

Sudan Renewable Energy Project

2. PROJECT NUMBER
650-0041

3. MISSION/AID/W OFFICE
USAID/SUDAN

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY)
1 FY

5. KEY PROJECT IMPLEMENTATION DATES

A. First PIO-AG or Equivalent FY 81
B. Final Obligation Expected FY 85
C. Final Input Delivery FY 87

6. ESTIMATED PROJECT FINDING 6.0 million
A. Total with German Aid 4.6 mil
B. U.S. plus IC LS 3.7 million

7. PERIOD COVERED BY EVALUATION
From (month/yr.) October 1982
To (month/yr.) October 1984
Date of Evaluation Review Sept. 27, 1984

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study.
(NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)

| B. NAME OF OFFICER RESPONSIBLE FOR ACTION | C. DATE ACTION TO BE COMPLETED |
|---|--------------------------------|
| Richard Macken | Dec. 15, |
| Richard Macken | Dec. 15, |
| Donald Lake | Dec. 15, |
| Mel VanDoren Richard Macken Jay Carter Contractor GOS | April 1, 85 |
| Richard Macken Jay Carter Contractor GOS | Oct. 1, 85 |

1. Amend Project Paper, Logical Framework, Project Agreement and Amplified Project Description to reflect the inclusion of urban areas within the project scope and the priority status being given to fuelwood production, charcoal production, charcoal stoves, woodstoves, and photovoltaics.
2. Write PIO/T incorporating above adjustments.
3. Amend Contract to reflect the inclusion of urban areas within the project scope and the priority status being given to fuelwood production, charcoal production, charcoal stoves, woodstoves and photovoltaics.
4. Determine by reviewing rate at which expenditures are being made whether amount of money set aside for dollar spending under the Renewable Energy Development Grant Program should be reduced.
5. Determine by studying costs and outputs whether photovoltaic research should be revised or phased out.

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Project Paper | <input type="checkbox"/> Implementation Plan (e.g., CPI Network) | <input checked="" type="checkbox"/> Other (Specify) <u>Contract</u> |
| <input type="checkbox"/> Financial Plan | <input type="checkbox"/> PIO/T | <input checked="" type="checkbox"/> Other (Specify) <u>Amplified</u> |
| <input checked="" type="checkbox"/> Logical Framework | <input type="checkbox"/> PIO/C | <u>Project Description</u> |
| <input checked="" type="checkbox"/> Project Agreement | <input type="checkbox"/> PIO/P | |

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. Continue Project with modification (listed in C)
- B. Change Project Design and/or Change Implementation Plan
- C. Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

- Jay Carter, Project Manager
Richard Macken, Project Officer
T. Eighmy, Evaluation Officer
Hassan Wardi Hassan, GOS, Project Coordinator

12. Mission/AID/W Office Director Approval

Signature [Signature]
Typed Name William R. Brown, Director
Date 1/29/85



CONTINUATION SHEET

BLOCK 1

| ACTION | RESPONSIBLE OFFICER | DATE ACTION TO BE COMPLETED |
|--|---|-----------------------------|
| Determine, following survey of industrial wood users, whether household woodstoves should remain one of the project's five priority areas. | Richard Macken Jay Carter Contractor GOS | Feb. 15, 1985 |
| Develop plan for fitting separate project elements into an integrated renewable energy strategy. | Richard Macken Jay Carter Contractor GOS | July 1, 1985 |
| Arrange for system of meetings, site visits and wider distribution of project information to ensure better coordination between project and different Mission offices. | Richard Macken Contractor | Dec. 15, 1985 |

13. Summary

The Sudan Renewable Energy Project (SREP) has evolved substantially from the original Project Paper and the Amplified Project Description in the Project Agreement due to changing external factors and the willingness on the part of USAID, the COS, and the contractor to correct certain problems inherent in the original project design.

The project as now constructed and focused is addressing key energy related problem areas in Sudan. These priority areas are: (1) fuelwood production, (2) charcoal production, (3) charcoal stoves, (4) woodstoves, and (5) photovoltaics. The original project purpose is still valid, but with an emphasis at project's end on process and replicability rather than on objects.

The project goal needs modification to delete references to a rural focus. The project's thrust has evolved from an initial emphasis on rural energy to one incorporating biomass production and use. The change is appropriate given the overwhelming importance of charcoal consumption in urban areas to the total use of wood for energy in Sudan. If the project were limited solely to rural areas, it would not be able to reach the major users of charcoal.

SREP has to date achieved much due to its action orientation and its ability to get project staff, equipment and funds into the field in a timely and effective manner. SREP's challenge in the future is to develop dissemination strategies for the five priority areas in order to avoid concluding the project with only a string of isolated efforts. Once these strategies are worked out, the project should direct most of its attention to testing and promoting ones that can and will be expanded and supported after the PACT.

14. Evaluation Methodology

This is a mid-project evaluation that focused on project implementation, contractor performance and recommendations for actions within the present scope of the project. Broader issues concerning biomass and energy supply will be the subject of a forthcoming assessment scheduled for November/December 1984. In this context, the team spent a good amount of time talking with the long-term contractors, reviewing documents, interviewing other donors (German Technical Aid, FAO and CARE) and other organizations working in the renewable energy area, talking with key COS individuals involved with the project, and visiting sites of many of the activities thus far implemented under the project (i.e. Seleit Shelterbelt, charcoal stove producers, etc.).

Documents reviewed included the PP, the Contract with the Georgia Institute of Technology (GIT), PILs, the Grant Agreement with Amendments, the Second Annual Work Plan, the Local Currency Project Implementation Report, the Monthly Reports, the five priority area activity reports, the Technical Assistance Report, the Renewable Energy Development Group performance reports,

the Procurement Listing, the M.Sc. proposed program report, the consultants' reports, and others.

Cost of Evaluation:

| | |
|------------------------------|----------------|
| PSC Forester - 84 PD&S Funds | |
| PIO/T 698-0510.50-3-40043 | \$10,600 |
| AID/W | 19 Person Days |
| USAID/Sudan | 10 Person Days |
| REDSO/ESA | 12 Person Days |

The Evaluation Team's report is enclosed as Annex 2 to this PES, "Evaluation of the Sudan Renewable Energy Project (650-0041)," September 1984, 34 pages.

The Evaluation Team consisted of Anthony Pryor, REDSO/ESA, Energy Advisor; Dague Clark, PSC, Biomass Expert; and Deborah Mendelson, AFR/FA/ESD, with the assistance of USAID/Sudan, the contractor and the GOS staff.

15. External Factors

There appears to have been some initial confusion and resentment between the GOS agencies and the SREP staff during the shift to the five program priority areas. This apparently has now been overcome. The Technical Committee of the Energy Research Council (ERC) has helped to reduce the institutional conflicts that contributed to the project's initial slow progress and threatened to isolate it. The Technical Committee appears to be a neutral forum in which to raise technical issues.

The construction and equipping of the Renewable Energy Research Institute (RERI) by the Germans has been delayed. The Institute is not expected to be completed until 1987. However, this delay should not have an impact on the new emphasis of SREP.

16. Inputs

During the project's first year, it suffered from a relatively weak Chief of Party, who was unable and unwilling to provide focus, and who emphasized institutional development at the expense of action. This problem has been rectified by the 1983 arrival of a new COP, who is in large measure responsible for rebuilding donor confidence in the project.

An area the project must still address is the M.Sc. program involving the University of Khartoum and the University of New Mexico. Besides the problem that only four out of eight students have projects that deal with any aspect of the five priority areas of SREP, the overseas training/site visit portion of the program has not yet been fully arranged though the students are scheduled to leave in January 1985. There is also a need to better tailor the overseas portion of the program to the students' specific disciplines.

With regard to technical services, the contractor and the RERI are requesting an additional 24 p.m. of medium-term technical assistance. While the issue is

not formally addressed in the evaluation, it is the subject of a side memorandum to the USAID Director. This question must be reviewed in the context of overall strategy development for this project and should be resolved soon.

17. Outputs

In light of the refocusing of the project on five priority sectors, as well as the recommendation by the Evaluation Team that the "objects" focus of the project be switched to "process and replicability," the Log Frame (see Annex 1) will require substantial modifications. Following is the Team's views on the current Log Frame:

1. The establishment of a facility for the RERI and an information center has been delayed. At this point, the design work for the center and the preparation of tender documents is under way. Actual construction should begin in March/April 1985, with completion expected in approximately two years. The RERI will, however, move to expanded temporary quarters in October 1984, where SREP, the German SEP (Sudan Energy Project) and the ERC will all be under one roof. This should provide sufficient space for the information center to be organized.
2. The institutional structure of the RERI is different than the Sudan Renewable Energy Center (SREC) in the Log Frame. The RERI is under the supervision of the ERC, which is a subunit of the National Council for Research (NCR). The RERI is divided into four departments: Solar Energy, Wind/Hydro, Biomass and Dissemination. Each of the four sections has a department head, researchers, applied research/engineers and technicians.
3. The project is not now focusing on rural energy, and only a few studies have been conducted. The emphasis on action, and on getting project staff, equipment, and funds into the field, is admirable and should avoid some of the problems normally encountered during the implementation of such projects elsewhere.
4. This output is basically satisfactory but needs to focus more on urban dwellers. Verifiable indicators are too focused on objects rather than process and replicability (see elaboration in evaluation report).
5. Both the output and indicators simplify the process of promotion and training in RETs (Renewable Energy Technologies). There is a need to be more flexible in order to take advantage of targets of opportunity.
6. This output should de-emphasize the rural majority but otherwise is satisfactory. The Evaluation Team again questions the numbers used in the indicators section, since we see this project as more process and replicability oriented, making numbers less crucial.

18. Purpose

The Project Agreement defines the project as "to assist the Grantee to strengthen its capability to develop and disseminate renewable energy technologies for use in rural areas of Sudan". This should be modified to delete the rural focus.

EOPs

1. The first EOPs is not appropriate since we have suggested the ProAm be revised to delete "rural."
2. SREP has focused its priorities, but still needs to develop strategies for leveraging these activities to assure that the project avoids ending with just a string of isolated efforts.
3. The project will not do as much as originally anticipated in this area. One reason is that the project is more activity/action oriented and has not focused as much on studies. In some areas, however, such as the survey of industrial/commercial woodfuel use being done by the National Energy Administration (NEA), studies may play an important role in identifying how to proceed. The studies area, particularly in terms of strategy, should be expanded if it can be done without taking too much time away from ongoing activities.
4. EOPs should be reached for this component. Demonstration and dissemination activities are proceeding and should become even more directed as a result of a consultancy currently under way in dissemination. Particularly effective promotional materials have been developed in the area of charcoal stoves, where radio/T.V. coverage has been used and training workshops are planned.
5. This EOPs is achievable with a modification from a rural to an urban focus.

19. Goal/Subgoal

The program goal as stated in the Project Paper is: "The widespread use of inexpensive renewable energy technologies which are economically, socially and environmentally sound, thereby conserving energy resources and improving the standard of living of the rural poor majority in the Sudan."

The project's focus has correctly evolved from an emphasis on rural energy to one incorporating biomass production and use. The change is appropriate given the overwhelming importance of charcoal consumption in urban areas relative to the total use of wood for energy in Sudan. The opportunities for successful innovation and diffusion are greatest in urban areas. Additionally, a major portion of the charcoal and improved stove market and principal concentration of formal and non-formal manufacturers are located in urban areas. If the project were limited solely to rural areas, it would not be able to reach the

major users of charcoal. Moreover, experience throughout Africa has demonstrated the difficulty in extending isolated renewable energy technologies in rural areas where people often do not purchase stoves and in situations where extension services are weak or nonexistent.

The Project Paper was too hardware-oriented. The Evaluation Team stresses that the current focus of the project should be to test and promote strategies that can and will be expanded and supported after the PACD. We, therefore, recommend that the project goal be revised in order to reflect more realistically the evaluation of the project.

20. Beneficiaries

The ultimate beneficiaries of SREP are the urban poor, but immediate effects are being felt by small farmers and local artisans (stove producers). The project's benefits include improved quality of the environment and increased charcoal supplies. Areas planted with shelterbelts benefit small farmers by increased agricultural and fuelwood production. Local artisans (i.e., stove producers) benefit from training/workshops provided by SREP. The quality of the environment is improved by reduced wind erosion and a better microclimate provided from the forestry activities. Increased charcoal supplies directly benefit charcoal users by keeping the price of charcoal down.

21. Unplanned Effects

No unplanned effects were noted by the Evaluation Team.

22. Lessons Learned

This project has benefitted greatly from its action-oriented approach to renewable energy research and dissemination. While other similar projects in this sector have become mired in studies, this project has focused increasingly on obtaining high-caliber staff and equipment, as well as moving the Renewable Energy Development Grants (REDGs) into the field. The REDG mechanism has been particularly effective for funding small-scale development activities through its ability to reach a wide variety of organizations and individuals and its fast turn-around time for funding. Much of this activity has been financed by judicious use of local currency made available to the project, thus saving contract dollars. The generally harmonious and action-oriented relations existing among the various GOS agencies is a credit to the GOS and the contractor. The project could all too easily have become bogged down in details of administration and coordination within and among the GOS organizations and other donors.

23. Remarks

The original Log Frame is attached as Annex 1. The Evaluation Team's report is attached as Annex 2 (34 pages)

Wide-spread use of inexpensive renewable energy technologies that economically, socially and environmentally sound, thereby conserving energy resources and improving the standard of living of the rural poor majority.

Number of rural households, and community institutions using improved renewable energy technologies which (a) reduce demand for wood and (b) improve the standard of living of rural majority.

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Conditions that will indicate purpose has been achieved: End-of-Project status,

1. SREC developing and field testing renewable energy technologies to meet needs of the majority of rural-Sudanese.
2. System functioning for identifying priorities for development of renewable energy technologies.
3. ESED assuring the collection and analysis of social, economic and environmental data required for identifying appropriate technologies for dissemination.
4. DID (a) supporting and coordinating existing institutions and organizations to promote demonstration and dissemination of feasible renewable energy technologies (b) developing promotional and training materials, and (c) conducting demonstration projects.

Household and community surveys.

Project evaluations

Project reports

ESED reports

1. GOS energy policies and programs are concerned with renewable energy technologies for rural households, and community institutions.

2. GOS is able to successfully marshal the cooperation of various ministries, parastatal and private entities to effectively implement its renewable energy policies and program.

3. Economically and socially feasible technologies can be identified for adoption by the rural majority.

1. Ministry of Energy and Mining commitment to renewable energy activities continuous.

2. Willingness of appropriate entities to demonstrate and disseminate renewable energy technologies and to feedback findings including suggestions for modifications to SREC.

3. GOS provides local funds to support SREC.

Project Purpose:

To assist the GOS in developing an applied research and dissemination capability in rural renewable energy technology, with verification through application of research results in rural areas.

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| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTION |
|-------------------|---|-----------------------|---|
| | <p>5. Sudanese capacity to manage and implement successful renewable energy technology activities in rural areas.</p> | | <p>4. Trained personnel remain with SKEC.</p> |

| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTIONS |
|---|--|--|---|
| <p>Project Outputs:</p> <ol style="list-style-type: none"> 1. Establishment of facilities and an information center. 2. Functioning SREC Sudanese divisional heads and staff. | <p>Magnitude of Outputs:</p> <ol style="list-style-type: none"> 1. (a) Facility construction completed. (b) Information center collection of 250 documents, training manuals and films. (c) Information Center using NRC documentation center to tie into world wide information systems. 2. (a) Manpower study assessing staffing and training needs. (b) Divisional heads with requisite training. (c) ESED containing at least one economist, environmentalist and anthropologist each with an MA and at least three trained research assistants. (c) ESED containing at least one economist, environmentalist and anthropologist each with an MA and at least three trained research assistants. (d) ESED with at least four affiliate members. (e) DID with trained graphic artist, audio-visual specialist, and extension/dissemination specialist. (f) Librarian regularly securing materials for information center. | <ol style="list-style-type: none"> 1. (a) Site visit observations (b) Project reports 2. (a) Project Reports (b) Project evaluations | <ol style="list-style-type: none"> 1. Other requisite assistance for construction and equipping of facility provided in a timely manner. 2. (a) Requisite personnel are provided by in timely manner (b) Trained personnel return to positions |

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| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMP. FACT ASSUMPTI. |
|---|---|--|--|
| <p>Project Outputs:</p> <p>3. ESED rural energy use cost/benefits, monitoring, evaluation and policy analysis reports.</p> | <p>Magnitude of Outputs:</p> <p>3. (a) 10 sub-contract reports received, (b) Simple cost/benefit analysis on all models selected for adaptive research, (c) 5 studies of rural energy use in 5 regions of Sudan, 10 monitoring and evaluation, and 2 policy analysis reports.</p> | <p>3. (a) Project reports (b) Project evaluations</p> | <p>3. (a) Affiliate members recruited (b) Cooperation of researchers abroad to conduct studies needed by ESED.</p> |
| <p>4. Development and field testing resulting in feasible technologies which benefit the rural majority and urban poor.</p> | <p>4. (a) Identification of least one feasible prototype of Wood-burning stove and of improved charcoal stove, (b) 3 other RETs of direct benefit to rural Sudanese field tested, (c) 3 institutional and commercial RETs field tested, (d) 200 rural families participating in field tests.</p> | <p>4. (a) Project reports (b) Project evaluations</p> | <p>4. (a) RET personnel committed to RET which benefit rural majority and urban poor. (b) Cooperation between PDC and ESED in monitoring field results.</p> |
| <p>5. SREC promotion of and training in RETs proven feasible by field tests.</p> | <p>5. (a) Report identifying existing planning structures and other GOS entities, and PVOs appropriate for promoting and disseminating RETs. (b) 5 training manuals and slide tapes produced to support dissemination of feasible RETs. (c) 5 seminars/workshops with participants from all regions. (d) At least two DID seminars/training sessions in each region. (e) Production of 3 sets of posters.</p> | <p>5. (a) Project reports (b) Project evaluations</p> | <p>5. Interest by Sudanese entities in RETs can be generated if feasible RETs identified.</p> |

Project Outputs:
6. Demonstration and dissemination of feasible RETs which benefit rural majority and urban areas

- Magnitude of Outputs:
- 5. (a) 12 RED Grants awarded
 - (b) 1800 rural families using RET units
 - (c) 1,000 urban families using RET units
 - (d) 3 rural communities benefiting from village-level renewable energy activities.
 - (e) 2 institutional and commercial RETs in use
 - (f) 50 artisans/technicians trained in production of RETs for rural areas,
 - (g) 50 promoters/disseminators actively disseminating field-tested RETs.

- 6. (a) Contractual agreement with grant awardees
- (b) ESED evaluations
- (c) Project evaluations

5. (i) Feasible RETs identified by project by SREC allow for evaluation of results of RED demonstrating and disseminating the
(ii) RETs proven feasible in a particular area may not be feasible in other areas in the Sudan. Hence demonstration and dissemination of RETs must begin with testing feasibility under local conditions.

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| NARRATIVE SUMMARY | OBJECTIVELY VERIFIABLE INDICATORS | MEANS OF VERIFICATION | IMPORTANT ASSUMPTION |
|--|-----------------------------------|---|---|
| <p>Project Inputs:</p> <p>Tech. Assistance Long Term (90 pm) Short term (45 pm)</p> <p>Training Long term US (132 pm) Short term US (40 pm) Short term third country,</p> <p>Commodities Vehicles Office, Workshop, field test, training, equipment and materials</p> <p>Other: Air charter Renewable Energy Development Grants.</p> | <p>See detailed budget table</p> | <p>USAID Controller records AID/W Controller records.</p> | <ol style="list-style-type: none">1. AID funding avail on timely basis.2. COS and related budg. support continues. |

Annex 2

Evaluation of the Sudan Renewable
Energy Project (650-0041)

September 1984

SUDAN RENEWABLE ENERGY PROJECT (SREP)

EVALUATION

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1. Summary

The Sudan Renewable Energy Project (SREP) was approved in August 1981. The contract for the project was signed in October 1982, and the contractor arrived on site shortly thereafter. The purpose of the project is to assist the Government of Sudan (GOS) to develop an applied research and dissemination capability in renewable energy technology, with verification through the application and dissemination of results in town and village projects. The five priority areas the project is focusing on are (1) fuelwood production (2) charcoal stoves (3) charcoal production (4) wood stoves and (5) photovoltaics.

The Sudan Renewable Energy Project has evolved substantially from the original Project Paper and the Amplified Project Description in the Project Agreement, due to changing external factors and a willingness on the part of USAID, the GOS and the contractor to correct certain problems inherent in the original project design.

Unlike most other renewable energy projects funded by AID in Africa, SREP has not over emphasized studies. The increasing emphasis on action, and on getting project staff, equipment, and funds into the field is admirable and should avoid some of the problems normally encountered during the implementation of such projects. However, the Evaluation Team recommends that more effort be spent on developing dissemination strategies, producing hypotheses and documenting the rationale behind certain project activities. We believe that the project has an opportunity to initiate, document and replicate approaches that can effectively disseminate and market improved stoves, as well as promote the increased production of firewood. However, if care is not taken, it is likely that many of the project's outputs will be relatively isolated and insignificant. SREP is a small project, and the funding for small pilot activities is not, in the opinion of the Evaluation Team, sufficient if the project is to be replicated.

In our opinion, the project should direct most of its attention to testing and promoting strategies that can and will be expanded and supported after the PACD. We believe that the project should be evaluated primarily on the basis of its ability to put in place governmental, non-governmental, and private sector mechanisms that will replicate the project's activities. The primary dissemination concept incorporated in the PP--that the demonstration of improved energy technologies will lead to their rapid construction or purchase by peasants--has proven to be faulty in other similarly designed projects. SREP should not, therefore, be expected to achieve outputs based on this original concept. SREP will not meet the project's purpose if the present outputs and End-of-Project status are adhered to. Therefore, the original Project Paper and outputs should be revised to reflect a greater emphasis on process and replicability than on objects.

We recommend that the Project Agreement be amended, that the Amplified Project Description be amended through a PIL, that the Contract be amended, and that the Logical Framework presented in the Project Paper be revised. Of these changes, only the first will require negotiating and signing an amended USAID/GOS document.

Assuming that the above changes are made, the project should substantially meet its project purpose and outputs by the PACD, January 1987.

The following specific recommendations and conclusions are discussed in more detail in later sections. ✓

Relevance of SREP to Sudan's Energy Problems and USAID's Development Program (See Section II)

1. The project as now constructed and focused is addressing key energy related problem areas in Sudan, i.e. fuelwood and improved stoves.
2. SREP should be viewed as a test of low-cost methods to reach individual consumers in ways which will be replicable without significant recurrent costs.
3. SREP's challenge is to develop a diffusion strategy to avoid concluding the project with only a string of isolated efforts.

Technical Programs (See Section III)

4. Forestry/Fuelwood

Much progress has been made in fuelwood production, but considerable effort is still required in dissemination/outreach as well as in relating specific project activities to a broader strategy.

Charcoal Production

5. It is recommended that the charcoal production efficiency study carried out by SREP be checked. All activities in the charcoal production area are based on this one study, the results of which differ by a large factor from what was previously believed to be correct and from experience in charcoal production (wood conversion) efficiencies in other countries.
6. It is recommended that SREP collaborate with the National Energy Administration (NEA) and FAO on a charcoal fines ^{1/} resource base study. This recommendation should be carried out before the arrival of the charcoal technical consultant.

Charcoal Stoves

7. The charcoal stove program has progressed well, although an effort should be made to promote innovation and the continued development and extension of a variety of stove designs. While non-governmental organization (NGO)-supported stove programs outside of Khartoum can be assisted and encouraged, the majority of effort should be centered on Khartoum.

^{1/} As used throughout this report, charcoal fines refer to charcoal bits, not dust.

8. Woodstoves

We suggest that SREP review the inclusion of rural household woodstoves as one of the five priorities because there is no example of a successful woodstove program in Africa, with the possible exception of Botswana. In general, those people who use wood rather than charcoal cannot afford to invest in a stove, and in most countries extension services are too weak to diffuse stationary stoves widely. We doubt that Sudan is different.

9. Focusing on wood use by small local industries is probably a more logical step. The team supports the survey to be conducted by the NEA of industrial wood users in the Khartoum area. We recommend that additional technical assistance be allocated should the survey prove it to be necessary.

Photovoltaics

10. We have some concern that this component as originally identified is too hardware-oriented. This priority should be carefully reviewed for possible revision or elimination by the end of 1985.

Dissemination

11. Dissemination strategies should be developed for each project area, with an emphasis on post-project replicability. This may entail further technical assistance and staff time, and should be a major consideration in the selection of future renewable energy development grants (REDGs). This should be done in coordination with the NEA.

Technical Assistance (See Section IV)

Long-term

12. The quality of present long-term staff is excellent.

Short-term (Foreign TA)

13. Short-term consultants have been of very high quality and are in large part responsible for the significant progress made in certain areas.
14. Certain consultancies should not be undertaken prior to the completion of studies on resource availability and alternative technologies. This applies in particular to the planned pelletization consultancy.

Local TA

15. The use of local consultants under this project has been extensive and effective, particularly in the forestry component.
16. The continued and expanded use of local consultants is encouraged in areas of local expertise, i.e. forestry, while still using foreign technical assistance to fill in gaps as needed.

Renewable Energy Development Grants (REDGs) (See Section V)

17. The REDG system has proven to be quite effective for funding small-scale development activities in terms of their turn-around time for funding and their ability to reach a wide variety of organizations and individuals.
18. While the present SREP team can effectively handle the current level of REDGs, any expansion in the grants area may require additional monitoring, possibly through use of local currency to hire more Sudanese staff.
19. The bulk of approved grants are in the area of fuelwood production. The Evaluation Team recommends at this point that more REDGs should be used to fund studies on how the economics and strategies of the five priority areas can be developed to meet the objectives of the project.

Training (See Section VI)

20. The long-term training program must be made more practical, with a mandatory course on project evaluation after the upcoming field work.
21. Additional regional site visits should be supported, funds permitting.
22. A manpower assessment related to each priority area should be prepared in order to guide further local training.

Management (See Section VII)

Home Office

23. Considering that the prime contractor has two subcontractors, the Evaluation Team was impressed by the smooth home office management.

SREP

24. The team was impressed by the management skills of both the contractor and the GOS. The strengthening of the Renewable Energy Research Institute (RERI), as well as the establishing of the Technical Committee, have reinforced the development of a professional, cooperative environment.
25. TransCentury, one of the subcontractors, will be responsible for the administrative/logistical support of the Peace Corps Volunteers (PCVs). As integral components of the project, the PCVs will be guided technically by the SREP staff, including the COP, the RERI Coordinator, and the relevant Project Managers. The COP and the Coordinator should represent the Volunteers in official dealings with the GOS, USAID, and the Embassy.

USAID (See Section VIII)

26. A better level of information exchange should be established among offices at USAID in order to utilize available technical expertise in forestry--for example, as related to agriculture. Also, USAID and the contractor should establish linkages with similar AID and regional activities to benefit from work being done in other countries.
27. Project management should improve with the addition of administrative support. USAID support and technical advice have been useful and at key times have had a significant impact. Until a natural resource/forestry specialist has been added to the USAID/Sudan staff, however, USAID should continue to draw upon REPSO at regular intervals for technical advice on energy, social science, and forestry.
28. Given the importance of marketing, extension, and dissemination, the Evaluation Team regrets USAID's decision to exclude from the evaluation a specialist in the dissemination of stoves and fuelwood. To get the most out of the project, USAID should consider an additional informal technical review in early 1985 to reexamine the project's dissemination strategies as recommended in this evaluation.

Government of Sudan - Institutionalization of SREP (See Section IX)

29. After initial problems among GOS institutions in terms of a base for this project, a good working relationship seems to have developed between the Institute, SREP, and the Energy Research Council (ERC). In large measure, this relationship has improved because of the skill and technical expertise of the ERC Director and the work of the ERC's Technical Committee.

Other Donors (See Section X)

FAO

30. Given the complementarity and overlap between the FAO/Dutch project and SREP, the dissemination strategies recommended above should be developed in close collaboration with the FAO team.

CARE

31. The REDG for stoves in El Obeid appears to be a good investment. Future collaboration should include activities in Gedaref.

German Agency for Technical Cooperation (GTZ)

32. SREP and the GTZ should continue to keep each other informed of progress being made in project activities.

World Bank

33. Future USAID support of activities initiated under SREP should take into account the results of the World Bank forestry assessment. The inclusion of SREP staff in the assessment, as recommended by USAID, would be highly desirable.

Project Design (See Section XI)

34. The Project Purpose in the Project Agreement should be revised by deleting from Section 2.1 the words "for use in rural areas of Sudan" and replacing them with "as defined by the project."
35. The contractor and USAID should work together to modify the scope of work of the contract to ensure that it accurately reflects the project's present focus and priority activities.
36. The contractor, USAID and the GOS should be commended for focusing and restructuring a potentially unwieldy project. It is doubtful that the Project Purpose would have been achieved if the decision had not been taken to concentrate all activity on five specific areas.

II. Relevance of SREP to Sudan's Energy Problems and USAID's Development Program

In evaluating SREP and its importance relative to other USAID activities, it is not enough to consider only the performance of the contractor. Is the purpose of the project still worthwhile? Will the approach being taken by this project have a significant impact on the problem it was meant to address? Are there alternative approaches that would be more cost effective?

As defined in this evaluation, the purpose of the project--to assist the GOS to develop and disseminate energy technologies, particularly in fuelwood and improved stoves--addresses one of the most important energy-related problems in Sudan. Given the immense scale of the problem, however, it is understandable that a project that trains local artisans and provides extremely small grants to a limited number of farmers should be viewed with some skepticism.

However, the basic concept underlying SREP's biomass activities is sound: fuelwood production and use in Sudan cannot be effectively addressed solely through large-scale endeavors. Individual decisions by consumers, by farmers, and by the informal sector presently constructing the country's traditional charcoal stoves are critically important, and can only be influenced through extension, outreach, and the promotion of small entrepreneurs.

SREP should be viewed as a test of low-cost methods for reaching these individuals in ways that will be replicable without significant recurrent costs to the GOS. The project may not directly have a significant impact on the fuelwood situation in Sudan, but it is doubtful that even the entire USAID budget would have much effect in the short-run.

If SREP is to be criticized for its relevance, therefore, it is not because of the size of the activities being undertaken, but rather because of the project's ability, or inability, to leverage these activities, to develop a private incentive diffusion strategy that can spread new stoves, and to grow fuelwood on individual farms or in agricultural schemes after the PACD. SREP appears to understand the need to harness such activities. The challenge for the project will be to avoid concluding with a string of isolated efforts.

The project's focus has evolved from an emphasis on rural energy to one incorporating biomass production and use. The change is appropriate given the overwhelming importance of charcoal consumption in urban areas to the total use of wood for energy in Sudan. The opportunities for successful innovation and diffusion are greatest in the Three-town capital area, which comprises the majority of the urban population, a major portion of the charcoal and improved stove market, and the principal concentration of formal and informal sector manufacturers. If the project were limited solely to rural areas, it would not be able to reach the major users of charcoal. In addition, experience throughout Africa has demonstrated the difficulty in extending isolated renewable energy technologies (RETs) in rural areas where people often do not purchase stoves and in situations where extension services are weak or nonexistent.

As for other activities, including photovoltaics, it should be remembered that energy is an intermediate good, and is only valuable in terms of its final use. From an aggregate supply and demand perspective, certain uses are not particularly important; improvements in process heat or irrigation pumping, for instance, do not have a significant impact on Sudan's energy balance. However, such uses may have a major impact in other priority sectors; e.g. agricultural and industrial production.

In its original design, SREP was trapped by two misleading assumptions: that priorities in energy are only related to the energy sector in the aggregate, and that renewable energy projects should define activities around technologies, not uses. While the decision to focus attention on the five priority areas has helped resolve this confusion, decisions as to future activities, and in fact the fate of photovoltaics, should be evaluated in terms of end uses of significance to the GOS and USAID.

III. Technical Programs

A. Forestry/Fuelwood

By emphasizing fuelwood and forestry, the SREP project is tackling the most important renewable energy problem in Sudan. However, the problems and complexities inherent in this decision should be clearly understood by all parties. Fuelwood production is not necessarily a technology per se but a process, a combination of technology and farming decisions that are not clearly understood. The project is also emphasizing on-farm plantings and localized nurseries. To accomplish this approach requires the interaction of forestry with agriculture. For SREP this leads to two potential problems:

- the need to draw upon expertise not ordinarily involved in the development and dissemination of energy technologies, and
- the difficulty of equating project activities to the larger energy-related SREP purpose.

SREP has dealt with these concerns admirably by developing a strong working relationship with the Forestry Administration. The proposed consultancy with Derek Earl on the economic incentives for farmers to plant woodlots for charcoal is another important step. However, considering that most of the proposed plantings deal with agricultural schemes and individual farms and that there is a strong interrelationship between forestry and agricultural programs, more effort should be made to coordinate these activities. If agricultural staff, particularly agricultural extension, could be seconded to the project, the effectiveness of the fuelwood/forestry activities could be greatly enhanced, and agricultural extension might also benefit in the longer run.

The SREP staff has been very effective in using the grant mechanism to initiate activities in the biomass area. The grants were used to greatly increase production in private and public nurseries, to plant woodlots and shelterbelts, and to demonstrate proper forest management. There are a number of very impressive activities developed in the past ten months of the project. However, while individual forestry projects are worthwhile, there is no apparent overall plan of how these grants will promote dissemination of fuelwood activities. There is no mechanism to find out how farmers make decisions on what to do and what not to do. Nor has there been any effort to find methods of bringing the information to the villagers, so that they can make these decisions.

The lack of consideration about how seedlings get from the nursery to the field can be seen even in the selection of species propagated in the nursery. Selection came only from ecological constraints and not from a list of species the farmers valued.

It is the opinion of the Evaluation Team that setting up mechanisms to find out how farmers make decisions and how to deliver information to that system are far more worthwhile objectives for SREP than

planting kilometers of shelterbelts or acres of woodlots. Once the system of villager decision-making is understood and information can be delivered to that system, planting becomes much easier. This study could be contracted out to an organization such as the Development Studies Research Center (University of Khartoum) or Tanmiah (a private agricultural consulting firm).

The grant process appears to be at the stage where it does not require as much of the SREP staff's attention, so they can devote more time to the dissemination process. The biomass technical leader should work closely with the dissemination project leader and the Agriculture Administration to develop a strategy for dissemination.

Once the FAO project's dissemination component becomes well established, SREP should take full advantage of those activities. If the FAO forestry extension course is developed, SREP should enroll the foresters involved in the project in this training program. It is our opinion that if an overall extension plan is not developed by SREP soon, the only outputs at the end of the project in the biomass area may be a series of unrelated forestry activities.

The Evaluation Team feels that the biomass component correctly emphasizes fuelwood supplies, while the nurseries need to be income generating. The type of seedlings that will be in highest demand may not be the fuelwood species. Currently, the nurseries are producing amenity species to help cover the cost of running the nurseries. The income producing species should be expanded to include fruit trees which are in high demand everywhere. Fruit trees are usually propagated by the Horticulture Department, but there is no horticulture nursery near most of the SREP nursery sites. Therefore, an agreement should be reached between the two parties before SREP starts raising these species. The species selected by the farmers once again ties into dissemination activities. With proper extension activities, one should be able to convince farmers of the value of planting fuelwood species.

B. Charcoal Production

Due to the widespread use of charcoal as a cooking fuel in Sudan and the diminishing supplies of charcoal, it is logical to include charcoal production in a renewable energy project. Activities to date in the charcoal production component of SREP have consisted mainly of an extensive study of the charcoal production industry in the Blue Nile Province. This study concluded, among other observations, that traditional charcoal production methods were twice as efficient as previously believed. There is some controversy as to the methods used to measure the volumes of wood in the traditional kilns. These discrepancies could greatly affect the efficiency calculations. Even if there were no controversy over the measurements, the results differ by such a factor that it would be desirable to recheck the methods used for this study, since SREP is basing all future activities in charcoal production on this one study. Therefore, the first recommendation is to run a detailed check of the volume measurements to get a clear idea of the accuracy of the first study. The recalculation of the efficiency rate should be carried out in conjunction with the NEA and FAO. Future activities in the charcoal production component of the project would depend on the outcome of the efficiency calculations.

A second recommendation, which is not contingent upon results of the traditional production efficiency check, deals with charcoal fines. These fines can be broken down into two categories: one is at the household level or in individual sacks; the other is at charcoal depots/rural conversion sites. The original study indicated that 20 percent of the charcoal at the household level is lost in the form of fines and powder. Traditional stoves cannot burn these fines and consume about 800 grams of charcoal per day. The improved stove being disseminated by SREP uses only 200 to 250 grams of charcoal and 500 grams of fines per day. It has been estimated that the introduction of this improved stove in only 20 percent of the current market will utilize all available fines. This, of course, is unrealistic since when demand for the fines increases so will the price of the fines.

The other source of charcoal fines and powder is the charcoal depots/rural conversion sites. A significant but unknown amount of materials from these sources is consumed in lime kilns. Also, there is disagreement about how much of them are usable and how much are sand. Therefore, one must first evaluate the resource availability for quantity and quality before recommendations can be made regarding how to best utilize the resource. SREP should once again cooperate with FAO and the NEA in the charcoal fines and powder resource base study.

Due to the limited amount of technical assistance funds available, the Evaluation Team suggests that the two studies recommended in this section be carried out before the short-term charcoal consultant arrives in Sudan. It is also suggested that the consultant have experience with charcoal fines utilization in Africa. The wider the range of experience the better; that is, he/she should not be limited to one method of conversion of fines into a marketable product.

C. Charcoal Stoves

The charcoal stove program has been a major success during this initial phase. Beginning with an innovative design for a charcoal stove partially using charcoal fines, the program has promoted production at various levels of the Sudanese economy. The stove developed at the University of Khartoum has been adopted and revised in part through a series of consultancies by Maxwell Kinyanjui and in part through spontaneous construction innovations on the part of producers.

The initial stimulus used to move the design out to potential manufacturers was a stove contest, originally suggested by USAID's energy advisor, Jay Carter. The use of such incentives, artisanal training, and a willingness to promote direct sales by the producer characterize what is quite likely the most promising new stove program in East Africa. SREP should be commended for drawing upon experience and expertise from other countries in the region, particularly Kenya.

The stove program is also the major activity of SREP's dissemination unit. Lessons learned from this technology should be applicable to other work.

However, certain problems still remain that need to be addressed. As discussed, the stove program has been relatively unhampered by household surveys, complex market studies, and other analyses. Based on a technically proven design and common sense drawn from other stove dissemination projects, SREP has initiated its program without becoming too academic. The potential market for the charcoal fines stove has not, however, been adequately defined. Is it a significant percentage of the total charcoal stove market? The estimate is that twenty percent saturation would eliminate the supply of fines. Who has access to fines? One individual suggested that in general the more affluent have a greater access to fines since they tend to buy charcoal by the sack.

It is not necessary or possible to answer these questions rigorously, but the uncertainties of the market should be explicitly stated. No stove is a panacea; putting it in context not only will help to improve dissemination strategies, but will guard against future disappointment. Much more so than in Kenya, the Sudan stove market includes a wide variety of designs and sizes. No single improved design will be sufficient, especially if it requires a relatively large amount of metal. Therefore, analyzing market constraints should help in the design, development, and promotion of other stoves.

The stove program is not just related to dissemination, but should also include the continued redesign of the charcoal fines stove in reaction to consumer preferences, as well as the design and testing of new models. We are of the opinion that modification and development must be actively promoted through judicious grants and consultancies, as well as design workshops for artisans. Such development efforts should be open to any individual or group in Sudan.

On the other hand, Sudan needs a practical but accurate testing facility, open to all artisans and developers. This testing facility need not be complex but should carry out tests similar to those proposed by Volunteers in Technical Assistance (VITA), so as to ensure regional comparability. RFFI, in conjunction with the University of Khartoum or any other interested institution, should develop a coordinated proposal for such a facility that promotes efficient design without stifling creativity and innovation. It is possible that some funding will be required from the dollar component of the REDGs, but this should be extremely limited, given the simplicity of the test most appropriate to the situation at hand.

The charcoal stove activities of SREP should also focus on Khartoum in order to maximize the effectiveness of its dissemination unit. However, similar stove programs by NGOs such as CARE's El Obeid grant should be encouraged for other regions with fuelwood/agroforestry activities.

D. Woodstoves

In keeping with SREP's original mandate, the woodstove program initially emphasized improved stationary and portable woodstoves for rural use. Since that time, the component has been divided into two segments. The first

expands on the original mandate by evaluating ways to increase the efficiency of traditional three stone fires, as well as stoves for small grocery and other stores in urban areas. The second segment will examine industrial wood users, with a focus on industries such as bakeries, potteries and brick kilns. This latter component will begin with a survey by the NEA or another organization of wood use by industries in Khartoum.

If these surveys and technical reviews indicate a potential for improvement, then SREP will design a development/dissemination strategy for this component. The Evaluation Team recommends that additional technical assistance be allocated should it prove necessary.

We are concerned, however, that SREP not continue to spend its efforts on household level wood stoves unless a strategic analysis forcefully argues otherwise. There is no example of a successful woodstove program in Africa, with the possible exception of Botswana. In general, those people who use wood rather than charcoal cannot afford to invest in a stove, and in most countries extension services are too weak to diffuse stationary stoves widely. We doubt that Sudan is different. We therefore suggest that SREP review the decision making rural household woodstoves one of its five priorities.

E. Photovoltaics (PV)

The photovoltaics program is the fifth priority area, and the only one not related to biomass production and use. It is also the only area to have drawn on dollar funds from the REDG program. The systems to be tested include self-contained lanterns, rechargeable lanterns, solar refrigerators, and street lighting.

A survey of the demand for each system is being designed, as well as a feasibility study for PV irrigation. Due to rising costs and the unavailability of fuel, it appears that testing PV pumping from shallow water tables or rivers could be further explored. While the Evaluation Team supports the carrying out of these studies as part of the strategic review of this priority, we have some concern that this component as originally identified is too hardware-oriented and not enough end-use oriented. This priority should be carefully reviewed for possible revision or elimination by the end of 1985.

F. Dissemination

Initially, SREP was to emphasize extension and dissemination, paralleling the research efforts of the GTZ's SEP. The Dissemination Unit has expanded its activities primarily through an emphasis on charcoal stove extension and artisanal training. The Unit has benefitted from a consultancy by Carolyn Huskey. The Unit, with the addition of the two Peace Corps Volunteers, should firmly establish its publications production skills and continue the effective use of radio/television. It is also clearly competent at the organization of demonstrations and training courses.

The Dissemination Unit is meant to be the major engine for the extension/marketing of technologies evolved from the five priority areas. As such, it is the primary part of the project that should identify the strategic

approach most appropriate for each technology: What audience/market is most relevant; how does that audience decide on such purchases or activities; what are the incentives and disincentives that affect the potential purchase or use of the developed technology?

At present, however, the Unit plays an ancillary role. As with many projects and institutions, dissemination is considered to be a mechanical, non-substantive activity. Instead, it should be considered an integral part of the project, an equal partner to the five priority areas, and a source of strategic guidance and market feedback.

The Evaluation Team expects that the present consultancy by Claudia Huff could permit the upgrading of the Unit and its role in defining the dissemination approach most appropriate for each priority area.

G. Project Hypotheses

The project's approach incorporates several hypotheses or assumptions about energy supply and use, as well as about technology dissemination. These hypotheses should be explicitly stated and the limiting factors or constraints identified. If it appears that certain gaps in knowledge significantly affect the outcome of a particular activity, then an additional study or consultancy may be necessary.

The purpose of this exercise is not to prepare academic studies, or to unnecessarily delay the excellent progress already being made. Rather it is to assist the project in the following ways:

- to avoid undertaking an activity that will have little national impact if widely replicated;
- to explain to USAID, the GOS and its own staff the relative importance of a given strategy;
- to avoid potential problems when a technology goes from a pilot activity to a widespread program (i.e. scarcity of fines, increased price of scrap metal, etc.).

The following are some of the hypotheses that appear to be implicit:

Selection of Five Priority Areas

- biomass technologies and wood production are the most important renewable energy activities in Sudan;

Selection of Overall Dissemination Strategy

- biomass production and the construction and purchase of biomass-related technologies are based predominantly on individual or private sector incentives;

Wood Stoves

- rural households that use wood do not buy stoves and hence represent a difficult market to penetrate (Are there regional differences? How much wood is consumed as firewood?);

institutional users (bakeries, lime kilns, potteries) represent a significant market (How significant?), where users can afford to invest in improvements;

Charcoal Stoves

- charcoal fires are presently a free good; a household stove based on their use will dramatically affect household expenditures for cooking (What is the saturation level for such stoves in a given community beyond which the scarcity of fires creates a price that makes this stove uneconomic to buy or operate?).

These and other hypotheses should be explicitly described, with the information confirming or contradicting the hypothesis presented and any potential impacts identified if the hypothesis proves to have been incorrect.

IV. Technical Assistance

A. Long-term Technical Assistance

The project suffered during its first year from severe institutional conflicts as well as from a relatively weak Chief of Party (COP). While enthusiastic and conscientious, the initial COP was unable and unwilling to provide focus and emphasized institutional development at the expense of action. Both USAID and the Georgia Institute of Technology (GIT) were at fault in selecting that individual for the job of COP, a position that did not permit the flowering of his considerable skills. The present COP, Donald Peterson, has performed exceptionally well. He is in large part responsible for rebuilding donor confidence in the project. His managerial and personal skills are excellent, and his technical judgement accurate and informed. Peterson and the Project Economist, Matthew Gamser, have identified most of the short-term consultants and have been able to draw upon other relevant projects and groups in the region.

Matthew Gamser has also performed well during the first year, under increasingly difficult circumstances. During the project's initial phase, his economics expertise was underutilized, and with the focus on the five priority areas, he became the project's key forestry/extension specialist by default. With the consultancies of Lester Bradford and Hamza Hamoudi, Gamser has been able to be more active in overall project activities.

Given the need to develop strategies, project targets, and economic rationale for project components, we recommend that Gamser try to allocate more of his time to these and other tasks originally outlined in his initial terms of reference.

B. Short-term Foreign Technical Assistance

During year one of the project, 13 p.m. were provided. Three p.m. were provided to assist in revising the program around the five priority areas, to survey the manpower needs of the RERI, and to design the formal training program. The remaining technical assistance was used to accelerate activity in several of the priority areas: 2 p.m. on charcoal production, 4 p.m. on forestry, 1 p.m. on charcoal stoves and 3 p.m. on dissemination.

During the second year, the project was planning to provide an additional 13 p.m.: on charcoal stoves, agroforestry, charcoal production, the Cassamance kiln, and the RET information center/library.

Six p.m. of the original technical assistance provided under the contract will remain for use during the remaining years of the project. The contractor and the RERI are requesting an additional 24 p.m., for two medium-term consultancies, one on dissemination, the other on fuelwood combustion.

The short-term technical assistance has been of unusually high quality; much of it has had a rapid impact on the project's program. The medium-term technical assistance has been particularly effective and apparently appreciated. Lester Bradford on forestry (4 months) and Carolyn Huskey on dissemination (4 months) have been remarkably effective. Shorter

consultancies by Maxwell Kinyanjui and Derek Earl have also yielded valuable results. Kinyanjui's consultancy permitted the transfer of the artisanal promotion approach that has proven so effective in disseminating improved charcoal stoves in Kenya. Particularly significant has been the emphasis on transferring the approach, not just a specific stove design.

In terms of future technical assistance, we concur, though with some reservations, with contractor's interest in providing additional medium-term assistance, and have some suggestions for alternative consultancies.

1. Consultancy on economic incentives of tree planting for farmers (D. Earl). We suggest that Jim Seyler (REDSO Forester) be asked to participate. In addition, USAID may wish to inform S&T/FNR, which is carrying out a similar effort worldwide. Earl will be useful but not sufficient.
2. Dissemination consultancy (Claudia Huff). This consultancy is well-conceived and should be an excellent follow-up to Huskey's consultancy.
3. Charcoal Pelletizing Consultancy (G. Curtis). This consultancy appears to be premature and possibly too restrictive. A survey in cooperation with the NEA and FAO should be undertaken first to better estimate the potential market constraints and site-specific availability of fines and powder.
4. Stove workshop and design consultancies (Kinyanjui and other specialists). These consultancies have been well designed and appear to have evolved to fit changing circumstances.
5. Dissemination consultancy (additional request). We recommend that this consultancy be divided into two consultancies of up to 6 months each: the first on extension/dissemination strategies, the second on marketing.

The first consultancy would draw upon previous dissemination efforts, the status of the forestry and stove components, and the project's overall purpose to define operationally useful end-of-project objectives, target audiences, and specific strategies and approaches designed to reach each audience. Additional technical assistance on dissemination mechanics is not considered necessary given the previous dissemination consultancies and the arrival of two PCVs with publications skills.

The second consultancy, in marketing, would supplement the work by Kinyanjui on artisanal development, as well as efforts in the forestry component to promote on-farm or agricultural scheme nurseries and woodlots. This consultant should have a background in entrepreneurial/small business development in Sudan.

6. Wood fuel, combustion consultancies (additional request). These 12 p.m.'s would support any further work identified in the institutional wood fuels survey about to be undertaken. We strongly support the need for work in this area, although an effort should be made to define such consultancies within the next six months.

C. Local Technical Assistance

This project has used local consultants more extensively and effectively than any other similar project in East Africa. Foreign technical consultants have been used to fill gaps in local expertise. Over 15 Sudanese specialists have been hired since the beginning of the project, and it is assumed that this level will continue or expand in coming years. The forestry component owes much of its drive and progress to Hamza Hamoudi; the other staff have increasingly become incorporated into the project.

The use of local consultants should be expanded, particularly in the forestry area. However, while it is clear that considerable expertise exists in Sudan, agroforestry specialists and forestry extension experts are not as common. Given the importance of such skills for this project, foreign technical assistance should not be completely eliminated. Foreign technical consultants have not taken jobs away from Sudanese, but rather have created several opportunities for local consultants. For example, work by Lester Bradford has clearly generated a significant amount of short-term consultancies that otherwise would not have existed.

V. Renewable Energy Development Grants - REDGs

REDGs appear to be an effective mechanism for funding small-scale development activities. The turn-around time from the date of application to the date of fund availability compares very favorably with most other sources. In addition, the grants represent one of the very few sources of small amounts of money available in Sudan.

SREP staff should be commended for the development of the REDG system. The grants have been used for a wide variety of activities by a large number of organizations and individuals. The majority of the 24 grants awarded to date have been in the forestry/fuelwood area. Seventeen grants have been awarded to cover these activities. The remaining seven grants are divided between photovoltaics and charcoal stoves. The number of grants for these two areas are five and two respectively.

The Evaluation Team feels that the current level of REDGs is about all the present SREP staff can handle. If the project attempted to expand its efforts in the grants area, it may spread itself too thin. SREP, in any event, may at some point have to use local currency to hire Sudanese staff for monitoring and technical assistance for the grants.

The local currency spending for the grants is on schedule, and it appears that the funds available are adequate. On the dollar side, however, only about \$50,000 has been spent out of \$2.1 million. All of the dollars spent have been for photovoltaics. While the encouraging trend in local currency spending is likely to continue, it is doubtful that the total amount of U.S. dollars available will be spent.

If the REDGs are used to extend activities to other regions, the local currency budget should be increased to meet these additional demands. The budget should reflect not only the funds needed for increased activities, but also the money needed to hire more Sudanese staff for monitoring and technical assistance for the grants.

Most of the accepted grants to date have been for fuelwood production. Part of the reason for the emphasis on production is pressure from USAID to initiate these activities. SREP is now at a stage where more REDGs should be used to fund economic and strategic studies on how the five priority areas can be developed to meet the objectives of the project. In particular, forestry/fuelwood activities must be examined to see how they can increase demand for fuelwood seedlings. The Evaluation Team believes that if the emphasis of the REDGs is not shifted from production to extension/economics the outputs of the grants at the end of the project may be a series of small unrelated activities enjoying varying degrees of success.

Seven REDG fuelwood/forestry projects were visited by the Evaluation Team. A brief summary of observations and recommendations follows.

1. Seleit Shelterbelt L.S. 42,365

A nursery of 32,000 seedlings/year capacity has been established and is producing seedlings to be out-planted.

as well as some ornamentals to be sold. There has definitely been an evolution in the design of the shelterbelts from August 1983, when planting consisted of whatever was available from the Khartoum and Soba nurseries, to the aerodynamically designed break planted around the nursery itself in April 1984. At the same time, though, an expansion of the windbreak near the poultry sheds, planted in April 1984, consisted of seven rows of eucalyptus and did not contain the mix of vegetation heights found in a good design.

The project had the strong backing of the agricultural manager of the scheme but appeared to lack coordination from time to time. For example, the windbreak planted along the sides of drain eleven was totally destroyed by animals because there was no coordination between the scheme's herders and the foresters.

The Seleit scheme was an excellent choice to receive a grant not only because the agricultural manager is pro-forestry activities, but also because the scheme is located so close to Khartoum, which means that there is an almost unending demand for the fuelwood produced. If the eucalyptus produced in the irrigated woodlots is turned into charcoal, the transport costs will be very small compared to supplies coming from the Blue Nile charcoal production area. In addition, the scheme could be used as a training/demonstration center to show the benefits of shelterbelts. Both agricultural and forestry personnel could use Seleit as a training center. Forestry students and staff could use the area to set up experiments on different windbreak designs, cropping combinations, etc. In order for Seleit to be an effective demonstration area, a comprehensive plan will have to be developed as soon as possible for the scheme. This plan should be developed in coordination with all department heads at Seleit.

In order to demonstrate the beneficial effects of shelterbelts some fields should be left untouched. These areas should be as similar in soil types, crops planted, amounts of water received, etc. as the fields planted with shelterbelts. The overall plan for the scheme should now be laid out in order for Seleit to be as effective a demonstration/training center as possible.

2. Mahdi Musa Agroforestry L.S. 500

Funds were used to purchase eucalyptus seedlings which were transported to Um Teirebat. These were then planted around Mahdi Musa's father's vegetable garden. Other villagers at Um Teirebat questioned why this was the only field to receive seedlings. Their questioning led to the Um Teirebat nursery grant proposal. The second grant proposed proves that the first one was successful in stimulating interest in the grant process.

This plan should be developed in coordination with all department heads at Seleit.

Examination of the field where the trees were planted revealed that several of the trees had been trampled or eaten by animals that were tied inside the enclosure. The only area where the trees were left untouched was near the section where sorghum was planted, presumably because the sorghum was protected from the animals. The lack of concern for protection of the trees shows that extension work should be carried out with the grant recipients.

Um Teirebat Nursery (under consideration)

The village of Um Teirebat had not received its grant at the time of the Evaluation Team's visit. The SREP members, however, felt confident that the grant would be approved. The village appears very interested in establishing a nursery and in receiving technical assistance in management of the natural Acacia nilotica forest growing nearby. The villagers also seemed enthusiastic about having a Peace Corps Volunteer live in the village to help them with the above-mentioned activities.

There is great potential for establishing shelterbelts along the many kilometers of irrigation canals in the Gezira scheme. Letters have been sent by SREP to the Gezira scheme administration concerning cooperation but no response has been received from the scheme. The lack of official agreement to cooperate should be settled before the establishment of the nursery and before the Peace Corps Volunteer starts working in the area.

One final observation on selection of Um Teirebat as a grant recipient is that because of the nearby acacia forest, fuelwood does not appear to be a major concern of the village. Since this is a renewable energy project and not a forestry project per se, maybe a surrounding village with a more pressing fuelwood problem would have been a better site to receive the grant. Due to the enthusiasm of the villagers, however, it can be seen why the grant was approved.

4. Khartoum Nursery L.S. 65,450

Plans are to expand the Khartoum nursery from a reported 15,000 seedlings produced last year to 300,000 seedlings/year. An agreement has been reached between SREP and the nursery to provide, free of charge, 27,000 seedlings for project activities. The remaining seedlings were to be sold to cover the costs of maintaining the nursery. At the time of the Team's visit approximately 30,000 seedlings had been sold, and several thousand were at an age where they should have been planted. The reason given for the shortfall in demand was the lack of rain.

Funds received from the grant were more than enough to cover the costs of the needed improvements to the nursery. As of early September 1984, only L.S. 10,429 had been spent. There was talk of using the excess funds for dissemination activities to increase sales of the seedlings. Stimulating interest in the seedlings is a good idea, but a comprehensive plan of how seedlings get from the nursery to the field should be developed. The plan could then be adapted to other nurseries in Sudan.

5. Um Inderaba Community Forest L.S. 10,500

The nursery has been established, and the Prosopis sp. (mesquite) seedlings produced are at an age where they should be transplanted. The reason given for why the seedlings remain in the nursery is the lack of rain.

The villagers had constructed a fence around the area to be used as a woodlot/shelterbelt, but only about 40 mesquite were planted. The forestry committee felt that 40 was the maximum number of trees they could keep alive by spot irrigation using two donkey carts. The area had been so affected by the lack of rain that the seedlings planted in the enclosure were the only green vegetation near ground level for kilometers. This greenery has attracted gerbils that feed on the seedlings. The villagers tried sprinkling poison and onions around the mesquite in an attempt to discourage the gerbils, but to date these methods have proved ineffective. The village forestry committee requested the SREP team to send poison bait from Khartoum.

Many other seedlings from the nursery were planted in villagers' compounds. The Evaluation Team was told that villagers were heavily fined if their trees died. Fines are an effective method of reducing tree mortality but do not lead to good forestry extension.

Another aspect of this grant was the fencing off of a section of the wadi to demonstrate that with proper management the wadi could be very productive. The barbed wire has been purchased and has been delivered to the wadi. The villagers claimed that the reason they have not constructed the fence was because they needed a vehicle to transport materials to the wadi. SREP arranged to have a vehicle in Um Inderaba on September 27, 1984. It should be noted that there are donkey carts in Um Inderaba that are being used to water the trees and could have been used to haul the materials for constructing the fence.

In spite of these problems, Um Inderaba was a good choice to receive a grant because the village could act as an

example for other villages where rainfed agriculture is practiced. The fencing off of a section of the wadi to show that proper forestry/range management can be very productive is also a good idea. There may be problems, however, with fencing off the wadi because several herders from outside the village use the wadi to water their animals. Receiving cooperation in keeping an area clear of animals is hard enough when the herders and land managers are from the same village. When the two groups are from different areas, it is far more difficult.

6. Soba Nursery L.S. 49,940

The original grantee, the Forest Research Center, did not show much initiative in performing the work designated in the grant. Work is now being carried out through a committee made up of two members each from the Forest Research Institute and the Green Belt (Forest Department). The Green Belt staff has managed to increase the seedling production to 100,000 trees/annum. Of these 100,000 seedlings, 60,000 were given to SREP for their projects, 12,000 were sold to farmers in the area, and the rest remain in the nursery. The seedlings that have not been planted are at the height and age where they should be outplanted. Once again, the lack of rain was the cause given for weak demand.

The plan is to eventually increase production to 300,000 trees/annum. Before the nursery's production is expanded, time should be spent on extension to stimulate interest in fuelwood species, to find out what species the farmers want, to find mechanisms to get the seedlings from the nursery to the field, etc. The extension activities would be a joint effort of the forestry and dissemination units of SREP and the Forest and Agriculture Departments of the GOS.

7. Sudan Poultry Farm L.S. 500

This grant is interesting in that it was received by a private farmer to establish a 10,000 seedling/year nursery. This individual has hired a forester to help with the technical aspects in the nursery and has used additional funds to expand the nursery.

The grantee has plans of planting a shelterbelt around his 53 feddans of bore-hole irrigated land, as well as a total of eighteen feddans of woodlots. He is also hoping to sell seedlings to neighboring farmers that also use wells to irrigate. There could be a problem with selling seedlings as it was speculated that he would have to charge more for them than nearby Soba nursery to cover the cost of his smaller nursery.

This grant could act as a good example of a privately run nursery, except for the problem that it is located so close to the government-run Soba facility.

In conclusion, the REDGs have been effective in establishing small-scale fuelwood/forestry activities. Grants have been used by a wide variety of organizations and individuals. Activities developed by the use of grants could act as demonstration projects for various types of fuelwood production. At this time, the problem is that there is no apparent plan for how these individual activities tie into the overall objectives of the project.

VI. Training

The training of manpower needed to implement SREP and to improve the institutional capacity of the RERI is a major component of the project. Training has included short-term foreign training, long-term training (combined foreign and domestic) and local training. Through a manpower assessment of the RERI, short-term training overseas (U.S., Egypt, Kenya and Swaziland) has been provided for eight individuals. The project has funded special training workshops/site visits to stove and agroforestry activities in Kenya and should continue to do so in the future.

Long-term training has centered on the development of an innovative M.Sc. program between the University of Khartoum and the University of New Mexico. Eight students are enrolled in the first cycle of this two year program which is nearing completion of its first year. The overseas training/site visits, if appropriate, are scheduled to begin in January 1985.

The option groups available for the M.Sc. program appear very good. But the Evaluation Team was somewhat concerned that only four of the eight students had proposed projects that dealt with any aspect of SREP's five priority areas.

The overseas training/site visits do not necessarily have to be carried out at the University of New Mexico. In fact, we were told that at least three of the eight would not go to the UNM.

The Evaluation Team is concerned that the overseas training/site visits had not been arranged as of September 30, 1984. If this training is to be of optimal value to the students, coordination with overseas institutions should be done immediately, especially if non-University of New Mexico trips are contemplated. For example, it is proposed that the student dealing with "Factors influencing farmers to grow trees on irrigated farms in Northern Sudan" visit Kenya, the United Kingdom and Michigan for the overseas portion of his training. Although these proposed visits are scheduled to start in January 1985, none of the institutions involved have yet been contacted. If the detailed agenda of each visit is not coordinated with the appropriate institutions very shortly, the students are likely to get very little from these visits. Some of the other students have not even proposed institutions for their overseas training section of the M.Sc. program. How are worthwhile visits to be arranged if the institutions have not even been selected?

The biomass staff at the University of Khartoum admitted that extension is a weak link in the program. If biomass production is to take place on irrigated schemes and with individual farmers, extension will be very important. For that reason, the biomass staff was very interested in collaborating with Richard Marks, FAO dissemination.

The Evaluation Team felt that an economic/social science input was vital to the long-term training course. Therefore, we recommend that returning students take a mandatory session of the project evaluation course prepared by SREP and USAID staff. The students should evaluate their own proposed projects after they have had a chance to gather data from the overseas portion of their studies.

Local training has included training courses at the Polytechnic and other institutions. While the short-term training appears to have been satisfactory, more emphasis should be put on regional site visits and study tours, funds permitting. These site visits (e.g. Kenya or Botswana) are more applicable to work in Sudan and much more cost-effective than most U.S. training.

While the manpower assessment has helped to identify training needs for RERI staff, we recommend that SREP develop a manpower skills plan for individuals, as well as for other institutions, to identify gaps affecting the success of priority activities. For instance, a training plan should be developed in cooperation with the Dissemination Unit and FAO on how best to educate farmers about windbreak and shelterbelt designs, or how to educate extension agents and others who interact with farmers.

VII. Management

A. Home Office

The Team was impressed by the apparent smooth functioning of home office management, given the inclusion of two sub-contractors, one of which has responsibility for procurement, participant training, and other logistics. The prime contractor should be commended for its professional approach in dealing with each institution.

It is our opinion that Georgia Tech underestimated the management costs and time required for home office oversight. USAID should have identified this as a potential problem during contract negotiations. On the other hand, much of the additional time required up to November 1983 was related to the need to change Chiefs of Party. Both GIT and USAID were responsible for the initial selection of an individual who did not have the required managerial or programmatic skills.

b. SREP

We were particularly impressed by the present management of the project in the field. Both the contractor's staff and the relevant Sudanese possess exceptional managerial skills. The level of confidence by the GOS and USAID in SREP is remarkable, given the concern and pessimism expressed as lately as January 1984, and is in large part due to the personalities and managerial talent of the present COP and the Sudanese Project Coordinator.

This has been aided by a greatly improved institutional structure. The strengthening of the RERI and the establishing of the Technical Committee have created a professional, cooperative environment that has given the contractor's staff an opportunity to be creative and positive in their management. The impact on the RERI's strength as an organization has been significant.

VIII. USAID

The Evaluation Team believes there are several areas of the project that the Mission should focus on. For example, in order to more fully realize the project's potential in agroforestry, the agriculture office could provide useful suggestions on strategies to further expand the work being done at Seleit. Other project areas could derive similar benefits by a greater interchange among offices, as when reviewing requests for local currency development grants. In terms of information exchange, the Mission and the contractor might benefit from establishing linkages with other regional activities, in order to obtain information on similar activities by USAID and other organizations in developing countries.

We urge the Mission to keep AID/W better informed of project activities and problem areas. For example, a recent file review of SREP in AID/W showed only the PP and cable traffic, with no reports or indications of grant activities, etc.

Since this project has a number of different actors, including the contractor, the GOS, USAID and other donors, a better mechanism for documentation of meetings to resolve issues and to summarize key actions which affect the project needs to be developed.

USAID should seriously consider bringing in an extension specialist to look at where SREP is heading in that area, given its importance to overall project success. REDSO had originally suggested including such an expert in the present Evaluation Team. This should be done soon in order to allow the specialist's suggestions and recommendations to be incorporated into a more narrowly focused dissemination strategy. The Evaluation Team strongly recommends Peter Hammond or Andrew Barnett for this work. In addition, Carolyn Barnes, REDSO's specialist in stove dissemination, should be requested to undertake a brief TDY to meet with the new Project Manager for Dissemination. Also, the Team questioned the lack of a GOS representative on the Evaluation Team.

While USAID has continued to provide some technical support to the project, project management should improve with the addition of administrative support. Given the diversity of activities in this important sector, as well as the contemplated expansion of personnel in it, the Team recommends that the Mission come up with a strategy for forestry and energy development. This might be done after the forestry sector assessment is finished in late November. At that time, the Mission may wish to bring in REDSO technical people to discuss where we go from here and what the key linkages/relationships are for promoting development in these vital areas.

IX. Government of Sudan's Institutionalization of SREP

From an uncertain beginning, the institutional base for SREP has steadily improved. The Energy Research Council's Director, Dr. Hassan Wardi, acts as coordinator for both SREP and the German SEP. Dr. Wardi's managerial skill and technical experience have sustained and strengthened the RERI over the past year. The present interaction among the Institute, SREP, and the ERC--all under one roof--has introduced a dynamism and collaboration that bodes well for the institutionalization of SREP.

There appears to have been some initial confusion and resentment between GOS agencies and the SREP staff during the shift to the five program areas. This apparently has now been overcome. The Technical Committee of the Energy Research Council, chaired by Dr. Yahia Hassan Hamid, has helped to reduce the institutional conflict that contributed to the project's initial slow progress and threatened to isolate it. The Technical Committee appears to be a neutral forum for raising technical issues.

An additional surprise has been the apparently strong working relationship that has evolved with the Forest Administration, due in part to links with SREP staff and consultants. The National Energy Administration is also working with SREP. It is hoped that this collaboration will continue since NEA's analytical mandate complements SREP's work.

The present SREP office is a vast improvement over its old office at the University of Khartoum. The major advantage of the present office is that SREP, the RERI, and the ERC are located in the same building. However, the present office does have a few drawbacks, one of the main disadvantages being the lack of space for storage and for a technical library. The 61st Street building, where SREP will move soon, should be a major improvement in that it will be a permanent office and will resolve problem of inadequate space.

X. Other Donors

SREP has a very good working relationship with the other donors involved in renewable energy activities in Sudan. In areas where there could have been possible conflict, the groups have met to discuss how all parties concerned could be best served.

A. FAO

The Evaluation Team has prepared a separate memorandum concerning FAO's request for local currency funding. Therefore, only possible collaboration or conflict with the SREP project will be covered here.

There is great potential for interaction between SREP and FAO if FAO receives the local currency it has requested. The FAO project will work in many of the same areas as SREP, though in some cases different philosophies prevail. For example, FAO's priority sector is large-scale irrigated fuelwood plantations, while SREP is attempting to work with farmers to grow fuelwood species. While both groups are working with fuelwood, their approaches are quite different. Therefore, in this case, there is little to be gained by collaborating.

There are other areas, however, where collaboration would be beneficial to both groups. One area where FAO has strength and SREP could use some assistance is in forestry dissemination. FAO has a long-term contractor for dissemination; it has two fully equipped audio-visual vans, and it has plans to establish a full-scale forestry extension training course. FAO has agreed to collaborate with SREP in the production of dissemination materials and to allow SREP to be involved in the extension training activities.

Both FAO and SREP have plans to work in the charcoal production area. While at this time there appears to be little overlap in the conversion of wood to charcoal activities, both groups plan to examine possible uses of charcoal bits and powder. This is an area where collaboration would benefit both groups. FAO and SREP have already met to discuss working together in the utilization of charcoal bits and powder, and they have agreed to continue collaboration.

From the documentation available and from discussions with FAO, it appears FAO is planning to disseminate the same stove used by SREP. This may cause a problem in that FAO is planning to focus on the rural population and the SREP stove is designed for urban dwellers. It is clear that FAO will either have to change its focus or come up with another stove design.

B. CARE

CARE/Sudan received a REDG from SREP for a stove project in El Obeid. This grant appears to be a good investment and should be used as an example for similar efforts elsewhere. A logical next step would be to fund activities in Gedaref, where CARE has an agroforestry project and is possibly

interested in starting a stove component. Gedaref is also an excellent site for SREP to collaborate with CARE in fuelwood production activities. Both parties would benefit by an exchange of ideas from similar activities in different areas of Sudan.

C. German Agency for Technical Cooperation (GTZ) - Special Energy Programme (SEP)

GTZ and SREP keep one another informed of progress made in their respective project activities. The original close relationship envisaged between the GTZ's SEP and USAID's SREP has been altered somewhat by changing circumstances: the projects are now complementary, but separate from one another. Three of the five activities under the GTZ project are currently on hold due to conditions in the South. The building and equipping of the Institute is not expected to be completed until 1987, although both SEP and SREP will be moving to new quarters on 61st Street in October 1984.

D. World Bank

Future USAID support of activities initiated under SREP should take into account the results of the World Bank forestry assessment. The inclusion of SREP staff in the assessment as recommended by USAID would be highly desirable.

XI. Project Design

Several documents should be revised in order to more realistically reflect the evolution of the project.

A. Project Agreement

Article 2.1, Definition of the Project, should be revised, replacing "for use in rural areas of Sudan" with "as defined by the project." This will require an amendment negotiated with the GOS.

Annex I, Description of the Project, should be revised. We suggest that the revised Scope Of Work prepared by the contractor for amending the contract can be used as a basis for a PIL revising this annex. In particular, the description of the numbers of technologies and people affected are misleading; insufficient emphasis is given to the testing of cost-effective production/marketing strategies.

B. Contract

As noted above, the contractor has been requested by USAID to prepare a revised Scope Of Work to more accurately describe activities presently being undertaken or planned.

C. Project Paper

Various parts of the Project Paper, in particular the Logical Framework, should be revised. The contractor should be asked to assist in undertaking this task. We have identified items requiring revision in the PFS.

XII. Contacts Made by the Evaluation Team

USAID

Thomas F. Cornell, Associate Director for Project Operations
Jay Carter, Energy Advisor
Thomas Eighmy, Economist (Evaluation Officer)
Richard Macken, Project Officer
David Martella, Agricultural Economist
Eric Witt, Agricultural Development Officer

GOS

Dr. Hassan Wardi Hassan, Director, Energy Research Council, and Coordinator,
SREP
Dr. Ahmed Hassan Hood, Assistant Coordinator, SREP
Gaafar El Faki Ali, Head, Technology Development & Implementation Section, RERI
Dr. Yahia Hassan Hamid, Chairman, Energy Research Council
Hamza Hamoudi, Forestry Advisor, SREP
El Tayed El Bashir, Mechanical Engineer, SREP
Dr. Mohamed Osman Sid Ahmed, Director, RERI
Ismael El Gizouli, Acting Director, National Energy Administration
Ali Ahmed Saleem, Chief of Afforestation, Forests Administration, FAO Fuelwood
Development Project
Mohamed El Amin, Khartoum Forest Nursery
Khallafalla Mohamed Ahmed, RERI
Awatif Mohamed, Dissemination Unit, RERI
Somaya Suliman, Dissemination Unit, RERI
Agricultural Manager, Seleit Food Production Ltd.
Dr. El Tayeb Idris Eisa, RERI
Village Committee, Um Teirebat Village
Village Committee, Um Inderaba Village
Kamal Badri, Forestry Department (Director - Currently on Secondment to
FAO/Saudi Arabia)
Dr. Yassin Mihaisi, University of Khartoum (Biomass Staff)
Dr. Hamid Dirar, University of Khartoum (Biomass Staff)
Dr. Mohamed A. El Rasheed, University of Khartoum (Biomass Staff)
Tageldin Hussein Nasroun, University of Khartoum (Biomass Staff)

Contractor

Donald Peterson, Chief of Party, SREP
Matthew Gamser, Energy Economist, SREP
Kenneth Maddox, Georgia Institute of Technology
Paul Chakroff, TransCentury
Maxwell Kinyanjui, Consultant, SREP (EDI)
Claudia Huff, Consultant, Georgia Institute of Technology
Djodi Deutsch, Peace Corps Administrative Support, TransCentury

Other Donors

Dr. Richard T. Marks, Forestry Extension Officer, Central Forestry
Administration, FAO Fuelwood Development Project
Bob Chaples, Assistant Director, CARE/Sudan
Adrian Vinck, FAO
Roberto Virela, FAO
Dr. Heinz Rade, GTZ (SEP)

Institutions/Other Meetings

Dennis Monaghan, Contractor, Energy Planning and Management Project
Renewable Energy Research Institute
National Energy Administration
Forestry Administration/FAO Fuelwood Project
University of Khartoum
CARE, Khartoum office
Energy Research Council, Technical Committee Meeting

Sites Visited by Evaluation Team

- Seleit Agricultural Scheme: Shelterbelts/Woodlots
- Saggana Market, Obeng, Halab (Charcoal Stove Production and Marketing Sites)
- Charcoal Stove Marketing Demonstration--Khartoum
- Um Teirebat: Future Nursery Site/Village
- Khartoum Forest Nursery
- Um Inderaba Nursery: Woodlot/Natural Regeneration Site
- Soba Nursery/Farm/Laboratory