desertification to describe the degradation of various types of forms of vegetation including the sub-humid and humid forest areas which have nothing to do with deserts either physically or biologically.

Rapp (1974), extended Le Houerou's definition to include higher rainfall areas. He defined desertization as "The spread of desert-like conditions in arid or semi-arid areas up to 600 mm, due to man's influence or to climatic change".

The United Nations Environment Programme (UNEP), chose to interpret desertification as having the broader meaning often attributed to desertization as defined by Rapp. (UNEP, 1975).

The expansion of deserts along their edges is attributed by many to human action, particularly, to permanent and increasing pressure of

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man and his animals on fragile and unstable ecosystems and to misuse of natural resources through careless management or lack of management, resulting in overgrazing, overcultivation and/or overexploitation of forests. (op.cit.).

At this point we would like to distinguish between desertification and drought. The latter is a conjunctural climatic event resulting from either a deficit of the annual rainfall or bad distribution thereof, so that vegetation, natural or cultivated, does not reach its maturity. (Anon 1983). The immediate consequencies of drought include food deficit, livestock losses, nutritional deficiencies and human displacement and/or mortality.

The current lift of food, medical and other supplies staged by international relief organizations to such countries as Ethiopia, Sudan, Chad and Mali, is to relieve drought effects rather than deal with the problems of desertification. This paper aims at dealing with the problems of desertification in Kordofan Region. The region lies between Lat. 16° 30' and 9° 30 North, and is bounded on the east by Long. 32 E, and on the West by Long. 27 E.

2. RESOURCE MISUSE

Land use patterns in the Kordofan region were classified by Lebon (1965). They very much coincide with the ecological classification of the region Fig. 1. Up to 1930, there seems to have been little evidence of over-use of land, except in the immediate neighbourhood of small towns and villages where trees were denuded for firewood and all plants except the Calotropis procera were consumed by goats in

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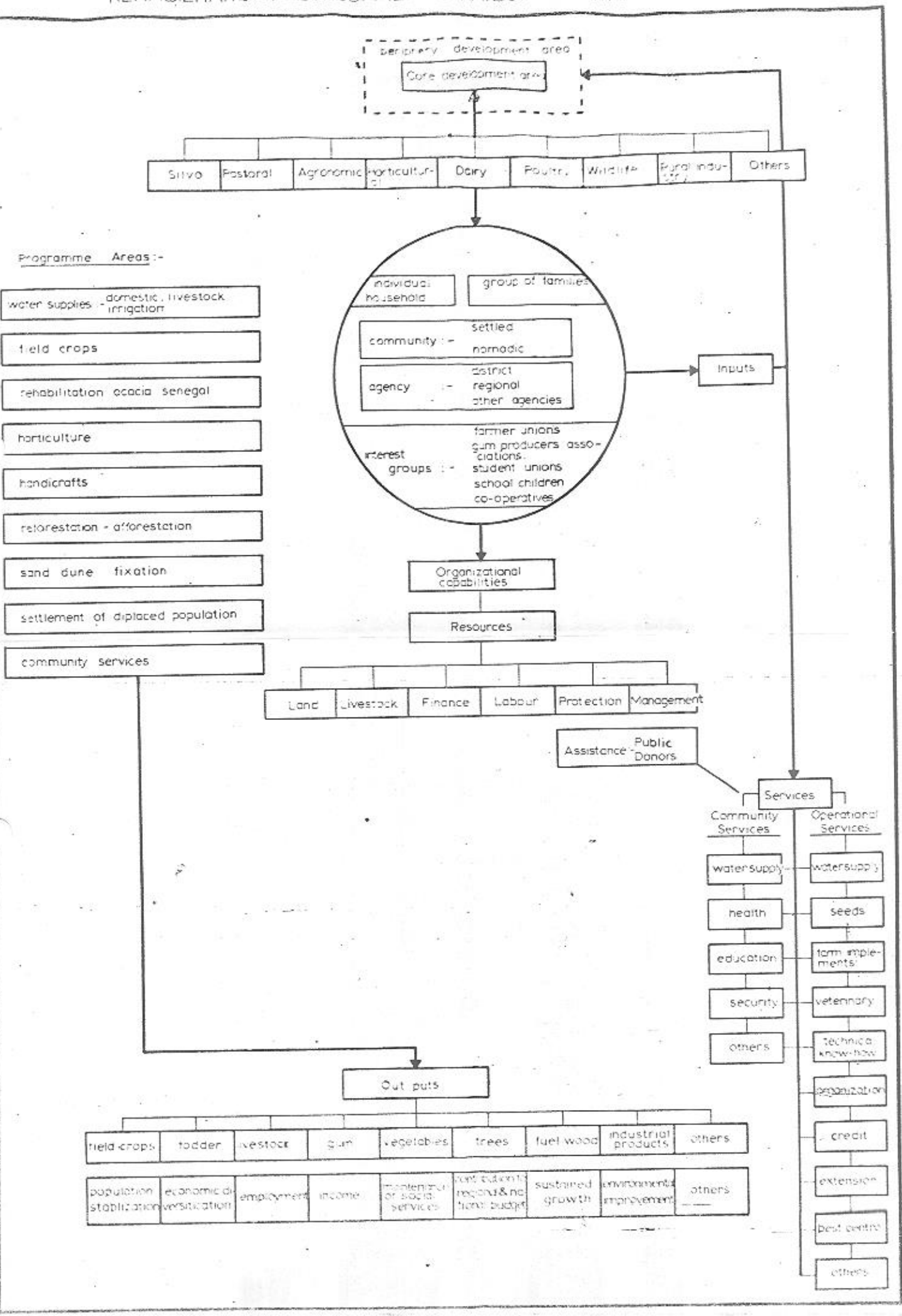
FIG . DIAGRAMATIC PRESENTATION OF PROPOSED INTEGRATED REHABILITATION / DEVELOPMENT STRATEGY - KORDOFAN REGION



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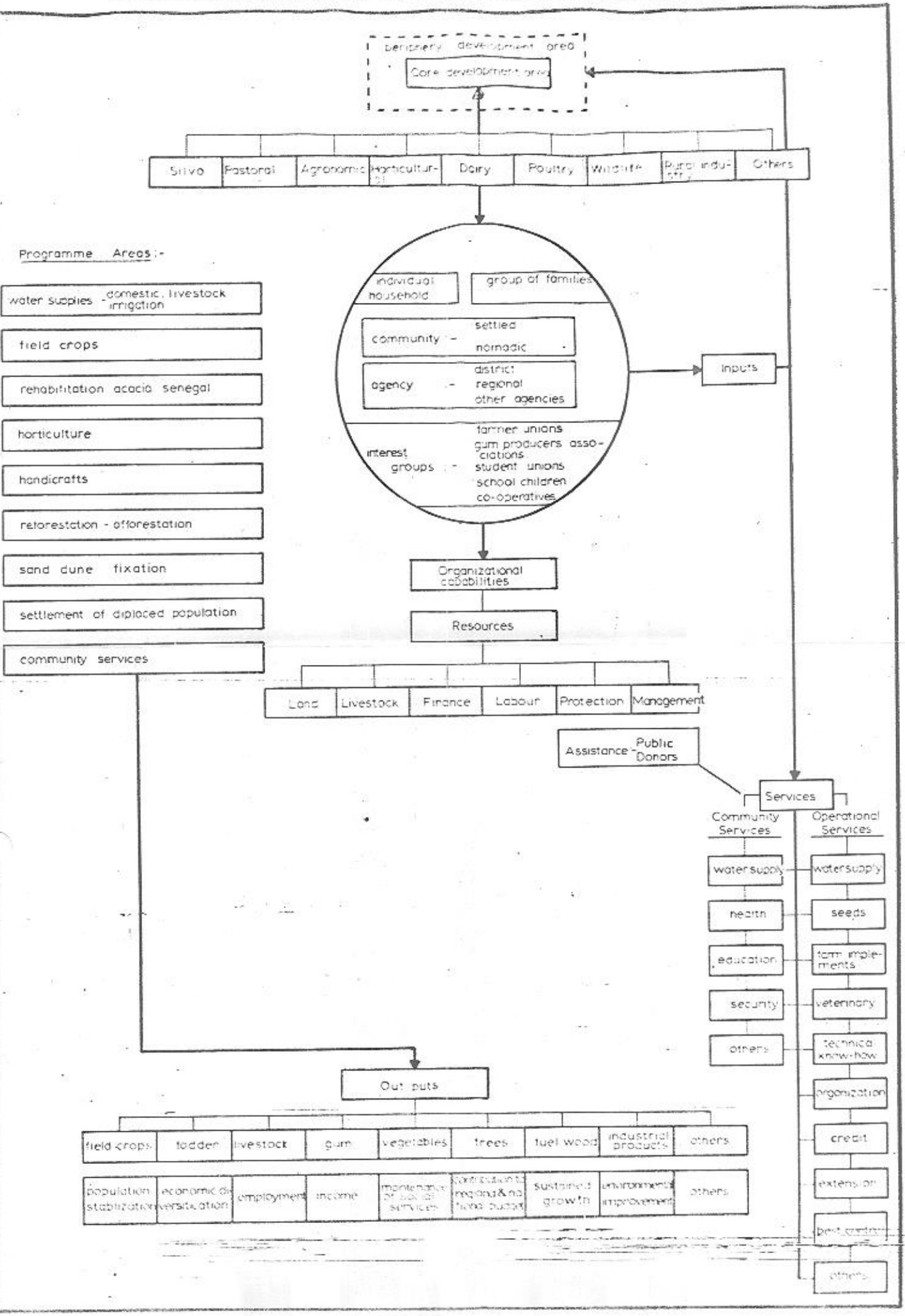

in their daily coming and going. By then deterioration from over-grazing was being observed. (ibid).

The extent of land misuse in the study area can be correlated to the growth of human and animal populations and to the excessive tapping of some natural resources at the expense of or disregard to others. The populatin of Kordofan has multiplied sixfold in 80 years, from just under half a million in 1903 to more than 3 millions in 1983, Table (1). Establishment of internal security (no tribal warefare), extension of cultivation (no famine) and checking of severe epidemics were some of the factors cited. (ibid).

TABLE 1. KORDOFAN POPULATION OVER 80 YEARS

YEAR	POPULATION	SOURCE
1903	550 000	Lebon (1965)
1910	590 000	(ibid)
1913	635 000.	(ibid)
1956	1 761 968	Dept. of Statistics (1958)
1973	2 098 073	Dept. of Statistics (1977)
1983	3 240 000	Anon (1984)

The population growth as such called for more land for cropping. As a result land under crops had increased in Northern Kordofan alone from 1 million in 1965/66 to 5 million in 1972/73 (Ahmed 1973). The growth of human population, accompanied by demographic changes, growth of animal population and lack of resource management have ultimately led to land misuse of varying intensity in many parts of the region.

The growing demand for land for cropping was met by horizontal expansion and reduction of land rotation. The former measure meant clearance of natural forest to give way to agriculture, while the

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latter left the tree (particularly A. senegal) out of the traditional fallow system. Both measures meant that land was not rested long enough after cropping and at the same time deprived of an important nitrogen source; that which is fixed by Acacias when used in tree fallow systems.

That is the state of affairs in the central sand zone (Northern Kordofan Province). Southern Kordofan is another site of human maltreatment of natural resources. Overcultivation and overgrazing on the accessible parts of the Nuba Mountains have reduced the woolands to scrub. Former areas of terraced cultivation have lapsed into eroded slopes. Elimination of trees from the pedimont and clay soils coupled with seasonal fires have accelerated erosion. (ibid). Recently introduced mechanized farming does not seem to appreciate or observe any role for trees and oculd eventually end up as a from of land mining.

Whether the tree crop from areas cleared for agriculture was made use of for fuel or building, or just burnt off into ashes (as frequently happens), amounts to the same thing, removal of tree cover. Growth of human population and demographic changes created a separate demand for wood for local consumption and for sale outside the study area, e.g. to Omdurman; thus more denudation of tree cover. Growth of animal population on the other hand has another direct bearing on tree cover. Trees in general are an important source of brouse. Excessive browsing and grazing of natural regenaration are determental to trees. Bayoumi (1983), estimated that plant cover in the Savannah area of the Sudan was curtailed by 50695 square kilometers (12 million Feddan) between 1961 an 1981 due to agricultural expansion. Kordofan Region could well account for a quarter of this.

The increase of the human population has been accompanied by an even greater increase in the animal population. This in turn has multiplied

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fourfold in 24 years, from 1.5 million in 1957 to 6 million heads in 1981.

TABLE 2. ANIMAL POPULATION IN KORDOFAN IN 24 YEARS

T Y P E	NUMBER OF HEADS IN *1957 1/	: 1981 2/
Cattle	590 416	1 066 000
Sheep	386 967	1 963 000
Goats	266 077	2 181 000
Camels	155 547	883 000
Horses	1 330	
Donkeys	71 875	
TOTAL	1 472 212	6 093 000

1/ : Barbour (1961) 2/ : Ministry of Agr. & Nat. Res., Kordofan Region.

The rise in animal population started in the early fifties. Prior to that the policy makers were aware of the consequencies of an undue increase in the flocks and herds. The aim until 1947 was to mitigate the effects of epidemics, i.e. to stablise numbers and reduce prevation by preventing disasters. But, from 1947, (possibly influenced by the potentialities of earth-moving machinery to dig reservoirs, and hence to augment water supplies), the Government decided to maximize the application of proved methods of disease prevention, on the assumption that animal numbers could be safely increased to support a growing human population and create a surplus for sale. Lebon (ibid).

Land misuse with regard to grazing is evident in many parts of the Study area. The Intensity and cause vary with locality "in the Semi-Desert Grassland and scrub of Kordofan, grazed by camel-owing tribes, the extent of overgrazing is less known because studies have been less complete. But of its existence there is no doubt. The three best grazing plants Aristida plumosa, Blepharis and Monsonia spp are now absent near water sources in the west and have completely disappeared

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over much larger areas to the east, where almost pure stands of little-grazed sedge Cyperus conglomeratus have appeared instead," Harrison (1958). So severe has been the grazing near Bara that sand has ceased to be stablized and is again forming living moving dunes which have begun to invade the cultivated zone of Kheiran. (ibid).

The misuse of land due to excessive grazing in the study area as a whole, however, is more evident around permanent water sources. It is attributed by many not so much to the increase in animal population but more to their concentration round such water sources. According to these sources, the situation can be alleviated by saving the 30% natural pasture destroyed annually by fire and by providing water in areas of unused pasture. (UNDP 1965), Darrag (1976).

Other changes such as increasing rate of urbanization have exacted on natural resources too. The growth of urban centres over the past 30 years shows that the population of some of these centres has more than doubled and that some once rural settlements have developed into town status. Urbanization and town dwelling called for more fuelwood for charcoal making, for brickfiring, for bakeries and for other industrial purposes such as edible oil processing. The Urban sector of Kordofan Region (12.8%) accounted for 24% of the total fuelwood consumed. The consumption of fuel and other wood is rising with population growth in other sectors as well, (Anon 1982). Table 3. (Page 7)

The rising demand for wood was not met by an equivalent forest reservation programme. The total area of reserved forests and those in

Cont./....7

TABLE 3. HOUSEHOLD FUELWOOD CONSUMPTION BY SECTORS IN C.M. GROWING STOCK EQUIVALENT

		TOTAL FUELWOOD 000 CUBIC METERS (c.m.)			
YEAR	POPULATION (000)	URBAN	RURAL	TOTAL	PER CAPITA (c.m.)
1960					
1975					
1980	2442	2766	8679	11445	4.69

the process in 1983 was 544296 feddan, 228696 Ha., Bayoumi (1983). It hardly doubled the estate as it was in 1952, when it was 275603 feddan 11580 Ha., (Anon 1952). The natural forests in the meagre area of reserves are not subject to any management plans and received very little enrichment planting.

3. IMPACTS OF RESOURCE MISUSE

The acuteness of the problem of desertification was highlighted recently by the accelerated loss of potentially productive soil to desert-like conditions, primarily due to the deliberate action of man, in many instances within living memories, Cloudsley-Thompson (1971). What has taken place in the study area over the past 50 years is analogous to the previously cited definitions in cause and effect.

Decline in crop productivity, denudation of town and village perimeters of vegetation particularly trees, mobility of once stablized sand dunes, burial of once productive land are documented phenomena. The productivity of the major cash crops has dropped drasticly over the past 25 years as can be seen from Table 4. (Page 8).

Other factors such as traditional farming cultural practices, pests and diseases accounted for part of the decline in crop productivity. (Ahmed ibid). The decline in soil fertility due to the ommitance of

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trees from the agricultural rotation is however, the major factor in the drop in productivity. Awouda (ibid), Seif El Din (1976).

TABLE 4. PRODUCTIVITY OF THE MAJOR AGRICULTURAL CROPS IN KORDOFAN BETWEEN 1960 & 1985

CROP	PRODUCTIVITY IN TONS PER FEDDAN								
	60/61	67/68	72/73	75/79	80/81	81/82	82/83	83/84	84/85
SORGHUM (dura)	0.377	0.120	0.136	0.254	0.207	0.237	0.204	0.117	0.104
Pennisetum (dukhun)	0.545	0.180	0.068	0.158	0.180	0.116	0.057	0.061	0.037
Groundnut	0.400	0.248	0.090	0.400	0.300	0.378	0.113	0.087	0.071
Sesame	0.348	0.093	0.090	0.098	0.087	0.044	0.028	0.063	0.047

Sources: 1960/73: Awouda (1974); 75/80: Berry & Geistfeld (1983); 80/85: AbuDeik (1985). Groundnut 79/80 Abd El Ghaffar

The decline in Gum arabic production in the study area is equally alarming and is attributable in the greater part to the shear removal of Acacia senegal trees. (ibid). The severity of grazing is evident in such places as Sodiri, where extensive areas are now devoid of any vegetation cover and sand dunes started to bury buildings. The effect near Bara and the threat of the mobile dunes to the Kheiran area was mentioned.

According to the latest observational studies conducted by the National Council of Research, the Semi-Desert region which extends between Lat. 16 and 14 N, is by now converted to true desert. The sand dune movement from this region is extending over vast areas southwards into the low-rainfall Savannah belt, at an alarming rate. Anon (1974). Thus, man himself is the ultimate victim of desertification.

4. A CALL FOR INTEGRATED ACTION

Whether the effects of desertification are reversible or not is

Cont./....9

debatable. The concensus of opinion is that on shallow soils, the effects are more or less irreversible. But, whenever the ground is soft, light and deep enough , vegetation recovery is possible, even in areas receiving as little as to to 80 mm of annual rainfall as was the case in such places as Mauritania, Libya, Tunisia and Iran. The extensive work of desert rehabilitation accomplished over several hundred thousand hectares in Iran shows that whenever the soil is soft and deep enough , rehabilitation potential (either naturally by protection from grazing and cultivation or artificially through shrub planting or seeding), are quite good at relatively low cost, even with little rainfall of the order of 60 to 80 mm. Le Houerou (ibid).

The success achieved at El Bashiri Oasis in the study area is an analogous to the above. Through fencing, mulching, seeding, tree planting and most important of all; popular support and participation, two dunes totalling an area of (1000 h.a.), were stablized and their vegetation reinstated.

A future strategy for rehabilitation and development of the study area should start from the premises that the previous approach to land use was piecemeal and was a failure. Provision of water supplies, improvement of veterinary services, expansion in cultivated area, rise in urbanization rates and the subsequent demand for wood, were perhaps implemented in fulfillment of legitimate popular demands. But since they were all in competition for land, it is clear that tapping any particular resource at the expense of another is determental to both.

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Man is an active element inhabiting the area and exploiting it. He should be taken as the focal part of the ecosystem. When components were intact, the ecosystem held its intrinsic balance. Treatment should therefore be wholistic. The search for solutions should aim at striking a balance between resource use and the ability of ecosystems to maintain human needs. Hence the objective of rehabilitation should not be growing trees, reseeding pastures or stablizing dunes as such. Exploitation of ecosystems should be in such a way as to attain sustained yield without further degradation. Would this sustained yield be enough to stand up to the aspirations of present and future generations? Answering this question calls for not basing development on the inertia of ecosystems, but on the capabilities of the economic bases: water resources, agriculture, range, forestery and non-agricultural activities, to sustain a bigger population with changing and diverging needs.

The problems to be addressed are of complex nature with many parameters whose relationships are continuously changing. They need to be attacked through long and short term planning. The start in both cases is to understand ecosystems, the components thereof and the land capabilities. That can only be achieved through studies, surveys and design plans which take into consideration all factors. This, unfortunately had not been attempted. On-going and future research ought to be directed along these lines.

Short and long term policies should aim that populations of the affected areas should be "pulled out" of their traditionalism. They can not be left to their own devices which proved failure.

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Local economics should be diversified through the introduction of income generating projects of all possible kinds. Such projects should tap the resource potential in crop farming both rainfed and irrigated, livestock raising, agro and handi craft industries, etc. If these do not suffice for meeting the needs of local communities the surplus population should be attracted somewhere else. This is well within the bounds of intra-regional and inter-regional policies encouraging ethnic merger of various groups into one nation.

While adhering to the above as a constantly adopted philosophy for rehabilitation and development, monitoring of the after-drought effects should be continously carried out in those hard-hit areas. Till the population is fully adjusted by becoming dependant on its internal resources, food should be provided to those short of producing it. To avoid temporal dependancy on donated food, developing into a social habit, food and cash (cash is emphasized) should be supplied in exchange for household member, (members are emphasized) involvement in viable rehabilitation activities.*

A recent rehabilitation/development strategy document for Kordofan Region** to which both authors contributed (with M. O. El Sammani as team leader) outlined the following policy framework as

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* Nursery development, establishment of shelter belts, windbreaks, village woodlots, Acacia Senegal plantations, pasture reserves, engineering structures connected with water harvesting and spreading programmes, maintenance of water sources, sand dune fixation, development of roads and feeder roads, etc.

**Republic of Sudan, Ministry of Finance & Planning (Planning) and UNDP Sudan, Kordofan Region Rehabilitation/Development strategy, Main Report Volume I, prepared by the Institute of Enviromental Studies University of Khartoum, 1986.

Cont./....12

The focus of short and long term programming:

i. Expansion of the food production base.

ii. Increasing of cash crop production.

iii. Creation of a sound agro-industries base.

iv. Enhancement of human resources with special reference to the role of women in development.

v. Development of water supplies.

vi. Alleviation of after-drought effects on hard-hit areas.

vii. Adjustment of displaced population.

viii. Delivery of services.

ix. Improvement of Intra-Structure.

x. Expansion of energy supplies.

xi. Atraction and utilization of external resources.

5. SUGGESTED IMPLEMENTATION MECHANISM

Transforming these policies into action programmes requires identifying strategies specific to each policy line. Equally it entails an implementation mechanism which marries community resources with others attracted from outside the Community, basically public and donors funding, and departmental and agency technical know-how. A suggested scheme for realizing this mechanism is explored in Fig. 2. reflecting the following basic components and inter relationships :

i. Rehabilitation/development priorities (to be transformed into action programmes projects) are listed on the left side of the daigram. The proposed programme areas are applicable to Zone I and northern part of Zone II in the suggested zonation frame (Fig. 3.). Programme priorities were reached after actual consultation with three district councils (En Nahud, Sodiri and Bara) when in December 1983 a team from IES visited the mentioned councils headquarters and dialogued with councilers

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(District Councils are made of elected members plus technical staff.) on rehabiliation/development strategies for their areas. Hence the proposals signify community priorities and relate directly to the resource situation and the problem areas of the two zones.

ii. At the Centre of the diagram partners in implementation of strategies and action programmes are indicated. Since little can be done in rehabilitation and development of such large belts of declining resources, without joining official and community interest, active and committed participation of beneficiant and affected populations is symoblized in the circle as the key factor to any realistic efforts to achieve successful ends.

iii. At the top, programme ideas are sorted under two categories: core development and periphery development. The former embraces economically and socially gainful activities to be realized through projects that are of immediate benefits to the target groups e.g. expansion of food/cash crop production, development of ago-industries/handicrafts, provision of community services etc. The peripheral developments have deferred benefits and address ecosystem rehabilitation, e.g. establishment of reserved forests, village wood-lots, wind breaks, town perimeters, pasture reserves, sand dune fixation, etc. Through implementing the core development programme communities shall be induced to stay, stablized and gradually adjusted. In the process they shall rehabilitate their locale. In this way the goals of the two programmes shall complement each other.

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iv. At the lower right side of the diagram envisaged inputs by government and donors are tentatively listed. These are broken into two groups: community services and technical/operational services, both of which are essential for the realization of programme objectives.

v. Expected outputs are furnished at the bottom of the diagram in two lines of boxes. The top one arrests the clearly seen benefits to communities, while the lower one outlines some of the desired change processes that improve ecosystem resiliance and help in restoring back the lost environmental balance.

6. CONCLUSION

We are in this paper introducing and emphasising a concept of intergrated resource planning for rehabilitation and development of those lands affected by desertification and drought. In our treatment the human factor is viewed as the core of development processes.

To achieve this, new planning philosophies and approaches are required. Long term outlook, interaction of disciplines, orientation of agencies at regional level to shoulder the responsibilities of planning and implementation in a multi-discplinary wholistic approach, are all important Pre-requisites. This also requires a strong back up services and training from the centre to help get ideas off the ground.

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The nature of the problem dictates that people in the natural and social fields concerned with the different components of the ecosystem (foresters, agriculturalistis, rangemen, veterinarians, engineers, economists and sociologists etc.), should work in harmony to achieve the objectives of the philosophy.

We would like to see in organizational charts, a council bringing these disciplines together at regional level to direct and draw policies. Such a body should develop in the future into a planning organization to implement and monitor development. El Obeid has the seeds of this through Agricultural and Natural Resources, Finance and Planning.

There is an important role for training to play, including on the job training. At the executive level, it is apparent that the problem is big and the area is expansive. The trained cadre is small and some kind of practical approach has to be applied to solve these shortcomings. This call for making maximum use of available professional cadre, patching the gap in medium-level staff (technicians) and drawing on resources of organization such as "National Compulsory Service", unemployed agriculture graduates, Youth Organizations., etc.

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Until this is achieved, staff available at the level of the small rural centres including teachers, medical assistants, nurses, veterinarian assistants, market clerks, policemen, etc. can be made use of together with trained community leaders. The experience gained during the implementation of "Restocking the Gum Belt" in Eastern Kordofan can be cited in this respect.

The involvement of the local population cannot be overstressed. People are aware of their problems, needs and priorities better than anybody else. People are being hit by the problem, feel the heat of it and should be respective to help. It is only people who can allocate their resources for solving the problem. People can institutionalize work through their organizations. People can guard whatever development there is. It is through development and change that we can extend the democratization process. We therefore believe in adopting "Development Centre Concept" with guidance, extension and an educational role, One centre per district, interdiscplinary staffed with a core of local representatives is recommended.

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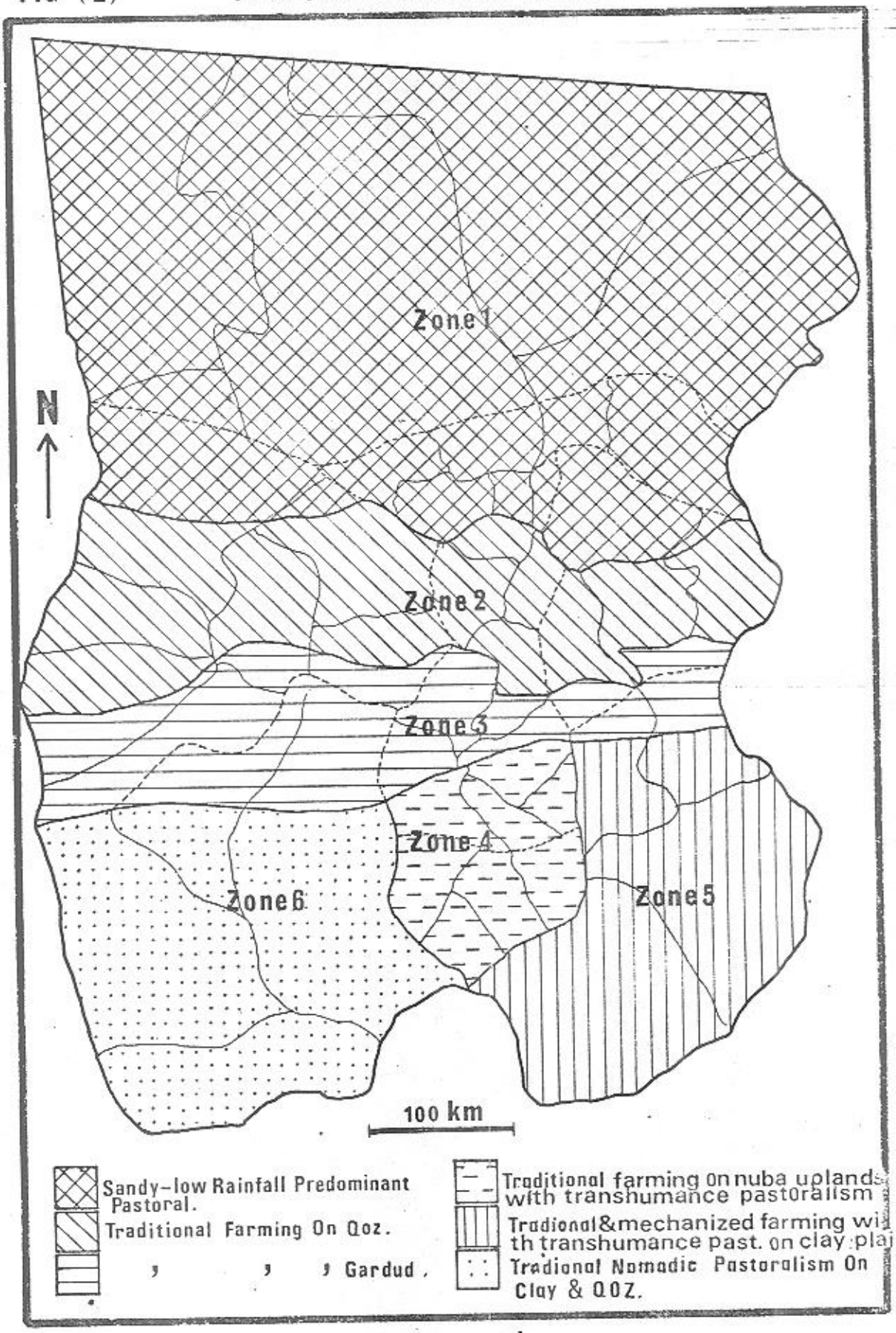
FIG.1 ECOLOGICAL CLASSIFICATION OF KORDOFAN REGION

Source:- Adopted from Lebon; J.H.G. Land use In Sudan, Geog. Publication Limited, 1965, Page(21).

FIG. (2) PROPOSED ZONATION FRAME



Drawn by : A/Aziz Ahmed