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REFORESTATION AND COMMUNITY DEVELOPMENT

IN THE SUDAN

Turi Hammer

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The views expressed in this paper are those of the author and should not be interpreted as representing the views of either A.I.D. or Resources for the Future.

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INTRODUCTORY NOTE

Residents of the Kordofan region of the Sudan, who previously farmed *Acacia senegal* for gum arabic and to restore soil fertility during the fallow, are suffering from a self-perpetuating cycle of drought, deforestation, shortened fallows, loss of soil fertility and falling crop yields. Their future wellbeing depends on breaking this cycle. "Reforestation and Community Development in the Sudan" examines approaches taken and explores reasons for their successes and failures. In doing so, it provides insights that are important to those designing, funding and implementing social forestry projects in other developing countries.

Before the current destructive cycle began, farmers grew *Acacia senegal* as a fallow crop in a rotation of 3-6 years of food crops followed by a fallow of variable length. The *Acacia senegal* seeds itself on fallow land and grows until the fields are brought into crop production again. This practice allowed the farmers to earn cash income by selling the gum arabic for export, and simultaneously the nitrogen-fixing and soil-retaining properties of the trees restored the fertility of the soil. Spurred by population growth, increased local demand for fuel has led to the cutting of live *Acacia senegal* trees for firewood and charcoal, while at the same time, pressure for more food production has led to decreased periods of fallow on cropped land.

The number of productive gum arabic trees has fallen, as has the productivity because the few young trees that remain are less productive than the older trees which are cut for fuel. As a result, local farmers have less cash income from gum arabic and are more likely to resort to charcoal production--destroying the remaining gum arabic trees--in order to meet immediate cash needs. At the same time, expansion of mechanized agriculture has pushed nomadic herders onto dryer land where overgrazing of communal pasture land has contributed to desertification, sand creep onto agricultural fields, and the buildup of moving sand dunes.

The Forest Department of the Sudan has altered its policies in response to these changed circumstances. Traditionally it sought to preserve the reserved natural forest, but in recent years they have been opened to supply urban charcoal demand to relieve the pressure on the stands of *Acacia senegal*. However, the reserves are not large enough to assure a sustainable supply of wood, and charcoal continues to be illegally supplied to Khartoum from the Kordofan region 400 kilometers away.

Sporadic attempts to counteract deforestation and desertification have been made since 1940. In the mid-1970s a master plan to combat desertification in the Sudan was prepared jointly by the Ministry of Agriculture of the Sudan, the U.S. National Research Council, the United Nations Environment Program and Development Program, and the Food and Agriculture Organization. The resulting Desert Encroachment Control Rehabilitation Program (DECARP) covers 650,000 square kilometers in an area which produces 80 percent of Sudan's gum arabic. It includes three tree-planting subprojects: sand dune fixation, shelterbelt establishment, and gum belt restocking.

The Gum Belt project, explored in detail in this case study, involves government provision of *Acacia senegal* seedlings for planting by the Forest Department on some abandoned lands and by farmers on their own fields. The objectives of the project include land reclamation, increased gum arabic production for export, and creation of local employment and cash income to counteract rural-to-urban migration.

A similar case study was undertaken by Margaret Skutsch in Tanzania. This case study was structured to explore several hypotheses. In it she explores the role of the forest department in the Tanzania and assesses whether forestry laws and extension have improved or exacerbated the fuelwood problems. She describes the cost organization and progress of the project. In a village case study, she tested a number of possible reasons for villagers joining the reforestation project to see which actually influenced farmers' decisions to participate. She measured the extent of participation by women and rural poor, and the role of village leaders and forestry extension officers in inducing participation. Finally she attempted to assess the overall benefits of the program and improvement in socioeconomic and environmental conditions.

The results of her study support the conclusions presented in this paper on the concept of project design based on forestry for multiple users. To the extent that a forestry project addresses villagers' daily needs, including provision of water and food as well as fuel, it is more likely to achieve local support and participation. In some cases, however, such population growth and small holdings do not allow for fallows, even potentially profitable ones such as planting *Acacia senegal* for gum arabic. Her results also underline the importance of reaching women farmers--who in a Moslem society can only be approached by female forestry extension officers--in order to achieve tree planting on a wide scale. Reforestation is hampered by the opposition of traditional village leaders, women's participation in such programs, and by the fact that women and the poor have no rights to land.

This study is an outgrowth of research on biomass energy in developing countries at Resources for the Future. The work was funded by the Agency for International Development under the ARDEN (AID-RFF Development and Energy) Cooperative Agreement No. AID/DSAN-CA-0179. Turi Hammer, who currently works at the Chr. Michelsen Institute near Bergen, Norway, was selected to undertake this case study of social forestry in the Sudan. In 1977, after fieldwork in the Sudan, Ms. Hammer completed her land. polit. thesis entitled "Wood for Fuel: Energy Crisis Implying Desertification: The Case of Bara, Sudan" for the University of Bergen. In 1980 she returned to the Sudan to work on the Integrated Sahel Program, then conceived as a joint venture between the International Union for Child Welfare and the Sudan Government. Her familiarity with the local language and village situation, combined with her already established contacts with the Government officials administering the program, made her uniquely qualified for this undertaking.

Related work already completed at RFF includes a working paper, "Deforestation, Wood Energy and Development," and the discussion paper, "Social Forestry in Developing Nations," which is an analytical survey of social forestry programs in various parts of the world. Another case study of social forestry programs in Tanzania, a study of the environmental consequences of deforestation in the tropics entitled "Deforestation and Forest Soils in the United States and the Tropics," are nearing completion.

Together, these six interrelated studies draw an intriguing picture of the problems and potential for wood fuels and forestry in developing countries.

These papers are issued for the dual purposes of informing the research and policy communities of results obtained from work in progress and of eliciting comments on our own efforts.

Milton Russell
Director, Center for
Energy Policy Research

AUTHOR'S PREFACE

Most of the material in this paper is based upon prolonged stays in the area described, first during field research into desertification in the years 1976 to 1978, then as coordinator of the Integrated Sahel Program, in 1980/81, and finally on a one-month assignment in September/October 1981 to evaluate the status of the development activities started by the program. I especially wish to thank Resources for the Future and the RFF staff, including Bill Ramsay, Julia Allen and Doug Barnes, for their support and advice in the later stages.

The main informants have been the local population in some 40 villages around Simeih, Umm Ruwaba, Ghabsha, El Ein, El Obeid, Bara and Azhaf. Together with hospitality and welcoming glasses of valuable water, their willingness to discuss living conditions and actively participate in schemes to improve village life were the source of learning and inspiration for all field staff.

The forest rangers assigned to Integrated Sahel Program/ Restocking of the Gum Belt willingly and with great patience have also tried to convey to me their long-standing experience in forestry work in the Sudan. Warm thanks for cooperation and friendship go to:

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Turi Hammer
Fantoft, Norway

Abbreviations Used in the Text

DECARP	Desert Encroachment Control Rehabilitation Program
FAO	United Nations Food and Agricultural Organization
IUCW	International Union for Child Welfare
NCR	National Council for Research
S	Sudanese Pound
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNSO	United Nations Sudano-Sahelian Office

Arabic Words Used in the Text

<u>Gardud</u>	non-cracking clay soil
<u>Goz</u>	sand dune
<u>Nazir, Omda</u>	traditional religious-cum-political leaders
<u>Sheikh</u>	village chief and religious leader
<u>Sheil</u>	credit system

Introduction

With its 2.5 million square kilometers, Sudan is the largest country in Africa. The climate is predominantly continental with maritime conditions only in a narrow strip in the northeast. Falling within the Doldrum region, the landmass is dominated by the Sahelian high pressure during winter and by the southern hemisphere's tropical highs which bring up to 1,400 millimeters (mm) of rain for seven to nine months to the southernmost part of the country, while only negligible amounts of rain fall toward the Egyptian border in the north during summer.

The major land forms are vast plains broken by a few widely separated groups of mountains. The bulk of North Sudan is covered by sandy soils of low water-holding capacity. Toward the Sudan-Egyptian border there are barren deserts with scanty vegetation only in the almost permanently dry watercourses. On the Acacia semi-desert and savanna further south, soil composition and rainfall allow the growth of a number of annual and perennial grasses and drought resistant deciduous trees, either scattered or in forests. Dense forests are found on the cracking clays of central and south Sudan, and on the permeable acid red ironstone soils of the south there are tropical forests. Along rivers and on flood plains, trees and palms grow densely on the silt.

In the extreme north and in the south the natural vegetation and potential agricultural output meet the expectations offered by prevailing climatic conditions and a stable soil quality. However, in the savanna belt, falling roughly between latitudes 12° and 14° N and receiving from 800 to 200 mm of rainfall annually, soil fertility began to decrease thirty to forty years ago and is by now much below normal. This belt covers 500,000 square kilometers (km^2) and is the homeland of some 60 percent of Sudan's estimated 17 million people. It constitutes an area which traditionally had exceptionally high fertility. This is the area where extensive measures to improve environmental and socioeconomic conditions are now being considered by the government and which will be the focus of this paper.

Chapter 1

HISTORY OF FOREST MANAGEMENT

Land Rights

Muslim penetration of the Sudan, which began in the seventh century through land purchase and intermarriage, over time resulted in private land ownership replacing feudalistic kingdoms along the Nile. When the Arabs began utilizing the eastern and western plains of the Sudan around the turn of the millennium, they brought with them the tradition of tribal acquisition of (and limitation of movement within) a territory or dar. To this tradition the indigenous nomads, who had used the area for millennia, eventually succumbed. Today, the tribal boundaries recognized on the savanna stem from approximately the fifteenth century when tribal wars had largely come to an end. Some people took to agriculture and settled in villages where ground water was easily obtainable from shallow wells or where huge *Adansonia Digitata* provided storage of rainwater. The dars were divided by the traditional religious-cum-political leaders (omdas and nazirs) and distributed to sheikhs, heads of subtribes, who acted as trustees of communal land. Each member of a settled community had rights of land use. Thus sheikhs allocated plots of land to the villagers according to need. Shifting cultivation was practiced (to allow the soil under the sheikh's custody to rest and regain fertility) and necessitated reallocation of plots every three to five years. Community members were also entitled to use the tribe's allocated lands freely for purposes other than cultivation [1].

This structure of land rights was disrupted during the Funj, Turkish, and Mahdist administrations when land was privately held, but was restored again under Anglo-Egyptian rule beginning in 1899. Thus, by the beginning

of this century the pattern of land rights differed only slightly from the one which the Funj had inherited four centuries earlier. The only significant difference was that now a central government existed which claimed the title to all land except some private holdings along the Niles and on mountain slopes and oases in the West. These holdings constitute less than one percent of total land area. The public laws and ordinances issued by the Anglo-Egyptian administration from the beginning of this century and by the national government after independence in 1956 all aim at protecting the rights and interests of those actually using the land. Thus the development of a landowner class of indigenous feudalists or European colonialists has been prevented [1]. The laws clearly state that all unregistered land belongs to the government [2]. The areas which are under the trusteeship of traditional leaders in communal holdings now amount to 40 percent of the country, the majority of which is in the central rainlands [1].

Traditional Land Use Practices

An area of some 65,000 square kilometers in the savanna region (see figure 1-1) is called the Gum Belt after the gum arabic-producing tree *Acacia Senegal* which grows naturally in the area and is the most dominant of the tree species.¹

Gum arabic has been exported for more than 2,000 years. The ancient Egyptians used it for the manufacturing of inks, water colors, and dyes. Europe began importing it in medieval times and at present Europe, the United States, and Japan are the main importers of gum arabic. Exported in its raw form, it is refined into an emulsifying and adhesive agent used in the confectionary, pharmaceutical, textile, plastic, and paint industries. Until 1970, gum arabic was Sudan's second most important foreign exchange earner after cotton, and now ranges fourth after cotton, groundnuts, and sesame, and provides about 7 percent of export revenue (1981).

1. Other trees found are mainly *Acacia* species, like *A. Tortilis*, *A. Mellifera*, *A. Radiana*, *A. Albida* and *A. Seyal*, and *Combretum Cordofanum*, *Leptamedia Spartium*, *Zizyphus Spina-christi* and *Balanites Aegyptica*.

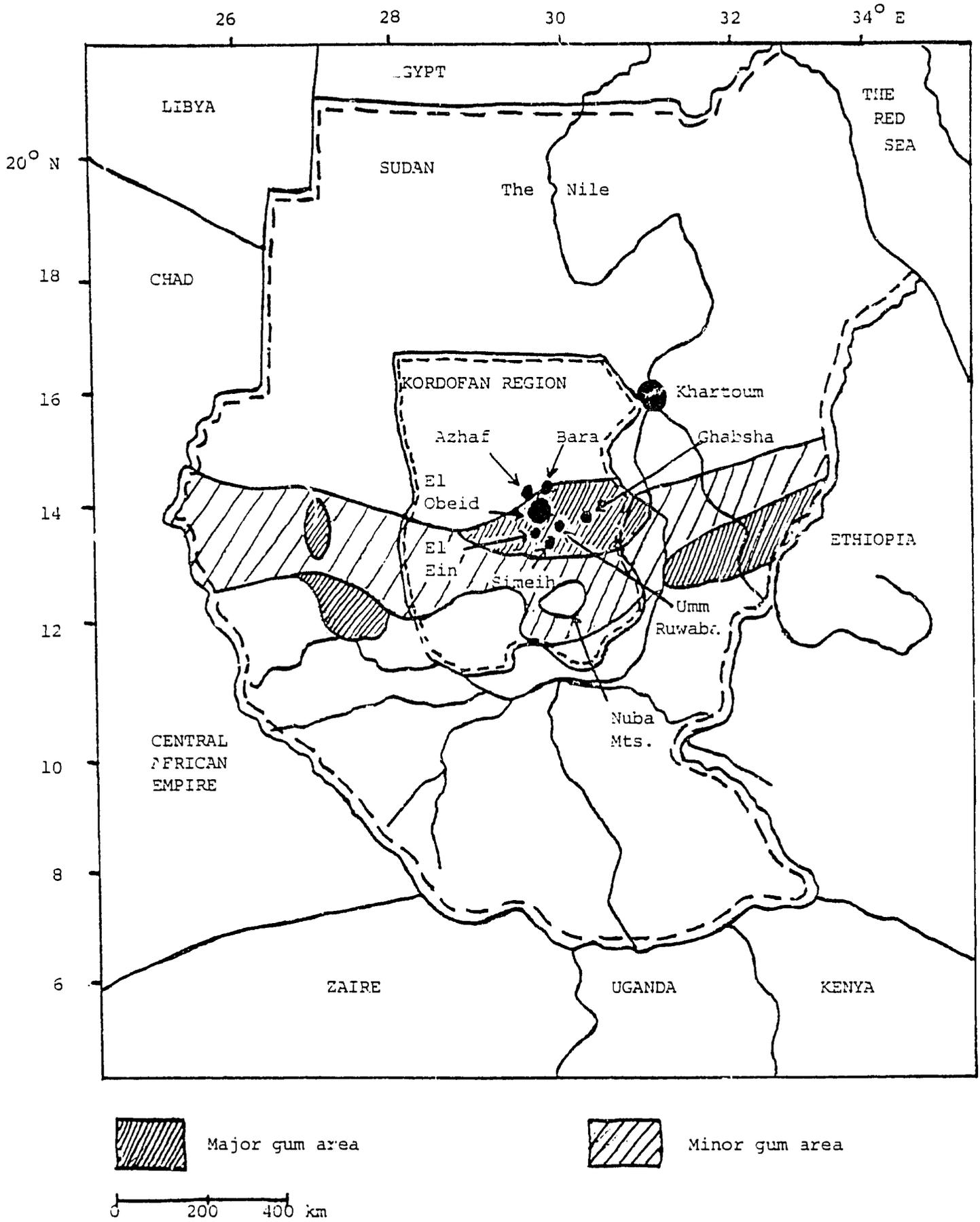


Figure 1-1. The Gum Belt in the Kordofan Region of the Sudan

Source: Redrawn from Abul Gasim Seif el Din and Mohamed Obeid, "Ecological Studies of the Vegetation of the Sudan, *Journal of Applied Ecology*, vol. 7, 1970.

Approximately 80 percent of world output of gum arabic originates from the Sudan, and half this amount comes from North Kordofan Province [3,4].

Gum arabic is tapped by agriculturalists from trees growing on their fields or, to a lesser extent, on village waste land. Ever since agriculture began on the savanna, crops have been grown mainly following the practice of shifting cultivation with each family using at least three plots on a rotational basis. The main crops are sorghum, millet, and watermelons (which constitute the staple food of the inhabitants, grown both for subsistence and for sale) and the cash crops sesame, groundnuts, karkadee and okra. Traditionally, as a protective measure to maintain soil fertility, the crops sown were alternated annually on any one plot, and in principle, a plot was cultivated for three to six years according to soil fertility. After the harvesting season the cultivators let their animals graze the agricultural waste or they open the fields to nomadic herds for fees. Acacia Senegal established itself naturally and was either left to grow along side of the agricultural crops or was cleared until the field was left for fallow. Only in exceptional cases did farmers sow Acacia Senegal seeds on their land. During the fallow years (which used to exceed the cultivation period) the Acacia Senegal was tapped for gum. Old farmers recall from their youth that the trees produced enough gum for tapping from the age of 3 to 40 years. Before a new cultivation cycle the land was again cleared of trees and bushes or the stems of Acacia Senegal were cut low to allow for coppicing.

This traditional agroforestry was most appropriate for many reasons: the fallow periods allow for reviving soil fertility; the Acacia Senegal binds the soil against erosion and brings it nutrients through its nitrogen-fixing capacity; gum tapping provides needed sources of cash and employment during winter when most people's financial resources are low and tasks other than domestic ones are few; and Acacia Senegal is a highly preferred wood for fuel. Furthermore, the system is labor intensive and fosters employment. Since the aeolian sandy soil is easily worked by hand, each family can cultivate wide areas, realizing relatively low yields per areal unit. The system lasted for centuries in the area without causing any serious degradation despite recurrent droughts and other upheavals.

A quasi-privatization of land developed on this trustee land in the late sixteenth century as trade in gum arabic increased in importance. The

farmers began to claim rights to plots even after the cultivation period in order to secure income from the Acacia Senegal growing on land they had cleared and cultivated. Such rights were granted by the sheikhs provided the family could work and make use of the land. In this way land use and fallow ceased to be regulated by the sheikhs and farmers gained continuous control over plots where they alternated cultivation, fallow, and gum tapping. Gum gardens (land systematically used for gum tapping), as well as virgin land allocated for cultivation by the sheikh, were now inherited like riverbank holdings according to Muslim tradition, but could not be sold [5]. In this tradition each female heir was given half the amount given to each male. If there was no heir the land reverted to the sheikh. For a fee, immigrants to villages could be given land to cultivate for a few years until they had proven themselves to be "good citizens." Then they would be allocated land on the same basis as the original dwellers [1].

Whereas rainfed agriculture and nomadism have been the main sources of livelihood on the savanna for centuries, irrigated cultivation of vegetables and fruits has developed in the last 150 years in scattered oases and on mountain slopes. During the last decades increasing areas of clay land in the southern part of the gum belt have been put under rainfed mechanized farming.

The main domestic use of trees is for fuel in the form of firewood and charcoal. Fuelwood is the main energy source in all but a few urban households, and for the majority it constitutes the only energy source. Until the mid-1900s dead trees or fallen branches constituted the major source of fuelwood, as live trees were cut only when clearing land for cultivation. Gum-bearing Acacia senegal, however, were never cut. Trees furthermore provide material for construction of fences and huts, for lining of wells and for rope making. A number of species found in the area have edible fruits, some of which have medicinal qualities, and most species are used by grazing herds of camels, cattle, goats, and sheep.

In 1935 the governor of North Kordofan reported:

"The vast majority of the agrarian population of this Province are still happily growing their crops and tapping their

gum trees under an elastic but ordered system of communal tenure, which does not deprive the individual of reasonable expectation of continued occupation of his family field or gum garden" [5].

Present Land Use and Soil Degradation

Since the middle of this century there has been a decline in the land's capacity to sustain the local population. The causes of this change are many and interrelated.

The encroachment of the Libyan desert in the northernmost part of the Gum Belt, measured from 6 to 10 kilometers per year [6], might be climatically conditioned, but this process has been reinforced by a system of cultivation and grazing in the area bordering the desert which leaves the land bare, deprived of vegetation that might act as a barrier against the moving sand. There has also been a change in species, as a number of perennial grass types have disappeared and been replaced by annuals.

Even more serious, because it occurs on traditionally very fertile and highly populated land, is the creation of desert-like conditions through overexploitation of the natural resources on the woodland savanna far south of the desert border. The main factors causing this desertification are overly intensive agriculture, overcutting of wood for fuel, and overgrazing.²

A major cause of the pressure on land is the increase in human and animal populations, resulting from reduced mortality brought about by vaccination and other governmental health campaigns. Furthermore, the settlement of nomads and the southward migration of farmers who have lost their livelihood on desertified savanna have put severe demands on cultivable village land in the core of the Gum Belt.

Cultivable land is, in practice, defined according to its distance from water resources. Thus land that is more than one day's journey by donkey--the only means of transport used by farmers--from such a source is used for grazing or is left unexploited. Even if arable nonvillage land is available adjacent to a population center experiencing land shortage, it

2. Unless otherwise indicated, the information in the remainder of this chapter is from Hammer [7].

has become difficult for the sheikh to increase the land over which he has jurisdiction. Whereas previously the village borders could be expanded according to growing needs with the consent of the omdas, the People's Local Government Act of 1971 has shifted administrative powers from the traditional leaders to the local and provincial councils which have politically appointed or elected members [8]. Of the traditional leaders, only the sheikhs have kept their roles as trustees of the government. Thus the sheikhs must apply to these new councils on matters related to land, and more often than not applications to expand village land are denied. Previously borders between neighboring villages could be changed through negotiations between their notables. Forseeing population increases and threats of land shortage, however, most sheikhs now are reluctant to diminish land under their trusteeship, and overpopulated villages must attempt to rent land from their neighbors. The growing population's increasing demand for food and fuel must thus be met to a large extent from land within fixed borders.

Local land shortages have also caused sheikhs to refrain from giving village land to newcomers. Newcomers may rent land for cultivation, but after the cultivation period they have no rights to the land or the trees that grow on it. Not surprisingly, these tenants have no interest in tending the trees that get established or in undertaking any other measures to uphold or increase soil fertility.

Demands from the population centers within the Gum Belt as well as internationally have led to a growing market economy. In the evolution of a money-based economy people find they must increase the number of crops and animals for sale in order to pay for commodities they have become dependent upon, particularly since so much of the produce is marketed within the sheil system--the main source of credit to small farmers. In sheil, next season's crops are mortgaged to merchants in return for loans in the form of cash or kind provided in the slack season to satisfy the needs for basic subsistence commodities such as medicine or sugar, tea and other foodstuffs not produced locally. This method of marketing gives farmers less than half the return they would get if they could afford to wait until after the harvesting season to sell their crops. At present the amount of gum arabic sold by the farmers at the auction market constitutes

a mere 30 percent of production. The rest is marketed through middlemen, approximately half of this in sheil [4].

Attempts are often made to increase production by prolonging the cultivation period and shortening the fallow. This method is counterproductive in the long run, however, as soil fertility declines rapidly during cultivation and cannot be restored if the required fallow is not observed. It also leads to a decrease in gum arabic production since a shortening of the agricultural cycle does not allow for the development of a strong root system and maturing of the trees. On continuously cultivated land, the agricultural output appears to have declined by a factor of four in the last ten years alone, and in areas where the Acacia Senegal a generation ago produced till it was forty years old, no trees above twenty-five years of age can now be tapped. Furthermore, fragile topsoil on land bordering the desert or on top of temporarily stabilized sand dunes is rapidly becoming exhausted soon after it is put under cultivation.

The increasing local demand for fuel has led to the cutting of live trees for firewood and charcoal. Even gum-bearing Acacia senegal trees are cut for personal fuel needs or sold for cash. Some farmers feel that cutting the trees is more profitable than tapping gum for sale within the sheil system. Other trees are felled by the increasing number of destitute nomads who seek income from selling fuelwood. In areas where sheikhs punish those who cut live trees, people sometimes secretly damage the trees to kill them, thus evading the proscription. Women are traditionally the main suppliers of household firewood, often assisted by their children. The cutting of trees has exceeded regeneration around most villages, however, and with increasing distances to forest stands, changes in energy procurement are taking place. Partly because Islamic custom limits the extent of women's travel away from their households, and partly because other tasks such as cooking, child rearing, and water collection require so much of their time, men are taking over the roles of energy suppliers.

Due to its higher energy content, charcoal is regarded as more economical to transport over long distances than bulky firewood. And since much energy is lost in the production of charcoal in earth kilns and no regard is paid to the replacement of felled trees, this change from firewood to charcoal represents yet another cause of desertification. Moreover, the change from self-sufficiency in firewood to procurement of

charcoal from professional burners implies that households must pay for fuel used. Women report that due to recent changes in the fuel supply they consume less than before. Many women now carefully extinguish the fire after cooking, thus not letting the food simmer properly--something which is important with respect to taste as well as health. There is also a tendency to cook all the day's food at the same time, thus serving one hot meal instead of the customary three a day. In the most fuel-scarce areas some women respond to the energy crisis by changing the household diet away from foodstuffs which require long cooking. Acacia senegal and other trees in the Gum Belt are also cut by professionals who organize transport of charcoal up to 300 kilometers to, for example, the markets in the capital. Such cutting of live trees leads to severe deforestation and is an important cause of desertification. It is also reflected in the sharp decline in exported gum arabic. In North Kordofan gum production at present is approximately 30 percent lower than the long-held annual average of 24,000 tons [4].

Desertification has also become a major problem in mechanized farming programs on clay land in the southern part of the Gum Belt, as private companies in particular do not do enough to restore the vast cleared areas after four to six years of cultivation. Fertilizers and pesticides are little used, the recommended crop rotation is not observed, and trees are felled without being replaced. This land use system has led to a massive increase in soil salinity since the trees which previously absorbed the salt-containing groundwater have been removed. The loss of tree cover also makes the soil more susceptible to erosion by wind and heavy rain [9].

Nomads displaced from newly mechanized or traditional rainfed farming have been pushed to more marginal land where their herds cause desertification. At present, nomads from the north bring their herds of camels and sheep into the Gum Belt for grazing in the dry season and cattle-owning nomads from the Nuba Mountains penetrate the southern part in summer. Since the new administrations which replace the omdas do not yet have the necessary system for allocating land, grazing takes place within the communal land tenure system without an institution controlling the exploitation of pasture land. This lack of control leads to local overgrazing, especially in water yards, and increased herd sizes among groups with the labor force and power to expand their grazing land.

The general widespread decrease in soil fertility and the depletion of forest stands in town and village perimeters which have been observed for some decades now were accentuated during the latest Sahel drought in the early 1970s. More recently, sand creep into agricultural fields and the build-up of moving sand dunes have occurred because vegetation has diminished to less than 15 percent coverage of the surface, leaving the soil open to wind erosion. Furthermore, long-since stabilized transverse dunes 2 to 6 kilometers long are already on the move, covering villages and agricultural land. There is reason to believe that if the processes of desiccation and desertification continue, the huge, billowy, longitudinal sand dunes, which became stabilized during a wet period some 20,000 years ago and which are found throughout the savanna, will start moving again.

The decline in soil fertility and the growing needs of an increasing population create a vicious self-perpetuating cycle. In order to break this cycle and reverse the environmental and socioeconomic degradation, the Government of the Sudan has devised plans for reclamation projects. These plans will be discussed in the following chapters.

Chapter 2

TRADITIONAL FOREST POLICY AND MEASURES TAKEN FOR ITS IMPLEMENTATION

The first legislative measure to control the use of trees and forests dates back to 1908 when the colonial government introduced an ordinance to regulate the Director of Forestry's demarcation and claiming of forest reserves. The two main objectives of this ordinance were the conservation of natural forests in pressure areas and the supply of forest products for public purposes. These objectives have since been leading principles for most governmental forestry legislation and activities.

The government has the legal right to reserve any unregistered land, although users are entitled to some kind of compensation if the land is taken over by a government department. Indemnity, often decided upon in court, may be in the form of employment, cash or other land. To avoid lengthy adjudication, the government tries to locate the reserves outside village boundaries. All activities within the reserves are regulated and permits are required for private use. Punishment for illegal cutting of trees, collection of wood products, and grazing is quite severe (fines and imprisonment) and as a rule the resources on the reserves are guarded and their boundaries respected. Since the forest departments do not have sufficient facilities to fully utilize the resources on the reserves, individuals are commonly issued permits for cutting, charcoal burning, gum collection, and the like. Furthermore, the public has access to waterholes and roads within the reserves. By 1975 some 7.2 million hectares, or 3 percent of Sudan's land area, was reserved [10].

In 1932 the power to claim land for forest reserves was divided between the Ministry of Agriculture, Food and Natural Resources³ and the provincial governments. The politicians at the provincial level became responsible for establishing conservation reserves around towns and other

3. In the text henceforth referred to as Ministry of Agriculture.

population centers, while the forest departments established so-called central reserves for commercial and industrial purposes. The relatively small amount of conservation reserves--1 percent of the reserved areas--reflects a lack of professional staff and the absence of a clear forestry policy at the provincial level. Suggestions to plant seedlings and sow seeds in these reserves date from the 1940s, but in practice, artificial regeneration has taken place only in a few instances.

Forest Department Activities

Funds allocated to the forest departments from the national budget are to be spent in reserved areas only, and the departments' primary task since they were established has been to supply the government with forest products for construction purposes and to produce firewood and charcoal from their central reserves. As a rule the policy of securing full regeneration of trees through planting and sowing according to output has been fulfilled. The gum arabic collected from *Acacia Senegal* within the reserves forms an important source of income for the government.

All sawmills in the Sudan are owned by the government and operated by the forest departments. Their main products are railroad ties, lumber for construction, and raw products for the match and particle-board factories. Most of the industrial forest production is located in the southern part of the country where the natural conditions for tree growth are most favorable, with emphasis on *Acacia* and other indigenous species. The production far from satisfies demand and 80 percent of the timber consumed in the country is imported [11].

Environmental degradation due to overcutting of trees and uprooting of desert scrubs first appeared around Khartoum. In 1928 the authorities forbade the destructive burning of charcoal in Khartoum Province and began to subsidize private production in other provinces up to 350 kilometers south and east of the capital. Since that time the forest departments have tried to control the supply of firewood and charcoal to the capital area through fuelwood plantations within reserves in Khartoum and adjacent provinces and through supervision of private enterprises on unreserved land. Despite proclamations of protective laws and careful planning, the area surrounding the capital lacks vegetation to a radius of 75 kilometers,

and the organized illegal supply of charcoal flowing into Khartoum from areas in North Kordofan Province 300 kilometers away is a major cause of desertification there. The forest departments in other provinces likewise have taken measures to supply the larger population centers with fuel. Thus the department in North Kordofan established a large reserve around El Ein to provide the provincial capital with charcoal--the main energy source of all town quarters. The production is not adequate, however, and an estimated 70 percent of the charcoal sold in the town originates from outside the reserve.⁴ The failure to provide firewood and charcoal can be attributed to both inadequate funding for this activity and the method of producing charcoal in inefficient earth kilns.

According to forest ordinances, all forest products from unregistered land is regarded as government property, and through the Royalties Ordinance of 1939, royalties were levied on all timber, firewood, and charcoal originating from such land except for charcoal for personal domestic use. All products intended for sale are to be brought by the seller to revenue stations run by the forest department. Failure to do so subjects those caught to fines or imprisonment [12]. However, because compliance rests with the individual sellers instead of forest officials, it is easy for people in need of cash to make a living from selling illegal fuelwood. Thus private trade in forest products goes on almost freely. For example, some 50 percent of the charcoal supply to El Obeid, the capital of the Kordofan region, is sold to consumers without the royalty being paid, and 95 percent of the 15,000 people of Bara, also in Kordofan, can obtain royalty-free firewood and charcoal.⁵ Increased enforcement by forest departments would probably greatly reduce the incidence of overcutting wood for fuel as a desertification factor.

The People's Local Government Ordinance of 1971 further decentralized forest policy and administration. The local councils, which are subunits within the provincial administrations, were empowered to issue orders

4. Information from forest officials in El Obeid and Bara.

5. Information from forest officials in El Obeid and Bara and village interviews.

locally to protect trees by controlling grazing, fires and tree-cutting [8]. Orders prohibiting the cutting of trees below a certain age have been issued recently, particularly in areas where demand for fuelwood exceeded the availability of dead trees and fallen branches. Little enforcement exists, however, and the cutting of immature trees is on the increase throughout the fuelwood-scarce North Sudan.

Conservation and Integrated Development Activities

At present the most effective preventative measure against cutting immature trees seems to be the warning given by some traditional leaders in certain districts. By making their communities aware of the effects of overcutting and at the same time organizing communal fuel supply from tree-rich areas within or outside the village border, these sheikhs have made the actual users of land its guards. Thus, being aware of the value of trees for environmental protection, the villagers report any wrong cutting, whether by the settled population or by nomads, and the matters are dealt with according to local rule.

The first effort to integrate conservation into development programs came in 1942 with the establishment of a government soil conservation committee to report and make recommendations on measures to prevent soil erosion and desiccation. Suggestions from this and succeeding committees indicate, for instance, that 5 percent of the area of any large-scale public or private agricultural development project should be kept under tree cover and that trees felled for land clearing in such schemes should be replaced after the cultivation period. However, no local action to implement these recommendations was taken until the 1960s. Without enforcement, moreover, exploitation continues and less than 0.5 percent of government spending on development programs is currently allocated to conservation measures [13].

During Anglo-Egyptian rule, the governments encouraged and assisted villages in the Gum Belt to grow communal tree plots for gum and firewood. At independence, the central forest department in its annual report suggested that this assistance should be continued, but no funds for such activities were designated from the national budget [10]. Still, many provincial forest departments have given free seeds of *Acacia Senegal* and

other indigenous species to farmers who want to plant on their own land. Such programs have been sporadic, however, and farmers become discouraged when they sometimes receive old and improperly stored seeds which do not sprout after sowing.

The Ministry of Agriculture's plans to grow irrigated forests for firewood and building timber inside the cotton schemes of Gezira were also hampered for many years because the corporate boards did not cooperate out of concern that the trees might harbor pests injurious to the cotton crops. Only since the 1950s have such plantations been allowed on a small scale within the cotton area [10].

The Ministries of Education and Agriculture have worked out plans using school gardens for teaching agroforestry to pupils. These "Green Education" plans were, however, never put into practice due to lack of funds.

Most government development plans since independence have stressed agriculture as the most important sector for economic growth, in the belief that development of the primary sector must take place before, and provide the basis for, the secondary and tertiary sectors. Thus the present six-year plan has "a vigorous and prosperous agricultural sector as its cornerstone." It takes into account that agriculture at present contributes nearly 40 percent to the Gross Domestic Product and 90 percent of exportable products measured in foreign exchange earnings; that 58 percent of the male and 88 percent of the female labor force (which together total an estimated 5 million people) work in that sector; and that some 80 percent of the population depends on agriculture and related activities for subsistence. Since traditional rainfed cultivation provides less than half the agricultural output, and since land and soil are available in abundance on the savanna, the agricultural sector is to be developed and development of all other sectors is to be coordinated with agriculture [14]. This goal is in accordance with the 1976 International Labor Organization (ILO) mission report, which states that "...only the development of traditional agriculture will reduce underemployment of the farming population and this is the only mode which could absorb a substantial share of rural population growth at higher income levels for some years to come" [15].

Despite the ILO recommendation that agricultural policy be reevaluated to develop traditional over modern agriculture, little progress can be foreseen in redeveloping traditional agricultural systems, despite the fact that these systems once worked well and would secure the livelihood of the poorest people in their homelands and preventing further centralization. The operational measures listed by ILO are not in line with the overall goal of the present development plan. Larger investments are planned for irrigated and mechanized farming than for rainfed cultivation, and the development of the savanna is to come about through mechanization, meaning that most traditional farmers can only participate as wage earners. Furthermore, forestry is to receive a mere 3 percent of public investment, with firewood, charcoal, and gum arabic (which are components of rainfed agriculture) each to have an annual increase of approximately 3.5 percent; whereas building poles, bamboo, and lumber produced mainly in reserve areas are to increase by 5, 11, and 15 percent respectively [14].

In the present development plan (from 1977), the objective is to cover 23,000 hectares in the Gum Belt annually with *Acacia Senegal*, 60 percent of which should be planted by the farmers on their own land. During the first four years of this planning period the mean annual planting was one-third of the target, with no seedlings and few seeds given to the farmers. Officials in the Ministry of Agriculture explain that the achievement rate is low partly because of the general time lag for central policy to filter down to the provinces and also because the People's Assembly did not allocate funds to execute the policy decided upon. Furthermore, a change in forest activities within reserved areas only to the inclusion of agroforestry on village land would require trained staff and transport facilities which are at present unavailable at the province level.⁶

In 1975 the forest departments reported that its 6,000 permanent employees plus a seasonal labor force of 1 million man-days was insufficient to meet the requirements of an expanding forest activity [10]. The present six-year plan estimates that by the end of the plan period (1983) only half the required agricultural trainees will be available [14]. Eighty-four percent of the farmers have said that they would listen to

6. Information from Abdel Aziz Bayoumi.

advice from agricultural and forest officials if approached, but due to lack of physical resources and logistical support the extensional agents so far have reached only some 8 percent of the farmers [16].⁷ To outside observers, it seems that a lack of facilities and effective management prevent the provincial departments from increasing their activities [4]. This impression is shared by a national newspaper which reports that of 700 agricultural trainees in 1981, only 51 found jobs, and that many departments are overstaffed, only serving to disguise unemployment [9]. Lacking sufficient tasks to fill a working day and with governmental wages lagging behind inflation, a number of highly qualified foresters now have emigrated to other countries. Still, the country seems to possess enough qualified foresters and agriculturalists to form the cornerstone for a sustainable development of the Sudan.

7. In North Kordofan Province the Regional Director of Agricultural Services reports an estimated 92 percent illiteracy rate, therefore government extension services aim at direct contact with the farmers. Most people learn about land use from their fellow villagers and malpractices, once started, might well spread.

Chapter 3

NEW EFFORTS TO RECLAIM DESERTIFIED LAND

Declining yields of subsistence and cash crops throughout the Gum Belt, expanding barren town and village perimeters, and sand dunes on the move have been observed and publicly recorded at least since the 1940s. However, little has yet been done to combat the desertification process. Officials from central and provincial forest departments have sporadically suggested public promotion of agroforestry on farmers' lands and the growing of shelter belts and fuelwood lots on village land, but as outlined in the previous chapter, public forest activities up to this time have been concentrated on supply of forest products from reserved areas primarily for governmental purposes. Anti-desertification activities which have begun have mainly been conservation oriented. These include the establishment of protected forest reserves around some towns and villages since 1944, research centers on agriculture and forestry which opened in the 1960s, and several sand dune fixation projects begun in the early 1970s. The experience gained from these efforts has not been reapplied on any significant scale outside the pilot areas, partly because the costs involved have precluded replication and partly due to lack of a master plan.

With the advent of large-scale international aid to community forestry in developing countries, forest policy in the Sudan has replaced past practices and plans with new priorities and perspectives. In the present development plan, 20 percent of most ongoing forest projects are financed by foreign contributions and the share will increase to 54 percent for projects scheduled to start in the period of 1979-1983 [14]. (This is a higher percentage than for new agricultural projects taken as a whole.) This might indicate that donors are aware of the importance of forestry for sound development. Officials in the Ministry of Agriculture report that the present policy of having forestry activities expand to farmers' land is

also to a great extent a result of pressure from donors who want to support projects where people are involved.⁸

The Desert Encroachment Control Rehabilitation Program

A master plan to combat desertification was made in the mid-1970s when a number of old suggestions and some new proposals were assembled into the Desert Encroachment Control Rehabilitation Program (DECARP) prepared jointly by the Ministry of Agriculture and the National Council for Research (NCR) in collaboration with the United Nations Environment Program (UNEP) the UN Development Program (UNDP) and the Food and Agriculture Organization (FAO) [17]. DECARP covers 650,000 square kilometers between latitudes 12° and 18°N, where some 80 percent of the Sudan's gum arabic is produced. If fully implemented, it would represent a breakthrough in making a comprehensive and organized effort to combat desertification in the Sudan, involve the inhabitants of the affected areas in such efforts, and expand the forest departments' work on private farmland.

The original DECARP proposal suggested that five provincial development centers be set up to implement the various anti-desertification activities. In addition, one national unit was to be created to coordinate the program and approach donors for funds. The establishment costs of these bodies, research activities, and field operations were estimated at U.S.\$26 million in 1976, 70 percent of which were to be raised from the international aid community. Although the proposal directed that financial surpluses be given directly to the five regional development centers so that they would be in a position to execute concrete anti-desertification measures in an integrated manner according to local conditions, funds solicited for field operations were also itemized by technical project to attract those donors who would want to donate to specific activities. The nine subject matter projects presented are shown in table 3-1.

8. Information from Abdel Aziz Bayoumi.

Table 3-1. DECARP Subject Matter Projects

	<u>U.S.\$^a</u>
Sand dune fixation	2,084,726
Establishment of shelterbelts in irrigated areas in northern province	1,424,352
Restocking of the Gum Belt	1,311,432
Upgrading land use and village settlements through integrated ranching farming systems and grazing cooperatives	3,483,852
Extension and training	1,602,932
Grass cover establishment using seeding	1,797,154
Management of grazing resources around permanent water supply centers	2,389,662
Water provision in the <u>goz</u> ^b and other areas through artificial underground storage and rain harvesting	1,458,853
Desert sheep station	870,636
Total	16,423,599

Source: Sudan Government, 1976.

^aIn 1976 dollars.

^bGoz means sand dune and is used as another word for the Gum Belt.

Together the projects listed would support and improve the two main traditional land use systems in the area--agriculture and nomadism--which both are heavily dependent on trees. By increased planting of grass and trees and controlling water supply and grazing systems, the former sound management of natural resources was expected to be regained.

Tree Planting Project Descriptions

The first three projects listed in table 3-1 comprise direct tree planting activities. The objectives of the sand dune fixation project are to reclaim sand dunes and protect areas threatened by sand dunes through stabilization and development of vegetation cover. To achieve this, the species of grass and trees best suited with respect to adaptability, growth rate, water requirements, and value will be identified. Accompanied by an extension and training program, seeds and seedlings are to be provided to

people for voluntary sowing and planting. This project is to be implemented in areas threatened by moving sand dunes throughout the Gum Belt.

The establishment of a shelterbelt project is confined to the riverbank areas of the northern province and involves planting seedlings around agricultural land along the Nile to protect the fertile soil from sand dunes moving in from the surrounding desert.

In the project to restock the Gum Belt, Acacia Senegal seedlings will be provided from all five provincial centers to be planted by the government on abandoned rainfed mechanized agricultural sites and by farmers on their private holdings. The long-term objectives of the project are to increase gum production, secure a steady supply of gum to meet world demand, contribute to the country's balance of payments, prevent desert encroachment, and reclaim land. Short-term objectives are to provide employment and improve living standards in the rural areas, thus curbing migration to towns.

Administrative Organization

Shortly after publication of the program, the government established the national coordinating and fund-raising body, called the DECARP Unit, as an office within NCR. It turned out to be difficult for the Unit, however, to obtain external funds since potential donors regarded the office as a research body. As a result, the Unit was moved in 1979 to the Ministry of Agriculture.

The original idea of establishing five development centers has been abandoned, partly because the government thinks that the newly formed regional administrations would be appropriate agencies to handle research, coordination, and execution of anti-desertification measures for their program areas, and partly because donors have preferred to fund specific projects.

The Unit works in cooperation with the United Nations Sudano-Sahelian Office (UNSO), which is the UN body in charge of assisting 19 countries of the Sudano-Sahelian region in their implementation of the Plan of Action to Combat Desertification adopted at the 1977 UN Conference on Desertification. According to an agreement between the Sudanese government and the UN, all DECARP projects will be executed by the government and will

receive their funds from the donors through UNSO via the national UNDP office. The plan is also to have nationals manage the projects, since Sudan has a large supply of government officials and other professionals who can be trained for DECARP work.

Since 1976 the subject matter projects have caught the attention of a great many international agencies, particularly during the UN Conference on Desertification, and the program area has been visited by media people and potential donors from all over the world. Most projects proposed by numerous aid missions differ only slightly from the original subject matter projects with respect to goals, approaches, methods, and budgets. This confirms for a number of Sudanese officials that the program was both comprehensive and detailed enough in its initial form to act as an appropriate basis for implementation and that activities could well have started several years ago with the funds donors earmarked for conservation and reclamation measures following the UN conference.

First Year Activities

Since 1979 UNSO has dispatched missions to plan projects and arrange meetings with donors to mobilize resources, and the first funds were released in 1981. The DECARP Unit was given U.S.\$300,000 to strengthen the office and map and monitor natural resources and desertification in the program area, and U.S.\$1.5 million was allocated to the restocking of the Gum Belt project, the first to be implemented. Other DECARP projects that may begin are Management of Grazing Resources around Permanent Water Supply Centers and Sand Dune Fixation. Two projects, Restoration of the Khartoum Greenbelt to Provide Firewood and Charcoal to the Capital, and Integrated Rehabilitation Project of Agricultural and Pastoral Land in North Kordofan Province, have been added to the DECARP list. These two projects, together with six of the original nine topical projects are still far from implementation.⁹

A \$4.5 million (European Currency Unit, ECU) Gum Arabic Development project that might soon be funded by the European Community overlaps with

9. Unless otherwise indicated, the information in the remainder of this chapter is from Farouk H. Ahmed.

DECARP in terms of geographical area and long-term objectives, but differs in method of implementation since only the larger farmers (those with holdings exceeding 21 hectares) will be offered trees to plant on their land and the project will have expatriate management [4]. This program's relationship with the DECARP-Unit has not yet been decided.

While the DECARP-Unit and UNSO developed an implementation plan for the program, the government independent of UNSO agreed with some voluntary agencies to start two projects included in DECARP. The Sudan Council of Churches, supported mainly by Swedish private organizations, started Sand Dune Stabilization through Afforestation in the Nile Province in 1977. The area planted by June 1980, mostly with *Prosopis Chilensis* and various *Eucalyptus* species, amounts to 216 hectares [18], compared to a target of 422 hectares [19]. The government will try to replicate this project in the Northern Province under DECARP.

The other project, the Integrated Sahel Program, was started in North Kordofan Province in 1980 with the Swiss-based International Union for Child Welfare (IUCW) as the sponsoring agency. The government initiated the Restocking of the Gum Belt project in 1981 by taking over from IUCW some of its North Kordofan activities. These combined projects will be presented and evaluated in the next chapter.

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Chapter 4

DESCRIPTION OF PROGRAM AREAS¹⁰

This chapter provides a description of the land holding system, water supply and fuelwood situation, and agricultural systems practiced in each of the program areas included in the community reforestation programs of the 1970s and 1980s. It also provides some perspective on the makeup of the population, land use, the water and energy situations, the extent of community organization present in the regions, the role and privileges of women, and the impact of nomads in the area. These data provide a basis for comparison of conditions between the regions and the reader can refer to chapter 5 regarding the response of the centers to reforestation and integrated development programs.

Simeih

The old village boundaries as registered in the 1930s leave no land outside the trusteeship of the sheikhs. Despite a population increase, each sheikh controls enough land in the area to satisfy demands of both village people and newcomers. Once land has been allocated, it stays in the family and is inherited according to Islamic law. All women have land, and some 25 percent cultivate it, while another 25 percent employ fellow villagers to cultivate for them. These show the highest percentage of women's use of personal land and probably reflect both the abundance of land and strict observance of women's rights according to prevailing inheritance rules. Another reason might be that women, to a large extent, have been freed from the role as suppliers of water since the early 1970s and thus have more time to spend on agricultural tasks. Prior to the Sahel drought, women drew water from shallow wells and natural reservoirs close to their villages. After several years of rainfall the ground water has

10. Information about Integrated Sahel Program/Restocking of the Gum Belt drawn from plans and reports, interviews with staff, politicians, public officials and villagers.

disappeared and water must be carried by donkeys up to 20 kilometers from an artificial reservoir in clay soil close to Simeih. Because tradition and household chores prevent most women from spending the whole day collecting water so far away, men and children have taken over this task.

After four to six years of cultivation, the fields are left fallow in gum gardens for nine to eleven years. In addition, most farmers have waste land which is not part of the agroforestry cycle. Due to desertification, caused to a large extent by lack of rain, agricultural yields have declined by some 50 percent during the last ten years.

Women collect dead wood for fuel and do not report any difficulties in getting enough at short distances from their homes to cover their needs.

Fourteen of the sixteen villages clustered around the nursery are organized within farmers' production cooperatives which have access to cheap credit from the Agricultural Bank of Sudan. Such cooperatives are not found in any of the other centers. Sheikhs and other members of the Cooperative villages meet regularly in a farmers' union in Simeih and, in most villages, the obligatory Sudan Socialist Union (SSU) units function.

Umm Ruwaba

In Umm Ruwaba, land use and availability as well as inheritance rules are similar to the Simeih area. However, a lower percentage of women cultivate their own land, reportedly because they are too busy with household chores including the fetching of water and fuelwood. In addition, most women assist in clearing and cultivation of their husbands' land.

Although proper fallow periods are usually observed, crop yields have declined by an estimated 30 percent in ten years. The decline is due mainly to a number of years with insufficient rain. Umm Ruwaba is a main gum arabic producing area, but production has gone down recently, reportedly because people have started to cut gum-bearing trees to meet the fuelwood needs of the growing population. Distance to forest stands from the villages has increased due to overcutting, and men have started to assist the women in the collection of firewood using donkeys for transport. A number of households also buy charcoal from professional burners.

Not all Umm Ruwaba villages are well organized in SSU and farmers unions, and participation is especially low among women.

Ghabsha

The Ghabsha area suffers from extreme land shortage due to population increases. This situation has been intensified by immigrants expecting job opportunities along the railway line built at the beginning of this century. Immigrants often find they must turn to subsistence agriculture to support themselves. Since the sheikhs want to keep land for the original village members and there is no land between village boundaries, newcomers never get their own land and are left to rent from others. Due to the land shortage, women as a rule do not inherit land, and there are few female landowners. According to the sheikhs, this practice has developed in order to slow down the extensive land fragmentation which leaves each male farmer with too little land to support a family.

The tradition of agroforestry died more than fifty years ago when the fallow period was shortened to allow for more intensive agriculture. Now most farmers have small holdings which they cultivate continuously. Some sheikhs and other particularly knowledgeable farmers associate the dramatic decline in yields--estimated at over 50 percent during the last ten years--with intensified land use. But the majority of the farmers do not seem to understand the causes of declining yields. Only the few farmers who have more than 7 hectares of land leave their plots in fallow for five to six years after three to four years of cultivation. In the dry season, many families migrate to seek wage labor in the Gezira irrigation schemes. It has become common for some of the family members, most often the women, to return in the rainy season to cultivate the land.

Women and children are responsible for collection of firewood and water. *Calotropis Procera*, which grows only where the natural vegetation has disappeared, is the dominant tree species and main fuel source. The area obtains drinking water from various deep wells, but the supply is unstable due to frequent breakdowns of pumps and the distance to a running water source which may exceed 10 kilometers. All family members take part in water collection.

Organization in SSU and farmers' unions are even weaker here than in Umm Ruwaba.

El Ein

Most land surrounding El Ein nursery is registered by the government for use as forest reserve and water reservoir, so the nearest villages are found 15-25 kilometers southwestward on noncracking clay soil (gardud) which in patches is covered with goz. Apart from the reserved areas, all land is under the trusteeship of sheikhs. Due to population increases, all goz land has been allocated to farmers, but the less fertile gardud soils are used in common by all villagers, free of charge, for wood collection and grazing. Women used to get land according to Islamic inheritance laws, but for the same reasons as in Ghabsha their rights now are not always observed. Some female farmers have 5 hectares of land, and most male farmers have 14 hectares. Most women work on their husbands' fields and sometimes get 1 hectare to cultivate on their own. The cash earned from this is controlled by the women, although all marketing of produce is done by men. Newcomers might get land, but only after a tenant period of at least five years. The villages are situated along nomadic routes and suffer from the intrusion of grazing herds on agricultural and waste land.

Rotational cycles of five years of cultivation followed by five years of fallow are found in a few villages, but where land shortages are more acute, the plots are now worked continuously. Agricultural yields have dropped by some 30 percent in the last ten years. Because of intensified agriculture and overcutting of wood for fuel, gum production declined until 1967 when most *Acacia Senegal* was uprooted in an earthquake. Here the population has learned through bitter experience that disappearance of *Acacia Senegal* stands leads to decline in soil fertility and they welcome the program as a means to achieve ecological balance again.

The firewood crisis is quite severe, and since the people are relatively poorer than in the other program centers, only a few can afford to buy charcoal from the nomads who pass through the area from the south on their way to the El Obeid markets with fuel. Furthermore, most villages suffer from water shortages and it is not uncommon for two members of a household to spend the whole day collecting water. Some young males have started delivery by horse- or donkey-driven water carts.

Besides some SSU and farmers' unions, the villages have traditional self-help schemes, including the collective building of schools and well-digging.

El Obeid

Around El Obeid, villages are separated by unregistered government land, and all areas classified as village land have been allocated to farmers. Land shortage is on the increase and women's inheritance rights to land are not always observed. Furthermore, female landholders often let male relatives cultivate their land, and eventually give away their right to it. As compensation, the women might get 1 hectare of this land to cultivate on their own. On such land they tend to grow cash crops for personal profit, while the men grow both food for consumption and cash crops and are responsible for maintaining the family. The common farm size is 14 hectares per male and 3 hectares per female farmer. None of the villages has any common land. Quite a number of farmers control more than 140 hectares, however, which is often land they have taken over from relatives who have migrated to El Obeid in search of wage labor. Allocated land remains in the family, if not assigned to newcomers who might get land upon the sheikhs' consent after a tenant period of two years.

Proper rotational cycles of five years of cultivation and fifteen years of fallow are commonly observed, but agricultural output and gum production have declined due to lack of rain, overcutting of wood for fuel, and grazing. Fires destroy the rich grass cover on fallow land leaving domestic and nomadic animals to browse the Acacia Senegal, the most common tree in the area.

Firewood is scarce in all villages and the use of charcoal produced by male farmers is on the increase. The water reservoirs found in the area do not meet the demands of the growing population, especially since silting in recent years has reduced their capacity. Water is transported by donkeys or camels and the odd commercial or government water lorry from El Obeid. To a large extent water is paid for with cash obtained from charcoal sales.

The villages are rather weakly organized in SSU and farmers' unions.

Bara and Azhaf

Bara villages are separated by unregistered government land, and none has common land. Islamic inheritance rules are observed, so most women have land. Other women cultivate their husbands' land as in the El Obeid area. The men's holdings are approximately 10 hectares and the women's 4 to 5 hectares. There are few newcomers to the Bara villages.

The common rotational cycle is four to five years of cultivation followed by six years of fallow, and gum is tapped for a few years before the live trees are cut for fuel. Desertification is severe around Bara, and agricultural yields have declined by 30 to 50 percent in the last ten years. Many farmers associate the dramatic decline in yields with the present tree cutting practices and reduced fallow periods.

In the area surrounding Azhaf villages there is less unregistered government land than in the Bara area. Due to emigration of the original farmers of Azhaf (which used to be an important center in North Kordofan during the last century), and since settling nomads are given land on a tenant basis only, the land here is controlled by relatively few farmers with holdings exceeding 140 hectares. Women are given land according to need rather than Islamic inheritance rules, and thus tend to have farms as big as those of men. Emigrants' land is returned to the sheikh and immediately distributed to needy descendants of the original dwellers. In Azhaf, newcomers never receive permanent rights to land. The other villages in the area were established just before village boundaries were drawn by the government and traditional leaders in the 1940s. They have since experienced a large natural population increase which has led to land fragmentation and holdings averaging only 14 hectares.

Fallow exceeding cultivation periods are not always observed, and yields have declined by some 30 percent in the last ten years. As in the rest of North Kordofan, the decline is caused in part by some bad rain years. Like those in Bara, however, the people in this area are aware that current agroforestry practices make the situation worse. Furthermore, all village land is now used for agriculture. These factors, combined with heavy grazing by nomads' herds and commercial fuel production from young trees, have caused an imbalance in the ecosystem. Sand from overexploited fields invades fertile land, and huge sand dunes have formed which bury both agricultural land and villages.

While women collect firewood only for their own use in Bara and Azhaf villages, a number of male farmers cut gum-bearing *Acacia Senegal* for commercial charcoal production and sale to Bara and El Obeid consumers. They say, complaining about the sheil system of marketing, that fuel gives greater economic return from the trees than gum does. Together with nomads

and newly settled villagers, they secretly damage trees to make them die, thus evading the sheikhs' decrees that no live trees shall be cut.

Neither Bara nor Azhaf villages have any significant traditions in self-help schemes, but their SSU and farmers' unions function.

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Chapter 5

INTEGRATED SAHEL PROGRAM

The Plan

Planned Activities

The overall goal of the Integrated Sahel Program, as stated in the project document signed by the Government of the Sudan and the International Union for Child Welfare (IUCW) in May 1980 was to offset adverse economic, social and ecological imbalances within the 5,000-square-kilometer triangle between Bara, El Obeid and Ghabsha in the Province of North Kordofan, the core of the Gum Belt. The program built on the Restocking of the Gum Belt project formulated as part of the Desert Encroachment Control Rehabilitation Program (DECARP). It set out to alleviate some of the causes of deteriorating living conditions experienced in the area by (1) providing encouragement for people to continue cultivating potentially rich arable land, and (2) halting the tendency of migration to already overpopulated larger villages and cities.

The immediate objective was to restore the traditional agricultural system of rotational farming, including the intercropping with Acacia Senegal explained in chapter 1. This program aimed to reduce sand creep and improve soil fertility, increase agricultural output and farmers' earnings from the cash crop gum arabic, and improved availability of wood for fuel. At the national level, one important effect would be to increase export revenues and to prevent fluctuations in world demand of gum arabic by providing a steady supply.

Together with national counterparts, IUCW included the DECARP project in a community development program. Thus, once the restocking of Acacia Senegal in this part of the gum belt was well under way, other activities aimed at improving village life would be implemented. Plans for such activities were not worked out in detail in the signed project document. It was agreed, however, that the program activities as a whole should have an integrated approach and the planned reforestation would only be a

starting point for a comprehensive community development program. In particular, attention was focused upon the need to improve the water situation throughout the program area. The action plans for improved water supply and other activities were to be prepared in the field during the first year of implementation by the program staff in collaboration with the target groups and government agencies. The proposals and budgets would be presented for agreement between the government and the executing agency before additional funds for such activities were sought.

During the first year of implementation, four main nurseries were to be put into operation for the production of Acacia Senegal seedlings. The nurseries to be located at Bara, El Obeid, Umm Ruwaba and Ghabsha were to act as development centers for their surrounding areas. El Ein and Simeih nurseries would complement El Obeid and Umm Ruwaba respectively. All nurseries would be situated within nurseries set up by the forest department. Bara and El Obeid nurseries, which had been out of use and without water supply for years, would be restored, and the well-functioning Umm Ruwaba, Simeih and El Ein nurseries expanded. In Ghabsha, a new nursery would be established. For the rainy season of 1981 each nursery would produce 225,000 seedlings, for a total of 900,000 seedlings. The total area to be planted with seedlings would amount to 1,260 hectares. In addition, an equivalent area would be sown with 5,000 kilograms of good quality seeds. All seeds and seedlings would be provided free of charge to the farmers of five villages surrounding each center for them to plant on their own land, and to schools which would implement the "Green Education Program" previously proposed by the government. The goal was to have 240 families plant seedlings and sow seeds the first year. Since the centers vary with respect to fuelwood availability, gum production, agricultural practice and output, population density, grazing intensity and distance to larger population centers, the comprehensive experience drawn from these varied conditions could be the basis for later reforestation activities throughout the Gum Belt.

First year activities would also include presentation of the program to local government officials and promotion of the entire program to the first twenty participating villages. Since the Integrated Sahel Program was the first international aid project in the area based upon the active participation of the target groups themselves and aiming at self-help

activities, particular attention would be given to presenting the program to the population and to gaining their confidence before activities started. Program committees would be established at four levels:

1. village committees to act as communication agents between farmers and the program staff;
2. district committees comprising representatives from each village to coordinate work in each center;
3. a provincial committee consisting of government officials to facilitate program activities at the headquarter level in El Obeid;
4. a central committee in Khartoum for the various ministries involved to act as a policy-making instrument and coordinator of other activities with goals similar to or overlapping those of the Integrated Sahel Program.

Furthermore, the staff recommended that the forest department be trained in community forestry extension techniques to act as extension agents for the villagers and the schools receiving seeds and seedlings. Plans for community development activities were to be presented to the executing agency for appropriate formal follow-up before implementation.

In the second year, total seedling production would be increased to 1.2 million and in year three the estimated 1.5 million maximum annual capacity would be reached. The provision of good quality seeds would be increased accordingly, so that at the end of the planting season of 1985, 18,480 hectares would be covered by Acacia Senegal, 50 percent of which were started as seedlings from four nurseries. In program year three investigations and surveys would be conducted to study establishing new nurseries in areas adjacent to the four main nurseries to serve villages further away, as well as methods for supplying water in areas where water is now provided by merchants for a fee. In 1984 water storage schemes would be implemented and experiments into efficient cooking methods begun. Project activities are scheduled to be completed in 1985 at which time it is anticipated that water provision, improved cooking methods and other community development activities, including health measures, should be widespread and well established within the program area.

After five years, the external financial support for reforestation activities within the Integrated Sahel Program would cease, and the government would have responsibility for continuing the activities. Funding and assistance for the implementation of other community development activities might be required for some years to come.

Benefits and Beneficiaries

The beneficiaries of the program would primarily be farming families within the program area. The aim was to involve especially the poorest families with small land holdings, and particular emphasis was placed on involving women in tree planting activities. The village committees were to have members representing all segments of the community, and as they listed all farmers interested in receiving seeds and seedlings, emphasis would be on families with the smallest earnings. Prior to program implementation, the government committed itself to taking steps aimed at increasing the farm gate price of gum to reduce the impact the shell system and other obstacles to gum production have in the marketplace. One such measure would be to introduce cheap credit facilities through the Agricultural Bank of Sudan to members of cooperatives wanting to plant Acacia Senegal. In the presentation of the program, the staff would give advice on and recommend intercropping Acacia Senegal with agricultural crops rather than propagating pure gum plantations, partly because only the more well-to-do, predominantly male, farmers have sufficient land to commit to gum plantations alone, and partly because of the importance of Acacia Senegal to agricultural output and the farmers' economy. It is estimated that the growing of Acacia Senegal together with other crops might increase agricultural output by 15 percent [4].

Prior to the start of the program, representatives from several villages in the area had approached the government and other agencies actively seeking to participate in activities of this sort. A sense of obligation among these villagers to carry out activities on a self-help basis, if assistance from external bodies would be provided in the initial stages, was noted by those who formulated the reforestation plan. Local participation and commitment were thus expected to be high. The population of the program villages would be invited to participate in evaluation and in continuous planning of the reforestation scheme as well as in planning

community development activities to follow reforestation. This participation represented an important condition for a program which would truly benefit the target groups.

Town people would benefit both from reduced immigration (by experiencing less competition for scarce jobs in the already overpopulated cities) and by getting more food and fuel for their markets.

The forest department would benefit from the influx of financial and material resources as well as from involving its employees in vital and interesting work. This is particularly true for the forest rangers assigned to the program who would be involved in the implementation of existing plans and the formulation of follow-up activities, thus expanding their professional responsibilities from forestry on government land to agroforestry on village land combined with other development activities.

The country as a whole would gain from a steady or even increasing supply of gum arabic to the world market. The financial situation and dependence on imports of vital products create an immense demand for foreign currency, and gum arabic represents an important foreign currency earner in this connection.

Budget

Budget projections (covering the reforestation part of the program only) for five years were worked out by the IUCW Geneva Headquarters and included in the agreement with the Sudan government (see table 5-1).

From the start of the program it was evident that IUCW would have difficulties in providing their share of the planned expenditures for first year activities. The total funds available to the program amounted to U.S.\$60,000, coming from IUCW's fundraising agency, Enfants du Monde, Switzerland. In addition, the governments of the United States, the Netherlands, and the UN Voluntary Fund for the Decade of Women had indicated support amounting to approximately U.S.\$2.2 million. However, all parties deemed it important to begin activities in 1980. The administrator in the field, together with the forest rangers, worked out a revised budget for program year one based on a more realistic estimate of funding and on new priorities with respect to nursery construction.

During early travels in the program area, the management team learned that the population would welcome the program with enthusiasm and that the

Table 5-1. Reforestation, Program Budget
Years 1-5--External Contribution
(U.S. dollars)

Expenses	Year 1			Year 2 (external contribution)	Year 3 (external contribution)	Year 4 (external contribution)	Year 5 (external contribution)	Total (external contribution)
	Sudan Government	Farmers' contribution	External contribution					
Salaries and labor	\$126,000	\$48,000	\$ 85,480	\$ 92,400	\$ 65,000	\$ 64,000	\$ 64,000	\$ 370,880
Buildings and construction	30,000	--	10,860	--	--	--	--	10,860
Vehicles and machinery	60,000	--	--	--	--	--	--	190,900
Equipment	7,500	500	19,400	6,000	6,000	--	--	31,400
Material and running costs	20,000	12,000	100,525	100,205	106,390	91,790	98,680	497,590
Administration/ Geneva	--	--	108,176	64,900	65,560	61,077	62,506	362,219
20% inflation	--	--	--	52,700	48,590	43,373	45,037	189,700
Total	243,500	60,500	515,341	316,205	291,540	260,240	270,223	1,653,549

Source: Present study.

^a From year two to five the Sudan government would continue paying wages to forest staff plus seeds and polythene bags. From year six onwards, that is, after estimated government takeover of reforestation activities, yearly running costs are estimated at U.S.\$111,540 plus salaries to permanent forest staff.

^b From year two onward the farmers would continue providing labor, tools and work animals for their work on own land.

demand for seeds and seedlings would greatly surpass what the original plans set out to provide. After consultations with forest department staff and IUCW, it was decided to include Simeih and El Ein nurseries as main centers in addition to the four already planned, and to have each of the six centers produce 200,000 seedlings of Acacia Senegal, making the overall target for program year one 1,200,000 seedlings.

Because reestablishment of the Bara nursery appeared too expensive considering the funds available, plans for this were laid aside. Agreements were made instead to have two farmers in the oases of Bara and Azhaf produce 100,000 seedlings each in their private irrigated gardens. The program would cover production costs and provide for silvicultural supervision, leaving the organization and daily running of the work to the farmers who would participate in the activities on a non-profit basis.

The budget revisions concerned only field activities and not that part of the budget administered by Geneva Headquarters, which was not affected by priorities put forward from the field. This revised budget (see table 5-2) became the working tool for the planning and execution of activities at the field level and is itemized in the following table.

This budget suggested that activities might be carried out with less funds than originally planned and treated any additional funds raised to meet the original IUCW government budget (a difference of \$140,000 between the original and revised budgets) as a reserve fund. Vehicles and Machinery and Material and Running Costs were cut drastically after a more modest vehicle program was suggested. Radio communication sets were included, thereby increasing the Equipment line item. Other differences in line items are mainly due to redistribution, particularly among the first six items.

IUCW would pay the salaries of the management team (one national and two expatriates) and of occasional labor. In addition, IUCW would top the wages of foresters assigned to the program, since it has become a practice in the Sudan that officials working on projects financed by foreign aid receive standardized incentives. IUCW would also pay travel and other allowances. Responsibility for staffing of all other posts rested with the

Table 5-2. Reforestation Program Revised Budget
Year 1--External Contribution
(U.S. dollars)

Salaries and labor		\$ 66,817
Coordinator/administrator	\$34,285	
Project manager	6,857	
Allowances, government staff	5,475	
Travel and overtime, government staff	9,000	
Drivers' overtime	4,800	
Occasional labor	6,400	
Buildings and construction		\$ 18,377
El Obeid center	\$ 472	
El Ein center	630	
Simeih center	1,210	
Umm Ruwaba center	1,449	
Ghabsha center	3,276	
Bara and Azhaf centers	8,820	
Villages	1,260	
Water storage tanks	1,260	
Vehicles and machinery		\$ 81,144
Motor vehicles	\$50,400	
Locally made vehicles	18,900	
Water tanks, movable	6,804	
Water pumps	5,040	
Equipment		\$ 42,681
Office, El Obeid Headquarters	\$ 901	
Field	38,000	
Household, coordinators	3,780	
Material and running costs		\$ 44,500
Polythene bags	\$ 5,000	
Seeds	5,000	
Office material and PTT	2,000	
House rents, management team	6,000	
Fuel	5,500	
Fodder allowance	4,200	
Material freight	2,000	
Insurance, vehicles	2,300	
Spare parts and maintenance, vehicles	12,500	

Table 5-2 (cont'd)

Miscellaneous		\$122,318
Contingencies	\$15,000	
Coordination, Geneva headquarter	20,600	
Administration, Geneva headquarter	67,218	
Insurance, management team	11,500	
Travel, management team	8,000	
Reserve fund		\$139,504
Overall total		U.S.\$515,341

Source: Integrated Sahel Program, addendum to monthly report May 1980. El Obeid, May 1980.

government, which was to assign the following personnel from the provincial Department of Forestry:

- 4 forest rangers
- 8 forest overseers
- 32 extension officers
- 23 skilled laborers.

In addition, the leadership of the Provincial Forest Department (consisting of one Conservator of Forests, his three assistants and three Forest Officers) would take part in program activities.

All work for the establishment of nurseries and seedlings was planned and carried out by program staff, although villages would be asked to collect seeds from good stands of Acacia Senegal and do all work related to the outplanting of seedlings and sowing of seeds on their own farms.

Implementation

Staff

The first year's management team (two men and a woman) consisted of a forester who served as project manager, a geographer who served as project coordinator, and a trained administrator. The latter two were the only

expatriates on the program. The project manager, who had been instrumental in the program planning phase, monitored progress from his base in Khartoum, and to a limited extent visited field sites to participate in management and other activities.

The forest department assigned three full-time and three part-time forest rangers to work on the program. In reality, the work of all rangers exceeded full-time. In addition, permanent staff (nursery workers and guards) in five nurseries were added to the program.

Field Expenses

Table 5-3 shows actual expenses of field operations in the first year.

A detailed breakdown of the item including wages and allowance shows that occasional labor was over (revised) budget. Prevailing uncertainty about forthcoming funding necessitated postponement of nursery construction and increased use of occasional labor once limited funds came forward to get the nurseries operational on time. Reconstruction of an abandoned nursery (El Obeid) and the establishment of a new one (El Ghabsha) turned out to be far more costly, while the expansion of the others was less than expected when the revised budget was made (see table 5-4). This might be a reflection of the various center leaders' level of experience in estimating expenses and organizing work. Also, no houses were built for extension staff, as the extension part of the program was far behind schedule. Due to lack of funds the program operated with only one Landrover pick-up truck instead of the planned vehicle pool of six Landrovers, three tractors and one lorry (IUCW budget). Consequently no trailers or water-tanks were built locally as planned. For the same reason, field equipment including radio communication sets were not purchased. Polythene bags and seeds, which were paid for by IUCW contributions, were budgeted to U.S.\$5,000 but cost approximately U.S.\$17,000. Only one house was rented for the management since the national expert lived in Khartoum. Fuel and insurance costs were greatly reduced due to lack of vehicles. Animals were not used either, so no fodder allowance was paid.

Table 5-3. Field Operation Costs May 1980-April 1981
 Distribution of Sub-items^{a,b} and Percentages
 (U.S. dollars)

Sub-item	Subtotal	Subtotal (percent)
Allowances (government staff)	3,756	4.1
Travel allowance/overtime (government staff)	1,468	1.6
Drivers' overtime	323	0.4
Occasional labor	13,671	15.0
Buildings and construction		
El Obeid	3,010	3.3
El Ein	435	0.5
Simeih	156	0.2
Umm Ruwaba	1,171	1.3
Ghabsha	1,764	1.9
Bara/Azhaf	3,500	3.8
Water storage tanks	298	0.3
Motor vehicles	18,315	20.1
Office equipment, El Obeid	641	0.7
Field equipment	1,369	1.5
Household items, coordinator/administrator	4,629	5.1
Polythene bags	17,119	18.7
Seeds	4,423	4.9
Office running costs, PTT	275	0.3
House rents	2,696	3.0
Fuel	3,010	3.3
Material freight	660	0.7
Insurance vehicles	6	0.0
Maintenance/spare parts vehicles	560	0.6
Contingencies	3,538	3.9
Travel management	4,339	4.8
Total	91,132	100.0

Source: Integrated Sahel Program, Financial statement May 1980-April 1981. El Obeid, May 1981.

^aBudget sub-items excluded (administered by IUCW/UNDP):
 Wages, coordinator/administrator
 Wage, project manager
 Coordination, Geneva
 Administration, Geneva
 Insurance, project management

^bEmpty sub-items:
 Buildings and construction, villages
 Locally made vehicles
 Water tanks, movable
 Water pumps
 Fodder allowance

Table 5-4. Nursery Costs, May 1980-April 1981
(U.S. dollars)

Project center ^a	Allowances government staff	Travel- allowances/ overtime	Occasional labor	Buildings and construction	Water tanks	Polythene bags	Fuel	Total
Ghabsha	675	880	3,325	2,184	229	3,346	428	11,067
Umm Ruwaba	550	473	1,471	1,464	--	3,281	271	7,510
Simeih	425	94	2,940	148	140	3,281	188	7,216
El Ein	425	--	1,800	319	141	3,610	188	6,483
El Obeid	425	70	3,366	3,474	--	3,281	45	10,661
Bara/Azhaf	238	90	179	3,500	--	3,281	313	<u>7,601</u>
Total								<u>50,538</u>

Source: Present study.

^aPercent distribution:

Ghabsha	21.9%
Umm Ruwaba	14.9%
Simeih	14.3%
El Ein	12.8%
El Obeid	21.1%
Bara/Azhaf	<u>15.0%</u>
Total	<u>100.0%</u>

Table 5-5 compares actual expenditures with the original and revised budgets. The balance of U.S.\$91,130 constitutes 23 percent of the field related expenses of the original IUCW budget and 38 percent of those of the revised budget which were estimated to be the minimum for securing reasonable progress and program output for year one.

Table 5-5. Comparison Between Actual Expenses and the Original and Revised Budgets (U.S. dollars)

Items	Actual expenses	Difference from original budget	Difference from revised budget
Salaries (local)	\$19,219	\$-6,261	\$-6,456
Buildings and construction	10,331	-529	+8,006
Vehicles and machinery	18,315	-172,585	-62,829
Equipment	6,640	-26,040	-42,681
Material and running costs	28,731	-71,794	-15,769
Miscellaneous	7,894	-20,906	-26,606
Balance	91,130	-298,209	-146,336

Source: Integrated Sahel Program, Financial Statement May 1980-April 1981. El Obeid, May 1981.

By May 1981, around one million seedlings were growing well in the seven nurseries and on schedule for outplanting in July. In addition, 6,300 kilograms of good quality seeds were in storage for broadcasting. Thus 3,015 hectares of farmland could be covered with *Acacia senegal* seedlings and seeds in the first rainy season, as opposed to the 2,525 hectares planned.

Villagers' Response to Reforestation Plans

According to the project proposal, five villages would receive seeds and seedlings from each nursery. There was interest in the program among

the local population throughout the program area, and in May 1981, 40 villages were registered to take part in reforestation in the coming rainy season. Of these, three belonged to Bara center, four to Azhaf, six to El Obeid, four to El Ein, five to Umm Ruwaba, four to Ghabsha and fourteen to Simeih center. The project management accepted such a large number in the Simeih because the villages are organized in a union of cooperatives which volunteered to take active part in extension work.

By May 1981, 2,100 farmers in twenty-seven villages were registered as recipients of seeds and seedlings. The total land area these farmers wanted covered in program year one was 8,543 hectares, with 3,919 hectares to be covered by seeds and 4,624 hectares by seedlings. The number of farmers registered constituted an estimated 80 percent of all farmers in these villages, and 500 of them were female. It was evident, even before the remaining thirteen program villages had submitted their order lists for seeds and seedlings, that demand would be far in excess of supply.

Committees

Committees were set up in all villages. As a matter of course the sheikhs acted as committee leaders. The number of members elected by the villagers in public meetings varied from seven to fifteen according to the population size of the village. Upon request (and in some instances mild pressure from the program staff), three to five women were selected by the villagers to serve on each committee. Committee work progressed in some villages by the end of April 1981, and a number of meetings with and without program staff had been held. Some committees had at that time only just begun the task of listing *Acacia Senegal* recipients.

Only in Simeih was there any kind of organized committee work at the district level. Sheikhs from the fourteen program villages there discussed program matters at the monthly farmers' union gatherings. Neither the villagers nor the staff felt any immediate need for planned district committees, as bilateral communication would take place when people from various program villages met occasionally. Such committees might prove useful in situations which arose later.

At the province level there was cooperation with government officials from a number of departments and from the regional administration. Through frequent formal and semi-formal meetings with the staff, officials were

kept informed about program development and were consulted about future planning and implementation. Still, a formally established committee have facilitated communication.

Cooperation with officials at the central level could certainly have benefited from the existence of a program committee. Directives from the central government level and reports from the field to the Ministry of Agriculture, for instance, were forwarded but not received due in part to misunderstandings and poor coordination within the program's management team. This might have been avoided through a formalized means of communication between the field and the central government.

Planning of Community Development Activities to Follow in the Wake of Reforestation

Program staff in cooperation with villagers and government officials planned a number of activities aimed at improving village life and submitted the action plan to the agency. All activities would be carried out on a self-help basis with limited funding, consultants provided by the agency, and some personnel from various government departments. These activities are listed below in the order of priority given by the villagers.

Water provisions. All seven districts suffer from an inadequate water supply. Some village committees said that their sole reason for joining the program was the hope of also improving the water situation. Without adequate drinking water they would have to abandon their homeland and there would have been no point in planting trees. One district had been supplied from wells dug to a ground water layer 15 to 20 meters below surface. This water disappeared as a consequence of the Sahel drought and is not expected to come back until after a good many years of adequate rainfall. Another district never had its own water sources and people therefore were compelled to transport water by donkeys from reservoirs and other sources up to 25 kilometers away from their settlements. These measures take children away from school and adults from agricultural tasks, and reinforce both seasonal and permanent emigration. Inadequate consumable water leads to dehydration and poor quality water leads to other health hazards. These two districts proposed that external funds be used to transport water by

vehicle and tanker, with operating costs, and repair and replacement of broken down vehicles paid by the consumers. The five remaining districts experience occasional water supply crises due to broken down pumps and permanent scarcity due to increased demand from the growing population. Separate projects were suggested to assist these areas.

Training of traditional birth attendants. On most villagers' list of options to improve village life, trained midwives ranked before energy saving devices and after improved water supply. The villagers have seen that death, illnesses, and infections have declined dramatically when government-trained midwives have been assigned to their communities. Since educating sufficient professionals to meet demand is not feasible, it was suggested that courses in hygiene and sound health practices be offered to traditional birth attendants.

Production of charcoal and consumption of wood for fuel. The energy crisis is serious in all villages in the program area and most acute in the northern part and in Ghabsha. In wood-scarce areas the women as a rule perceive the energy problem as more severe than do the men. Throughout the area, charcoal is produced in inefficient earth kilns, and wood and charcoal are burned in the open or in inefficient stoves. Testing of selected kilns and stoves before distribution was suggested. The idea of village fuelwood plantations was left for follow-up by the Forest Department.

Treatment of water. Contamination of water by humans and animals is common at the open reservoirs, well sites and within households. Campaigns were suggested to inform people about hygienic water treatment, to include simple ways of protecting wells and reservoirs from contamination and keeping water for drinking uncontaminated.

Health campaigns. To some extent the very low standard of health in the program area can be ascribed to lack of information. Large scale information campaigns at the village level and visits by health personnel to individual households for inspection and advice were suggested.

Sanitation. Sanitation practices are unhygienic and cause disease, particularly in larger villages. The introduction of simple pit latrines was suggested.

Adult education for women. Women in villages with relatively satisfactory fuelwood and water supply wanted some education, albeit late

in life. Courses covering health, birth control, and home economics were given highest priority in the plans.

Nomad programs. Arrangements must be made to discourage grazing of agricultural waste from fields intercropped with Acacia Senegal. The setting up of fodder stations, combined with provision of health care to nomads and their herds, was suggested.

Transfer to New Executing Agency

IUCW had to withdraw as executing agency due to internal difficulties. For an interim period, the UNDP office in Khartoum channeled released funds from the UN Voluntary Fund for the Decade of Women to field activities. After months of discussions between various UN agencies, donors, the government, and IUCW, it was decided to combine the nurseries, local forest staff, villages, and equipment of the Integrated Sahel Program into the Restocking of the Gum Belt project, which UNSO/DECARP now was ready to implement. According to DECARP project policy, the Sudan Government then decided it would execute the project and the transfer was made in May 1981. With this arrangement, U.S.\$1.5 million donated by the Netherlands to the reforestation activities almost a year earlier was released three months after finalization of the project transfer.

Restocking of the Gum Belt

Plan

The transfer of project activities from IUCW to the government has led to changes in some of the objectives. The aims of the reforestation part of the project remain substantively the same, with the significant difference that the smallest farmers might be excluded from participating. Plans are to offer seeds and seedlings only to farmers with more than 3.5 hectares of land, the reasoning being that it is uneconomical to cultivate gum for sale on smaller plots. There is strong opposition to such a limitation from the villagers themselves. They argue that even small farmers will benefit economically from gum production and that it is of particular importance that small holdings, which tend to be cultivated more intensively than large holdings, become stabilized to prevent sand creep and that their soil be improved through the planting of nourishing trees.

The project covers three years, with targets of 1.2 million seedlings and a certain quantity of seeds being planted annually. In addition to the five government nurseries already in operation, a new one remains to be established in Bara.

According to the project document, the support for seedling production by private farmers will be stopped. The present Regional Minister of Agriculture, however, has proposed that small Acacia Senegal nurseries be established in all villages where water is available so that farmers can cultivate their own seedlings.

The program's integrated approach has been replaced by a sectoral approach and the restocking project will deal with reforestation only. The central Ministry of Agriculture and its Department of Forestry argue that the executives of the Integrated Sahel Program had imposed an integrated approach in order to foster cooperation between various government ministries and departments, at least until government takeover at the end of the project period, but that a sectoral approach was more in line with basic public management principles.

All parties realize, however, particularly after the first year's experience, that reforestation in itself is not enough to improve the living conditions of most participants to any significant degree. Thus work has started to bring, for example, water supply and energy-efficient stove projects to the area. These efforts will be separate from the restocking project as regards foreign funding and project administration, but some cooperation might take place in the field.

The restocking project budget amounts to approximately U.S.\$1.5 million in foreign contributions. The line items do not differ significantly from the previous project's revised budget, except as regards administration and salaries. It is not known how much UNSO and UNDP will charge for their services, but it is expected to be relatively less than the administration costs charged by IUCW under the former agreement. All basic salaries are to be paid from the forest department budget, with their budget overruns to be paid from external funds. As the management team, drivers, and extension workers have been added to the list of those receiving monthly incentives, this line item has been increased from U.S.\$5,475 in the revised IUCW budget to approximately U.S.\$34,500 (a 630 percent increase).

The responsibility for execution of the restocking project rests with the provincial forest department, which has its headquarters in El Obeid. The Assistant Commissioner for Forestry and his deputy will lead the project in addition to their other duties, while the third member of the management team, a forester/sociologist transferred from the central forest department, will work full time on the project. This arrangement might lead to less direct contact between the management and the rest of the staff than previously, which is regretted by the rangers in charge of the various centers who say they will miss continuous support and supervision. On the other hand, the project activities might become more closely integrated with other public forestry work. The change in management furthermore implies that the whole project staff is now male, a fact which might reduce the chances of establishing contact with female farmers.

Implementation

As the villagers learned about the changes outlined above, some decided not to accept seeds and seedlings. Some withdrew because they learned that the water supply project might be excluded; others withdrew when the expatriates in the management left, since representation of the international financing community was regarded as an assurance against a possible government claim of the trees at a later stage. The ramifications of the 1971 law, which confirms that all land belongs to the state, has gradually been understood by the farmers, particularly as they saw the powers of their omdas and nazirs vanish. Thus the law becomes an obstacle to their participation in a reforestation program on lands they considered permanently theirs. Reassurance from trusted forest rangers that nobody would take away from the farmers the trees planted seemed to expedite implementation of the Integrated Sahel Program. Nevertheless, the participants would have much appreciated an official letter to this effect from the central or regional government.

The change in both executing agency and management team came at a very critical period in the activities--just as training of extension workers and detailed planning of the imminent distribution of seeds and seedlings for outplanting should have begun. In the months that passed between government takeover in May 1981 and the signing of the accompanying project document three months later, unclear terms of reference and

responsibilities led to a severe disruption in activities. For example, the UNDP office in Khartoum, through which project funds were to be channeled, did not send money to the field regularly and the field did not file their requests for money according to UN standards. Thus the new management team was left without equipment for transport of seeds and seedlings from the nurseries to the villages, an enterprise estimated at some 9,000 transport kilometers, but had to borrow and rent vehicles, which proved to be both a difficult and costly operation. The field staff and regional government did a remarkable job in mobilizing all sorts of vehicles, however, and managed to get more than 90 percent of the produced seedlings and 1,305 kilograms of seeds transported to the villages. These operations took time to organize and implement, however, and an estimated 204,000 seedlings arrived in the villages in August/September after the rainy season was over and thus could not be planted. Another 20,000 seedlings died after outplanting due to lack of rain. Furthermore, a course to train staff of the forest and agriculture departments in agroforestry extension work was not arranged.

The project money spent from May through July 1981 is as follows:

Table 5-6. Expenditure of Project Money
May to July 1981
(U.S. dollars)^a

Month	Salaries and labor	Management team	House rent, coordinator	Rents, commercial vehicles	Spare parts ^b	Total
May	\$ 4,090	\$ 45	\$188	--	--	\$ 4,323
June	4,719	--	188	\$ 294	--	5,201
July	5,455	435	205	2,219	\$4,147	12,461
Total	14,264	480	581	2,513	4,147	21,985

Source: Restocking of the Gum Belt, accounts. El Obeid, September 1981.

^aS = U.S.\$1.25.

^bRepair of one forest department tractor. (In May the project obtained a Landrover station which is not reflected in this table.)

Status of Reforestation Activities at the End of the First Rainy Season

Overview

All but a few of the foresters assigned to the program readily accepted the ideas of changing from traditional forestry work on government land to agroforestry extension work among farmers, and they worked long hours to reach the first year's production and planting targets. Although they regarded the scope and framework as externally fixed, they became instrumental in the planning which took place at the field headquarters level after the program's start and were quite free to administer the activities within their respective districts.

The center leaders' degree of experience with and acceptance by the communities within their districts were factors that influenced their work performance. The rangers of the well-established nurseries and the private farmers producing seedlings could easily recruit school children and other locals for nursery work and otherwise carry out practical tasks and extension work with the assistance of the target groups. In the other centers, all operations proved to be both more costly and time consuming since their rangers had to rely on labor from the forest department only. All other inputs, including vehicles and equipment, were to be supplied by the program, which did not always have the material required throughout the year to adequately implement the activities it began.

The first year's experience shows that production costs per seedling ranged from 2.6 to 4.4 piastres¹¹ in the government nurseries, varying with quality of local management, construction techniques, distance to soil for seedling production and so forth.

The estimated production costs in the private gardens proved no more than for seedlings from government nurseries. The fact that such a small share of the seedlings privately grown were planted in the field was due, to a large extent, to factors beyond the farmers' control. If the

11. 1 S = 100 piastres (pt). The currency exchange rate used by the Integrated Sahel Program was 1S = U.S.\$1.25. The unit costs calculated for each center represent the costs of the targeted amount of seedling production, ending in April 1981, and comprise building and construction of seedbeds, water canals and tanks, soil transportation, polythene bags, occasional labor plus travel allowances and incentives to permanent staff.

silvicultural supervision had been given at the right moments and if transport facilities had been available in the rainy season, the private experiment would probably have been very successful. The farmers involved (and a number of others with control over water) remain interested in starting commercial seedling production for their fellow villagers. They do, however, regard production costs of 3 to 4 piastres as too high, given the farmers' low purchasing power.

A total of 973 farmers planted *Acacia Senegal* seeds and seedlings in the first rainy season. Although some of them might belong to the same household, the number of families directly involved in the first year's reforestation far exceeds the IUCW target of 240. Seventy-two percent of the farmers belong to the Simeih center, planting an average of 2 hectares each. Ghabsha farmers constitute only 2 percent of the total recipients of seeds and seedlings, and here three large farmers received 90 percent of the seedlings and planted an average of 38 hectares each. The variation in numbers of farmers participating in each center probably reflects the various districts' experience with organized activities and feelings of group solidarity. In some areas well-organized societies shared the seeds and seedlings provided between all interested farmers regardless of their farm size. In villages or groups of villages with little sense of community, the more active and powerful farmers--almost solely males with rather large holdings--were favored.

Of the farmers who planted seeds and seedlings, 171 were female--18 percent of the total number of recipients. Their number is larger than envisioned by the program planners and staff, as this group is looked upon as difficult to reach in extension work due to prevailing norms of female seclusion and because so few have land which they cultivate for themselves. During the first year of program implementation special efforts were made to mobilize the women. The forest rangers took care to get to know the villagers and be accepted as one of them so that they could meet with women in public gatherings. In a number of villages the female member of the management team had separate meetings with women in which matters were discussed more readily than in meetings where men were present. When alone, the women would assert their right to land and argue against opinions put forward by the men in the common meetings. Still, the percentages of female recipients vary from 0 to 50 in the various villages.

This indicates that program promotion, in at least some villages, was insufficient to reach the female part of the target group. Furthermore, female farmers were more severely hit by late deliveries of seedlings than were male farmers, as they had less time for planting in July and August due to their responsibilities for weeding agricultural crops.

Schools of five centers were invited to implement the "Green Education Program" originally put forward by the government several years ago, but only in one center were seedlings provided for the plots given by the sheikhs before the school holidays started in June.

The forest departments estimate the survival rate of seedlings they plant on government land at approximately 60 percent. The forest rangers, acknowledging that trees get established more easily on weeded fields than on waste land, are confident that the villagers will protect the planted trees against grazing and foresee a survival rate exceeding 90 percent. Table 5-7 shows seedling survival by center since May 1981, and table 5-8 presents data on seed distribution. The impact these trees might have on people's daily activities and economic situation is impossible to estimate at present. Likewise, soil improvement and sand stabilization cannot be assessed. However, the fact that close to 1,000 farmers have actually planted seedlings together with their agricultural crops and that many more are in line to join next year's activities, show that the farmers themselves--small and large, men and women--regard the restocking of the gum belt through agroforestry as one important measure to help secure a safe livelihood in the area. Great disappointment about the late delivery and inadequate supply of seeds and seedlings was registered by the villagers. They expressed their optimism, however, that the coming year's efforts would have greater success.

The village studies show that motivation for carrying out reforestation is high except where there is significant land scarcity or where people do not have a lasting right to the land they cultivate. The motives are many, ranging from soil fertilization to halting sand creep, from wood and charcoal supply to cash earnings from gum. This contradicts findings from a part of the Gum Belt adjacent to the area here under study, that "the economical output farmers get from their gum is the reason for decline in production, and that only by increasing farm gate prices can people become interested in producing gum" [4].

Table 5-7. Estimated Numbers of Produced, Lost and Surviving Seedlings after First Year of Reforestation Activities

Project center	Number of seedlings produced by May 1981	Number of seedlings remaining in nurseries due to lack of transport	Number of seedlings lost at village site due to lack of rain	Number of seedlings planted	Number of seedlings lost after planting due to lack of rain	Number of planted seedlings not expected to survive for other reasons	Number of seedlings expected to survive
Simeih	200,000	--	--	200,000	--	14,000	186,000
Umm Ruwaba	200,000	--	10,000	190,000	--	13,000	177,000
Ghabsha	160,000	40,000	30,000	90,000	10,000	10,000	70,000
El Ein	200,000	36,000	104,000	60,000	--	3,000	57,000
El Obeid	200,000	--	50,000	150,000	--	8,000	142,000
Bara and Azhaf	48,000	10,000	10,000	28,000	13,000	1,000	14,000
All centers	<u>1,008,000</u>	<u>86,000</u>	<u>204,000</u>	<u>718,000</u>	<u>23,000</u>	<u>49,000</u>	<u>646,000</u>

Source: Present study.

Table 5-8. Amounts of Seeds Distributed^a
 All Sown by Middle of the Rainy Season 1981

Area center	Amount (kg)
Simeih	360
Umm Ruwaba	540
El Obeid	405
All centers	1,305

Source: Present study.

^aThe estimated amount of seeds per hectare is 3.93 kilograms. Thus, 330 hectares have been sown with *Acacia senegal* seeds on private farm land in the rainy season of 1981.

Since conditions influencing the reforestation efforts vary greatly within the project area, the status by the end of the 1981 rainy season in each center are described separately. The following section contains descriptions of projet implementation in the regions of Simeih, Umm Ruwaba, Ghabsha, El Ein, El Obeid, and Bara and Azhaf and the expectations of participants and villagers of the direct program and for related community activities.

Simeih. All fourteen villages of the Simeih farmers' union wanted to join the project and were accepted since the farmers' union took upon itself to assist in organization and extension work. Initially the union was to be the sole representative of the villages to the project. The management decided, however, to establish special program committees at the village level since normally, Islamic and local traditions allow only men to take part in the collective union meetings. In these special committees the elected women proved to be as active as the men. The committees applied organizational experience of the community to the project as they took active part in the transport of seedlings from the nursery to the villages, appointed a man to be responsible for watering at the collection sites before outplanting, and determined the distribution of plants. The farmers loaded seedlings onto wooden beds for transport by donkeys from the collection sites to each field. As the supply of seeds and seedlings was not adequate to meet demand, the committees arranged for distribution to

all farmers who had cleared land for agricultural crops. No distinction was made between large and small farms and the recipients thus represent a cross-section of the various socioeconomic groups in the area. The committees' recommendation to mix seeds with crops on plots in the first year of the rotational cycle and seedlings in the second year was closely followed. Furthermore, farmers worked in groups to plant the seedlings on each other's land to facilitate transport and watering just after the planting. The farmers also made plans for collective guarding of the fields in the critical months when nomadic herds pass through the area.

The Simeih nursery is situated on cracking clay soil close to its project villages to the north and on the adjacent goz. Seedbeds and water canals could be dug directly in the ground and the rich clay soil used in a mixture with sand transported from the goz land for the growing of seedlings in polythene bags. Water is easily available in a reservoir within the nursery and can be tapped at low cost. Under excellent local management, 200,000 seedlings were produced at a direct unit cost of 2.9 piastres. In July 360 kilograms of seeds were sown and planting of seedlings took place in August just before some late rains occurred which ensured their establishment in the fields.

Approximately 23 percent of the project's 700 recipients of seeds and seedlings were female, reflecting the relatively high number of females working their own land. Credit must be given to the staff, however, for activating this group of farmers which usually do not take part in public affairs.

The population surveyed believes that a comprehensive tree planting scheme will enrich the desiccated soil and thus make cultivation more viable. For them the main objective for growing Acacia Senegal is to increase soil fertility, and secondarily to earn cash from gum to purchase water. However, they predict that the project might fail if it is not accompanied by assistance to facilitate water provision. If the basic water needs are not met, then the emigration by young people (which is now on the increase) might eventually leave a labor shortage for harvesting the gum. A reforestation-cum-water project might be the incentive to enable the many migrants who wish to return to come back to their land.

Umm Ruwaba. Based upon extensive knowledge of the area, the ranger selected five villages which all agreed to participate in the program in

its first year. The villages are scattered on goz land from 3 to 22 kilometers from the nursery.

Like Simeih, Umm Ruwaba for years had a well-functioning nursery under good management. The ranger in charge expanded the nursery at the site and obtained water from the city pipeline at low cost. Even though both sand and silt had to be transported for the bags, and cement and bricks were used for seedbeds, the 200,000 seedlings were produced at 3.0 piastres each.

Instead of waiting for transport arrangements from the project headquarters, the ranger rented a market lorry and thus managed to get 540 kilograms of seeds and most of the seedlings to the villages in time for planting before the rains stopped.

To some extent the committees decided who should get seeds and seedlings, but the principle of first-come-first-served was also applied once the loads appeared in the villages. This did not benefit the female farmers, who in general were slower than the men to react to the project. As in Simeih, however, small and big farmers were equally represented among the recipients.

Although women were elected in all program committees, they did not always take part in the discussions, as program matters tended to be dealt with in the men's informal gatherings at night from which women traditionally are excluded. The female committee members said they would come forward, however, if formally invited by the men. The low number of female recipients of seeds and seedlings (only 3 of 100 in the five villages), can partly be explained by this lack of participation in the committees. Another factor is the women's heavy workload at planting time, in particular their preoccupation with caring for people suffering from malaria, a disease which reaches its peak just at the beginning of the agricultural season. Furthermore the supply of seeds and seedlings was insufficient to satisfy demand, and the committees served the men first. Still, a number of females said they would try to get some seedlings next year, if available, since they had finally realized that women were meant to be part of the target group. Although the women wanted the trees mainly to get gum and firewood, the male farmers' motivation was, like the people of Simeih, to enrich the soil. Women see the offer of seedlings and seeds as an incentive to make some effort at cultivating their land and earning

money on their own, since they do not control the cash from crops they have helped to cultivate on their husbands' land.

In these villages, striving to meet the basic needs of food, water and fuel does not occupy the population full-time. Thus they requested the project staff to assist in setting up adult education, especially for women who have never attended school, and cottage industries such as grinding mills and handicrafts, which could employ young people during the dry season when a large number of them tend to migrate to seek work elsewhere. They would also appreciate and cooperate in efforts geared to improve hygiene and sanitation.

Ghabsha. The ranger first suggested villages close to the nursery as recipients of seedlings, but after months of extension work the farmers there were not convinced of the positive effects that planting *Acacia Senegal* would have on their crop yields and economic situation. Some sheikhs and old or widely traveled farmers supported the program staff in trying to convince the rest of the villagers that tree planting would improve agricultural output, but met with little success. The farmers thought that if they, following the government's advice, planted trees on their land, there would be no room for other crops. They expected the government to assist them by providing tractors so that they could start cultivating the hard clay soil some 7 kilometers south of their present farmland. Only one village in this heavily desertified area decided to join the program in its first year, while the others waited to learn from the experience of this village. In the end, only three farmers from this village agreed to receive seedlings. The staff then offered seedlings to villages up to 20 kilometers north of the railway line where land is more abundant and the gum tradition still exists.

The Ghabsha nursery was established for the program. However, an inexperienced staff, breakdowns of the new deep bore well, expensive transport of sand and silt, as well as rather sophisticated construction of seedbeds and water canals from bricks and cement, brought construction costs up to 4.4 piastres per seedling. Furthermore, some 20 percent of the seedlings died in the nursery due to insufficient tending.

In early August 1981 a commercial lorry was used to transport seedlings. However, the month passed without rain and no watering was organized at village sites and these loads were lost. The seedlings

transported and planted in September received some rain which helped the roots establish themselves in the soil, but since mostly untrained hired laborers were used, close to 20 percent of the seedlings are expected not to survive. The loss of seedlings due to factors other than lack of rain in the other centers vary between 5 and 7 percent. No seeds were distributed in Ghabsha.

In the villages which joined the reforestation activities toward the end of the rainy season, there was no time for extension work or the formation of committees. Seedlings were distributed among twenty large farmers, two of whom were female, of large holdings in hopes that they would act as change agents, by encouraging those with more modest areas of land to participate in later years' seedling distribution. In addition, four schools received a total of 10,000 seedlings to begin implementing the "Green Education Program."

El Ein. All five villages approached were eager to join in the program in its first year. Committees were easily established due to village experience with organizing self-help activities. It was difficult, however, for women to take part in the meetings and the lists of potential seedling recipients prepared by the committees consequently contained very few female farmers.

In the old El Ein nursery, seedbeds could be dug directly in the clayish soil, which also provided the main ingredients for the mixture to be used in bags, and water was easily obtained from the adjacent El Obeid water reservoir. With these favorable physical conditions and under the management of an experienced forest ranger and well-trained staff, a low production price was obtained here--3 piastres each for the targeted 200,000 seedlings.

The El Ein area was severely hit by the delays in transfer of resources from headquarters for operations in the critical planting period. Vehicles to transport seeds and seedlings to the villages were not available until mid-August and there was rain in only two of the villages after they had received seedlings. Here all seedlings received were planted, mostly by the more innovative farmers who first came forward (all of them men). More farmers wanted to plant, but there were not enough seedlings to satisfy demand. More than half the amount of seedlings produced died at the distribution sites in the remaining three villages

since they arrived after the rains had stopped, and many were left in the nursery for the same reason. Sheikhs and farmers in the area were disappointed that neither seeds nor seedlings were delivered in time. They would still prepare their fields for planting next year, and urged the forest ranger to come with seedlings in June at the latest.

Although the villages welcomed reforestation activities as a means to recover ecological balance, both men and women stressed that inadequate water is the most pressing village problem. They now hope that the program might help in getting loans for their share in government drilling schemes to make use of the 30-meter-deep groundwater. Women also stressed the need for fuel-efficient stoves and instructions in preventive health measures.

El Obeid. Four villages on goz land north of the nursery were invited to participate and two others volunteered. El Obeid nursery was reconstructed for the program with seedbeds from brick and cement, and new water pipes were connected to the town pipeline system. Expensive transport of sand and silt, combined with relatively high wages paid to occasional labor and inexperienced management, brought prices up to 4.3 piastres per seedling.

Women were active only in the committees established for the program. The committees were responsible for distribution of seedlings and seeds, and large farmers were the favored recipients of seedlings because the most economical use of the tractor cart (made available by the forest department for a limited number of days) was to have it bring large loads to big fields close to the village. Of the 100 seedling recipients, 5 were women and all were committee members with between 4 and 8 hectares of land. The 405 kilograms of seeds brought to the villages, however, were distributed equally between big and small farmers. Whereas demand exceeded supply in the four northern villages, seedlings were left unplanted in the two villages closest to El Obeid. Here most farmers work in town during the dry season, and after delivery the potential recipients withdrew from the program because they would not be able to protect the seedlings against animals. Some of these seedlings were then taken to the villages further away at the end of the rainy season and planted just before some heavy rains occurred.

The villagers in this area also have expectations that the program will help provide credit to begin motorized transport of water or re-digging of the reservoirs.

Bara and Azhaf. The five villages of the Bara area invited to join the program welcome the reforestation activities provided that the ongoing energy crises are solved through introduction of energy-saving devices or alternative energy sources. Otherwise, they warn, the cutting of young trees would continue. Around Azhaf, however, such reservations were less extreme, and of the many villages which wanted to join in the activities, four were included.

Program management contracted with two farmers in Bara and Azhaf to produce 100,000 seedlings each in their irrigated gardens at a unit price of 3.0 piastres to be paid by the program. Despite resentment of this action, the forest department assigned a forest ranger to assist the farmers in the production of seedlings, an operation previously carried out only by the forest department. The ranger was stationed in El Obeid, however, without transportation to do proper extension work or supervise the silvicultural work often enough. This became particularly critical as the seedlings matured and their roots became ready for pruning. As a result, more than 50 percent of the seedlings died in the gardens after May 1981. Breakdown of pumps and nightly intrusion of goats into the unguarded seedbeds reduced the number of seedlings suited for outplanting even further. The new project management had to delay the last monthly installment for production costs due to lack of operational funds and this led to decreased work from at least one of the two farmers.

The suggestion of the people to combine reforestation with activities to make charcoal production and fuelwood use more efficient, combined with lack of transport to carry out proper extension work, led the management of the restocking project to give the seedlings from Bara nursery to the forest department for its planned protection scheme in the Bara town perimeter. Planting took place too late in the season, however, and all seedlings died in the ground due to lack of rain.

About 20 percent of the seedlings suited for out-planting from Azhaf were left in the garden due to lack of transport before rains stopped, and a similar percentage were lost at the village site as they arrived after the end of the rainy season.

In the Azhaf villages, committees had been established but only one had started functioning before out-planting of seedlings. Thus the seedlings, which were transported to the villages late in the agricultural season when the female farmers in particular were busy with weeding of crops, were taken at random by 28 male farmers. Their holdings varied from 5 to 140 hectares. It was difficult to get any of the many tenants interested in planting and tending Acacia Senegal since they rent plots only for the cultivation period and would not benefit directly from agroforestry. Thus all recipients in this area belong to the group of original dwellers.

No seeds were distributed in Azhaf or Bara.

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Chapter 6

CONCLUSIONS

Integrated Versus Sectoral Approach to Development

All facts presented in the previous chapters support the argument that policy for a sound development in the Sudan would be to emphasize the strengthening of traditional agriculture. The majority of the people living on the land traditionally met their basic needs following traditional agricultural practices and potentially could do so again. By reviving customary land use practices in the Gum Belt, the present deterioration in ecological and socioeconomic conditions can be reversed, and agriculture could generate an economic base for development in the secondary and tertiary sectors of the economy.

Only programs which deal with the very acute and special problems of each community can be welcomed as the remedy which will make life bearable for present and future generations. Most farmers view the restocking of the Gum Belt as crucial to their future lives there, particularly as they see that the benefits of an *Acacia senegal* planting project (open even to the smallest landholders) are many. They argue, however, that such a one-dimensional approach to development is not adequate to support them on their land, as their needs are so many. Some are reluctant to join a project such as tree planting when they must commit the better part of the day trying to meet their need for such basics as water, food, and fuel. In some cases, people find it meaningless to invest in the future through such a project, no matter how much they realize the benefits that might come in respect to soil improvement, halting sand movement, earning cash from gum, and obtaining wood for fuel. Even an expanding tree-planting effort still might offer too little to reverse the increasing emigration of young people who provide the labor for harvesting. This applies, for example, to the Ghabsha district where population increase and land fragmentation force the small farmers to cultivate their land continuously without regard to

maintaining the soil's fertility, and to the Simeih district where people now consider leaving their land due to the water crisis.

All parties involved in field activities during the first year of reforestation activities (including the regional administration, politicians, and officials at lower levels) have concluded that the situation at the village level speaks for an integrated approach. Their reactions ought to guide new project proposals, whether at headquarter levels in the capital of the Sudan or in the capitals of the many donor countries and international institutions. The commitment and dedication shown by the local staff and government should diminish the external planners' fears that a multi-faceted development effort would strain local commitment or administrative capabilities.

Response to the Activities Started

Foresters

The response from foresters to expanding their work from silvicultural operations within reserves to agroforestry extension work among farmers was positive and committed. Experienced forest rangers were aware of the needs of the villagers and welcomed the opportunity offered by the program to do their share in order to help meet these needs. Cooperation with expatriates assigned to the program was good, and after an introductory period of about a year the foresters were in the position to take over the management of the activities.

The achievements and financial accounts show that reforestation is possible at very low cost. For potential replication elsewhere, however, one should note that the staff in this instance worked harder and longer than should be expected of anyone, and that the difficulties created by lack of transport and poor logistics put a strain on them which should not be part of anyone's normal work day.

The variations in motivation between regions of the Gum Belt and even within villages as regards reforestation, necessitate promotion and extension agents who are open to the views of the target groups and who can operate within frameworks which allow for flexibility in the implementation of activities. The staff in the instance described above met these requirements to a very high degree. It should be noted, however, that the

inclusion of female extension agents be part of the staff of any project in Muslim societies would make a significant impact on the participation of women on a level with the men. Most of the foresters working on the program became frustrated as they did not have access to the important part of the target group that female farmers represent.

Villagers

Farmers and nomads alike have proved their willingness to try to adapt land use practices which lead to ecological harmony. Their adaptability toward more viable systems where these have been necessary and possible also gives hope for the future. Thus any development effort in the area should include the local population in the planning, execution, evaluation and redesign of schemes, so as to take advantage of their experience and build on their enthusiasm for such improvement projects.

At present the population, to some degree, fears that projects might be imposed upon them. Some farmers who first suggested a number of the proposals presented in DECARP complain that they are no longer adhered to, and that physical and socioeconomic changes which have taken place since the early 1970s are overlooked in the present project planning processes. The need for assistance in improving living conditions is overwhelming, however, and so there is a tendency to accept whatever comes, albeit at times with a degree of reluctance.

Awareness of ecological deterioration and knowledge of the old agroforestry traditions made most villagers welcome reforestation assistance. The underlying factor for people's eagerness to join from the start was that the activities implemented did not bring in new ideas, but built on a long-established (but now deteriorating or lost), sustainable land use system.

Again, the female population must be included in agroforestry schemes because many either own their own land or help cultivate that of their husbands. While some sheikhs oppose female participation in public affairs, the experience is that such village leaders are few and that informed discussion can lead to a change in attitude. Another obstacle is the women themselves who, due to tradition and religious customs, are slower than men to come forward and less accustomed to express their opinions among professionals such as the extension agents.

Another situation that deserves special attention is that of tenants. In the Azhaf district, the land-right obstacles can perhaps be resolved among the inhabitants themselves, either by the sheikhs giving tenants shares of the gum from trees planted while they cultivated a plot (as tenants get rights to fruit from palm trees along the Nile), or by the original settlers renting out plots of land to newcomers for longer periods (say, 15-20 years) instead of for the food crop cultivation period only.

With some introduction and supervision, egalitarian societies where basic needs are being met can probably carry out most of the reforestation activities as described. In others, the foresters must play a very comprehensive role.

Forest authorities might also be instrumental in establishing reserves for fuelwood production in fuel-scarce areas and in teaching the villagers the technicalities of running such village woodlots.

Participation by private farmers in seedling production is another activity to be kept in mind for future activities. It might be necessary to subsidize such production in order to allow people with little money and many needs to buy the seedlings.

The presentation of the Integrated Sahel Program and the Restocking of the Gum Belt project shows delivery of seeds and seedlings were lower than projected to the villagers right up to the beginning of the planting season. This negative experience may turn out to be an obstacle for future reforestation activities as well as for other development projects that might start in the area.

Politicians

Whereas Sudanese officials with roots in gum belt villages were instrumental in the original formulation of DECARP, it seems that the present planning exercises to a large extent are dominated by donors and their coordinating offices. Local government authorities presiding in the areas where anti-desertification measures are to be taken have very little say in the formulation of project documents. Missions come without notice and call officials at the regional and district levels to meetings which turn out to be mere formalities instead of constructive subject matter discussions. This would perhaps be avoided if the new regional administration were given negotiating authority with donors and

responsibility for project execution. The politicians of Kordofan clearly saw the benefits of the Integrated Sahel Program and the Restocking of the Gum Belt project and from the start (particularly after the organizational and financial situation of the executing agency became known at the field level) the local politicians and their officials went out of their way to assist in carrying out the scheme according to plan. They did not, however, approve of the change from the approach of the Integrated Sahel Program, and tried to convince the DECARP Unit and UNSO that the solving of water problems should be the first goal of any development activity in the region.

The fact that activities once begun could not be implemented according to plan due to financial and organizational problems at the headquarters above field level made some central level politicians and forest officials suggest that seedling production and planting should perhaps not have started in 1980/81. They felt that the staff had been given tasks that were poorly financed and not carried out according to logistical plans and that the resultant risk of failure was too great considering the high expectations of the target groups.

Local politicians and forest officials claimed after the rainy season that the institutions behind the program had shown utter neglect regarding implementation of the signed agreements. They were aware that their own input and good will were crucial to the desired results, and would continue to support the project staff and villagers in their endeavors to improve living conditions in the region.

In some areas the prevailing rights to land preclude a successful reforestation project involving the most destitute people, women, and the landless. The government might have to increase the land trusted to sheikhs in the El Cbeid district, for instance, so that they can give land to the females. In the Ghabsha district, relation of farmers to unregistered government land might be achieved by careful location of new deep wells with a suitable amount of the surrounding land being given to sheikhs on the traditional trusteeship basis.

The newly appointed Minister of Agriculture in the Kordofan Region, Taj Fadlallah, addressed these administrative shortcomings and his expectations for the future:

It was wrong to let any effort to combat desertification in our area depend to such a large extent on the contributions of foreign decision makers, and this is partly the reason why DECARP failed to materialize until now.

With a new spirit the administration will start anti-desertification activities making full use of the resources we have in abundance; trained officials and villagers eager to work. As an example the Regional Ministry of Agriculture will encourage and assist villagers to grow some *Acacia senegal* seedlings and other indigenous plants wherever water is available. Taking the conditions into consideration such production shall have to be on a small scale.

With the assistance of international aid, our humble efforts could be expanded to become a most viable measure to reverse the present deterioration of the environment and help to provide living conditions worthy of the populations inhabiting the region. If donors come, let them come on our conditions and support activities which go on and which have grown out of factual needs of the local societies as perceived by them and their leaders.

To summarize, in the Northern deforested area of the Sudan, villagers and village leaders are aware of the ecological and economic deterioration resulting from the abandonment of the old system of *Acacia senegal* fallows in the farming system. They respond positively to projects, such as DECARP, which seem to relieve the vicious cycle of diminishing fuelwood supplies, falling agricultural yields, shortened fallows, and reduced gum arabic production. Especially when they are integrated so that they address villagers' daily needs for food and water as well as fuel, forestry-related projects are likely to achieve the participation of rural populations. Once basic human needs are being addressed, villagers need much less encouragement to undertake reforestation projects than if they are under great stress to find fuel and water. Also, private farmers who have land available express the desire for tree seedlings, while farmers in areas with high populations and fragmented land holdings have less freedom to reestablish fallows even for potentially profitable gum arabic trees. Furthermore, women and the landless face greater obstacles to participating. In all villages surveyed, land ownership and use of land among women and tenants, the opposition of village leaders to changing roles for women, and the lack of women trained as forestry extension officers all inhibited the participation of the marginal population

subgroups; these are the sensitive issues that program planners must address in order to expand outreach of and impact of reforestation programs. Incorporating villagers, village leaders, local forestry extension officers, and local politicians into project design and implementation will continue to increase their participation in reforestation activities and the chance of project success.

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