AN EVALUATION OF THE UNIVERSITY OF FLORIDA TRAINING PROGRAM IN ALTERNATIVE ENERGY TECHNOLOGY

(Training in Alternative Energy Technology,
Project No. 936-5716)

Report to

THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D.C.

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EXECUTIVE SUMMARY AND RECOMMENDATIONS

A. INTRODUCTION

The purpose of this report is to present our evaluation of the Training in Alternative Energy Technologies (TAET) Program at the University of Florida. While the evaluation concerns a wide range of questions, it focuses on two basic areas:

- To what extent has the program been successful in delivering training that is responsive to the needs of the LDC participants?
- To what extent has the University of Florida been in compliance with the cooperative agreement with USAID?

The findings in this report are based on intensive interviews with TAET participants, faculty and administrators, a review of course materials, and examination of the course outline. In addition, our findings reflect the review team's experience and background in the areas of economic development, alternative energy technology, and education.

Your contract specified that our report should include an analysis of the following:

- The attitudes and perceptions of past and current participants.
- A program review that considered objectives, curriculum, faculty, administration, participant life and University oversight.
- Costs associated with the TAET Program.
- University of Florida compliance with the cooperative agreement.
- Review of the 1980 AID Management Review Team's report.
- The relevance of the TAET Program to the needs and interests of the LDC participants.

Compliance with these specific contract requirements produced a series of reports that all focus on essentially the same issues and come to similar conclusions. In order to avoid possible redundancy in the body of this report, we have therefore put the detailed analyses required by the contract into a series of appendices.

B. GENERAL FINDINGS

1. Overall Evaluation

While we believe that substantial changes in many aspects of the TAET Program at the University of Florida are warranted, we find that the program makes a useful contribution to the understanding and utilization of a number (but not all) alternative energy technologies of importance in the range of developing countries from which the participants come. The

program operates in compliance with contract requirements and within cost parameters that are consistent with USAID guidelines and is taught for the most part with skill and enthusiasm. Participants generally express satisfaction and many of them are attempting to apply their technological training to projects in their own countries. While this report does not spare the program from criticism and makes a number of suggestions for improvement, we recommend that it be continued at the University of Florida.

With respect to the requirement of our contract that we "recommend whether introducing contract competition for the continuation of this program will result in a improvement of the type and quality of training", we are of the opinion that it will be more cost-effective at this time to make such improvements through moving toward adopting the recommendations of this report and that seeking competitive offers should be held in abeyance until sufficient time has gone by to provide a basis for observing the response of the University and TAET management. This recommendation obviates the need for meeting the related requirement of our contract that we "indicate other academic institutions that might offer all or part of this training under AID financing"; although we are in a position to do so on request.

2. Participant Opinions

In general the participants whom we interviewed at the University during the final week of Program III expressed satisfaction with the course and stated that it is a worthwhile undertaking. Special importance was attributed by the participants to the dedication and enthusiasm of the TAET teaching and support staffs.

On the other hand participants were critical of various aspects of the program. The most significant of these criticisms, in our opinion, are:

- That excessive attention is given to small-scale solar thermal technologies leading to relatively limited emphasis on wind, biomass. and small-scale hydro technologies which are of particular interest in many LDCs;

- That insufficient emphasis is given to overall applications analysis, including socio-economic evaluations of systems relevant to LDC needs;

- That there is a lack of emphasis on reviewing the overall status of the technology including commercial availability in the U.S. and elsewhere of systems, components, and special materials;

- That there is inadequate preparation of guest speakers and a general lack of experience in the LDCs and with LDC energy problems on the part of TAET staff other than the Program Director;

- That there is need for more laboratory equipment, covering a broader range of technologies;

- That the selection of site visits could be improved, especially by including a wider exposure to successfully operating systems of relevance to LDCs.

We also interviewed ten former participants through telephone conversations. These former participants had opinions which were very similar to those of participants in Program III.

3. Program Review

- Goals and Objectives

There appears to be a lack of full consensus between USAID and the University of Florida about the goals and objectives of the TAET Program. This lack of fully agreed upon goals and objectives complicates the tasks of conducting and of evaluating the success of the course.

- Curriculum

Solar thermal technology plays a predominant role in the TAET Program. Exposure to a number of non-solar thermal technologies is incomplete, spasmodic, and often provided by outside lecturers with little awareness of participant interests or needs. There is bias towards small-scale rural applications to the point where discussions related to technologies that could more significantly affect a country's energy balance are not covered adequately.

The strong focus on technology tends to limit discussions of important socio-economic factors associated with the implementation of alternative energy technologies. Of particular concern is the fact that most discussions of socio-economic issues are presented by guest lecturers and are not integrated into the technology discussions.

Laboratory work could be improved by greater emphasis on evaluating a broader range of commercially ready systems in alternative configurations or those using competing equipment or technologies.

The field trips are considered an important program activity by the participants and several sites displaying operational equipment to advantage are visited as part of the program. A number of the demonstration systems visited, however, were non-operational or, in some cases, not particularly relevant to the needs of the developing countries. The field trip schedule should be reviewed and modified to expose participants to a larger number of successful systems employing a broader range of commercially available technologies of specific interest in the developing countries.

Faculty

Our overall impression of the faculty is that it lacks the background to cover material outside the area of solar-thermal technology. The primary experience of all of the tenured and non-tenured TAET faculty is technological with the result that socio-economic areas receive limited attention.

The new faculty proposed to date do not appear to be in a position to deal effectively with the above issues.

Guest speakers are a concern because of the uneven focus and structure of their presentations and because of their very significant role in the TAET Program. In particular, it appears that many guest lecturers are not prepared to address subject areas relevant to participant needs.

Teaching loads for the TAET faculty seem low by comparison with those in other academic institutions and with those in traditional teaching environments. The TAET administration defends the relatively light formal teaching loads because faculty are expected to spend a large number of non-classroom hours with the participants. Because of the time frame in which we performed our evaluation, we were unable to fully evaluate this issue.

- Teaching Materials

Our general impression is that there is room for improvement in the quality and assortment of teaching material provided to the participants. Handout materials are not well organized and do not include the wealth of material that is available and is directly relevant to LDC problems in this field.

- Administrative Staff

Two areas of the administrative structure are of some concern. There do not appear to be clearly defined lines of responsibility within the administrative staff, a condition which can lead to inefficient use of resources. Partly as a consequence, there is an apparent excess of administrative personnel.

- Participant Selection and Life

The TAET Program has some difficulties in dealing with the heterogeneity of its participants. This is a problem, common to similar programs, which probably can be mitigated by careful planning of the curriculum.

Many participants reported that they felt isolated from the University and the people of Gainesville, a condition that would be difficult to ameliorate because of limitations imposed by the physical location of available facilities. It can be argued that there are compensating advantages.

- University Advisory Committee

All but one member of the University Advisory Committee have primarily technological backgrounds. As a result, the Committee as now constituted may not be well positioned to advise the TAET management on the range of non-technical issues which may be important factors in evolving a broader-based course responsive to LDC needs. It is also not clear that the Advisory Committee has to date played an active role in critical evaluation of the program.

4. Compliance With the Cooperative Agreement

The University of Florida is in compliance with the terms of the cooperative agreement and a program of the type being offered is clearly within its scope. The few minor departures from literal requirements appear to flow primarily from ambiguity or differences in interpretation.

5. Program Costs

Per participant, monthly costs appear to be within USAID cost guidelines. There are, however, a number of areas where cost control measures could be considered with possible savings up to $100,000 a year.

6. Review of 1980 AID Management Review Report

Many of the issues raised in the 1980 AID Management Review Report ("Site Assessment") of the TAET Program remain as issues of concern to the Arthur D. Little evaluation team. Specifically these "carryover" issues are:

- The extent of emphasis on solar thermal technology,
- Inadequate attention to non-technology areas; e.g., economics,
- Organization and content of course reading materials,
- Background and LDC experience of the faculty,
- Uneven quality of guest speakers, and
- Size of administrative staff.

7. Relevance of the TAET Program to Developing Country Needs

There are questions meriting consideration about the TAET Program's relavance to developing country needs as represented by participants:

- Does the course contribute to the capability of technically oriented decision-makers to identify which technologies merit R&D to adapt them for use and manufacture in-country?
- Does the course provide planners with an approach for determining which Renewable Energy Resources (RER) systems merit consideration for widespread use?
- Does the course sufficiently expose the participants to equipment status and development on a worldwide basis so as to discourage excessive duplication of effort.
- Is the relative emphasis among technology options appropriate?

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will undertake programs in high technology systems (for example, solar thermal power) with only a vague notion of how much they are likely to cost or their potential use.

As a result, much of the research, development, and demonstration activity in LDCs is inappropriate since even technical success does not lead to useful output.

- National Impact

It is possible for systems to be technically successful and have acceptable cost while still being of minimal utility to a country due to a limited number of applications.

Conversely, the benefits of implementing RER systems can include increased employment opportunities, decreased foreign exchange drains, and rural development. These benefits would not normally be quantified in the evaluation of individual systems, but could be critical in determining the overall merits of the technology on a national basis.

Most participants in RER development in LDCs are not inclined by training to consider the full range of national impacts when considering different technology research and development programs. Again, this tends to result in poor evaluations of technology options and subsequent poor use of resources.

b. Course Objectives

The overall objective of an RER course funded by USAID should be to provide training to participants in RER development which will help them make better decisions in allocating scarce manpower and financial resources for R&D, implementation, and commercialization activities.

An effort to achieve this overall objective should address the specific issues referred to previously. As such, it is suggested that the course have the following mutually supporting objectives:

- Objective 1

To instruct technically-oriented LDC participants on the analysis and operation of applicable technology options.

- Objective 2

To provide participants with up-to-date information on technology status in the U.S. (and elsewhere) and to identify potential sources of goods and services which individual LDCs might contact to assist in their R&D and implementation activities.

- Objective 3

  To instruct participants in how to evaluate the technical and economic performance of systems when serving both small and larger scale applications identified as being of importance in LDCs.

- Objective 4

  To outline the methodologies by which the overall national impacts of RER systems can be assessed and, thereby, provide the required information for allocating manpower and financial resources.

Only the first of these objectives is now addressed in any detail within the course and then primarily for solar thermal technologies. Limited attention is also given to Objectives 2 and 3 although not on any consistent basis between technologies.

At present very little attention is given to Objective 4 which may well be the single most important objective of a program aimed at furthering USAID's policy of assisting LDCs to become more energy self-sufficient.

2. Academic Changes

The evaluation team believes that the effectiveness of the TAET course could be improved if significant modifications were made in subject matter emphasis. The recommendations made reflect the opinions of the evaluation team that meeting the course objectives stated above requires a broader overview of the technical/economic implications of RER development than is now the case. Specific recommendations relative to academic changes are divided into two areas:

- Changes in course content and emphasis to better meet overall objectives, and

- Changes in composition of teaching staff (including guest lecturers) required to effectively implement the recommended course modifications.

a. Course Content

One of the most serious concerns of the evaluation team is the lack of consistent presentation of technology alternatives and an over-emphasis on engineering detail at the expense of applications analysis (including the full range of socio-economic factors involved in such an analysis). Although progress has been made in this area, additional efforts should be made to give the course better balance. Appendix X presents a preliminary outline of how a revised course might be structured to meet these criteria. Specific recommendations consistent with the suggested course outline include:

- Give more attention to wind, small-scale hydro, and biomass systems with particular emphasis on their application in LDCs. These technologies were consistently referred to by participants as being of

particular relevance in their countries and as having been treated ineffectually in the course.

- Provide participants with an overview of relevant activities in the United States (and elsewhere), including the commercial status and availability of equipment. This would tend to stimulate future contacts between LDC interests and U.S. manufacturers, thereby serving a number of general foreign policy objectives. It might help LDCs reduce costly duplication of effort in system development and better ensure that their efforts are preferentially directed to areas where they can efficiently add to the value of systems.

- Review the cost structure of different equipment options now available and study approaches to estimating the costs of equipment and systems. Particular emphasis should be given to how the cost of systems divides among purchased materials, special processing, manufacturing, distribution, installation, and operation. This will help participants better evaluate system options and identify those systems which can most economically be manufactured and used in their countries.

- Show how the economic performance characteristics of all systems should be evaluated, based on both present and projected cost structures. Approaches for comparing the economics of systems with both conventional and non-conventional options should be outlined. This evaluation process should be integrated within the discussion of each technology and should not be relegated as a special (almost irrelevant) subject to be addressed by a guest lecturer as is now the case.

- Present and involve participants in the analysis of case studies of how such systems have been and could be used within LDCs. These studies should include the technical analysis, design constraints, installation issues, operating experience review, and economic evaluations. Such case studies would provide participants with a better perspective on all the issues associated with the RER option under consideration.

- Discuss the numerous socio-economic issues relevant to LDCs which are associated with each technology option. These issues include the requirements for local manufacture, utility interface problems (for electric power systems), impacts on foreign exchange due to reduced oil imports, and installation and organization and management infrastructure requirements.

In response to the comments of the first review team, which made suggestions similar to those just presented, TAET course management made certain course modifications. These included the use of University of Florida guest lecturers to address biomass and wind power technologies and short seminars on methods of economic evaluation. In our view, these measures are not sufficient. Specifically we believe strongly that the socio-economic issues should be an integral part of the discussion of each technology option and that these important issues cannot be effectively treated by short-term guest lecturers.

Also, the design of course content in each technology must be done by TAET personnel if this content is to address adequately the rather special needs of the LDC participants. This does not preclude the use of guest lecturers. It would ensure that such lecturers, when properly prepared, are addressing issues pertinent to and integral with overall course objectives.

b. Teaching Staff Requirements

Presently the staff is intellectually dominated by Dr. Farber, who has many years of experience in solar thermal technologies and is a well-known expert in this field. The other TAET staff members also have a solar thermal technology orientation. Two new staff slated to teach in Program IV have very limited experience in RER and are also from primarily technological backgrounds. In short, it does not appear to us that the present staff mix can effectively undertake the recommended course content modifications.

We therefore recommend that the TAET course teaching staff be modified so that it includes:

- One or more staff members with an in-depth knowledge of important non-thermal RER technologies such as biomass (with particular emphasis in LDC applications) and wind energy utilization.
- Individuals with an overall technology-evaluation orientation including economic analysis and national socio-economic assessments.

A further recommendation is that staff with these backgrounds should also have experience in the LDCs. Most of the participants noted that the staff has not had LDC experience and that his was evident from their course presentations.

It appears, therefore, that in order to give the appropriate re-direction a new senior staff person is required, a person who has a broad view of technologies and their application in the LDCs. This should be accompanied by a review of the backgrounds of present and new staff members to determine whether other changes are needed.

3. Administrative Changes

The recommendations in this subsection on administration are aimed at the following goals:

- Reducing the administrative costs associated with the TAET Program
- Increasing the breadth of academic input into the program
- Clarifying lines of responsibility and increasing the amount of delegation of authority and responsibility

We believe that the TAET Program could run efficiently and effectively with an administrative staff performing the following broadly outlined duties:

Program Director	This individual would be totally responsible for the TAET Program. It would be a full-time position in which the person managed both the academic and administrative affairs of the TAET Program. The person in this position should be a fully-qualified academic with wide experience in the full range of topics to be covered in the program.
Program Administrator	This is a full-time position in which the individual would be responsible for the academic and fiscal administration of the TAET Program. Duties would include program scheduling, cost planning and control, interfacing with faculty, ordering books and coordinating handouts of teaching material.
Participant Affairs Coordinator	This is a full-time position with the individual having responsibility for those activities which have direct interface with participants; i.e., housing, transportation, admissions, insurance, social activities.
Budget Clerk	This is a full-time position with the individual having responsibility for maintaining the TAET Program financial records.
Secretary	Full-time, general secretarial functions.
Word Processor Operator	Full-time, general secretary and word processor operator.

Figure 1 shows this streamlined organization in the form of a traditional organization chart. To complete the picture we have added Faculty and Advisory Committee to the chart.

This new organization is designed to give greater authority and responsibility to the University Advisory Committee. We believe that this group should have a more significant role in the overall running of the TAET Program.

The Committee should include a wider diversity of individuals. There should be representation from individuals who can contribute expertise on economic analysis and on the sociological issues. There should be greater representation from individuals with LDC experience.

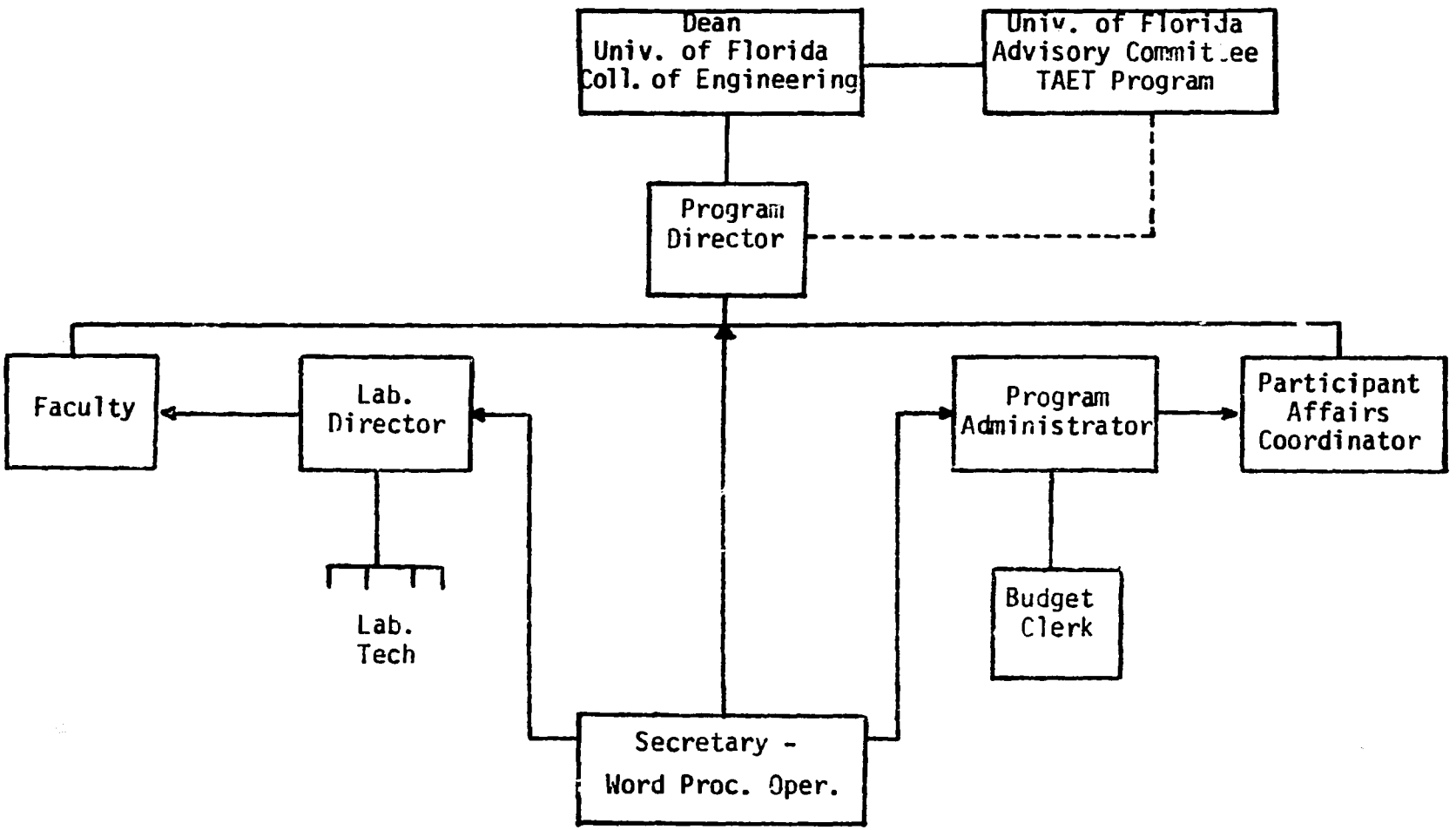

FIGURE 1: RECOMMENDED TAET ADMINISTRATIVE STRUCTURE

We believe that success in making the improvements that these recommendations suggest will require active participation by USAID DS/EY with TAET program management, especially in bringing course goals and objectives fully into line with evolving USAID objectives and AID Mission needs as well as assuring that there is full consensus on the translation of these into program structure, staffing and management.