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UNCLASSIFIED  
CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol U-447

1. PROJECT TITLE Renewable Energy Technology			2. PROJECT NUMBER 632-0206 / 15	3. MISSION/AID/W OFFICE USAID/Lesotho
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) 632-83-4			<input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	
5. KEY PROJECT IMPLEMENTATION DATES		6. ESTIMATED PROJECT FUNDING		7. PERIOD COVERED BY EVALUATION
A. First PRO-AG or Equivalent FY79	B. Final Obligation Expected FY79	C. Final Input Delivery FY84	A. Total \$ 1,845,000 B. U.S. \$ 1,600,000	From: (month/yr.) January 1982 To: (month/yr.) April 1983 Date of Evaluation Review April 1983

B. 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
<p>Action Recommendations:</p> <p>A. <u>General</u></p> <p>1. Consider an amendment to the Project Paper or seek regional support to:</p> <p>a. Expand the scope of the project to include development and dissemination of broader range of technologies and systems for rural development with emphasis on technologies to increase small farmer agricultural production.</p> <p>b. Specify a plan for dissemination of technologies identified as being responsive to Basotho needs, and which (1) redefines Village Energy Technician training by incorporating the concept of small enterprise development and training of small enterprise managers and technicians in the production and/or marketing and distribution of appropriate equipment for agricultural production and rural development, (2) stresses dissemination through target multiplier organizations including effective government institutions and private organizations and through</p>	USAID Project	March 31, 1984

<p>9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS</p> <p><input type="checkbox"/> Project Paper    <input type="checkbox"/> Implementation Plan e.g., CPI Network    <input type="checkbox"/> Other (Specify) _____</p> <p><input type="checkbox"/> Financial Plan    <input type="checkbox"/> PIO/T    _____</p> <p><input type="checkbox"/> Logical Framework    <input type="checkbox"/> PIO/C    <input type="checkbox"/> Other (Specify) _____</p> <p><input type="checkbox"/> Project Agreement    <input type="checkbox"/> PIO/P    _____</p>	<p>10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT</p> <p>A. <input checked="" type="checkbox"/> Continue Project Without Change</p> <p>B. <input type="checkbox"/> Change Project Design and/or</p> <p><input type="checkbox"/> Change Implementation Plan</p> <p>C. <input type="checkbox"/> Discontinue Project</p>
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<p>11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)</p> <p>Wes Fisher, REDSO/Nairobi Dean Bernius, USAID/Lesotho Thato Mofokeng, Ministry of Cooperatives and Rural Development, GOL</p>	<p>12. Mission/AID/W Office Director Approval</p> <p>Signature: <i>Edna A. Boorady</i></p> <p>Typed Name: Edna A. Boorady, Director</p> <p>Date: January 20, 1984</p>
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DECISIONS/UNRESOLVED ISSUES

NAME OF OFFICE  
RESPONSIBLE  
FOR ACTION

DATE ACTION TO  
BE COMPLETED

committed individuals who affect such groups, and (3) incorporates where feasible USAID's Food for Work strategy.

c. Extend the project completion date to permit the development and implementation of dissemination strategies for those technologies developed under the project which are suitable for widespread distribution. The period of this extension to be decided after discussion with Ministry of Cooperatives and Rural Development. At the time of the evaluation these included:

- stone paolas
- metal stoves
- retained heat cookers

2. Improve overall project administration and project direction to include:

RET Chief of Party/ November 30, 1983  
ATS Chief

a. Identification and allocation of defined duties and responsibilities to all staff.

b. Supervision.

c. Ensure that job descriptions, responsibilities and supervisory relationships are clearly defined prior to engaging the services of additional volunteers. Within 90 days of finalization of this evaluation, the COP shall have developed a draft; allocation of duties, job descriptions for all project personnel and a list of other improvements/steps being taken to improve supervision and project administration.

3. The project and ATS staffs are encouraged develop a plan for the long-term, full utilization of the Khubetsoana workshop. The plan should identify how the center will be used: (1) identify and test commercially available appropriate tools, equipment, and methods which meet priority Basotho development needs (with emphasis on systems to increase small farmer agricultural production), (2) adaptive research and development of technologies and systems which make more effective use of energy, including human and animal energy, and biomass, (3) training in

RET Chief of Party;  
RET Laboratory  
Supervisor; ATS  
Chief

October 15, 1983

small rural enterprise tool and equipment production and/or repair, and small business management, and (4) limited production runs for training and market field trials.

4. The development of plans to guide the process of technology development are recommended. These plans should, to the extent possible

RET Chief of Party;  
RET Laboratory  
Supervisor, ATS  
Chief

October 30, 1983

-- synthesize the social/needs research which led to the selection of the technology for project research and development attention;

-- identify and cost similar products which are available on the market and/or are used/constructed by the user;

-- provide an explanation of what improvements can be made to improve overall cost-effectiveness (e.g., increase efficiency, increase durability, reduce production costs, or improve the quality of rural life);

-- provide detailed cost and test logs which will permit other researchers to follow the process of research and development. This will include a description of the improvement being introduced to the products, labor and production cost details related thereto, test data, and similar information.

5. The project staff is encouraged to develop training programs which will facilitate phased and organized professional growth, in particular for ATS Basotho staff. Such plans should respond/identify to skills needs in the ATS and be used as a guide in building ATS competence/institutional capability.

RET Chief of  
Party; ATS  
Chief

November 30, 1983

6. It is recommended that copies of the contractors budgets when submitted for payment action to USAID also be provided to MORD. Equally, that all regular correspondence with USAID be cleared through the ATS chief, who will decide whether or not it should also be circulated to MORD offices and personnel.

RET Chief of  
Party

Immediate

7 The project is encouraged to develop a strategy for acquiring and analyzing additional data which may be necessary to establish energy and rural development

RET Field Supervisor;  
EIA/Nairobi COP

December 31, 1983

priority needs. Explore the potential for data analysis and collection support through Energy Initiatives for Africa (698-0424).

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|--|--|-------------------|
| 8. The GOL is encouraged to provide the ATS Project Chief in Maseru and the two Engineering Assistants with housing equivalent to that normally accorded to individuals with their professional qualifications.  | USAID Project Officer; RET Chief of Party                  | Immediate         |
| 9. It is suggested the GOL grant/permit the use of a radio for communication between the Bonhome building and the Khubetsoana workshop. This would greatly facilitate work schedules and efficiency.   | ATS Chief; RET Chief of Party, USAID Project Officer       | Immediate         |
| 10. It is recommended the project employ a short-term consultant for not less than 3 months to design and implement market research and survey strategies for metal stoves, retained heat cookers, and other items which may be manufactured in the future following completion of product research and development (e.g., solar dryers, growhole covers, small farmer tools and equipment). | RET Chief of Party, USAID Project Officer                  | Sept/Oct, 1983    |
| 11. Drawing on RET's experience to date, prepare a paper outlining a model process for appropriate technology project development. The purpose of the document would be to provide the Ministry with a strategy for guiding future appropriate technology projects which may be proposed or carried out by the GOL.  | ATS Chief, RET Chief of Party                              | December 31, 1983 |
| 12. Devise and discuss a plan with the Ministry for overall coordination and/or information exchange among all groups working in Lesotho who are carrying out major appropriate technology research, development and dissemination projects.   | ATS Chief, RET Chief of Party                              | December 31, 1983 |
| 13. In cooperation with the Ministry of Cooperatives and Rural Development encourage the development of procedures covering the provision of services and products for cash. The following is recommended:   | USAID Project Officer; RET Chief of Party, ATS Chief; MORD | Sept. 30, 1983    |
- a. All cash received from the sale of technologies and services is to be deposited to a project account for the purchase of replacement project material, procurement of additional workshop materials and equipment, and payment of salaries of

individuals who are involved in temporary field trial production and marketing.

b. Project personnel will be responsible for keeping proper records on all such transactions, i.e., the selling of products or services of a community service nature. As needed, project funds should be employed to train personnel in bookkeeping, accounting ordering, inventory management, and to provide for external audits.

**B. Personnel**

A number of changes in organization and staffing are recommended. These changes are considered essential if:

-- Project direction, management and supervision are to be improved.

-- The focus of the project is modified/reoriented to a broader range of technologies and systems for rural development with emphasis on technologies to increase small farmer agricultural production.

-- The project is to be properly institutionalized within the Ministry of Cooperatives and Rural Development.

The staffing/personnel recommendations identified herein respond to these issues. It is assumed that USAID funding will not be available to finance all the positions and personnel listed and GOL personnel/support will be required to continue/expand the technology development and dissemination effort. Recommendations are listed in priority order (both for action and funding consideration).

1. Consider the upgrading of the USAID funded administrative assistant position to administrative officer, and hire an individual locally who will be assigned to the project office in Maseru to oversee procurement actions, financial accounts, office direction and other administrative duties essential to project operation.

RET Chief of Party  
USAID Project Officer  
ATS Chief

Immediate

2. Review the need for a second clerk/secretary from MORD who has proven competence and upgrade secretarial performance.

RET Chief of Party  
USAID Project Officer  
ATS Chief

Sept., 30, 1983

3. Consider the procurement of the services of one (1) technology specialist

RET Chief of Party  
MORD, USAID

Sept., 30, 1983

who has specific experience with small farm equipment and machinery as well as general agricultural and rural development technological research and development skills and knowledge of small farm production systems.

ATS Chief

4. Consider the employment of two (2) Basotho dissemination specialists experienced in conducting rural training programs, preparing written and audio-visual materials, and in the dissemination of ideas and technologies in rural areas. One specialist to act as the overall director of the dissemination element of the project. The dissemination specialist will be stationed in Maseru.

USAID Project Officer Oct., 15, 1983  
MORD, RET Chief of Party,  
ATS Chief

5. Decide if additional PCV's or other donor volunteers are needed within the next year to overlap with the 'Malefiloane/Mokhotlong volunteers and to assist with research, development and dissemination.

RET Chief of Party Nov., 30, 1983  
ATS Chief

13. Summary

The Renewable Energy Technology (RET) project under the Ministry of Cooperatives and Rural Development Appropriate Technology Section (MORD/ATS) was approved in August, 1979. Implementation was, however, delayed due to AID contracting difficulties. Despite the fact that two members of the contractor's personnel were employed locally, the full project contract team was not in place until late March, 1981. Further delays were encountered when project workshop space proved inadequate and financial difficulties, on the part of the Government of Lesotho (GOL), prevented the immediate hiring of counterpart personnel. As a result, contractor personnel and Peace Corps Volunteers (PCV's) assigned to the project were unable to initiate project activities as planned. These problems were particularly acute in Maseru and it was not until June, 1982 that the project was able to complete construction of workshop facilities at a site provided by the GOL at Khubetsoana, 5 kilometers from downtown Maseru. While this site is excellent in terms of space and road location, it still lacks electricity and telephone services. In late May-June, 1982, technical counterpart personnel were engaged. While young, these personnel have proven themselves to be articulate, quick to grasp the ideas presented by the project and have demonstrated a capacity for intelligent, hard work. The Chief of Party is to be commended for the close integration and on-the-job training for his GOL counterpart. While research and development activities at Maseru were largely at a standstill until June, 1982, the Peace Corps Volunteers (PCV's) in cooperation with a Danish (DVS) volunteer were able to locate workspace and begin limited RET activities in 'Malefiloane, some 1 1/2 hours by rugged mountainous road from Mokhotlong. Despite problems which required the unanticipated construction of a workshop, the PCV's and 'Malefiloane/staff's achievements are commendable and they have proven themselves adept at dealing with the problems of being located in a

remote area. The remote 'Malefiloane location has the advantage that the success or failure of the ideas and methods being used there can be directly traced to the activities of the center personnel. In addition, the center addresses itself to often overlooked needs of that portion of Lesotho's rural population who live in the rugged and mountainous interior.

The first evaluation of the project was undertaken in January, 1982, roughly 10 months after project startup. At the time of the evaluation project counterpart staff were not in place and the Maseru staff operated out of inadequate office and workshop space. The RET workshop consisted of roughly one half of a 20 X 30 foot metal shed, a large portion of which was filled with Ministry supplies. Focusing on these issues, the evaluation was taken seriously and permitted USAID to negotiate for improved space and personnel. The evaluation, as well, identified a number of weaknesses with respect to project design. For example, the evaluation team suggested that the project geographic focus be reduced from three rural districts to one. Further, the project noted that while the project design called for institutional development, the funds, objectives and time allotted or specified in the project design were more appropriately those associated with a pilot effort. The team concluded that the creation of a permanent renewable energy organization could be partially achieved, but that the PP was overly optimistic and unrealistic with respect to the planning and implementation of a nationwide program. Institutional development was seen as requiring a follow-on program with additional posts and staff within the Ministry's Appropriate Technology Section. All of the recommendations made in the January, 1982 evaluation have been acted upon and/or successfully resolved. This evaluation examines the progress made with respect to those recommendations, the progress the project has made in terms of technology research and development, and provides additional recommendations to improve project operation and focus, including the relationship of the project to priority Mission and GOI objectives in the agricultural and education sectors. The Ministry of Rural Development

has more than met its commitments to this project, because of the high level of support and cooperation from the Ministry and the commitment of ATS/RET staff, the project's efforts seem to have gained stature and acceptability with other branches of government and with the general public. Despite early problems, this project has come a long way in a relatively short time. Prospects for even more rapid progress in the future appear good.

#### 14. Evaluation Methodology

This was the second annual evaluation of the Lesotho Renewable Energy Technology Project. The basic evaluation team consisted of the USAID/Lesotho Project Manager, REDSO/EA Energy Advisor, and Ms. Thato Mofokeng of the Ministry of Rural Development's Planning Office. The team was assisted by contract personnel from the ARD technical assistance team. The basic purposes of the evaluation were to: (1) review overall project effectiveness and the relationship of project activities to USAID's FY 1984-1986 CDSS, (2) measure progress in meeting realistic project objectives and in responding to recommendations made in the first annual PES, (3) provide recommendations to improve project management and to lay the groundwork for a PP amendment that will bring the project more in line with GOL intentions to create a functioning Appropriate Technology Section within the Ministry of Cooperatives and Rural Development, USAID's increased emphasis on agricultural production and education in Lesotho, and AID's interest in encouraging creation of small enterprises.

The team visited RET offices and workshops in Maseru and 'Malefiloane, the RET Mokhotlong office, as well as RET supported activity in Butha-Butha. Contractor progress reports, personal interviews, and RET project files were used as resources for the evaluation. Interviews were also held with representatives of groups who have been or are interested in drawing upon RET services including:

- Food and Nutrition Coordinating Office (FNCO)
- Flying Doctors Service
- Home Economics Section, Lesotho Agricultural College
- Agricultural Research, Lesotho Agricultural College

Ms. Mofokeng concentrated on interviewing Basotho staff, outside observers and rural women in Sesotho language. All principal members of the RET staff received personal interviews to identify problems and obtain objective opinions on project effectiveness and suggested future directions.

The evaluation was conducted March 28-April 9, 1983. See Annex A for a list of persons contacted by the evaluation team.

#### 15. External Factors

The external factors mentioned in the first annual PES which delayed project implementation initially have now been largely overcome. Principal counterparts are in place and are for the most part committed and highly capable individuals. Workshops are completed and functioning. Nevertheless, these factors were largely responsible for the fact that 30-40 percent of project effort to date has been expended on providing basic project infrastructure (e.g., construction of workshops and procurement of project commodities).

A failure in project design which has contributed to slow project implementation is the lack of a skilled administrative officer to handle routine office matters and procurement. The contractor should have recognized this deficiency and sought to correct it much earlier in the project.

Another recent external factor affecting project implementation has been the fact that \$28,000 in GOL project support to be used for construction of RET offices at the Khubetsoana site was unavailable. This has forced a separation of offices and workshop. To overcome the communication and other difficulties this presents, the evaluation team recommends: 1) the immediate employment of one trained administrative officer for the Maseru office. This individual should be a contractor local hire employee and should oversee all procurement actions, financial accounts, office direction and other administrative duties essential to project operation; (2) approval from the GOL for radio communication between the Maseru office and the Khubetsoana workshop.

16. Inputs

The inputs required of each organization (USAID, GOL, Peace Corps and DVS) participating in the project will be reviewed from three points of view - quantity, quality and timeliness of provision of inputs.

I. USAID

A. Long-Term Technical Assistance

The project calls for five full-time (3 years) technical assistance positions to be provided by AID. Four of the five positions have been filled; the stock and supply manager (local hire) position remains vacant. Contractor funds have been used instead to hire three assistances for the 'Malefiloane/ Mokhotlong field offices. These positions it was understood will be converted to GOL civil service. To date only one of the three has been converted.

In addition, contractor funds have been used to hire an administrative assistant/secretary. This position was identified in the PP and considered necessary to augment the GOL secretarial contribution. Unfortunately, the contractor supported administrative assistant's performance has not justified the decision to hire from outside the GOL civil service system. Contractor professional staff, while on the whole technically competent, have been pre-occupied with functions which do not use their professional skills, e.g., office management and procurement. Weak project direction has contributed to (1) personal problems among both contractor and GOL staff; (2) unclear definition of job responsibilities and supervisory relationships;

(3) inadequate management of Khubetsoana workshop research and development activities by the Laboratory Supervisor. The evaluation team believes these problems can be corrected through the following actions:

1. Upgrading the USAID funded administrative assistant position to administrative officer and hiring locally an individual who will be responsible for office management functions now being handled by the Chief of Party (COP) and the Field Supervisor.
2. Requesting a second secretary from MORD and upgrading secretarial performance.
3. Providing the Khutetsoana workshop with a driver/messenger.
4. Taking firmer action in dealing with existing personnel problems by the COP and his counterpart.
5. Revising one senior technical officer position job description to serve as counterpart to the Field Supervisor/Coordinator.
6. Develop plans which will guide the process of technology development. At a minimum, these plans should :
  - synthesize the social/needs research which led to the selection of the technology for project research and development attention;
  - Identify and cost similar products which are available on the market and/or are used/constructed by the user and provide an explanation of what improvements can be made to improve overall cost effectiveness (e.g., income efficiency, increase durability, reduce production costs, or improve the quality of rural life);
  - Detailed costs and test logs which will permit other researchers to follow the process of research and development. This will include a description of the improvement being introduced to the products, labor and production cost details related thereto, test dates and results and similar information.

The Laboratory Supervisor has expressed his intention to leave the project in December 1983. The evaluation team recommends that the laboratory supervisor position be filled with a local hire Mosotho or expatriate who has specific experience with small farm equipment and machinery as well as general agricultural/development technological research and development skills and knowledge.

of small farm production systems. This should provide a relatively smooth shift in project emphasis which is more attuned to perceived GOL and USAID priorities.

A major weakness in the original project design was the failure to provide sufficient resources for energy survey work and needs assessment. Thus while an assessment for the highlands was accomplished no lowlands survey has been performed. The evaluation team recommends that data be developed which will establish energy and rural development priority needs for all areas of the country. The potential for data analysis and collection support through Energy Initiatives for Africa (698-0424) should be explored.

A second major weakness in design was insufficient support for the dissemination component of the project. For dissemination to be effective both personnel requirements and costs for production of written and visual media should be carefully estimated. Both are expected to be significantly higher than provided under the current contract.

The evaluation team recommends the following additional TA related to dissemination:

Engage the services of a Mosotho dissemination specialist as an overall director of the dissemination element of the project. This individual should have nationwide knowledge of target multiplier organizations, including effective government institutions and private organizations. This person should also be known and respected by committed individuals who affect such groups. This individual would be expected to coordinate nationwide dissemination efforts and oversee preparation of written and audiovisual materials.

- Provide local hire funding for a dissemination specialist who should be assigned to work in Mokhotlong/'Malefiloane.
- Provide temporary local hire funding for the replacement of the individual who was handling dissemination/accounts at "Malefiloane and who recently resigned from that position.

B. Short-Term Technical Assistance

On the whole, work performed by the contractor's short-term consultants has been of high quality, particularly that of Margaret Thomas and Glenn Burket. Future short-term technical assistance inputs generally appear sound. However, with respect to building monitoring TA, the RET team should try to ensure prior to arrival of the monitoring consultant that low-cost energy-efficient public housing is available for monitoring against standard low-cost housing and that interest on the part of the GOL is sufficiently high that energy-efficient design will be incorporated into future public low-cost housing. In addition to previously planned TA, the evaluation team recommends a minimum of three months short-term TA related to test marketing of renewable energy and rural development equipment which is identified by the RET team as ready for commercial manufacture and/or marketing and distribution.

This consultant should be responsible for design and implementation of a test marketing strategy to be used to quantify consumer demand and consumer willingness to pay for commercially available equipment promoted by the project. Specifically, the consultant should oversee test-marketing of the metal stoves and should instruct RET professional staff in commercial test-marketing and market survey methodology.

C. Commodities

An inordinate amount of project effort has been spent on procurement, relative to other projects of a similar nature. A new procurement system is being implemented for the project which hopefully will overcome this problem.

1. Vehicles - As recommended in the first year PES, two additional vehicles were requested by RET in August 1982. Due to a change in USAID controllers, the request was not acted on in a timely fashion and the vehicles are not expected until May-June 1983. The delay has had a measurable impact on project efficiency.

2. Media Equipment and Supplies - The budget for media preparation and dissemination has still not been carefully defined and will depend both on the set of technologies to be disseminated by the project and the estimated budget to implement the strategy proposed by the project's dissemination consultant.

Clearly, however, estimates contained in the original Project Paper for dissemination were too low. Upon finalization of the dissemination strategy, the Project should re-examine media equipment and supply needs.

3. Curriculum Materials - The amount of curriculum materials will depend, as well, upon the dissemination strategy adopted.

4. Laboratory and Scientific Equipment - Following the January 1982 evaluation, an effort was made to re-examine laboratory and scientific equipment needs. Equipment purchases to date account for roughly one-half the approved level of \$109,566 as established in the contract. Expenditures for laboratory and scientific equipment and commodities are not expected to increase significantly during the remaining life of the project and may, in fact, total slightly less than budgeted. The principal reason for this is that the Village Energy Technicians concept has not met with total acceptance and the number of technicians to be equipped with tool sets will be reduced substantially.

5. Research and Development Equipment - In accordance with the refined design of the project, biogas and mini-hydro equipment and supplies will not be procured. This responds to recommendations in the January 1982 evaluation and the findings of the NRECA mini-hydro feasibility study done under the auspices of the RET Project.

6. Energy Saving Devices, Construction Materials - The construction of an energy conserving demonstration building at the 'Malefiloane workshop site is questioned by the evaluation team for the following reasons: (i) The site is too remote to serve effectively as a demonstration energy conserving building; (ii) Tests are not being conducted at the site to determine if the design does represent an improvement; (iii) The techniques of construction are considered too sophisticated and costly for replication in the Mokhotlong district; (iv) The design is not in keeping with the design of local structures and it is not clear from discussions with project staff if the building was designed as office/housing; (v) The techniques of construction and the return from employing such techniques and materials cannot be easily demonstrated, i.e., the building is constructed but it is impossible to determine or demonstrate the materials used or techniques employed without removing walls, etc.

While expenditures for such demonstration units and devices are supported and encouraged by the evaluation team, any devices and structures to be constructed should be in a location where demonstration and training can be effectively accomplished.

With respect to the construction of energy saving or conserving devices, project activity has generally not met expectations. Reasons for this include: (i) Failure of the Khubetsoana workshop/laboratory to become operational as planned; (ii) Shortcomings in management and delegation of duties and responsibilities which have resulted in the project not giving adequate attention to the design, development and testing of prototype devices. Accordingly, the evaluation team reserves comment upon the adequacy of budgetary allocations for the construction of energy conserving/saving devices.

7. Shop Equipment - This category is outside the contract and is budgeted at amount shown in the PP. Both of the shops at 'Malefiloane and Khubetsoana are equipped and operating and no further major purchases of shop equipment are contemplated or recommended.

D. Training - The evaluation team noted that the PP did not budget funds for long or short-term training of Basotho staff. This appears to have been an oversight in PP design. Nevertheless, the team recommends that individual training programs for professional growth be developed, particularly for the Basotho personnel. These plans may then become the basis for seeking training support through Energy Initiatives for Africa or other donors.

Such plans should cover:

- Short term training programs in essential manual skills and small business management;
- Training courses to familiarize personnel with energy and rural development technology issues and activities in neighboring countries.

This would include short courses in energy related subjects in neighboring countries and trips to other projects in the area for demonstration and training purposes;

- Long-term training (e.g., engineering production and design) with a small farm tool and equipment manufacturer in the U.S. or a Third Country.

Village Energy Technicians - Under the recommended PP amendment, the project focus would be shifted from training of Village Energy Technicians to the training of individuals who affect large multiplier audiences or who will train small entrepreneurs/artisans. The training cost requirements are not expected to change however.

E. Construction - The establishment of two workshops - one in 'Malefiloane and the research laboratory in Maseru offer advantages in terms of high mountain and lowland research. Construction of the Maseru workshop lagged, however, and only recently has it reached an operational stage. The team found the 'Malefiloane workshop impressive as a rural workshop and testing center. Its location remains such that the projects effects can be observed directly as outside influences are minimal. Equally, however, its remoteness has a price. It is not centrally located and thus not easily visited. Further, it cannot easily provide services or respond to the needs of Mokhotlong and the GOL agencies located there. A continuing concern of the MORD, this led to the establishment of a small ATU/RET office in Mokhotlong. It remains to be seen if this is a feasible alternative to having a strong (ATU/RET) workshop in Mokhotlong.

While the evaluation team questioned the construction of an energy conserving office/house at 'Malefiloane (see above), the project seems to have experienced some limited success in the development/dissemination of designs for such energy answering structures. The absence, however, of readily accessible demonstration units, clear prices and cost figures and unambiguous data on energy savings and/or the inability to transmit the information and concepts involved argue against the project having any major impact. Until data (prices, etc.) is developed and an acceptable dissemination plan established, project time on this element or phase should be minimal.

## II. Government of Lesotho (GOL)

### A. Personnel

The Government of Lesotho has provided highly capable personnel to the project, especially the ATS Chief and Engineering Assistants. MORD has also more than met its original personnel commitments. The presence of well-qualified and committed individuals in the key counterpart positions is evidence of MORD's strong interest and support to the RET project. Nevertheless, the success of the project will also depend on the quality of lower-level support staff. For example, insufficient or inadequate secretarial support may result in major expenditures of time by professional staff in activities which do not use their professional skills. Also, qualified lower-level support is essential to research, development, field testing, and dissemination. The evaluation team recommends that job performance among lower-level staff be reviewed with care and discussed with the Ministry to determine if competence can be increased or if it will be necessary to increase current staffing levels. The team believes that without improvements in lower-level staff competence, secretarial support will remain critically deficient and research and development at Khubetsoana will be hampered. In addition, now that the dissemination phase of the project is beginning, need exists for dissemination specialists. The evaluation team recommends that local hire positions be established for the dissemination coordinator, and the temporary hire of two dissemination specialists in 'Malefiloane and Mokhotlong. Further, that MORD be asked to create and fund the 'Malefiloane/Mokhotlong positions as soon as possible.

### B. Office, Workshop and Warehouse Space

The construction of the workshop on the Khubetsoana site 5 km from Maseru is also evidence of the GOL strong commitment to the project.

However, it had been hoped by both MORD and USAID that the Maseru offices and workshop would both be located at Khubetsoana. MORD had planned a \$28,000 expenditure for construction of offices at Khutetsoana, funds which were inadvertently lost in March 1983 during the annual budgetary process. Thus the offices and workshop will remain in separate locations for the time being. The Khubetsoana site has a water hook-up and is currently being wired for electricity, however, it will not have telephone service. The absence of rapid communication between the Maseru office and Khutsoana presents a serious coordination problem for Maseru activities. The evaluation team recommends that RET and USAID as soon as possible request the GOL to grant use of a radio for communication between the Maseru Office in the Bonhomme Building and Khubetsoana.

### III. Peace Corps (PC) and Danish Volunteer Service (DVS)

#### A. Technical Assistance

The project currently has three Peace Corps Volunteers - two in 'Malefiloane who have been associated with the project since September 1981 and who may extend for a third, and one in Mokhotlong who joined the project in September 1982.

A total of seven Peace Corps Volunteers have been associated with the project, three of whom resigned early in their assignments for either personal or professional reasons. The accomplishments at 'Malefiloane and Mokhotlong can be directly attributed to the commitment of the PCV's working there and the Basotho staff working with them.

In addition, the Danish Volunteer Service (DVS) contributed an experienced individual who provided direction to the PCV's in 'Malefiloane and oversaw the construction initial operation of the workshop. This volunteer left the project in early CY 1983. DVS has offered to assign another volunteer to 'Malefiloane to assist with RET related activity. The evaluation team believes that the successful activity at 'Malefiloane was largely the result of the Peace Corps and Danish Volunteer contribution. The team recommends that the project request additional PCV's or other donor volunteers within the next year to overlap with the 'Malefiloane/Mokhotlong volunteers and to assist with research, development and dissemination. However, the Contractor COP and ATS Chief should develop clear job descriptions, responsibilities and supervisory relationships prior to making additional requests.

## 17. OUTPUTS

### A. Trained Personnel

The project has made excellent progress in developing a qualified Basotho staff. In particular, the ATS Chief has been assuming increasing responsibility for overall project operation, with a corresponding increase in self-confidence. The Contractor Chief of Party has taken special care to ensure the ATS Chief's personal development and assumption of project management responsibilities.

The training of eight MORD staff by the PACD appears certain, however, it should be noted that the PP did not budget funds for long or short-term training of staff. This means that the degree of specialized training will be limited to the staff's interaction with the Contractor team and short-term consultants in-country. The evaluation team believes the absence of funds for U.S. or third country training creates an adverse effect on staff morale

and limits professional growth. The team recommends the development of individual career training plans which can then be used to pursue funding from other programs, projects, or donors. The evaluation team believes the concept of training 140 village energy technicians and 2,500 villagers as proposed in the PP, should be reexamined and modified as part of a Project Paper Amendment. It is likely that more than 140 key individuals will be trained prior to project completion through training of committed individuals who affect large multiplier audiences (e.g., government institutions and private voluntary organizations). In addition, the project now shows the potential for successfully training small entrepreneurs in the production and/or marketing and distribution of appropriate equipment for agricultural production and rural development. The target of 2,500 villagers trained to produce renewable energy technologies may apply only to one technology, the stone paola.

B. A Technology Design, Development, and Implementation Process Based on Village Definition of Needs

A village energy needs assessment has been completed for the Mokhotlong district. However, as discussed under Technical Assistance Inputs, the project was provided with only limited financial resources for energy survey work and needs assessment, resulting in information gaps in the Mokhotlong district survey and no energy needs assessment information for the lowlands. Without such information on needs it becomes extremely difficult to set priorities for technology development and dissemination. The Energy Initiative for Africa Project may represent an additional source of support for needs assessment. The project still lacks a systematic approach to technology development. An important step in this direction would be the implementation of the technology development plans recommended under 16.A.5 above.

C. Introduction of Improved Energy Conserving Technologies

At present three technologies appear to be suitable for widespread dissemination: the stone paola, metal stoves, and the retained heat cooker. It is expected that a number of other technologies will be identified over the next eighteen months, thereby exceeding the EOPS indicator which calls for introduction of four village technologies. A draft dissemination plan has recently been completed, but person hours and budget requirements and time allocations for current and proposed staff need further analysis. The evaluation team recommends that these estimates be completed before the end of September.

Two technologies identified in the PP have been eliminated from RET consideration -- biogas production and microhydro development. A short-term consultant supplied by the contractor concluded that because of the low temperatures in Lesotho, water availability problems, and other constraints, biogas development potential is limited nationally. Furthermore, UNESCO is supporting biogas research at the National University.

A team from the National Rural Electric Cooperatives Association (NRECA) completed a microhydro survey assessment for Lesotho during 1982. The team concluded that only a handful of sites exist in the country where user demand exists in close proximity to streams with year round flow sufficient to justify a micro-hydro installation on economic grounds. Thus RET support of micro-hydro development would have limited replicability. However, USAID does not preclude the possibility of developing a pilot micro-hydro site as an integral part of a USAID supported agriculture or rural development project.

D. Research and Development Laboratory Operational

Two workshops have been completed -- one of which is to function as a research and development laboratory. However, a plan is needed to ensure it will be utilized effectively. The evaluation team recommends that the plan identify how the center will be used to: (1) identify and test commercially available appropriate tools, equipment, and methods which meet priority Basotho development needs (with emphasis on systems to increase small farmer agricultural production); (2) conduct adaptive research and development of technologies and systems which make more effective use of energy, including human and animal energy, and biomass; (3) train in small rural enterprise tool and equipment production and/or repair, and small business management, and (4) produce limited production runs for training and market field trials. In addition, procedures are needed to cover the provision of services and products for cash. These should be developed in cooperation with MORD. The following are recommended:

a. All cash received from the sale of technologies and services is to be deposited to a project account for the purchase of replacement project material, procurement of additional workshop materials and equipment, and payment of salaries of individuals who are involved in temporary field trial production and marketing.

b. Project personnel will be responsible for keeping proper records on all such transactions, i.e., the selling of products or services of a community service nature. As needed, project funds should be employed to train personnel in bookkeeping, accounting, ordering and inventory management.

E. Design, Construction and Evaluation of Improved Energy Efficient House/Structures

Project support for energy efficient building design has more approximately taken the form of a short-term consultancy to develop plans for energy-efficient low and medium-income housing, including both urban concrete block/sheet metal roof housing and improved traditional rondavels, and the incorporation of energy efficient building design principles into the workshop construction at Malelane. A short-term consultant is expected to implement a building monitoring program in the near future. Comments on the timing of this consultant are contained above under 16.

F. Schools

In late 1982 and early 1983, the project attempted to introduce energy efficient technologies into selected primary schools. Mothers at the schools, supervised by RET project staff, constructed stone paolas and other devices. The mothers were paid (for labor) with food (Food for Work). Two groups of women (approximately 10 each) were put through a six-week training/construction program. Results from this experiment, which was encouraged by USAID, were mixed. The effort itself suffered from poor timing, (either school was out or school feeding programs were out of food and thus could not cook on paolas), transportation and other problems. Interest was expressed by those trained and by those students who were in attendance but cost effectiveness is in question and it is generally felt by RET personnel that schools do not represent a feasible dissemination technique. The results could, however, be different if better timed and organized and the evaluation team felt it did have some promise.

18. Purpose

The evaluation team has concluded that purpose of the above project, as stated in the PP, to disseminate a set of renewable energy technologies throughout rural pilot areas ... results in a narrow research focus which fails to address other high priority rural development needs. It is suggested that the project paper be amended to allow for the research, development and dissemination of a range of technologies for rural development and small farmer agricultural production.

19. Goal

Similarly, the application of renewable energy technologies to the stated PP goal of meeting expanded energy demand among lower income groups has created an engineering focus on only a small range of technologies which satisfy this requirement. The result is a misallocation of engineering talent away from technologies which address other priority rural development needs.

20. Beneficiaries

The immediate beneficiaries will be the ATS staff and individuals who affect larger multiplier audiences in Lesotho. However, the ultimate beneficiaries are expected to be rural people, particularly women, who will be the recipients of technologies which make daily tasks easier and which improve the quality of rural life.

21. Unplanned Effects

None to date.

22. Lessons Learned

See recommendations listed under Item 13.

Persons Contacted

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EXECUTIVE SUMMARY

Prepared by: Lyle Dean Bernius, USAID/Lesotho/PRM

Date : March 14, 1984

Project : Lesotho Renewable Energy Technology (632-0206)  
PES 632-83-4

Period Covered: January 82-April 83

Cost : \$1,600,000

I. What constraint did this project attempt to relieve?

This pilot project attempts to meet expanding energy demand, primarily among lower income groups, in ways that minimize national requirements for scarce, expensive or non-renewable energy. More specifically, the project attempts to reduce the demand for combustible fuels through: village level conservation measures, the introduction of energy conserving construction practices and the development/production of energy conserving technologies such as improved and more fuel efficient cooking and heating devices, solar dryers, and growholes (cold frames).

A secondary goal of the project is to establish the institutional base for continued identification, research, development and dissemination of energy technologies appropriate to Lesotho's needs and resource endowment.

II. What technology did the project promote to relieve this constraint?

Among the principal technologies developed by the project which are either under dissemination or under advanced design prior to dissemination are: (1) metal stoves, (2) stone paolas (stone stoves), (3) growholes (cold frames), retained heat cookers, solar dryers and energy conserving house and office designs. While the areas of major focus under this project are the same as specified in the Project Paper, some of the technologies identified in the Project Paper were given reduced attention when (a) it was determined that other donors were working with the technologies, (b) needs surveys confirmed that the technology was not of a high Basotho priority, or (c) when it was determined that commercially available products were adequate and reasonably priced.

III. What technology did the project attempt to replace?

The project did not attempt to replace existing technologies--rather it attempted to improve on technology efficiency, cost or suitability for use by rural beneficiaries.

For example, stone paolas and metal stoves are known and used throughout Lesotho. The metal stoves are, however, usually purchased in South Africa. They are more expensive and are not amenable to the three legged pots commonly used for cooking in Lesotho. Further the metal stoves imported from South Africa are designed to use coal or wood-fuels which are expensive and often hard to obtain in Lesotho particularly in remote rural areas. Lastly, they display very poor fuel efficiency when fired with shrubs and dung, common fuels in Lesotho. The RET designed stove responds to these concerns--it burns locally available materials at increased efficiency (30-45) percent, accommodates three-legged pots and is cheaper.

With other technologies such as solar dryers and growholes (cold frames), the technology is known but improvements are needed to make them attractive to local consumers.

IV. Why did project planners believe that intended beneficiaries would adopt the proposed technology?

Project planners believed that the introduction of improved technologies which were more efficient and less costly would be attractive to Basotho beneficiaries. Specifically, the technologies would reduce the time required for fuel gathering (an onerous task), increase food supplies (cold frames and solar dryers) and improve the quality of rural life.

V. What characteristics did the intended beneficiaries exhibit that had relevance to their adopting the proposed technology?

In terms of the projects heating and cooking technology focus, all beneficiaries used and shared a common need for improved technologies for cooking and radiant heating. Beneficiaries need and want technologies that will reduce the amount of time required for fuel gathering (dung, shrubs, etc.), for cooking and heating (retained heat cookers) and will increase production or preservation of agriculture crops such as vegetables, fruits, etc. (dryer, growholes, etc.).

VI. What adoption rate has this project achieved in transferring the proposed technology?

The RET project design proposed that dissemination would be done by Village Energy Technicians (VETs) who would be trained to produce the technologies designed under the project. In accordance with project design, the VETs would derive their income or a substantial portion thereof from the production and sale of the technologies produced. Project experience has shown this approach to be unrealistic. Certain technologies such as metal stoves cannot be produced by the VETs as the manufacture requires sophisticated equipment and a level of skill normally in excess of that envisioned by the VET. Equally, as the units will be marketed through commercial channels, the VET would need to possess considerable market knowledge and have resources for publicity and dissemination. Other technologies can be produced directly by the homeowner with modest training thereby alleviating the need for a VET. Technologies that fall in this category include the retained heat cookers, the stone paola and the growhole (coldframe).

The RET project equally underestimated the costs involved and effort that would be required in dissemination of the technologies produced. To address this problem, the USAID has requested the assistance of the Energy Initiatives in Africa (EIA) regional project. Under an EIA subproject, dissemination capabilities of the Appropriate Technology Section (ATS) of the Ministry of Cooperatives and Rural

Development (MinRuDev) will be strengthened and dissemination of RET developed technologies expanded. This sub-project will begin in the third quarter of FY1984.

Despite shortcomings in the design of the RET project and the need to strengthen and expand the dissemination capabilities of the Ministry, some dissemination has taken place under the RET project and the lessons learned will be of value in the implementation of the EIA country activity. To date, under the RET project, over 300 stone paolas have been constructed by home owners who have been trained under project auspices. Twenty metal stoves have been produced by the project and are undergoing user tests.

Efforts to disseminate other technologies have also been initiated. These efforts will be expanded and strengthened under the EIA country activity.

VII. Has the project set forces into motion that will induce further exploration of the constraint and improvements to the technical package proposed to overcome it?

Yes. Under the RET project, the capacity to identify, design, adapt, test and disseminate technologies appropriate to Basotho needs and resource requirements has been created. This capacity will be further strengthened under the planned two year regionally funded EIA sub project.

VIII. Do private input suppliers have an incentive to examine the constraints addressed by the project and to come up with solutions?

Yes. One of the objectives of the RET has been the creation/strengthening of small rural entrepreneurial capabilities to produce the technologies developed or adapted by the ATS. The workshop at 'Malefiloane, one of two workshops created under the RET project, has already spun off the production of iron grates for stone paolas, production of certain agricultural implements, etc. These entrepreneurs continue to be guided by the workshop staff who offer assistance in management, production, etc., as required by the entrepreneur. In the future, the Basotho capacity to produce metal stoves will be developed/strengthened. Other opportunities for the private production of technologies exist and the RET and follow-on EIA project will direct attention to these possibilities. They include: involving private entrepreneurs in the manufacture of growhole (coldframe) kits, in the production of solar dryers, etc.

IX. What delivery system did the project employ to transfer technology to intended beneficiaries?

See discussion under item VI. above. Project used GOL multiplier audiences such as agriculture college, teacher training institutions, cooperative credit associations, PVO groups, etc.,

X. What training techniques did the project use to develop the delivery system?

Project attempted to maximize contacts through the use of multiplier audiences, i.e., those audiences whose normal functions included training and direct contact with potential rural beneficiaries. These included official GOL institutions such as the Ministry of Agriculture, the Agriculture College, Food and Nutrition Coordinating Office women's groups, PVOs such as CRS and CARE and Save the Children, etc. Training methods employed consisted of training sessions and demonstrations.

XI. What effect did the transferred technology have upon those impacted by it?

As noted under item VI. above, dissemination efforts will be expanded/strengthened under the follow-on EIA subproject. Dissemination experience gained under the RET project suggests that the principal gains from selected technologies will include:

- 1) Metal Stoves: Technology responds to both cooking and radiant heating requirements of Basotho beneficiaries. Technology is cheaper than similar KSA model, more fuel efficient, and better suited to conventional Basotho cooking practices, i.e., use of three legged pots. Improved efficiency will reduce the need for

fuel and fuel collection thereby freeing the beneficiary for other production or income producing activities. All ancillary benefit will be the reduced removal of ground cover and dung thereby benefitting conservation objectives. A second ancillary benefit will be reduced health problems commonly associated with the use of paolas (tin) paolas (now commonly used). This includes reduced eye problems, respiratory illnesses, burns (particularly among children), etc.

- 2) Stone Paolas (stone stoves): Technology is more fuel efficient than commonly used metal (tin) paolas. The stone paola is also cheaper than the metal stoves thereby responding to the needs of a separate category of user--those who cannot afford the metal stove. (NOTE: If produced by the home owner the cost of the stone paola may be as low as R7-9.00 as compared to the metal stove which will cost an estimated R120.00)

Other advantages include: the stone paola is stationary thereby alleviating the danger of fire or burns from over-turned device. Equally, the paola is designed to minimize accidental burns to children. The stone paola is also considerably more fuel efficient thereby reducing the time required for fuel collection. This frees time for other production or income producing activities while having an important conservation side effect. Drawbacks are that the stone paola is stationary and cannot be moved into the home to respond to radiant heating needs (the metal paola can be moved). Equally the stone paola will most commonly be used outside in a separate cooking facility.

Present Basotho practice is to light the fire outside, let the smoke diminish, cook outside and then move the paola inside for heating when the family retires.

3) Retained Heat Cookers: Reduced fuel consumption.

4) Growholes: Seedlings can be started earlier in the year thereby insuring a crop in the highlands where the growing season is short. In lowland locations the growholes can be used for food production the year around thus insuring an improved diet and reducing the need for commercial purchase of foodstuffs.