

**An Evaluation of  
Fuelwood/Forestry Grants  
Awarded by  
Sudan Renewable Energy Project**

**M. H. EL. LAKANY**  
**(With Contribution by M. Kamel Shamsi)**

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## TABLE OF CONTENTS

	<b>PAGE</b>
1. Summary .....	1
2. Introduction, Objectives and Statement of Work .....	3
3. Field Visits .....	6
3.1 Small (Private) Farms .....	6
3.1.1 Mhd Ibrahim Abdu .....	6
3.1.2 Dr. Yousif El Khalifa .....	6
3.1.3 Musa Ahmed .....	7
3.1.4 A. H. Ramly .....	7
3.1.5 Sudanese Poultry Farm .....	8
3.2 Village (Community) Forestry .....	9
3.2.1 Um Indraba .....	9
3.2.2 Um Triebat .....	11
3.2.3 El-Hosh Hospital .....	12
3.2.4 Shawwal Village .....	13
3.2.5 Temied Hag El Tahir .....	13
3.3 Irrigated Schemes .....	14
3.3.1 Seleit Project .....	14
3.3.2 Assalaya Sugar Company .....	17
3.3.3 Gezira Scheme Shelterbelts .....	18
3.3.4 El-Doum Village Shelterbelt .....	19
3.4 Government Agencies (State Nurseries) .....	19
3.4.1 Soba Nursery .....	19
3.4.2 Khartoum Forestry Nursery .....	21
3.4.3 Gezira Aba Nursery .....	21
3.4.4 Wad Banaga Nursery .....	22
3.4.5 Shendi Nursery .....	23
3.4.6 Canal Side Planting, Kaboshiah and Seyal .....	24

4.	Discussions with Local and International Organizations .....	25
4.1	Central Forestry Administration .....	25
4.2	USAID (Agriculture/Forestry) .....	25
4.3	UNDP .....	26
4.4	FAO/CARE .....	26
4.5	FINAID .....	27
4.6	SCS Sahel International .....	27
4.7	SREP/Arab-Sudanese Blue Nile Agriculture Co. ....	27
5.	Evaluation and Recommendations .....	29
5.1	Small Farms .....	29
5.2	Village Forestry .....	30
5.3	Irrigated Schemes .....	31
5.4	Government Agencies .....	32
6.	Itinerary .....	35
7.	Persons Contacted .....	36
7.1	SREP Staff .....	36
7.2	G.O.S. Agencies .....	36
7.3	International Agencies .....	36
7.4	Others .....	37

## 1. Summary

A review of Fuelwood/Forestry renewable energy development grants (REDGs) was initiated upon the request of the Sudan Renewable Energy Project. The objectives were to evaluate the forestry technologies applied by the SREP and to identify new areas of activity as well as new disseminating techniques for promoting Fuelwood/Forestry initiatives.

The Fuelwood/Forestry grants were grouped into the following categories: a) small (private) farms, b) village woodlots (community forestry), c) irrigated schemes, and d) government agencies (state nurseries). Representative grantees were visited, accompanied by the SREP Fuelwood Project Leader. The progress and effectiveness of each project was evaluated and recommendations were made for improvement. Other relevant forestry projects in the Sudan were discussed with several local and international agencies. The overall development of the program was evaluated and the general recommendations made were discussed with SREP staff:

- Growing trees on private farms should be encouraged further, especially on those farms with potential for development into large-scale, commercial plantations.
- Support to community forestry, while it may look uneconomic at present, should continue for the direct benefits of isolated population centers. Forestry should be integrated with some form of agriculture (agroforestry) in order to promote the involvement of the villagers and to maximize the use of water. Problems of land tenure and rights to harvest fuelwood should not be overlooked.

- The best chance of success for REDGs may be in irrigated schemes. Establishment of shelterbelts, windbreaks, and woodlots on marginal land would improve the environment and generate high income if properly executed. Intercropping of annual crops and forest trees is worth pursuing.
- State nurseries may continue to receive support provided that they produce improved stock and engage in relevant applied research, such as species and provenance trials and agroforestry. Duplication of grants by different agencies to the same organization must be avoided.

For all grantee groups, economic analyses are indispensable. Both recipients and financing agencies would need such studies before any commercialization of activities initiated by SREP.

The social aspects of the projects should not be overlooked. Exchange of information between SREP and other donor agencies is essential. There is an urgent need for dissemination of information among interested parties. Teams made up of foresters and extension/dissemination experts should visit the sites more frequently. As the geographic area covered by REDGs is vast, the technical forestry team must be expanded and responsibilities should be divided among the team under the supervision of the Leader. Local and international training should continue as it has proven to be fruitful. Seminars and workshops, which bring together foresters, agriculturalists (particularly agriculture managers of large irrigated schemes), economists and sociologists as well as extension and dissemination experts, should be organized by SREP.

In general, the REDG program is commendable and is believed to have contributed favourably to the promotion of Fuelwood/Forestry activities in the Sudan.

## 2. Introduction, Objectives and Statement of Work:

The Sudan Renewable Energy Project (SREP) has been financed by USAID and implemented by the Energy Research Council of the National Council for Research and Georgia Institute of Technology, since 1982. The five priority areas that have been identified and developed are:

- Charcoal production
- Fuelwood resource development
- Charcoal stove development and commercialization
- Fuelwood combustion
- Application of photovoltaic on a small scale.

Four out of these priority areas are related directly to forestry.

SREP is adopting an integrated approach to the development and application of its activities and the commercialization component is stressed. Information dissemination and training are also integral components of the project.

The Renewable Energy Development Grants (REDGs) program has been instrumental in the development and dissemination of SREP technologies. The grants are awarded to communities, private farmers, agricultural schemes and public entities to promote afforestation. The main objective has been to support shelterbelt and woodlot establishment, canal-side planting and nursery construction and maintenance.

In the third year of the project a review of Fuelwood/Forestry REDGs was needed in order to:

- Identify the forestry technologies and techniques that have proven to be successful and accepted by the individual grantees.
- Identify the various organizational methods that have proven to be effective.
- Identify appropriate technical assistance required for support of Fuelwood/Forestry REDGs.
- Identify new areas of forestry technology experimentation such as species variation, shelterbelt design and canal-side planting design.
- Identify possible new organizational and dissemination techniques for promoting fuelwood/forestry initiatives.

A team of two forestry experts was appointed to review Fuelwood/Forestry REDGs and to conduct the required field work with the assistance of SREP Fuelwood staff.

The tasks, as stated in the "Statement of Work" were as follows:

1. Divide fuelwood/forestry grants into separate classifications which will distinguish the various approaches.
2. Visit selected grantees to determine project progress and effectiveness.
3. Review technical assistance being provided to SREP Fuelwood grantees with SREP staff and other organizations doing fuelwood/forestry projects.

4. Discuss fuelwood/forestry options with Central Forest Administration, SREP, CARE, FAO and USAID.
5. Prepare report.

Findings to be reviewed by the team plus the Assistant Coordinator to SREP and Fuelwood Project Leader.

### 3. Field Visits:

#### 3.1 Small (Private) Farms:

Four small farms were visited in addition to one private agricultural company.

##### 3.1.1 Ibrahim Mhd Abdu:

This is a small farm agroforestry grant for one year (LS. 4,000). The farm is located near Soba, 14 km. South of Khartoum. The objectives of the grant were procurement of pipes for irrigation, establishment of a small nursery and the planting of seedlings in a 7.5 feddan area as a woodlot, in addition to establishing windbreaks around the farm.

##### Observations and Comments:

The nursery is not in a good state; there are a few old seedlings under heavy shade. They should have been planted a long time ago. Some rows of eucalypt were planted on one side of the farm.

This farmer needs some technical advice as to how to improve the nursery. It would be better to provide him with seedlings from the nearby Soba nursery.

##### 3.1.2 Dr. Younis El-Khalifa:

The farm is located in the Central Region, at Bager, 35 km South of Khartoum. The farmer was granted LS. 300 for one year in order to help in planting a shelterbelt around his farm and to establish a nursery. He was also given 2,000 eucalypt seedlings.

##### Observations and Comments:

There is a three-row windbreak around the farm, the outer one is ketter (Acacia mellifera) and the inner two

are E. camaldulensis and E. treticornis. The trees are growing well, except that the spacing is too wide (approx. 3-4 m). In the small nursery, seedlings are placed in basins dug deeply in the ground, which causes a lot of salt to accumulate on the surface of the soil and on the polyethylene bags. It is recommended to give this farmer 2,000 eucalypt seedlings to fill the gaps between established trees in order to improve the spacing and thus the efficiency of the windbreak. He also needs technical assistance as to nursery operations. This is a very promising "Grant", as the owner is an educated man who is convinced of the importance of growing trees. This farm can serve as a model for the neighbouring newly established farms. The owner is willing to grow a woodlot on most of the area.

### 3.1.3 Musa Ahmed:

This small farm is located close to Um Triebat village, 25 km South West of Wad Medani. The owner was given some tree seedlings from Um Triebat nursery to plant as a windbreak around his farm.

#### Observations and Comments:

Some eucalypt trees are growing vigorously around the farm to form the inner row of a dense hedge made up of Ketter. It seems that the two species can co-exist without competition. The row of eucalypt needs to be intensified by planting more trees in between. The farmer should be provided with the seedlings.

### 3.1.4 A. H. Remy:

A 120-ferkan farm located on the road between Medani and Sennar in the Central Region. The small grant of LS. 775 was to help the farmer to plant a windbreak and to establish a nursery.

Observations and Comments:

The farm is owned and managed by a retired agriculturalist and his sons, who are well qualified to run such an enterprise. It is very well maintained. Fodder crops such as elephant grass and Sorghum are successfully grown to feed some 200 head of cattle and a few sheep. Molasses and urea are used to supplement the feed. Milk produced on the farm is processed into cheese and marketed in Khartoum. Other crops include Karkadeh and a lemon orchard.

The windbreak consists of one row of mesquite on the outside and two inner rows of eucalypt. The idea is to prevent goats from entering the farm as they may feed on the pods of mesquite from outside. The trees are growing very well on the farm. A small nursery was established to produce seedlings needed for the windbreaks and for sale later. The nursery is very well arranged; it may need shade only. It should be noted that the farmer used the grant to initiate tree planting, but built the nursery on his own, which means that he realizes the potential benefits.

This farmer should be encouraged and supported technically by specialized foresters. He and his sons are very receptive and their farm can be developed into a successful agroforestry model. As there is a lot of biomass produced by animals and plants on the farm, biogas generation may be feasible as an alternative source of renewable energy. The farmer has endorsed this idea and is willing to adopt it.

**3.1.5 Sudanese Poultry Farm:**

This farm, which is privately owned but may be classified as an irrigated scheme, is located near Koba. SREP donated 500 seedlings to initiate shelterbelts and windbreaks. Technical help and training in nursery operations have been also provided to this project which has a grant of US. 500.

**Observations and Comments:**

The nursery is relatively small and contains a few seedlings of different species. There is a shortage of water inspite of the presence of a well and a pump on the farm. A nursery technician, seconded from Forest Research Institute at Soba, visits the farm once a week. He is aided by a group of agriculture engineers who reside on the farm.

The nursery needs more improvement. The owners were very eager to increase the productivity of the nursery as well to expand the area of woodlots. There are successful attempts to intercrop Karkadeh with eucalypts.

Such a large private agricultural development should be further supported by SREP as it has many ingredients of success: there is a need to protect the animals and crops the nursery is established, the region is in bad need of fuelwood and there are several farms being developed in the area. What is needed most is more technical support and frequent visits by SREP staff. Providing the nursery with good seeds of selected species will be beneficial. The owners may be willing to establish large areas of woodlots for commercial production of fuelwood as the farm is close to the market in Khartoum. They have plenty of land and other agricultural activities are not going as well as it was anticipated. An integrated agroforestry activity may be feasible.

**3.2 Village Woodlots (Community Forestry):**

**3.2.1 Um Indraba:**

The village of Um Indraba has been granted LS. 43,645 to undertake this project since 1983. It is located nearly 100 km. South West of Ondurman, in Northern Kordofan. The objectives, as stated in the proposals for the two phases, are to:

- a. establish a nursery and produce seedlings.
- b. plant a shelterbelt/woodlot; provide for fencing, irrigation, facilities and guarding.
- c. maintain the irrigation system.
- d. plant trees in the home.

Observations and Recommendations:

The ecologic, social and economic symptoms of desertification are quite visible in this village. Sand is creeping on the houses and many villagers (nearly 1/3 of the population) have deserted the village. Animal population has also been reduced due to high mortalities during the past few very dry years. The social structure is still very strong and people are very much aware of the desertification problems. There are 18 forest guards who are in charge of protecting forest reserves and preventing illegal cutting and transport of fuelwood and charcoal. Yet the only Forest Administration car available is not functioning. There is a need for a new well to be drilled, the pump toward which SREP already has contributed with a REDG.

Millet used to be grown in the village before the drought. The tree nursery is small, but well protected and the nursery man in charge was trained in Khartoum. There are about 1500 seedlings ready for outplanting but were not due to shortage in water supply. The tree plantation which is meant to serve as a shelterbelt, is in a fairly good condition. It consists of nearly 2000 trees of mesquite, irrigated manually. The plot is well fenced but rodents are causing some damage. Some trees are planted by the villagers in their houses and they are well guarded against browsing.

While the nursery and woodlot may not be spectacular, the community is very proud of its achievements. Tree planting is regarded as the main defensive move to stop desertification. This village can

serve as an example for future activities in community forestry.

What is urgently needed is the drilling of the well and more frequent visits by SREP staff, who may provide seeds and technical advice.

As the present method of watering the trees is very tedious and expensive, other techniques deserve trying. For example, simple drip irrigation systems may be feasible. Alternatively, soil amendments which retain large quantities of water may be tested, provided that they can be available and are economically effective.

### 3.2.2 Um Triebat

The village is located in the Central Region, 25 km. South West of Wad Medani. A small grant of LS. 997 was given to the school to initiate a nursery in order to provide trees to the village and other communities scattered around it. In addition, Peace Corps Volunteer Jim Adams, a forester with SREP, was posted in Um Triebat to help organize and start the project.

#### Observations and Comments:

We were received very energetically and enthusiastically by young teachers and school masters. The nursery is small but well-built. More than 10,000 seedlings of mesquite, eucalypt and albizia have been produced. The school manager is working in the nursery after hours, aided by pupils and villagers. He received some training in Khartoum through the help of SREP. The nursery needs an open area for hardening the seedlings prior to outplanting. Some of the stock produced is sold in the local market at LS. 0.25 per seedling, which is a source of income to the nursery. The cost of transportation to the market is high, however. Some funds are still needed to pay for the purchasing of polyethylene bags, potting soil, incentives to the labourer and transportation to the market. SREP may wish to contribute to such costs in order to encourage this very active group

of people to continue this successful project. However, the recipients must show an account for expenditures and income which can serve as an example for other groups. The active involvement of school teachers in such project is commendable.

### **3.2.3 El-Hoah Hospital:**

A very modest grant of LS. 135 to this hospital located near Um Triebat village. It is aimed at providing seedlings for planting as windbreaks around the hospital and to start a tree nursery.

#### **Observations and Comments:**

A good number of trees have been planted on the hospital ground. The seedlings were obtained from Khartoum and locally. Species grown are E. tretecornis, E. micrsotheca, neem, mahogany, Paltophorum and others. They will provide shade and reduce dust blown onto the hospital. The director is very enthusiastic and supports tree planting. He requested more seedlings and was advised to seek them from the nearby school nursery. Some technical help is needed in order to upgrade the nursery located at the hospital.

Although such an afforestation activity may not fit the general purpose of REDGs directly, it contributes a lot to the understanding of the role of trees in the community.

### **3.2.4 Shawal Village:**

This small village is located 50 km. South of Dewam, in the White Nile Province. The community was granted a small amount of money to help purchase polyethylene bags for a newly established nursery.

Observations and Comments:

The nursery is very small and the seedlings grown are not healthy. The basins are lined with plastic sheets and the water is stagnating. It was recommended to drain the standing water. This nursery is a typical case where technical advice and frequent visits by SREP staff are needed. Simple but effective hints may improve productivity to a large extent. Supplying seeds of suitable species would also be very helpful.

**3.2.5 Temied Hag El Tahir:**

This village is located 70 km. South of Shendi in the Nile Province. The community was granted LS. 16,290 to establish a nursery, to plant five feddan around the bore well and to fence the shelterbelt plantation.

Observations and Comments:

This again is a good example of a village which was prosperous, but suffered drastically because of desertification. The Wadi nearby has some very fertile soil, but the lack of rain and high cost of drilling hinder its cultivation. According to the village elder "Omdah", everybody took part in planting trees including women and children. The very small nursery is well protected and the few mesquite seedlings grown are very healthy. The "shelterbelt" plantation is made up of 1,400 mesquite trees which look good. Trees are watered manually from 2 basins to which water is piped from the bore well for a distance of 1 km. This is much more efficient than using donkey carts to transport water like in Um Indraba. The plantation is well fenced with barbed wire and posts.

Both this plantation and the similar one at Um Indraba are not shelterbelts in the formal sense. They are rather woodlots that are longer than they are wider. If they are to exert shelterbelt effects as proposed

originally, they must be extended to surround the village or at least to form an "L" shape at a right angle to the direction of prevailing winds. Nevertheless, the enthusiasm and interest of the villagers and their leaders are overwhelming. They also appreciate the support and frequent visits by the Forestry Administration staff from Shendi. SREP should capitalize on that interest and use this village as a demonstration site for the region. The request for a well should be endorsed to local and regional authorities. SREP staff should pay frequent visits to the project in order to give technical advice and to provide seeds of suitable species.

### **3.3 Irrigated Schemes:**

#### **3.3.1 Seleit Project**

This project is a grant to the Seleit Food Production Co. Ltd, which is a state company. It is located 24 km. North of Khartoum. This was the first REIG, the first phase of which began in November 1983 and the second in January 1985. The total amount of the grant is LS. 67,415. The main objectives have been to:

- a. produce poles and firewood.
- b. protect fodder crops against wind and to stabilize the soil.
- c. improve the micro-climate for the animals
- c. build up forestry capacity of the scheme.

The activities undertaken include:

- a. planting a shelterbelt consisting of 3 rows around one block of 250 feddan at a spacing of 2 m. between rows and 3 m. between trees within the rows using E. treetecornia.
- b. establishing a nursery.
- c. building up of a forestry staff in the company.

Observations and Comments:

Apparently this is the most important forestry project financed by a REDG and is frequently used for demonstration. The nursery is very well maintained and efficiently supervised by forestry technicians and by a professional forester delegated full-time from the Forestry Administration. It produced 53,000 seedlings last year. Some of the eucalypt seedlings are old and should be outplanted as soon as possible. Most of the species grown are healthy, but some others such as Casuarina are not as good, perhaps for the lack of nodulation.

The company has allocated 850 feddan of marginal land for woodlots. This year, it is planned to afforest 50 feddans in addition to the 100 feddan woodlots already planted. The 15-month-old plantations look very good, but may need some weeding if not too expensive. Otherwise eucalypts may suppress the weeds eventually. The new plantation (50 feddan) in which F. tateana was intercropped with Karkadeh is very healthy. This practical approach to agroforestry is commendable and has proved appealing to the company. It is recommended to carry out some economic study of such system in order to show to the company and other interested parties the financial benefits of such system. It is believed that this is the only type of agroforestry activity under experimentation in the Sudan. As it has proven to be biologically sound, it may also prove to be economically feasible.

Introduction of additional forest trees is highly recommended to avoid the possible hazards of monoculture and to diversify the end products. A study of micro-climatic changes as a result of tree planting is also recommended to be undertaken in cooperation with Forestry Research Institute, the Forestry Administration, or the Forestry Department of Martouk University.

In an informal discussion with the assistant manager of the company, it was suggested to introduce and test some multipurpose trees and shrubs. Acacia saligna was recommended as it has proven to be very successful in Egypt. The shrub produces very palatable foliage of high nutrient value for sheep and cattle. It is an evergreen species, which will provide fodder during the dry season. In addition to being a nitrogen-fixer, it coppices freely. The wood produced is suitable for charring or direct burning. This idea met the approval of agriculturalists and foresters. Seed samples were given to the forester in charge for a small-scale trial.

This REDG project is very successful and may serve for further training of foresters and nursery technicians as well as agriculturalists. It was used during the AFTAH Seminar for demonstrating successful agroforestry practices.

The initiation of this project by SREP is also commendable. SREP should continue to provide technical advice through frequent visits by forestry staff, but further financial support may be limited as the company must be convinced by now by the results and should be ready to invest more money in the agroforestry activities. It has been proposed to manage the woodlots on a 6-year rotation, after which the financial gains will be fully realized.

### 3.3.2 Assalaya Sugar Company:

A grant of L.S. 23,000 was made available to Assalaya Sugar Co., which is located 12 km. North of Rabag (White Nile Province) in order to improve its tree nursery and to increase its output to 200,000 seedlings annually. Afforestation of 150 feddan annually and sale of seedlings to private farmers in the region were also sought. The company is committed to maintain the nursery and to continue the planting programme after the grant is finished.

#### Observations and Comments:

The present nursery is in a fairly good state and the Forester in charge is a very active and interested young man. There are nearly 20,000 seedlings ready for outplanting and many other young germinants. These will soon need singling as the number in each bag is very high. All items needed for the extension and building of new nursery facilities have been purchased.

There are 380 feddans of woodlots; 80 of which are ready for harvesting (age 6 years) and will be sold this year. It is expected that the income will be very high (nearly IS. 6,000/feddan).

The vast areas of sugar-cane plantations need windbreaks. The agriculture manager was advised to plant trees along canals and roads as well as between plots.

This project, when completed, may serve as a good example of the forestry activities by large public agricultural companies and large schemes. The other sugar company close by (Kenanah), which is privately owned, has very active afforestation programmes and well-established nurseries.

### 3.3.3 Gezira Scheme Shelterbelts:

Gezira University was granted LS. 16,000 in order to study the influence of shelterbelts on water use efficiency and sand encroachment in the fields of Gezira scheme. Two locations were visited, namely Tahamid (Gezira - Managel area, 120 km South of Khartoum) and Sehemat (Abu Gota area, 80 km South of Khartoum).

#### Observations and Comments:

At the Tahamid site the shelterbelt consists of many rows of E. microtheca, but they were not uniform. Some belts are on the edge of farm lands, while others border bare land. Most of the belts were cut, especially the ones at the edges. Accordingly, sand encroachment on canals, roads and farms is visible. It would be difficult to delineate the effects of shelterbelts and cultivated land on sand movement and microclimate in this site. At the second site, Sehemat, the belts are much wider and some of them protect farms from sand creeping from open fields. They consist of many rows of eucalypt (more than 30), but sand accumulates only in the first 5-7 rows. Some spots would be suitable for the proposed studies.

In a lengthy discussion with the graduate student and his advisors, it was realized that the research will deal with sand movement and wind speed at a low height behind, within, and on the leeward side of the shelterbelt. Some very accurate instruments are therefore needed. However, the full scientific value of such simple measurements can hardly be attained. If portable anemometers are available they can be used to measure wind speed with an acceptable degree of accuracy. Additional monitoring of air and soil temperatures, relative humidity, evapotranspiration, and sand movement would contribute greatly to the conclusions drawn from the study.

### **3.3.4 El-Doum Village Shelterbelt:**

This village is located 50 km North of Khartoum in the Nile Province. The cooperative society was given 2,000 seedlings by SREP to be planted as windbreaks.

#### **Observations and Comments:**

Eucalypt trees are scattered along an irrigation canal and are in a somewhat neglected state. There is a lot of beating up needed as well as maintenance for the growing trees. This is a good example of the need for continuous supervision and technical advice by SREP experts. Otherwise the results may set back the successful examples and many other schemes would be reluctant to carry out similar activities. There is a need for protection and fuelwood in the area which can be fulfilled by such plantations, if successful.

### **3.4 Government Agencies (State Nurseries)**

#### **3.4.1 Soba Nursery:**

The Forest Research Institute at Soba, 20 km South of Khartoum, was granted LS. 45,940 to:

1. Renovate Soba Nursery.
2. Upgrade nursery procedures.
3. Produce seedlings for the Institute and community.

The specific objectives of the grant have been for:

1. Renovation of the irrigation system (installing a new pump).
2. Maintenance of nursery facilities.
3. Provision of material for the nursery.
4. Training.

The output of the nursery is to be increased to 300,000 seedlings a year.

Observations and Comments:

A new pump has been installed and is used as a standby for the old pump. This facilitated the continuous supply of water for the nursery and the arboretum. There are 10,000 seedlings grown in the nursery at present. The major species produced are E. camaldulensis, neem, Conocarpus lancifolius and Albizia lebbeck. They are available for sale to the community and farmers around Soba at 25 piasters per seedling. The proceeds are deposited in a special account to be directly used for the nursery operations. It is a good policy to separate the budget of the project from the general budget of the Institute in order to give more flexibility.

There is some ongoing clearing of the land across the road from the Institute. The 50 feddan area is to be planted as an arboretum as proposed for the next phase of the project. The F.R.I. has applied for a grant to conduct "Developmental research on species trials for biomass production for energy at Soba arboretum". The main objectives of the project are to assess the performance of 72 taxa potentially valuable for biomass production, to use the arboretum as a gene reserve and a source of tree breeding material, to study the taxonomy of the taxa used, and to collect seed for sale and research purposes.

If all of the above noted objectives are fulfilled, the arboretum can be very useful both scientifically and commercially. Seedling production from known seed sources after some assessment of their progeny would help to improve the productivity of fuelwood and biomass. The main task, however, should be to make improved seedlings available for the private and public sectors at reduced prices.

### **3.4.2 Khartoum Forest Nursery:**

The Khartoum nursery located in the city received a grant of LS. 65,450 to:

1. develop the nursery for fuelwood species and to increase production from 30,000 to 300,000 seedlings annually.
2. make seedlings available and carry out research on shelterbelts and amenity plantations
3. train staff in nursery techniques
4. grow forest species in the arboreta.
5. increase income from sales.

#### Observations and comments:

Although the target for production has been set at 300,000 seedlings annually, the nursery was unable to produce this number this year. The seedlings grown in the nursery are moderately good, but can be improved substantially with more attention. The operation is slow, due to the reduction in sales. It is expected that the quantity and quality of seedlings produced by such an old and well-known nursery would be much better. There were no signs of research on shelterbelts and the old arboretum is not as good as one would expect. The number of species grown has been the same for a long time. Introduction of new taxa is highly recommended.

### **3.4.3 Gozira Abu Nursery:**

The Forestry Administration was granted LS. 17,000 for the improvement of existing nurseries and establishment of new ones. The nursery visited is located in Gozira Abu, 80 km south of Dewann, White Nile Province. The objective of the grant to this nursery is to increase production to 250,000 seedlings annually.

**Observations and Comments:**

The nursery is located in a good agricultural area and very close to many villages. It is in a very bad state at the moment. Materials for construction of a new nursery basins and sheds are on the site. Work is expected to begin very soon. It seems that the nursery is not supervised by foresters as much as it should be.

The location and set up of the nursery have all the ingredients of success. It is very close to a permanent supply of water from the White Nile, the land around it is in bad need for trees for shade and shelterbelts and villages can use a lot of seedlings for different purposes.

This project deserves more attention from the SREP forestry staff. More frequent visits should be paid by the staff and financial support should continue at least for the next year.

**3.4.4 Wad Banaga Nursery:**

This nursery is located close to Wad Banaga (Kobba) village, nearly 110 km. North of Khartoum, in the Nile Province. A grant of LS. 21,300 was made to the Forestry Administration, out of which LS. 16,026 has been spent. The objective has been to establish a nursery with a production capacity of 100,000 seedlings annually to be planted as shelterbelts and along irrigation canals in order to meet the needs of the farmers and to help promote fuelwood production.

**Observations and Comments:**

The existing nursery is in a bad state and seems very neglected. A few seedlings of gum, mesquite and eucalypt of different ages are kept in the nursery.

Most of the seedlings should have been planted a long time ago. The area around the nursery looks very prosperous agriculturally. Good crops of clover, faba beans, bananas and mangos are grown on small farms nearby. There is an obvious need for windbreaks and canal side planting in the area. Fuelwood seems to be in short supply as the natural forest kept by the Forestry Administration is degraded.

This project may have good potential for integration between forestry and agriculture if properly managed. The farmers should be encouraged to plant trees on their farms, but seedlings must be made available first by the foresters. Extension will play a major role in this regard.

#### **3.4.5 Shendi Nursery:**

The Forestry Administration of the Nile Province at Shendi (185 km. North of Khartoum) was granted LS. 8,700 to improve its main nursery. The grant contributed to the purchasing of a pump that secured water supply to the nursery. The other objective has been to produce 100,000 seedlings annually to be planted as shelterbelts and along canals.

#### **Observations and Comments:**

This nursery, being located in the city, is in a much better condition than the one at Wad Hanaga. It contains some 60,000 seedlings of mesquite, eucalypt, casuarina and others. Some of the mesquite are very old and should be outplanted as soon as possible.

Many seedlings were distributed to the farmers with small holdings ranging from 5 to 10 faddans far from the Nile. The output of this nursery can be improved with more attention and supervision. Additional species should be tried.

### 3.4.5 Canal Side Planting, Kabashiah and Seyal:

These two activities are part of the grant to the Forestry Administration at Shendi.

The main canal of Kabashiah Project (40 km North of Shendi) was planted for 11 km with tree seedlings three months ago. The species used are F. camaldulensis and Casuarina spp. Most of the trees are surviving well, but some were dry. Apparently the seedlings were transplanted at an old age (maybe 1 year), which is not advisable.

The second canal-side planting is at Seyal scheme, across the Nile from Shendi. Ten kilometers of the canal were planted on one side at a spacing of 10 m between trees. The trees are similar to these planted on the Kabashiah canal.

#### Observations and comments:

These two activities should be given more attention as they may serve as good examples of the viability and success of canal-side planting. Although it may be expensive to plant and guard long stretches of canal sides, it may be worth pursuing until the full benefits are realized.

4. **Discussions with local and international organizations:**

As stated in Section 2 (Tasks and the scope of work), discussions of fuelwood/forestry options with the Central Forest Administration, CARE, FAO and USAID were requested by SREP. Several meetings were held with SREP staff as well as with other organizations. The following is a brief summary of the discussions.

4.1 **Central Forestry Administration:**

The Administration, to further to its activities in forestry operations in Sudan, is assuming the role of coordinating among several forestry-related projects being conducted in the country (estimated at 20-30). A quarterly meeting is to be held for all agencies. The agencies were requested to register their activities with the Central Forest Administration and to provide it with copies of their reports. The efforts of SREP are endorsed by C.F.A. and both parties cooperate fully.

4.2 **USAID (Agriculture/Forestry):**

AID supports conservation projects such as tree planting, efficient charcoal production and extension. For example, CARE is helped to reforest some of the abandoned mechanized farming areas using indigenous species. There are no direct grants, but there is support to special projects such as the estimation of biomass in some forests, genetic variability in some important species.

AID is looking forward to the outcome of SREP projects, and there is a good possibility of supporting the replication of some of the successful activities.

**4.3 UNDP:**

There are several projects related to renewable resources which are funded and/or administered by UNDP in the Sudan. These are: Energy Sector Assessment, Indigenous Biomass Resources for Energy, Gasification of Agricultural Residues, Afforestation for Pastoral Development, Fuel Briquette and Improved Stoves, Northern Shelterbelts (Dongola), Restocking of Gumbelt (Darfur), Southern Region Fuel Project, Drought Programme Fuel Project and Afforestation.

**4.4 FAO/CARE:**

The major related project undertaken by FAO is "Fuelwood Development for Energy in the Sudan", which started in 1983. It includes irrigated plantations, as well as small demonstration plots such as canal-side strips and shelterbelts. Forestry extension is an important activity within this project. A report on extension has been prepared by a consultant and discussed by concerned agencies. Internal and external training is also an integral part of the project.

CARE is working on the development of small nurseries as well as rehabilitation in irrigated schemes. It received a grant from SREP to finance some of its activities.

**4.5 FINAID:**

The Sudan-Finland Afforestation Program is a very large one. The Finnish contribution to Phase III amounts to FIM 64,546,000 (approx. USD 10,600,000). The program is to include the following projects (1986-1989):

1. Continuation of afforestation in the White Nile Province.
2. Continuation of fuelwood plantations in Rahad area and in the Blue Nile Province.
3. Khartoum fuelwood and shelterbelt development.
4. Establishment of shelterbelts in the Nile Province.
5. Management and study tours.

One of the main activities of this project is the improvement of nursery facilities at the Forestry Research Institute, Soba.

**4.6 SOS Sahel International:**

This is a "Community Forestry Project" in Shendi, Nile Province. The first village chosen for executing the project is Seyal Kabir, near Shendi. One tree nursery was established and the second is being built. Some extension work was conducted in the area and good working relations were established with the villagers. There is a good possibility of fruitful cooperation between this project and SREP.

**4.7 SREP/Arab-Gudanesse Blue Nile Agriculture Co.:**

In a brief meeting with SREP staff in charge of this project the following points were discussed:

- a. Long strips of natural forests will not be cleared to act as shelterbelts. The length will be nearly

- 2 km and width 50 m. They will extend east-west as the prevailing wind blows from the north.
- b. A temporary (flyer) nursery will be established to provide seedlings to the scheme.
  - c. Hashab will be sown directly to reduce costs

It is recommended to plant smaller windbreaks inside the large (1000 feddan) plots in order to reduce wind speed as the distance between "natural" belts will be 2 km, which is more than 20 H.

These belts should also be intensified by seeding or planting indigenous and some exotic species in order to increase their efficiency. Economic analysis of direct seeding versus planting is advisable in order to quantify the differences.

It is generally realized that there are many similar activities sponsored by SREP and other agencies, but it seems that projects are conducted in different geographic areas. The role of SREP is also well recognized by these agencies. Further cooperation, particularly in the fields of extension and training is recommended.

5. Evaluation and Recommendations:

As a general evaluation of REDGs is very difficult the different categories of grants (groups) will be dealt with separately.

5.1 Small (private) farms:

Some of these projects are very successful such as A.H. Ramly because the owner is residing on the farm and takes personal interest in tree planting for different uses. The grantee is also an educated man who realize the benefits of trees. He should be encouraged and supplied with improved seeds of suitable species as well as technical advice, to which he is very receptive. This farm can serve as a good demonstration for similar farming activities in the region.

Some other projects are not successful such as a grant to a small farm where the grantee is an absentee landlord. The farm as a whole is neglected and tree planting is not successful. Although there is a need for trees as shelterbelts and as a source of fuelwood, such a project should be re-evaluated. There is no need to spend money on a lost cause. It should be directed rather to farmers with potential for success.

Regardless of the importance of trees to small farms, they will contribute little to the national demand for fuelwood unless a very large number of grants are given to small farmers, which may be impossible both financially and technically.

The best example for a large private enterprise is the Adian Poultry Farm. It may be classified as an irrigated agricultural scheme, but it does not fit this category. This successful example can be used to demonstrate the capability of private farms in carrying

out large-scale tree planting both as shelterbelts and woodlots. The owners should be encouraged to plant more trees and to develop their nursery. If an economic study is conducted for tree production and planting on this farm the grantee may be stimulated to seek financing of a large-scale tree plantation. Some international agencies may be interested in supporting such an enterprise, based on the successful initiation by SREP.

## 5.2 Village (Community) Forestry:

This is a controversial issue which has been the subject of discussions by local as well as international agencies. However, SREP has proved the validity of this activity, at least partially, in Um Indraba, Um Triebat and Tawid Hag Tahir. There is an urgent need for trees in all such communities and there is interest on the part of the villagers. Both of these factors represent the basic requirements for any successful tree planting program. Nevertheless, the few trees grown on each site do not really form proper shelterbelts, nor may they be able to supply the village with needed fuelwood on the short or long run. This activity cannot be evaluated economically either as the amount of money spent is not proportional to the size of nurseries established or the number of trees planted. A large part of the grants went to infrastructure, such as drilling of well and installing pumps.

These conservation-conscious communities should be supported and encouraged to plant more trees as a part of a integrated agroforestry systems. If a well is to be drilled at a high expenditure, the water should be used for some forms of agricultural activities such as vegetable growing on a small scale. Ecological balance between the number of people and animals and available resources should be maintained, however.

There is also an urgent need for socio-economic studies of these communities. Frequent visits by integrated teams of SREP staff (foresters, rural sociologists and agricultural economists) are necessary. Some of these communities and villages can serve as examples for others and may be used for extension purposes.

### 5.3 Irrigated Schemes:

Some of the most successful SREP grants fall under this category such as the Seleit Project. Some other projects can be improved if properly managed and carefully supervised. Still a few others are not as expected because technical staff is not available most of the time. While the successful examples must continue to enjoy the financial and technical support of SREP, other unsuccessful ones must be abandoned. SREP can also initiate similar projects in other irrigated schemes but only after economic evaluation of "old" projects. These studies are needed first to convince the management of these projects of the profitability of such undertakings which may lead to allocating more land and resources for tree planting. Other schemes may need to review such studies before they are committed to initiate tree planting activities. Some donor agencies and financial institutions may also require an examination of the economics before funds are committed. The report prepared for SREP by D. E. Earl in 1985 should be consulted as well as the Sudan Forestry Sector Review (No. 5911-SU) prepared by World Bank in November 1985. Ecologic studies should also be encouraged to realize the beneficial effects of shelterbelts and windbreaks on micro-climate and crop yields.

The irrigated schemes should adopt suitable agroforestry systems, such as the intercropping successfully practiced at Seleit. More multipurpose trees should be used, particularly those which can

provide protection, fodder and fuelwood.

SREP should support training and study tours for foresters, agriculturalists and irrigation engineers in relevant institutions both locally and in some neighbouring countries.

#### **5.4 Government Agencies (State Nurseries):**

These nurseries have a good chance to succeed in providing seedlings to both private and public sectors. They have the highly trained technical staff, well established infrastructure and long history of production. Some of them are not up to the standard expected due to many constraints. Lack of adequate funding and low sales of seedlings due to scarcity of rain in the past few years hindered the development of most nurseries. SREP can play a major role in upgrading these nurseries and can help in increasing their seedling production. They should be stimulated to try new species of known geographic origins (provenances), as well as some applied research, but purely academic research should receive only minimal support from SREP.

In conclusion it is generally recommended to:

1. Continue support of private farms, especially the ones which have the potential of developing large-scale afforestation programs for commercial purposes.
2. Develop more village forestry activities, in addition to existing ones where the need for trees is evident and the interest of communities is high. Technical help is as important as financial support for these projects. Extension and dissemination of information among communities are of utmost importance.

3. Initiate more projects in the irrigated schemes, based on agroforestry, as SREP may have its best chance of success in biomass and fuelwood production in these schemes. Economic and social studies should be undertaken in these projects.
4. Support government nurseries partially and direct their attention to tree introduction and applied research.
5. Avoid duplication between the activities of SREP and other agencies through continuous exchange of information. A strong data base with a retrieval system is needed.
6. Encourage training on different levels, and promote study tours as well as seminars.
7. The present area covered by RIGs is vast. It is recommended not to expand it unless more funds become available and additional staff is appointed.
8. The methods of evaluating the grants through personal visits by staff and monthly or quarterly reports is satisfactory. Development of a computer based system which will give the present state of each project is highly desirable.
9. The complex nature of fuelwood/forestry research in the Sudan necessitates the adoption of integrated, multidisciplinary applied approaches. Some research areas that deserve consideration are:

1- Biological Aspects:

- a. In situ and ex situ conservation of potential genetic resources, and species/provenance trials.
- b. seed collection and handling.
- c. nursery techniques.
- d. silviculture (tending, fertilizer application, supplementary irrigation, pest control, etc.).

- e. tree physiology (water requirements, drought and salt tolerance etc.).
- f. shelterbelts and protective plantations (design, composition, effects on micro-climate and crop yield), canalside planting.
- g. sand dune stabilization (new techniques).
- h. complementary farming activities (crops, fodder, vegetables, fruit trees etc.).

ii. Technological aspects:

- a. monitoring of climatological changes after tree introduction.
- b. site preparation.
- c. harvesting (volume, growth, etc.).
- d. wood properties (calorific value).
- e. charcoal production.

iii. Socio-economic aspects:

- a. demonstration plots and outreach.
- b. self-help projects.
- c. land tenure status.
- d. economic analysis.

The culmination of suggested research projects is the presentation of the results to the users. These are mostly subsistence farmers and nomads. The researcher and SREP should make every effort to present the results in a convincing form that the user can understand.

## 6. Itinerary

### February, 1986:

- 16 Arrived Khartoum, Meeting with SREP staff
- 17 Planning the work program
- 18 Visited I.M.Abdou Farm, and Sudanese Poultry Farm, Soba.
- 19 Meeting with USAID (Agric./Forestry). Visited Khartoum Nursery
- 20 Meeting with Gezira University group
- 21 Day off
- 22 Visited Dr. El-Khalifa Farm, Rager
- 23 Visited Um Inderaba Project
- 24 Meeting with UNDP and FINAID
- 25 Meeting with FAO and CARE
- 26 Visited Research Institute, Soba
- 27 Meeting with RERI Director Visited research facilities of SREP and SEP, Soba
- 28 Day off

### March 1986:

- 1 Left Khartoum - arrived Wad Medani
- 2 Left Wad Medani - arrived Assalaya
- 3 Left Assalaya - arrived Khartoum
- 4 Visited Seleit Project
- 5 Left Khartoum - arrived Shendi
- 6 Visited Tameid Hag el Tahir, returned Shendi
- 7 Left Shendi - arrived Khartoum
- 8 Meeting with SREP irrigated schemes forestry team
- 9 Writing draft report
- 10 " " "
- 11 Meeting and report
- 12 Seminar for SREP, USAID, Forestry Administration
- 13 Left Khartoum for Cairo.

## 7. Persons Contacted

### 7.1 SREP Staff

Dr. El Tayeb Idris Eisa, Coordinator  
Gaafar El Faki Ali, Assistant Coordinator  
Donald B. Peterson, Chief of Party  
Hamza Hamoudi, Project Leader, Fuelwood/Forestry  
Dr. M. O. Sid Ahmed, Director, RERI  
Khalafalla Sid Ahmed, Forester  
Jim Adams, Peace Corps Volunteer, Forester  
Ali Khalid, Forester  
Omar Awad Abd Karim, Forester  
Nahid Yayoub, Farm Windmills  
Carolyn Huskey, Information Specialist Consultant

### 7.2 G.O.S. Agencies

Kamal O. Khalifa, Director, Forestry Administration, Khartoum  
Abbas Ballal, Assistant Director " " "  
Dr. A. El. Houri, Forestry Research Institute, Soba  
El Tayeb El Hadi, " " " "  
El Sheikh Abd Allah, " " " "  
El-Zein I. Ramadan, Superintendent, Khartoum Nursery  
Imael A. El Gazouli, Director, National Energy Administration  
Tag El Din A. Hannan, Researcher, " " " "  
Ibrahim N. Nour, Conservator of Forestry, Gezira  
Abd Allah A. El Toum, " " ", White Nile  
Abul Casem M. Suliman, " " ", Blue Nile  
Arbab M. Abd El Rahman, Forester, Gezira  
Ezz el Din O. Makki, Director of Agriculture, Gezira Scheme  
Mahgoub Saleh, Conservator of Forests, Shendi  
Khalil Bahir, Director of Agriculture, Northern Region  
Hafez Ibrahim, Assistant Governor, Nile Province  
Osman Ali El Sayed, Assistant Director, Adult Education Training Center, Shendi

### 7.3 International Agencies

Tahir Qadri, USAID (Agriculture/Forestry)

Elizabeth S.F. Martella, Agricultural Economist, USAID  
Abd El Gafoor, UNDP (Forestry)  
Jim B. Ball, Project Manager, FAO  
John Miskell, C/ME  
A. Hamburger, Netherland Development Cooperation  
K. Karsisto, Sudan/Finland Afforestation Program  
S. Bristow, Field Director, SOS Sahel International, Shendi

#### 7.4 Others

Zachariah Abd Allah, Forester, Seleit Co.  
M.E. Hussein, Nursery Superintendent, Seleit Co  
A. Farouq, Assistant Director, Agriculture, Seleit Co.  
Fouad Abdul Hafiz, Director and Owner, Sudanese Poultry  
Co.  
Ahmed Sid Ahmed, Graduate Student (Shelterbelts), Gezira  
Univ.  
Prof. Hussein Adam, Meteorology, Gezira Univ.  
Prof. C.J. Stigter, Agronnet. Wageningen, the Netherland  
(Consultant, Gezira Univ.)  
Dr. Y. A. El Khalifa, Private Farmer  
Kamel El Naim, Director of Agriculture Assalaya Sugar Co.