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BAKEL SOLAR PUMP EVALUATION

Consultancy Report

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I. INTRODUCTION

Between April 23 and May 5, 1981, I spent several days in Bakel and at various perimeters in the irrigated perimeter project, and spoke with all the key individuals at the USAID Mission in Dakar and key individuals and project personnel in Bakel. The objective of this consultancy effort has been to advise USAID Senegal on the further design and implementation of the Bakel solar pump evaluation. This report is a summary of the key suggestions and recommendations for the evaluation.

Timing and delays in getting the solar pump operating continue to be a major problem. Of the 26 roof sections which comprise the area of collection panels, only three were installed as of my visit. At the present rate of installation (one a week), and with the rainy season coming, it is doubtful that the collectors will be in place before November. The SOFRETES French technician who is overseeing the installation of the collectors stated that the pump components would be arriving in July or August. Clearly, the first major use of the solar pump will probably not occur until June of 1982, which is approximately the beginning of the rainy season of 1982. This is also the opinion of AID technicians and mission personnel involved with the project.

The recommendations and suggestions for the continuation of the evaluation are based on this further delay in full pump operation.

II. RECOMMENDATIONS:

1) That USAID/Senegal immediately seek out and engage a local contractor for data gathering and other activities as outlined in this report.

2) That Rich Miller help the USAID project manager with this engagement and work with the contractor, following selection, to develop a detailed work plan and to explain the data gathering tasks, instruments, and procedures to the contractor.

3) That, given the uncertainties as to the field operations and development of the solar perimeter, the evaluation must consider other causal linkages between the pump technology and productivity besides the important stated one of farmer participation. These considerations are within the scope of the original evaluation design (PCI) and are indicated throughout that design.

4) That the baseline study be translated into French.

5) That Peace Corps Volunteers be actively sought by USAID to take part in the evaluation, as discussed herein.

III. REVIEW OF EVALUATION DESIGN

The overall design and intent of the evaluation as outlined in the Practical Concepts Inc. (PCI) report was found to be adequate and to provide the necessary continuing guidance for the evaluation. Some changes are needed, and they are identified and discussed below. However, in general, I would suggest that the PCI report continue to be used for both specific suggestions and as a general guide.

The major clarification important to make is the restatement of the key objective of the evaluation effort. This is, "to examine and analyze any differences in agricultural output related to effects of the solar pump as opposed to diesel pumps." Section II of the PCI report addresses this, but I think may focus overly on the issue of farmer participation and perimeter management as the only key research question. It will be important during data collection and analysis that everyone involved is aware of the effort to determine the technology (pump) dependent differences affecting both operation and output of the whole irrigation system--from pumping to field management to productivity and distribution of benefits. As the PCI report indicates, these causal chains are difficult to analyze, but the attempt must be made.

For example, SAED may strongly affect the farmer participation on the solar perimeter because of the solar pump's location. But, in a sense, this is technology related, or causally linked, only because of this particular situation and perhaps not because of something inherent in the technology. Such distinctions will have to be sorted out.

I recommend that during the analysis phase the differences examined be always causally linked, to the extent possible, to the technology. Those differences that are not strongly linked should not play a major role in the

evaluation analysis, or the main thrust of the comparative assessment will be lost. However, focusing on the technology as well as on participation is important, especially since with the SOFRETES pump we have only one of several possible solar or renewable energy pumping possibilities. Other solar pumps, i.e., PV, would probably present a completely different evaluation situation.

In sum, the data collection design outlined in the PCI report, along with the baseline work already done and the suggestions below, will provide the necessary data base for the final assessment and evaluation.

1) Baseline Studies

Collection of the baseline data has progressed well, and the sociologist, Rich Miller, should be providing the project with a report and data presentation by late September, 1981. Almost all of the data is collected for the socio/economic sections. Data on perimeter management and decision making is to be done shortly. I have suggested some changes in this instrument and have also suggested eliminating a separate questionnaire on broad attitudinal factors, as it is not directly enough related to the main thrust of the evaluation. Again, the collection of data is proceeding well, and the field team and enumerators in Bakel appear to be collecting reliable data.

For the baseline report, I have discussed with Rich Miller a process for highlighting the key indicators of change and for detailing how the longitudinal data collection will follow them. Also, the report will include an explanation of how the data categories will provide, or relate to, the technology/productivity causal links that the evaluation design hypothesizes may exist. That is, the key questions posed by the evaluation will be stated and baseline data and future data collection related specifically to them.

2) Comparative Data Collection

Baseline data is being gathered on Bakel (for the solar pump perimeter), on Diawara and Sebou (diesel perimeters), and on Gabou (dryland farming).

The original recommendations and design for periodic data gathering on these three perimeters or areas should be followed. I believe the five major topics are still valid, but some important changes will need to be made in the design of data collection. Below is a discussion of the five areas with suggestions for changes in how data is to be collected--both instruments and procedures, and in who should be responsible. These changes will have impact on both monitoring and on the budget to complete the evaluation. These impacts are discussed below. A local contractor and a U.S. social scientist will be needed over the entire course of the evaluation.

a. Cost and output of pumps. The suggested analysis of costs and outputs in the PCI design is certainly appropriate, but the data collection process will need adaption. At this time, there is serious doubt as to the ability of the groupements to gather and record data for the project. This doubt is shared by all people with whom I spoke. Rich Miller estimates that only about 6-10% of groupement members can read and write at all. This means that even if people take an interest in recording data, the practical problems will be great. It may still be possible that some or all groupements have the ability for, and interest in, gathering or recording data. This possibility should be actively explored by the contractor and SAED. However, a contingency plan must be set up.

Some meters have been ordered for the project. It would seem imperative that meters be put on all pumps that are in perimeters of the evaluation. Also, a Peace Corps Volunteer has been programmed to work with pump maintenance on

the irrigated perimeter project. The PCV should be charged with adapting the data sheet from the PCI report (pages 111-9, 111-10), with the help of the project technicians. He/she should then make sure these meters are working, and should collect the diesel data. The SAED technician should collect the data on the solar pump.

If the PCV is not in place when the comparative data gathering starts, now scheduled probably for June 1982, then the local Senegalese contractor should assume the responsibility.

Cost data can be provided by the means already suggested in the PCI evaluation design. The AID project manager should make sure that the project technicians gather cost data for the diesel pumps. The SAED technicians should be given the cost chart (PCI report, pages 111-9, 111-10) for adaption for the solar pump.

b. Perimeters and productivity. To date, very little production data has been gathered by SAED, and the future possibilities seem uncertain. During June and July of 1981, two contractors from Tuskegee Institute are scheduled to undertake both productivity and marketing analysis for the irrigated perimeter project. Part of their scope of work will be to design a data collection instrument and procedure for determining perimeter and dryland productivity. This instrument is to be used, or adapted for use, by the local Senegalese contractor in this evaluation. Therefore, by September 1981, the AID project manager should have both good economic and productivity baseline information on Bakel, Sebou, Gabou, and Diawara, along with the instrument for longitudinal data collection at all four sites.

I have allowed for approximately two months of person time (enumerators) each year under the local contractor for gathering of this productivity data.

Another possibility under discussion is that a PCV be requested to work with the irrigated perimeter project and help gather this data. Again, although groupement members can provide information, it seems unlikely that they can take responsibility for gathering or recording the data. SAED will be involved, but experience to date suggests the need for a backup plan, or at least an augmented effort by the contractor.

c. Groupements and their management. The design of data gathering instruments for this topic area is almost complete, using interviews and observation procedures that will be written on predesigned forms. Rich Miller has been completing this design. Again, groupement and community record keeping should be explored, but it seems highly unlikely that such strategies will be very productive of good data. I would suggest that the local contractor have the major responsibility for gathering this data. If a PCV (socio/economic science background) were to be requested, he/she should also be involved with this area of data collection.

The eventual solar perimeter size, and therefore the important dependent interaction with management and pump technologies, is uncertain. Varying opinion exists as to how big the cultivated area will be on the solar perimeter. In the field I got estimates ranging from 30H to 140H, with nobody saying 200H. Variance in opinion depended upon technician perception of: 1) the amount of water that can be taken from the river (and length of time it will be available each year); 2) the actual pumping capacity of the pump; 3) the types of crops which are raised and therefore the water demand; and 4) the sandy nature of the soil near the pump (100H or more), which may not be good for rice but rather for corn and other crops. Clearly, the eventual size of the perimeter will affect not only management, but productivity and the economic performance

of the solar pump.

d. Data on SAED. Questions related to SAED are in the interview schedules and will be included by Rich Miller on the observation direction for enumerators and the local contract personnel. I would anticipate that this will turn out to be a major issue area for examination. With SAED offices, project officers, and personnel located at the solar pump, the farmers working with these perimeters may have constant contact with SAED personnel. The data gathering procedures from SAED and by the local contractor will need close review during the first monitoring visit by the U.S. social scientist, to determine adequacy and appropriateness. If a social science/economist PCV is included in the project, his/her involvement in this area of data collection would be helpful. The possibility of the PCV who would work with pump maintenance being involved in this aspect of the data collection should also be explored.

SUMMARY

As a number of changes have been suggested, I have redone Table 111-1 (page 111-5) of the PCI report which summarizes the recommended data collection procedures.

SUMMARIES OF THE DATA COLLECTION PROCEDURES AND RESPONSIBILITIES

FACTOR	TYPES OF DATA	PROCEDURES	DATA COLLECTION RESPONSIBILITY	INSTRUMENT & DATA COLLECTION DESIGN RESPONSIBILITY
PUMPS	<ul style="list-style-type: none"> ● All costs ● Cubic meters of water delivered (times pumping height) by month 	Records & meters	SAED Thermo Electron PCV Contractor	PCV or Contractor
PERIMETERS	<ul style="list-style-type: none"> ● Land under cultivation ● Number of crop seasons ● Per ha. productivity by crop and season 	Records and periodic measurements	SAED Contractor	Tuskegee Consultants
GROUPEMENT(S)	<ul style="list-style-type: none"> ● Characteristics of members, leaders, decisions, work/contributions & distribution of benefits 	Surveys and interview, observation	Contractor	Rich Miller
FARM FAMILIES (& VILLAGES)	<ul style="list-style-type: none"> ● Baseline & progress data ● Attitudinal data 	Small (probability sample) surveys	Contractor	Rich Miller
SAED	<ul style="list-style-type: none"> ● Performance ● Attitudinal data 	<ul style="list-style-type: none"> ● Records ● Interviews (purposive sample) 	SAED Contractor	Rich Miller

IV. IMPLEMENTATION PLAN

As the baseline study will be completed (as well as the productivity and market analysis) without local contractor involvement, the original implementation plan has already been altered. A local contractor should be found immediately. Based on discussions in Bakel, and with the AID Mission in Dakar, it would seem that the selection of a local contractor should emphasize ability to work in the villages and to collect reliable data, rather than academic strength and design capability. It was concluded that a contractor should be engaged in July or August of 1981 for a four-year contract. This would mean that data would be gathered over three growing and harvest seasons before a final evaluation analysis would be carried out. Given monetary constraints and already experienced delays, this seems to be a reasonable time span to gather adequate data for the assessment and still operate within the overall AID involvement with the irrigated perimeters project. In March of 1982, or several months before the beginning of the first major crops on the solar perimeter, the AID Mission should verify that the contractor is ready to go into the field and is planning to proceed with the evaluation.

In addition to the local contractor, the implementation plan includes ongoing support from a U.S. social scientist. Also, in order to provide the most useful assessment for AID, the general consensus seems to be that the final evaluation and analysis should involve U.S. analysts.

1) Level of Effort for Local Contractor

a. A contract supervisor or senior researcher in Dakar who would have the main local contractor responsibility, and who would keep AID and the GOS

informed on progress of all work.

This person would hire the field staff and make at least two trips a year to Bakel during the times when major data gathering was ongoing in order to oversee the work and to carry out reliability checks on field work. Level of Effort: two months per year for three years.

b. Field supervisor in Bakel who would both gather data and oversee the work of the enumerators. Rich Miller has had someone from the Bakel region performing this role. This person seems capable and may be available to continue the work. (The general opinion is that finding a Senegalese social scientist at graduate student level to live in Bakel for a year or more is not very likely, and is also not the most cost-effective approach.) Level of Effort: six months per year for three years.

c. Two enumerators (data collectors) who would do most of the survey interviews, observation work, and productivity measurement. Individuals who come from the area have been working for Rich Miller and might be available again. Level of Effort: nine person-months per year for three years.

d. A data compiler in Dakar who would present all the quantitative data in an easy-to-use format. This person would work directly under the local contract supervisor. Level of Effort: two months per year for three years.

2) Scope of Work for Local Contractor

At a minimum, the work plan developed by the contractor during the first months of the contract should provide clarification on how the following tasks will be carried out and by whom. These should also be placed in bar chart format with dates on them.

a. The already designed socio/economic survey should be administered three times, probably from December to January, starting in December

of 1982. This is for groupements and farm families and villages, for which the sample has been drawn already.

- b. The data collection format for pump performance finalized with the project technician, and in place to begin with the first growing season of 1982.
- c. The data collection procedures on perimeter and dryland productivity following each of three harvests beginning with December of 1982. (The format to be supplied by the Tuskegee contractors and reviewed by the U.S. social scientist.)
- d. The data collection procedures on SAED operations to be done periodically each year starting in June of 1982. (The format to be provided by Rich Miller.)
- e. Reliability checks on field work.
- f. Annual progress reports which also present the data collected during that year, to be submitted to the AID project manager. (The data should be in tabulated form, but raw data should be kept for the final assessment.)
- g. Participation of the contract manager and, if necessary, the field supervisor, as members of the final evaluation team.

Clearly, the contractor is being provided with almost all of the initial data collection instruments. This is a change from the original concept. One element remains at this time--the final clarification of the key assessment questions. As stated above, the baseline report will provide final clarification of the relationship of the data gathering to the key assessment question. I would emphasize the need to continue with a focus on technology related analysis and identifying the causal linkages. The baseline study and the work by the Tuskegee contractors will provide a great deal of further information on the context and constraints for the solar pump evaluation. Within the context of the design that has already occurred, and which appears sound, I would recommend that following the first monitoring visit by the U.S. social scientist (see below), that he/she in cooperation with the local contract supervisor

restate and clarify the key assessment questions (based on the present design), and what has been learned at that time as to the feasibility of quality analysis in the final evaluation report.

In order to select a contractor in the most thorough manner possible, it is suggested that Rich Miller talk with and interview the potential contractors. AID should then immediately select and negotiate a contract with the most qualified person or firm. Mr. Miller can then work with the contractor to develop a full work plan before October, 1981.

Selection criteria should, in the following ranking, emphasize:

- a) previous experience with field data collection (40%);
- b) ability and willingness to work in the Bakel area (30%);
- c) understanding of the purpose and key questions of the evaluation (20%);
- d) reputation for delivering good quality work in a timely fashion (10%).

The above scope of work should immediately be translated into French.

3) Long-Term Monitoring

The AID project manager will have the contractor's work plan, milestone, and annual data reviews and progress reports. However, it is necessary that someone with a social science background, who understands the project and the purpose of the evaluation, monitor its progress. This will be necessary in order to assure: a) that data collection is adequate; and b) that, given the development of the project (i.e., the unknown size of the solar perimeter) and initial data results, the design of survey instruments and data gathering procedures is going to produce the appropriate data base for the final evaluation report. Therefore, I would suggest that a U.S. social scientist, preferably one of several who are already familiar with the project, be

contracted to monitor the evaluation. This could be done with a minimum of two field visits to Bakel during times that data is being gathered by the local contractor. This person should also review each annual report and data tabulation.

The scope of work for this long-term monitoring should be:

- a. a minimum of two field visits planned to observe field data collection;
- b. a review of all written reports and data tabulation;
- c. to observe general progress on the evaluation and to provide specific advice to the local contractor or firm as to modification or corrective action on any identified problems;
- d. to review all field activity and verify that the five topics to be covered and the key question of the evaluation are in fact having adequate data gathered so as to properly address the topics and questions;
- e. to check reliability and quality of data and data gathering procedures;
- f. to provide assistance to AID Senegal or resolve any major problems or questions concerning design or implementation of the evaluation;
- g. following each field visit to provide AID with a short summary of findings and recommendations. Level of effort for this would be approximately three weeks per year for two years.

4) Final Evaluation Report

A comprehensive final evaluation report will have to be prepared based upon the data assembled over the three growing seasons. It seems to be the general consensus that in order to have a report that will be helpful to both USAID and the GOS, a broader evaluation team should assemble the report, rather than just the local contractor. I would suggest that the report be prepared in both French and English by the local contractor's senior researcher and field supervisor working with a U.S. social scientist (preferably the same person carrying out the long-term monitoring), and an evaluation specialist

or economist as team leader. Clearly, there has been a variety of opinion as to how important or feasible a good financial or economic assessment is for this evaluation. It is my opinion that as much as possible should be done to carry out the kinds of complete economic analysis suggested in section IV-2 of the PCI report.

It may be feasible to use an economist with the local contractor or to hire another local Senegalese economist just for the final evaluation. Another possibility is to include an economist from REDSO on the team. In any case, the team should include, at a minimum, U.S. personnel with sociological and evaluation skills, with the economic analysis done by either the U.S. personnel or by a local contractor.

The final report should be prepared after the third growing season or approximately in March of 1985. This timing would allow for data compilation of the three annual data collections. Instead of another annual report by the contractor and a third visit by the U.S. social scientist, the final evaluation team would assemble in Senegal and spend approximately three weeks preparing the report.

V. BUDGET.) Local Contractor

a. Sr. Researcher (Dakar)	
2 months per year for 3 years	\$ 9,000
per diem - 6 weeks a year in Bakel*	3,600
b. Field Supervisor (Bakel)	
6 months per year for 3 years	7,200
c. Enumerators (2 people) (Bakel)	
9 person-months per year for 3 years	8,100
d. Data Compiler (Dakar)	
2 person-months a year for 3 years	1,800
e. Other Direct Costs	
2 mobyettes with spare part	3,500
copying, secretarial, etc.	1,000
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Total Local Contractor Costs	\$34,200

2) Long-Term Monitoring

a. 2 trips from the U.S. by a social scientist short-term consultant	\$12,000
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3) Final Evaluation Report
(2-person consultant team)

a. daily fees and per diem	\$14,000
b. travel	4,000
c. other costs	4,000
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Total Evaluation Report	\$22,000
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4) Translation and Contingency \$ 5,000

TOTAL COST OF EVALUATION	\$61,200
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*USAID Senegal will need to provide transportation to and around Bakel three times per year for two weeks each for the Senior Researcher from Dakar.

Options for Cost Reduction

Two possible ways of reducing costs and still providing the same skills, continuity, and final product are:

- a) For the USAID Senegal Mission to assign a sociologist from mission staff to carry out the long-term monitoring; or
- b) For mission or REDSO staff to carry out the preparation of the final evaluation analysis and report.

A third possibility exists, but it is one which would change the nature of the final product. This would be to utilize the same data gathering plan with the local contractor, but indicate in the work plan that the contractor would also have the responsibility of producing the final evaluation report. In this instance, the work plan would also have to indicate the key focus of the evaluation and the key questions as they are to be stated in the baseline study. The final report would be prepared by the local contractor with support from whom-ever was available at the time from mission staff. If this option is chosen, a strong weighting should be given to the analytical and academic competence of the local contractor during the selection process. This last possibility is the least attractive from a broadbased and in-depth evaluation perspective.