

**AGRICULTURAL RESEARCH AND EXTENSION**

**(669-0135)**

**Second Evaluation**

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**The views and interpretations expressed in this report are those of the authors and should not be attributed to the Agency for International Development.**

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## GLOSSARY

ADP	Agricultural Development Project, Liberia
AVRDC	Asian Vegetable Research Development Center, Taiwan
BCADP	Bong County Agricultural Development Project, Liberia
CARI	Central Agricultural Research Institute, Liberia
CIMMYT	International Maize and Wheat Improvement Center, Mexico
COP	Chief-of-Party
FAO	Food and Agriculture Organization
GOL	Government of Liberia
IDRC	International Development Research Center Canada.
IITA	International Institute of Tropical Agriculture, Nigeria
IRAT	Institute of Tropical Agronomic Research
IRRI	International Rice Research Institute, Philippines
LSUAC	Louisiana State University Agricultural Center, USA
MOA	Ministry of Agriculture, Liberia
MOF	Ministry of Finance, Liberia
MPEA	Ministry of Planning and Economic Affairs, Liberia
ULCAF	University of Liberia College of Agriculture and Forestry
UNDP	United Nations Development Program
USAID	United States Agency for International Development, Monrovia
PP	Project Paper
WARDA	West African Rice Development Association, Liberia

# The Agricultural and Extension

USAID Project No. 669-0135

## Second Evaluation

### EXECUTIVE SUMMARY

The Agricultural Research and Extension USAID Project No. 669-0135 is a cooperative effort between CARI, representing the MOA, and Louisiana State University representing USAID/Liberia. The project is intended to develop the capacity of CARI to conduct adaptive research with crops, soils, livestock, fish, agricultural economics, food and feed technology. Methods are to be developed to interface with the extension service and other organizations to disseminate improved seed, plant propagules, livestock, fish stock, appropriate technology and information.

The evaluation team has reviewed institutional management, organization, staffing, facilities and equipment to determine if the CARI is developing satisfactorily to carry out its mission. Research projects were studied in depth to determine whether the individual projects were well planned and coordinated with other projects to effect interdisciplinary approaches leading to an overall national research strategy. Research outputs were investigated to not only determine progress but also to ascertain whether research-extension linkages were developing to effect the flow of improved plant, fish and animal germplasm, technology and information to the farmer. Finally, the evaluation focused on whether progress was sufficient to warrant a second phase of AID assistance to the CARI and if so, what form it should take.

As a prelude to the review we considered the effect of the following factors on the recruitment of American advisors: The lengthy period of negotiations to initiate the project and the unsettled country conditions immediately following the coup d'etat on April 12, 1980. We also considered the ineffectiveness of the team during the first months of the project because permanent housing was not available for 9 months after their arrival. The first months were obviously spent on securing housing and on other logistical support items as well as trying to organize their work assignments with Liberian staff.

This project has had serious communication problems from the time of its inception. During the first year there were three different acting directors of CARI. The CARI staff did not understand the project and in many instances either did not have access to the basic project documents (grant agreement or project paper) or did not understand the importance of them. Because of staff turnover, staff being sent abroad for training or lack of trained staff or counterparts, the American advisors initially tended to run CARI. This inevitably led to misunderstandings. It appears

that there were seldom regular staff meetings (Director and staff, departments, or American advisory group) to transmit information on project matters. These we deem essential in the future.

In reviewing USAID documents we have had great difficulty tracking the project's progress. We were unable to find any semi-annual reports required by the contract between LSU and USAID/Liberia in the latter's files. Furthermore, only two quarterly reports and one annual report have been found by the team.

A final general problem, that of commodity procurement, must be mentioned. LSU was not equipped to procure the commodities required by the project. Initial commodity procurement was by USAID but then contracted to SECID. A number of commodity procurement delays were experienced in sorting out a procurement system.

Despite all of these initial problems CARI is a very viable institution. Trained staff are returning and filling critical research positions. Although there are still gaps in the research program and a serious deficiency in research/extension linkage, we found many project accomplishments. The following narrative summarizes our assessment of the project's progress during the first two years of activity.

#### Administrative Structure

Agricultural research is an activity which must evolve over a number of years. It is a complex interaction of institutions, institutional relationships and disciplines which try to understand a country's agricultural production systems and address the constraints on those systems and introduce change. This requires a well orchestrated mix of trained research scientists, technically trained support personnel, adequate and dependable financing, good research and support facilities, adequate and well maintained equipment. Above all, the system requires an unwavering commitment by the central government at all levels since a country's agriculture will stagnate without a sound, progressive research program.

CARI is a viable research organization and Liberia's only agricultural research station. It has been in a very precarious state of development for 30 years, but is now on the move. The next 5-10 years are the critical years. The future viability depends on the strengthening actions for development. There are actions the evaluation team feel are urgent. The Directorship should be a permanent appointment (appointment being renewable depending on the progress of CARI), and the Director should answer directly to the Minister of Agriculture. Full autonomy should be given to CARI with the Technical Committee being advisory only. Since the entire welfare of Liberia depends on food, CARI is one of the most important national institutions.

CARI staff must improve communications. Reporting on project plans and research results needs to be improved. If the Agricultural Research Council, the Technical Committee and the Research Advisory Committees are to be effective in assisting to strengthen the CARI, research proposals, plans of work and annual reports must be completed in a timely manner and placed in the hands of committee members. Improved technology and production packages of practices should be published twice a year for extension use for all crops and livestock.

Financial constraints continue to plague Liberia and we recognize the cash flow problem. However, we feel agricultural research should receive a top priority in national planning. The team has noted several development projects which are better financed than CARI such as the Agricultural Development Projects (ADP's) and which are almost totally dependent on CARI for research technology and information. This appears to be an inappropriate allocating of revenues.

There has been good progress made on giving the Director of CARI some autonomy as to the expenditure of research funds; however, the problem still remains that although funds are budgeted for the year, the Ministry of Finance (MOF) does not forward the funds for CARI in a timely manner. These chronic delays are creating a crisis in research management. The evaluation team suggests that since agriculture research has been given the highest priority by the central government, that the MOF, MOA and other responsible bodies make every effort to ensure that the CARI financial allocations be released in a timely and expeditious manner.

Second only to finance is the problem of the lack of well trained scientists and technically trained support personnel. The current project has faced this problem squarely and has allocated funds for 457 person/months of training in the U.S.A. There have already been 289 person/months committed to training.

The evaluation team reviewed the entire research mission and found several personnel problems which should be addressed if CARI is to succeed: 1) no promotions or salary increases have been received in several years as per government policy; 2) the Director is restricted from recruiting scientific staff to fill critical positions as per government decree; 3) there is some loss of the better research personnel to other projects which should have lower national priority; 4) excess, unqualified personnel are retained on the CARI payroll which claims a large part of the operating budget. The evaluators strongly suggest these problem areas should be discussed at the highest government level, possibly the Agriculture Research Council, and action taken to prevent a "brain drain."

Progress on the development of laboratory and support facilities has been very slow. During the final months of phase I and in phase II, efforts should be taken to accelerate these developments.

We are especially concerned about the lack of effort placed on support facilities for extension and agricultural engineering for appropriate technology. We are also bothered by the lack of effort to train maintenance personnel and equip the support units which must maintain the CARI buildings, laboratories, utilities, vehicles and farm machinery. These problems must be prioritized in phase II.

Finally, the role of socio-economic investigation in research strategy, a formal farming systems research program, the need for agricultural economics research, physical facilities development and equipment for handling data analysis need to be addressed in phase II. We feel there is an urgent need to strengthen these activities to assist in developing strategies, priorities and identifying appropriate technology.

### Research Activities

#### Research Plans of Work and CARI Research Strategy

The evaluation team noted that considerable progress has been made during the first two years of the project on research planning, execution and reporting. Initial project plans of work have been completed. Much of the research was already in progress so the complete plans were often an "after-the-fact" exercise, although a worthwhile activity. Much now needs to be done by the Director, the Research Coordinator and the staff to review and revise project plans of work and to develop a comprehensive research strategy for CARI.

The team received comments from several staff that research units did not cooperate effectively with one another. Research strategy must involve coordinated interdisciplinary research and methods must be found to foster esprit de'corps and an atmosphere conducive to interdisciplinary harmony and cooperation. We found that scientists and technical staff were seldom told whether their research efforts were satisfactory or not. Certainly meritorious and substandard performance should be noted. We recommend that the Director, Research Coordinator, Socio-Economic Officer, and Extension Liaison Officer at least spend one day per quarter together with each unit reviewing research accomplishments, plans, constraints and staff problems.

#### Common Constraints to Research at CARI

There are numerous problems facing CARI which affect the execution of research. Some of the most common problems to all units are lack of good security on field research plots, poor library facilities, an inadequate analytical laboratory, poor office and laboratory facilities, poor seed and chemical storage, inferior or lack of maintenance on staff housing, office buildings, laboratories, vehicles, farm machinery, and inadequate utilities. The



evaluation team reviewed building plans on a number of structures and urge that construction be given a high priority. We further recommend that a master plan for maintenance and construction be developed which would include: buildings, equipment, staff needs and personnel training.

The evaluation team recommends that a complete inventory of buildings and equipment needs to be completed during the final 9 months of phase I. Several short-term expatriate specialists should be hired to study and design changes to improve the electrical, water and maintenance systems. It is important that the design team for phase II have access to a prioritized list of needs early in 1984.

### Branch Stations

Some excellent research has been done at the CARI-Suakoko and now requires multi-locational testing and verification. This not only includes new varieties of field, vegetable, root and tree crops but also agronomy and appropriate technology.

Current off-station testing is ad hoc and poorly organized. It primarily involves personal contacts with the County ADP's or a few County or Regional Extension personnel. The review team feels greater consideration must be given to the development of a few well run branch experiment stations. Selection of these is discussed in more detail in the research section, however, we feel action should be taken immediately to establish a branch station at the College of Agriculture/University of Liberia. Testing research results on farmers' fields also needs attention.

Phase II should address the development of the CARI Branch Experiment Station System: station location, development and staffing of individual stations. This would certainly include funds to develop facilities at the College of Agriculture for a joint research mission.

### Strengthening Research Capabilities

The evaluation team felt that progress in Crop Science has been very significant since the inception of the project. This is partially due to three projects with donor agency funding, expatriate direction and/or back stopping which were initiated before the CARI/USAID Project. Contributing significantly to the department's success is a well trained Liberian head who has integrated the donor supported projects with the overall mission of the department.

When considering the total research-extension mission of the CARI, several disciplines can be singled out for priority attention; those are the departments which will have expatriate staff. In most cases Liberian counterparts are being trained or have been identified for training. The plan is a good one provided the CARI can retain its trained staff and expatriate counterparts

can be provided for several years after the leadership role is passed to the trained Liberian. Of course, one Liberian trained in research does not make a strong department. Recruiting and training must be intensified in phase II of this project.

We found the development of the applied research program of the CARI to be very weak in the areas of soils and soil fertility, weed control, vertebrate control, agricultural engineering, inland fisheries, food and feed technology, tree crops, legume crops, plant physiology, agricultural economics, biometry and experimental design. In addition, the research programs in plant pathology, entomology and animal science should be strengthened by recruiting and training Liberians. The phase II design should consider a logical sequencing for strengthening the above mentioned subject areas. The soils area and agricultural economics should be high priorities for developing a farming systems research capability. Biometry is needed badly for experimental design and data analysis.

The evaluation team suggests that the CARI should be restructured with a Research Coordination Division and an Extension Liaison Division. The Research Coordination Division will include the Departments it previously administered in addition to a department of Socio-Economics. We suggest that the Analytical Laboratory administration be placed under the Research Coordination Division along with a Biometry and Experimental Design section, since these are research support facilities.

### Extension Activities

The interface between CARI and government extension institutions appears to be almost non-existent. Since the county agricultural development projects (ADP's) have an extension component there are some weak linkages with these groups in varietal testing and plant protection activities. Certainly no one could label these outreach activities. The evaluation team feels the situation is so critical to the success of CARI's mission to feed Liberia that dramatic changes must be effected in phase II of this project to develop strong linkages for the flow of improved technology.

We recommend that the design team consider the reorganization of CARI, as suggested above, into two divisions: Research Coordination and Extension Liaison. We feel that seed multiplication and plant and fish propagation activities should be separated from research activities and placed in the Extension Liaison Division. This structure provides the Extension Liaison Officer and staff with a number of opportunities to establish contacts with County ADP's and extension organizations to disseminate technology and information while distributing seed, plant and fish stocks. In time, animals and livestock information may also be distributed in this way. Raising the Extension Liaison Officer's activities to a Division Level in CARI would permit the employment of sufficient trained staff to organize and publish information on new and

recommended technology.

This extension thrust would be carefully integrated with the Smallholder's Rice Seed Project and ADP efforts. It could lead to the establishment of county and regional extension centers for information, seed, plant cutting material and fish propagation and distribution. A pilot study should also be considered for phase II as to the feasibility of subject matter specialists in plant protection being recruited for the Extension Division.

#### Linkages with International Organizations

CARI has done an excellent job in developing research linkages through Memoranda of Agreement with FAO, IITA, IRRI, AVRDC, and IDRC. The personnel, methodology, equipment, and germplasm provided by these groups has permitted rapid advances in research and development. Most of the donor financed projects are quite well integrated into departmental research missions and provide an opportunity to develop an area of research while Liberian scientists are trained.

#### Additional Linkages with Liberian Institutions

The phase II design team should suggest some bold approaches to integrating and better utilizing Liberia's scarce scientific resources. The review team suggests consideration should be given to a grant system jointly administered by the Director of CARI and the Dean of the University of Liberia/College of Agriculture and Forestry (ULCAF). The total grant fund should be modest. It could provide the ULCAF with a vehicle for transportation for scientists and students to and from CARI and any CARI branch station for joint research. Inputs and equipment for specific, joint research projects could also be provided.

#### Annual Research-Extension Conference

An annual CARI research-extension conference would be an excellent method for reviewing CARI's research activities, discussing production constraints, developing research ideas for the following year and developing extension recommendations. The conference should be an internal one with the technical committee participating. This should be held before the end of phase I. As the conference develops during phase II, extension personnel could be encouraged to attend. Possibly a CARI Field Day or Report Day should be organized for extension personnel and ADP's only.

### INTRODUCTION

#### Background and Objectives

The Agricultural Research and Extension Project is a cooperative

effort between the Ministry of Agriculture, Louisiana State University Agricultural Center (LSUAC), and USAID/Mohrovia. The project is intended to develop the capacity within the Ministry of Agriculture to conduct adaptive crop, soil and livestock research and to disseminate research results and other information to the extension service and other user organizations. Three phases of this project are planned. The phases are:

- Review of constraints on research institutional management and organization.
- Extension system development with some assistance provided to individual research departments.
- Consolidation, refinement and institutionalization of the research capability and the research-extension-development linkage.

The initial phase of the project encompasses three major components:

- Development of an effective interface with regional and international centers to the extent that CARI will utilize basic and applied research discovered by these centers for adaptive research in Liberia.
- Further development of the capacity to conduct applied research within the MOA on crops and livestock.
- Forming effective linkages among research, extension and development programs in Liberia.

USAID funding in phase I covers 228 person months of long and short-term assistance to advise and assist the MOA to build the capacity to conduct the adaptive research described above. Four hundred fifty-seven person months of agricultural training is also planned. A commodity component is included to equip labs and workshops and to directly support the contractor. MOA funding is required for staffing, continued development and maintenance of the project site to house activities required for all components of phase I.

The project was authorized for \$4,209,000 on January 3, 1980. The project agreement was signed on March 10, 1980, with a PACD of September 30, 1983. The project was extended until September 30, 1984 due to delays in AID/Washington and in Liberia. Louisiana State University Agricultural Center signed a contract to implement and work cooperatively with Liberia on June 3, 1981. Because of higher than anticipated contract costs the AID funding was increased by \$788,000 in September of 1982 to a LOP total of \$4,997,000.

## Methodology

The project document of the agricultural research and extension project provides for two evaluations during phase I. The initial evaluation was completed in December of 1982. The following recommendations were submitted:

### A. Administrative

1. That the greatest possible degree of autonomy for CARI be assured.
2. That the Director of CARI be accountable directly to the Minister of Agriculture as Chairman of the Research Council.
3. That the LSU team function in an advisory capacity while their Liberian counterparts assume line responsibility.
4. The MOA technical committee should meet regularly as related to CARI projects and programs.

### B. Staff Development

1. CARI labor force should be reorganized to ensure the timely availability of technical labor for research operations.
2. The Government of Liberia policy makers be made aware that adequate staff and funding for research activities is essential if the country hopes to increase agricultural production over-time.
3. Economic and Social Analysis Office add one or more Liberians.
4. LSUAC and GOL give priority to filling vacant positions in the appropriate technology department.

### C. Research Library

1. A properly trained librarian be employed as a short-term consultant to train and supervise the existing library staff, organize the library and compile/place orders for books and periodicals.
2. A well qualified person with a B.S. degree be employed as a librarian and be scheduled for M.S. degree training.
3. Better lighting, office equipment, more shelving, photocopier and air conditioning be installed and that insects and other pests be controlled in library.

### D. Physical Facilities

1. A complete study of the need for improved physical facil-

ities at CARI should be conducted prior to finalizing the phase II Project Paper.

Continuation of the project without change was also recommended.

The review of the second year of phase I was conducted by two outside consultants, the USAID Assistant Agriculture and Rural Development Officer, representatives of the Ministry of Agriculture and the Ministry of Planning and Economic Affairs. There were no LSUAC personnel on the evaluation team as in the previous evaluation. The scope of work for the evaluation was prepared by the Assistant Agriculture and Rural Development Officer, who served as the team coordinator. One of the outside consultants served as the team leader.

The scope of work for the evaluation consisted of a review of the following points:

**Objective:** To carry out the second evaluation of the Agricultural Research and Extension Project.

1. Evaluation of the status of the Central Agricultural Research objectives, long-term work plans, farming system research methods, capabilities and accomplishments in the past year.
2. Make specific recommendations for improvements in the project that should be incorporated in the design of phase II, including levels of technical assistance and relative emphasis on the continued development of physical plant and supporting infrastructure.
3. Identify any institutional bottlenecks which impeded implementation of phase I and make recommendations for their resolution.
4. Determine progress toward attaining objectives as specified in the project paper logical framework and review objectives to determine their continuing relevance to Liberian farmers and the goals of CARI.
5. Assess whether USAID, LSUAC and the GOL have provided project inputs as planned and whether planned inputs for the remainder of the project are yet valid.
6. Assess the institutional capability of CARI to plan, administer and manage an adaptive research program oriented toward the problems of subsistence farmers.
7. Suggest the professional composition of a four person design team for a phase II project and draft a detailed scope of work for the design effort.

The evaluation team was divided into two groups, administrative and technical. A field tour of the entire facilities of CARI was taken by the evaluation team, CARI research and administrative staff and the LSUAC team. The team interviewed members of each research department, administrative staff and members of the LSUAC technical assistance contract team both individually and as a group. Project documents and CARI reports were also reviewed. Meetings were held with representatives of Bong County Agricultural Development Project (BCADP); the University of Liberia College of Agriculture and Forestry (UCLAF); representatives of the Ministry of Agriculture (MOA); and representatives of the Ministry of Planning and Economic Affairs (MPEA).

The team leader for the evaluation team visited LSUAC enroute to the evaluation site. The LSU Campus Coordinator provided comments in reference to the administrative leadership by which the project was governed from LSUAC.

## THE ADMINISTRATIVE STRUCTURE FOR CARI

### Background

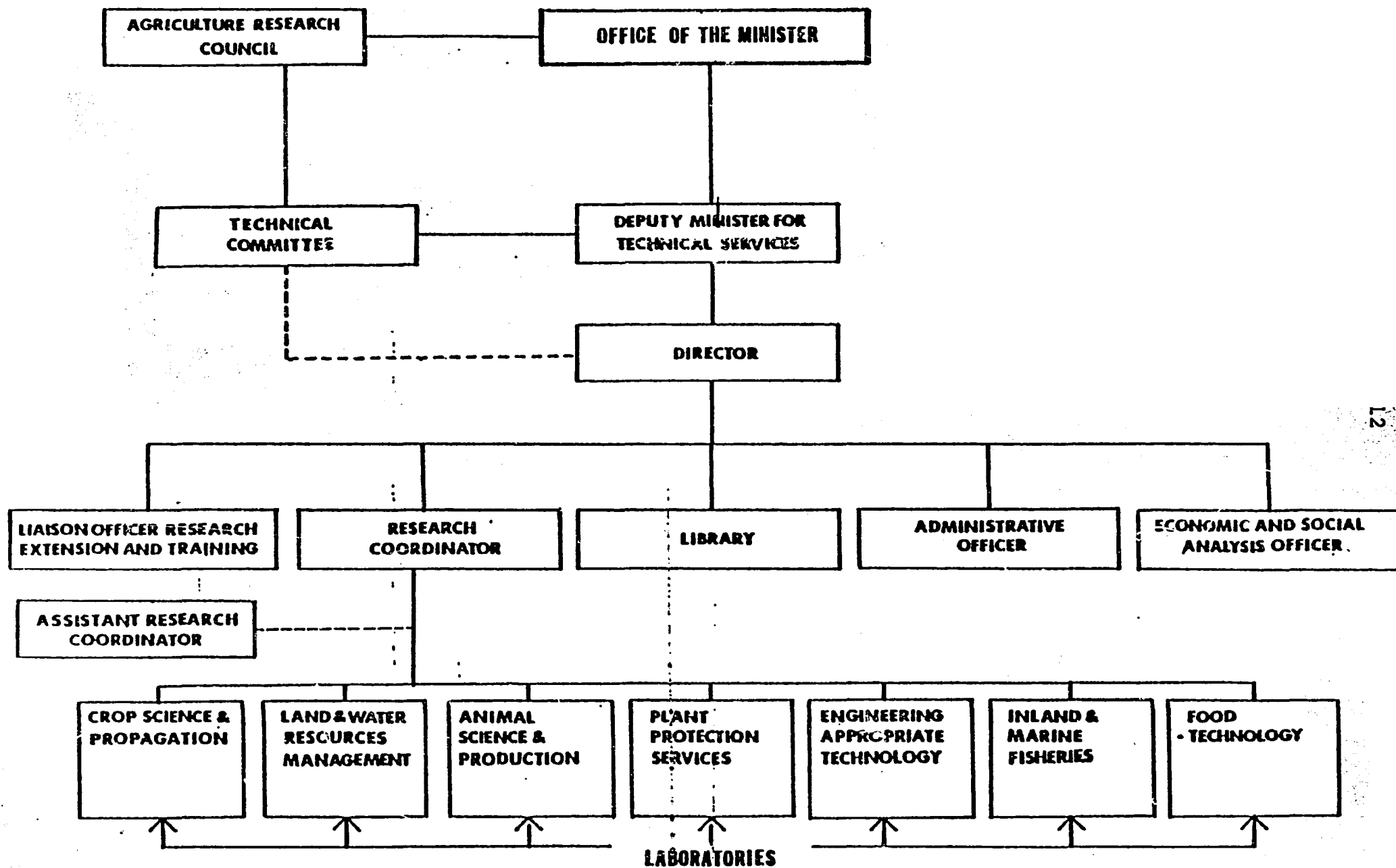
The Ministry of Agriculture (MOA) of the Republic of Liberia published its long range strategy ("the Blue Book") "Liberia's Agricultural Development: Policy and Organization" in June 1980. In discussing technical information in support of development it was stated that a Central Agricultural Research Institute (CARI) will replace the existing Agricultural Experiment Station at Suakoko. It will have semi-autonomous status to insure that the Director has the necessary administrative and budgetary authority to conduct a strong and cohesive research program. However, overview administration of the Institute through research and technical committees will insure that it remains responsive to development needs as defined and enunciated in large part by the MOA.

### Project Paper Proposals

The Project Paper (PP) Liberian Agricultural Research and Extension 669-0135 sets forth criteria for the development of the CARI at Suakoko as THE agricultural research institute of Liberia. The Ministry of Agriculture Research Organization Chart, figure 1, from the PP, presents the structure for the new MOA research organization. The MOA is responsible for agricultural research policy but depends on an Agricultural Research Council to recommend actions and general areas of funding. The Minister or his Deputy chairs the Council whose members include high ranking government and private sector individuals.

Working under the Council and with the Deputy Minister for Technical Affairs is the Technical Committee. This committee's function is to examine various proposals for research in agriculture. It

Figure 1. Current CARI Organizational Structure.



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shall suggest (when necessary) new topics or lines of research and continuously review all research work in progress. It will also seek to establish working relationships with other agricultural research institutions and organizations throughout the world and particularly with those in neighbouring countries. The Technical Committee is supposed to meet at least four times a year.

The Director of CARI answers to the office of the MOA through the Deputy Minister for Technical Affairs. The Central Agricultural Research Institute is supposed to be a semi-autonomous organization within the MOA. The Director of the CARI is responsible for its research strategy, budgets, personnel, physical facilities, linkages with other institutions and its outreach or extension programs. The responsibilities of the Senior Advisors to the Director and Senior Research Officers (Departmental Coordinators) are outlined in the PP.

The PP called for six expatriate positions (the technical assistance team) with a tenure of service of 3 years with a Liberian counterpart to be trained to fill the position thereafter. These expatriate positions are: 1) Research Coordinator (Team Leader); 2) Liaison Officer for Research, Extension, and Training; 3) Economic and Social Analysis Officer; 4) Departmental Coordinator for Crop Science and Propagation; 5) Department Coordinator for Engineering and Appropriate Technology; and 6) Head Chemist, Analytical Laboratory. Their duties are outlined in the PP.

#### Current Status (Second Evaluation)

CARI has been established as the agricultural research institution of Liberia; however, a number of objectives set forth in the project paper have not been fulfilled. The Agricultural Research Council has never met although the Technical Committee has met four times.

Sustained interest, review and guidance on the part of the MOA are required to nurture CARI's development. The Minister of Agriculture should convene the National Research Council at least once a year to discuss agricultural policy as it relates to and affects CARI. The agenda should be prepared by the Minister in consultation with the technical committee and the Director of CARI.

The Technical Committee should be convened at least twice a year: at the beginning of the rainy season and the dry season, the date and place being set by the Director of CARI in consultation with the MOA. The agenda for each meeting should be prepared by the Director of CARI in consultation with the MOA and forwarded with appropriate reports to each member of the technical committee by the Director of CARI two weeks prior to the meeting.

The review team detected that the structured committees have not

functioned according to project expectations. CARI staff and the LSU team have contributed to this deficiency. It is only recently that project plans of work and an annual report has been completed. The MOA, the Agricultural Research Council, the Technical Advisory Committee and the Research Committee have yet to receive copies of these documents. It is imperative that proposals for new areas of research, project plans of work, the overall research strategy of the CARI and technical reports be in the hands of committees two weeks prior to any meeting date. Three problems are briefly presented below to illustrate areas in which the team feels the Agricultural Research Council and the Technical Committee could assist the CARI.

Research is the life blood of agricultural development. Many serious interproject problems should be addressed by the Research Council and monitored by the Technical Committee. An example is the elimination of support to CARI for rice research from the Bong County Agricultural Development Project (BCADP) of the Ministry of Agriculture. When established, BCADP was budgeted \$30,000 per year by donor agency planners for rice research at CARI. After July 18, 1982, funding to CARI was suspended due to "a 62% budget cut and reasons of tight budget." This problem, which is crippling rice research at CARI, should be discussed by the Agricultural Research Council and policies established for a more even-handed approach to funding.

For years the predecessor Central Agricultural Research Experiment Station at Suakoko accumulated excess non-trained personnel which are not technically competent at any research level to assist in the research mission so vital to the country. Capable staff are continually being hired away at higher salaries by other projects and the current system does not permit the Director to remove unqualified people from the CARI payroll. Of a total of 263 salaried employees the Director and his advisors deem 136 staff members qualified to work at various levels of technical competence at CARI, whereas 127 are unqualified. This latter group cannot be discharged and are a negative influence on the success of the research mission as well as a budgetary burden. The Agricultural Research Council should discuss this problem and determine a solution other than wait for vacancies through retirement or death to supply the answer.

### Autonomy

Although the Director of CARI has been granted the responsibility for the actual research station operating budget, too often the line item budgeted funds are not released in a timely fashion. Research is a long-term activity which is predicated on a dependable, timely flow of funds. Examples were given of critical fertilizer experiments which were planned and planted but aborted because of the delay of the disbursement of funds for research by the Ministry of Finance.

The MOA has permitted some autonomy to be exercised by the Director in decisions on staff training based on guidelines of the GOL, but the Director has not been granted authority to promote or raise salaries of staff.

### Organizational Structure of CARI

A restructuring of CARI's organizational chart (see figure 2) should be considered. The support operation of the institute should be placed under the administrative officer (utilities and fuel, vehicle and farm machinery maintenance, structures and laboratory maintenance, finance and accounting) who answers to the Director. Also associated with the Director's office would be the library, clearly delineating these support groups from research and extension activities.

A reorganization would leave two major mission-oriented divisions in CARI: the Research Coordination Division and the Extension Coordination Division. The Research Coordination Division would include the seven previous departments: Crop Science Production, Land and Water Resource Management, Animal Science Production, Plant Protection, Engineering Appropriate Technology, Fisheries and Food Technology. A Department of Socio-Economics should be added. We also suggest that the administration of the Analytical Laboratory be transferred to the Division of Research Coordination and that a Biometry and Experimental Design Laboratory be established in that division. Both are service units for research.

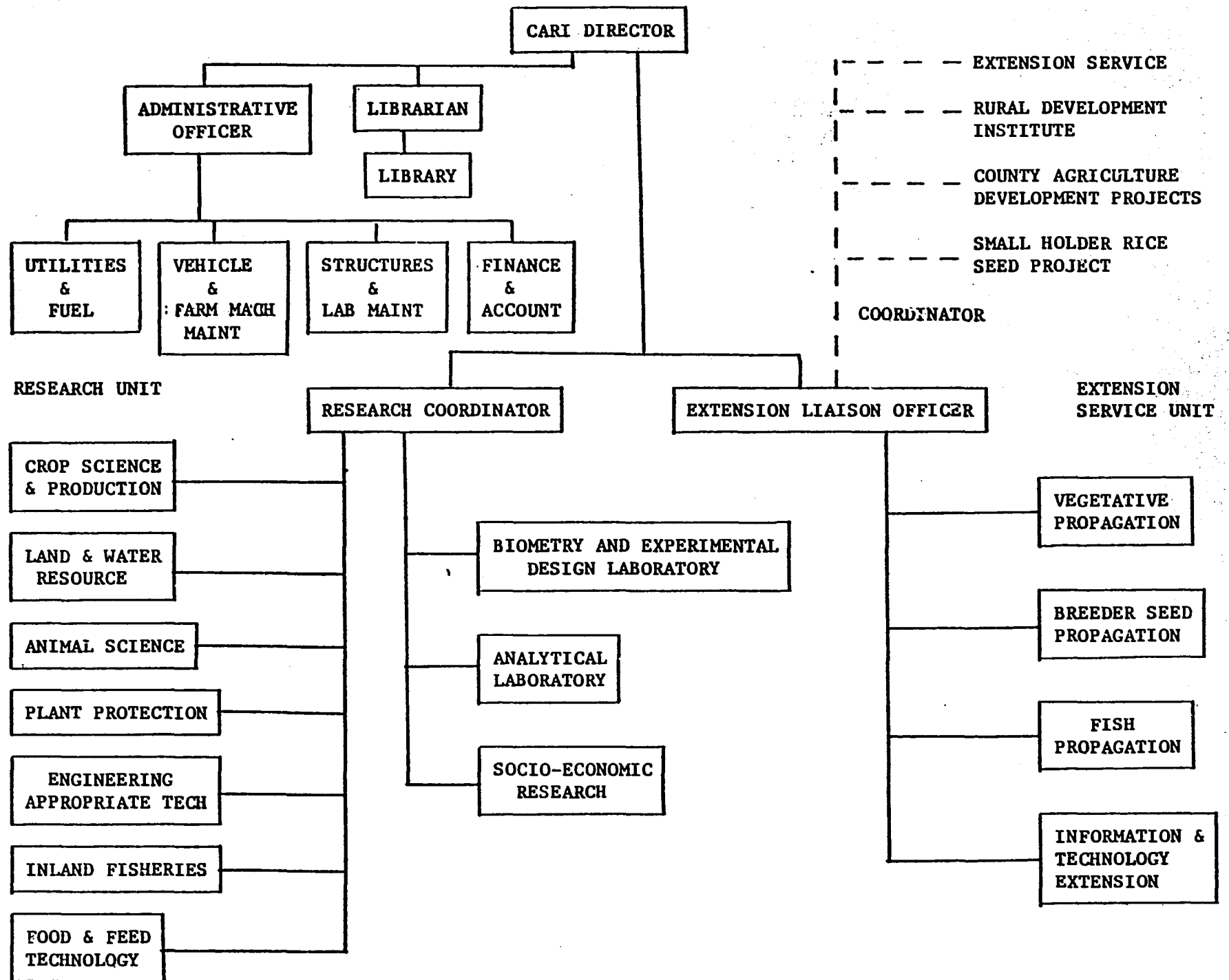
Several activities inherited by CARI from the previous Central Agricultural Research Station are not research functions and should be assigned to the Division of Extension Coordination. These activities are vegetative propagation of cuttings, seed and fish propagation.

### Substations of the CARI

Due to personnel and budget constraints, the CARI Director has not been able to consider the development of substations for verification trials and multiple location testing. Guidelines have been developed by the CARI staff for station site selection and operation and these have been approved by the MOA.

CARI is located in a medium-high rainfall (70 inches) zone of lateritic, highly leached, acidic upland soils. Two sites in the high rainfall area should be considered for substations: one with coastal sandy loam upland soils and the other with lateritic, highly leached, acid upland soils.

Figure 2. Suggested CARI Organizational Structure.



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## RESEARCH ACTIVITIES

### Background

The Project Paper pointed out that the research program in 1980 was at best very limited. Research work at the Agricultural Research Institute was confined to investigations of soils, livestock, agronomy (rice, roots and tubers) and basic chemistry. Research in land and water, agricultural engineering and appropriate technology, plant pathology, entomology, weed control and production economics was almost totally lacking. Research was piecemeal and not coordinated. No long-term research strategy which considered economic factors had been developed. Linkage of research with extension and development efforts in the country was weak and had little structure. The Agricultural Research Institute had little technology to extend and as a consequence, extension had little technology to deliver to the farmer.

### Project Paper Proposals

Under the grant agreement approximately 210 staff months of long-term technical service comprised of three senior advisors to the Director of CARI (one Research Coordinator, one Liaison Officer for Research, Extension and Training, and one Economic and Social Analysis Officer) and three senior Research Officers (Departmental Coordinators) was planned. These expatriate senior Research Officers were to coordinate activities for the Department of Crop Sciences and Propagation, Department of Engineering and Appropriate Technology and the Analytical Laboratory. The agreement also provided for approximately 18 person months of short-term consultants in disciplines to be determined by the implementing team. To further strengthen the research component of CARI, the project provided for training and commodities which are discussed elsewhere.

Considerable progress has been made in the area of research planning and execution since the inception of this project. The department heads and the individual project leaders have prepared plans of work which have been submitted to the Research Coordinator. In most cases where Departmental planning and execution of research is weak, the cause can be placed on the lack of personnel with research training and/or lacking or inadequate technical assistance. This problem will correct itself in time as trainees return from U.S. Universities to take up positions in the various departments.

The team found that long-term research strategy and prioritizing of research at CARI was only in the formative stage. Research coordination has not moved past the stage of receiving project proposals. It is noted that there were many problems associated with the initial project start-up.

During the last nine months of phase I of the project, highest priority should be placed on serious review of each proposal by the Office of Research Coordination and peers in interdisciplinary subject matter. In the review process a discussion should be held with the originating department head and scientist. After reviewing all projects, a long-term research strategy with priorities should be formulated for CARI by the Director and his staff.

The evaluation team commends the CARI Director, his staff, and the expatriate team for completing the 1981-82 Annual Research Report.

### Crop Science and Propagation

The evaluation team felt that progress in Crop Science was very significant. The department appears to be functioning very smoothly under Liberian leadership. The several projects (root crops - IDRC, vegetables - FAO, and post-harvest losses - FAO) which are funded by donor agencies are fully integrated into the department's research Mission. The department maintains very close research ties with six international centers (IITA, IRRI, AVRDC, IRAT, WARDA and CIMMYT).

Numerous rice varieties isolated in yield trials at CARI exceed LAC 23 in coordinated yield trials. Approximately 35 elite varieties for upland or swamp conditions have been identified at CARI. It is suggested that major research efforts in the next years should be shifted to off-station testing. Upland rice comprises 90% of rice production in Liberia. Although yield is low, a 25% increase is possible with improved varieties. The potential for increasing yield through increased use of commercial fertilizer is not good due to cost; however, research on use of legumes in rotation could enhance both soil fertility and yield.

Rice produced under swamps or paddy conditions has a higher yield per hectare although the total area of swamp rice production is small. Yield increases with swamp rice can be attained through improvement in varieties, improved agronomy, use of fertilizer and further swamp development or improvement. Research strategy should consider these points. Interdisciplinary research on iron-toxicity, fertilizer response and plant protection is developing nicely and should be encouraged.

Cassava research during the past four years has been emphasizing testing and selecting new varieties. The new varieties have been provided by IITA as seeds and as plants in tissue culture media. Three high yielding varieties which have yielded as high as 50 tons/ha at CARI without fertilization (the national average is 7 tons/ha) are being tested off the institute in multilocational tests. Interdisciplinary research on plant protection (green spider mite, cassava mosaic virus, and cassava bacterial blight) should be strengthened. Agronomic work on leaf-harvest yield (Liberians eat cassava leaves), the effect of multiple stakes (plants) per

hill, and response to N,P,K and/or Mg. fertilizer is in progress. Data for physiological correlations are being collected and quality is being evaluated on cyanide levels, starch content, total dry matter content and taste.

Sweet potatoes are quite important in the diet of Liberians but are in short supply. High yielding lines have been received from IITA but have had limited testing because of a lack of personnel. Eddces (cocoyam) research is progressing very slowly because of the lack of germplasm and trained personnel.

Research on legumes (both edible and forage types) needs to be expanded. Because of the very low soil fertility in Liberia, the high cost of fertilizer and the need for animal feed with high protein, this program should receive a high priority in CARI's research strategy.

The vegetable program has released five vegetable varieties (okra, bitter ball, hot pepper, sweet pepper and egg plant) during the past year. One of the major problems in the vegetable program is the availability of seed. Seed of pepper, okra and bitter ball can be locally produced but all others have to be imported. CARI cannot be expected to produce seed for general use, but at present there is no organization to do that.

Maize research has been in progress only two years. A number of high yielding lines have been identified but none have been adequately tested. Most tests have had high coefficients of variation so considerable agronomic work remains to be done.

Research on tree crops has been greatly neglected. Most of the work centers around the propagation of citrus. There are several experiments on coffee and cocoa which were started on the land of the Liberian Produce Marketing Corporation about 8 miles from CARI by a previous FAO tree crop expert. Efforts are being made to keep these fertilizer and shading experiments going. Research staff should be recruited as soon as possible to strengthen research on citrus, cocoa and coffee.

The evaluation team felt that there is not a clear cut delineation between research (plant breeding, plant physiology and agronomy) and plant propagation. A mechanism should be found to take major seed and vegetable plant propagation duties out of research departments. The team feels these functions should be transferred to a unit under the Extension Liaison Officer.

The Division on Post-Harvest Technology was productively engaged in research before this project was started, however, its research must be considered in the overall strategy of CARI. Research on village level parboiling methods with rice has enhanced milling recovery. Wooden and metal storage bins for farm use to eliminate rodent and insect loss and the development of improved harvest and threshing methods have all reduced post-harvest losses by at least 10 percent.

The serious shortage of Liberian research scientists inhibits the development of the CARI research mission in root crops, vegetables, and tree crops. Another serious problem is the inability to do off-station variety testing (especially on rice) due to the non-existence of developed branch experiment stations and money for gas and per diem. Research laboratories, propagation house, controlled temperature and humidity seed storage, greenhouse and tissue culture facilities are high priority needs of the Crop Science Department.

### Land and Water Resource Management

Work in this department has focused on the following areas: re-research on soil fertility and fertilizer recommendations, analysis of soil and plant tissue samples in relation to soil fertility research, collection of meteorological data and soil survey work. The department currently lacks sufficient staff trained in research as well as critical analytical equipment.

There are many soils questions in a slash-burn system of agriculture which need to be answered. Soil fertility in these highly leached soils seems to be associated with the small amount of organic matter accumulated by the vegetative cover and the ash left after a burn. Little is known as to the micronutrient status. The department has done few verification tests to correlate soils laboratory tests and fertilizer recommendations. Soil surveys, agro-climatological and ecological mapping should be done for the country and soil conservation research should be initiated in cooperation with farming systems research.

### Plant Protection

The department is composed of two divisions: Entomology and Plant Pathology. Work in the department is supported by the UNDP/FAO Project, "Development of Applied Research in Plant Protection." The department is very short of trained Liberian research personnel. The entomologist investigated the varietal resistance in rice to the paddy case worm and its association with plant height. Studies were also conducted on the control of Nymphula depunctalis, in rice by chemicals and by draining the swamp. Significant yield increases were obtained over the control by all treatments. Termite control was studied in cassava using two insecticides and a control. All insecticide treatments increased yield significantly.

Plant pathologists studied leaf spotting of bitter ball, a stunting disease of okra, rice scale, viruses on hot pepper, and bacterial wilt in egg plant. This department does considerable insect and disease diagnostic work. It is frequently called upon to interact with other crop research projects and is very important to the total research mission of CARI. Future plans should consider staff recruitment for research on weed and vertebrate (bird



and small mammals control.

### Fisheries Department

The Fisheries Department was created in 1980 to conduct adaptive research on fish culture. The department does not conduct research but is producing fingerlings of five species for distribution. The department is in critical need of trained research personnel and upgrading of facilities.

### Animal Science

The Animal Science Department of CARI currently has three operating divisions. The Animal Breeding and Production Division has research activities which are basically aimed at identifying characteristics of beef cattle, sheep, goats and pigs under Liberian conditions. Research is targeted at reducing economic constraints on their production. The Animal Health and Veterinary Research animals are maintained by the Department. This division is also involved in the classification of the diseases of livestock in Liberia. The Animal Nutrition Division is involved in studies aimed at reducing animal feed costs by utilization of locally available ingredients.

The beef herd consists of indigenous N'Dama, Mutura and some of their crosses. Studies are being made on improved permanent pasture, animal health, factors influencing reproduction and rate of gain. Swine research is being conducted on hampshire, seyher and the indigenous ishanti breed. Breeding and production is being carried out under an intensive management system. Feed formulations use locally available ingredients, and a limited quantity of essential imported ingredients.

Animal health research consists of diagnosis and treatment of diseases and parasites found in the CARI animals. Since very limited veterinarianian service is available locally, the CARI group provides this service to area farmers.

### Socio-Economic Research

The PP did not set up a socio-economic research unit per se but rather established a senior advisor to the Director on Economic and Social Analysis. This advisor was to engage himself, under the supervision of the Director, in the translation of agricultural research into data useable by other sectors of the economy and to assess socio-economic impact or potential impact of research activities at the Institute. He was also to assist and advise the Institute's Administrative Officer in the first year of operation.

During the first year of operation, the expatriate spent consider-

able time on the latter activity, assisting and advising the CARI Administrative Officer in adhering to the provisions of the grant agreement. Apparently, the Socio-Economic Officer did not view his role as an economic researcher per se but rather to provide economic guidance in the development of the overall research program. This view may have resulted in some functional overlapping between the Socio-Economic Office and the Research Coordinator's Office.

The Economic and Social Analyst also conducted research on zero tillage during this project period at CARI. The work involved 3 locations, 5 fertility levels, 2 herbicides, and a rotation. The experiment must be considered an agronomic rotation experiment with minimum tillage involving two crops (rice and cowpeas) and several levels of fertilizer with rice.

It appears to the evaluators that farming systems research should be conducted to evaluate the slash-burn farming system versus a system of rotations on continuously farmed areas. Great care has to be exercised in planning research to generate technology to introduce changes in farming systems. Interdisciplinary research should be encouraged and studies on the micro-economics of technological change should be introduced. It should be noted that only recently was a Liberian counterpart assigned to this area at CARI.

The evaluation team recommends that a Socio-Economic Department be established in the Division of Research Coordination during phase II in lieu of the present arrangement of a Socio-Economic adviser to the Director. It would conduct micro-economic research and conduct and supervise interdisciplinary farming systems research. This restructuring will eliminate overlapping functions of the Research Coordinator and Socio-Economics officer while still allowing for socio-economic input into the research planning and coordination process.

### Engineering-Appropriate Technology

Agriculture engineering is a new discipline at CARI. The original LSU team included a member for this position but he returned to the USA for medical reasons after a very short time. The current engineer has no counterpart although there is a Liberian studying for a B.S. degree in agricultural engineering at Washington State University. He is not a CARI employee, however, and his availability to CARI is not guaranteed although it is expected that he will join the CARI staff on completion of training in January, 1984.

Because agricultural engineering is a new activity at CARI, there is no facility and very little equipment to support adaptive research, either for research equipment or appropriate technology. A plan for the development of the Appropriate Technology Depart-

ment is lacking and badly needed.

The engineer is also an advisor for maintenance of agricultural equipment and other support equipment at CARI. The maintenance section of CARI is poorly equipped and requires considerable upgrading to make it effective.

The evaluation team recommends that the project on post-harvest loss be transferred to the Department of Engineering-Appropriate Technology in phase II and that emphasis be placed on personnel, facilities and equipment for this period.

### Food and Feed Technology

The evaluation team recommends that this department be activated in phase II and that emphasis be placed on personnel, facilities and equipment for this project. We recommend an expatriate advisor also be assigned to this area.

The review team recognized the research being conducted in the Animal Science Department on drying and preservation of chopped cassava roots. We recommend the development of an interdisciplinary project with Engineering and Appropriate Technology on the development of cheap solar driers to be used during the dry season to preserve cassava.

## EXTENSION ACTIVITIES

### Background

Extension is the basic institution providing a linkage and a flow of technology and information between the research system and the farmer. The United States Presidential Mission on Agriculture in Liberia and the IBRD found that the Extension Service was over-staffed for the work and the resources they have. Most of the qualified extension personnel have been recruited from the MOA extension service to work on the ADP's in Bong, Lofa and Nimba Counties.

The "Blue Book", Liberia's Agricultural Development: Policy and Organizational Structure, gives the following summary of agricultural extension in Liberia:

1. A comprehensive and cohesive extension program does not exist.
2. Extension elements have been built into almost all special projects and parastatal organizations.
  - a. Personnel usually have responsibilities for extending limited information in one specialized area. Their time and capacity is grossly under-utilized.

- b. There is overlap and duplication of responsibilities among projects and agencies.
3. Clear lines of responsibility for a comprehensive extension program do not exist.
  4. Relatively few farmers have been reached or affected by extension activities.

No sound interface presently exists between CARI and the farmers of Liberia for the transfer of technology and information.

### Project Paper Proposals

A Senior advisor to the Director of CARI was provided as Liaison Officer for Research, Extension and Training. This Officer was to basically be an extension or production specialist, competent in economics, farming practices and extension work. He would have a basic understanding of agricultural science and be able to interpret field experiments to determine whether innovations would be feasible and profitable for farmers. He was to have an understanding of socio-economic costs and benefits, appropriate input packages, cropping systems and marketing alternatives. He was to serve as the principal link between research and extension, be able to understand new ideas and communicate them effectively to rural people through the extension channel. He also was to plan, prepare and present appropriate information for the target audiences and obtain feed-back from them.

### Current Status

The Extension Liaison Officer made minimal contact with the Bong County Agricultural Office and County Agricultural Officer. Visits were made to become acquainted with district personnel and agricultural problems.

Some contacts and working relationships were established with the Bong County ADP and other agencies in conjunction with CARI research projects. A few arrangements were made for on-farm trials of various rice, cassava and vegetable varieties.

It does not appear that a vigorous outreach program was attempted in contacts or in the preparation of extension literature. We found little imaginative planning on how technology was to be extended. There are some obvious reasons for some of these such as lack of money for gasoline and per diem for travel and lack of an organized facility to produce reports.

The review committee learned that a number of improved plant varieties in rice, vegetables, cassava and sweet potatoes have been identified by CARI which should receive off-station tests. The

Research Coordinator and Extension Liaison Officer should increase their efforts to get these materials into the hands of ADP's, County or District Agricultural Extension personnel who could cooperate in further testing. Considerable technology already exists in the area of appropriate technology for harvest, threshing, storage and processing of rice which should be transmitted to the farmer.

The review team suggests a vigorous effort be made in the final 9 months of phase I of the project to initiate some imaginative efforts in extension. These could include: 1) renewed efforts to effect off-station testing of improved varieties and post-harvest technology; 2) development of new ideas on how to interface with the current extension service, ADP's, RDI; 3) an Annual Research-Extension Conference. A one-day conference should be held each year to report on research conducted at CARI, to report on collaborative off-station testing, to solicit collaborative efforts on off-station experiments and varietal tests for the coming year and to discuss and develop extension recommendations for the coming year. Extension literature should be prepared and published for certain technologies deemed ready for extension. An experienced, field oriented extension agronomist should be recruited immediately to fill the extension advisor vacancy in the TA team. This individual should implement the above program and initiate planning for the extension component of the phase II design.

The establishment of a Division of Extension Coordination has been recommended above for phase II in a modest reorganization of CARI. Vegetative, seed, and fish propagation are not research activities and should be classified as extension activities. Appropriate units for propagation should be established under the direction of the Extension Liaison Officer to disseminate seed, cuttings, budding material and fish stock to the Extension Service, the Rural Development Institute, Area Agricultural Development Projects, the Small Holders Rice Seed Project and other appropriate users. The CARI Extension Liaison Division should distribute only small quantities of improved stock. The recipient projects should organize to rapidly increase the improved stock for more massive distribution. These activities will provide the Extension Liaison Officer with a number of new contacts to not only distribute improved germplasm but also new technology and production information.

## RESEARCH LIBRARY

### Background

An adequate research library is a major part of an up-to-date and functioning research institute. Prior to initiation of the project, the research library was in need of updating, expansion and staffing. The volumes were outdated, journals were of

no value to the existing research program and research scientists housed their up-to-date scientific publications at home. This provided no exchange of professional information and expertise between research scientist and support staff. The availability and exchange of scientific information must occur in a research environment in order for the research institute to expand. The library room was also in need of shelving, lighting, seating and an overall system of support.

### Project Paper Proposals

The project paper proposed \$20,000 for improvement of the research library. Short-term and degree training is available for use by present library staff. Short-term technical assistance is provided for implementation of a system of cataloging and streamlining the library. Professional journals, research abstracts and other publications are to be acquired.

### Current Status

A library committee composed of six senior staff members was named and began its work by sorting the accumulated materials in the library room and discarding useless, out-of-date publications. The acquisition of new materials was started by extensive correspondence with national and international research centers and other institutions. The Dewey Decimal system of classification was recommended. A library consultant has been appointed and charged with the responsibility of working with the library committee and the library assistant. The consultant is conducting in-service training for the present library staff. Air conditioning and shelving have been installed in the library. The evaluation team recommends that a typist, additional space, a professional librarian and long or short-term training for the staff member presently employed in the library be initiated. A system needs to be developed that will provide adequate journal and research abstracts to the library for use by research staff.

## STAFF TRAINING

### Background

Long and short-term training are key components whenever institution building projects are undertaken. Prior to implementation of the present project the research staff at the project site had received very limited training through USAID and other international donors (FAO and World Bank) and no procedure was in place by the MOA to provide for upgrading of staff. The long-term professional staff that had received limited training were being recruited away by other development projects that were being initiated by USAID

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and other international donors. However, there was a need for crops and livestock research to improve the economic condition of the Liberian traditional farmer.

### Project Paper Proposals

The Project Paper proposes four hundred fifty-seven months of long and short-term technical training. It further states that the training is not limited to those areas supported by U.S. technicians. The university contractor is to assist with and provide training to research institute staff. Further, the contracting university will serve as a link to place all recommended research staff in advanced degree programs. The university technical assistance team is to assist with technical assistance and fill positions vacated by staff on long-term academic training. The university technical team should also initiate a series of seminars at the project site to improve and expand the technical knowledge of the research support personnel.

### Current Status

Eleven CARI staff members are presently enrolled in 289 months of long-term degree training. The degree plans include most of the departments within CARI. The Bachelor of Science, Master's of Science and Doctor of Philosophy graduates will return to CARI and provide the needed staff assistance to conduct research on problems of Liberian agriculture. Sixteen and one-fourth months of short-term non-degree training has been received by four research staff members. The areas covered were tropical animal disease, agricultural extension, and agricultural research. One hundred fifty-seven months of training remains of the projected 457 months of long and short-term training projected for use in the initial phase of USAID participant training to CARI staff.

CARI administrative staff should take immediate action to utilize the remaining long-term and short-term training available to research staff. The areas of present need are animal science, agricultural economics, library science, utilities maintenance, and appropriate technology. If current staff is not available, a special waiver request should be submitted through the Research Council to the GOL to employ qualified staff for long-term training. The table below provides summary of CARI staff who have been and are now on training details.

<u>No. of Mos.</u>	<u>Name</u>	<u>College or University</u>	<u>Academic Major</u>	<u>Degree</u>	<u>Duration</u>
18	Mr. Winston N. Bedell	Washington State	Ag. Eng.	B.S.	5/82-12/83
2	Mr. O. C. Brandy	Texas A&M	Ag. Econ.	M.S.	6/83-8/83
48	Mr. O. C. Brandy	U. of Missouri	Ag. Ext.	Ph.D.	8/83-8/87
24	Ms. Naomi I. Cassell	Auburn U.	Fisheries	M.S.	9/82-9/84
24	Mr. Varney J. Goba	LSU	Plant Path.	M.S.	9/83-8/85
24	Mr. James K. Harris	LSU	Biochem.	M.S.	1/83-1/83
24	Mr. Alan S. Gobeh	Acceptance Pending	Entomology	M.S.	Date Pending
24	Mr. Wilson E. Kagabo	U. of Hawaii	Agronomy	M.S.	8/83-8/85
*24	Mr. William Massaquoi	Pending	Agronomy	M.S.	9/83-9/85
19	Mr. Charles Mulbah	LSU	Soil SC (Agronomy)	Ph.D.	6/82-12/83
1/4	Dr. Steven Ravindra	Orlando Florida	Tropical Disease	none	5/83-5/83
2	Dr. J. Q. Subah	U. of Maryland	Ag. Res.	none	6/83-7/83
24	Mr. Francis Sumo	LSU	Agronomy	M.S.	1/82-1/84
12	Mr. William T. Swen	Florida State U.	Ag. Res.	none	9/83-9/84
36	Mr. Walter T. Wiles	LSU	Ag. Ext.	Ph.D.	1/83-1/86

\*In process of selecting university for long-term training.

The COP of the LSUAC technical Assistance team and the Research Coordinator for CARI developed the following procedures as a guide for selection of staff members for long and short-term training.

Proposed procedures for CARI staff requesting USAID/CARI/LSUAC Scholarships:



1. Candidate applies to Division Head.
2. Request goes through Department Heads to Research Coordinators for review. The Research Coordinator submits documents to the Director for approval.
3. Director consults with the selection committee.
4. Director of CARI passes to LSUAC, COP for his written approval.
5. Candidate can then make preliminary school selection based on advice from Research Coordinator, Department Heads or others. A source of information on U.S. Universities is the U.S. Education and Cultural Foundation in Monrovia.
6. The applicant proceeds to take the GRE, TOEFL and other tests with results submitted to the selected universities. The request cards should be submitted to the COP so that the adequate fees can be paid.
7. A standard application will be completed and given to the COP-LSUAC. All materials will be submitted to Director, International Programs, LSUAC, Baton Rouge, LA, who will arrange for communications and applications to the preferred universities. LSUAC will inform COP of acceptance. LSU will also pay all fees, except international travel.
8. If the above procedure is not followed LSUAC will not pay school fees.

## PHYSICAL INFRASTRUCTURE DEVELOPMENT

### Background

The Research Institute possessed the following infrastructure to support the research program prior to implementation of the project. Staff housing was in poor condition and in need of renovation and expansion. Also, new housing was needed to serve the existing and projected staff. The water supply appeared adequate but was in need of a filtration/sanitation system. Electrical supply was inadequate as provided and the source in need of renovation. A communication system was non-existent and one was needed prior to initiation of project activities. Roads were in need of foundation work, grading and maintenance. Laboratory and office space were jointly inadequate to serve the needs of the staff and to impose a technical assistance team into this space would only add to the unproductive situation that presently existed. Equipment and supplies were almost non-existent. Utilization and maintenance of transportation vehicles was in need of major input. Some equipment was in a state of disrepair because of a lack of parts and poor maintenance training.

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## Project Paper Proposals

The project paper proposes staff housing, vehicles, laboratory supplies, electrical generator and four laboratories. Long-term technical assistance by an agricultural engineer is also proposed. Short-term technical assistance is called for as well as short-term training for existing staff. Major commitment is given by the Government of Liberia for construction of housing for the technical assistance team as well as the construction and renovation of laboratories. Improving the library room is also specified in the project paper.

## Current Status

Staff housing (6) for the technical assistance team has been completed. Additional electrical generation (2) equipment has been purchased and partially installed. Vehicles were provided to the long-term technical assistance team. Supplies and equipment are purchased as needed. The laboratories will be constructed prior the end of phase I with GOL funds. Bids have been let and construction on three lab/office buildings will commence in November, 1983. Major equipment for these laboratories has not been purchased because there is not adequate on-site warehousing to store the equipment while awaiting the construction. The agricultural engineer has begun a plan to renovate and use discarded machinery that is in need of minor repair.

Conditions that existed prior to the initiation of phase I in the following areas have not been upgraded significantly: Liberian staff housing, utilities, communications, laboratory and office space. The remainder of the areas listed under background need additional work. The evaluation team recommends that USAID, LSUAC and CARI jointly conduct a major review of the physical infrastructure of the CARI and initiate a joint plan that will be cooperative in nature and solve problems in this very important area.

## CONTRACT IMPLEMENTATION ISSUES

### Contract Provisions

The contract for the Agricultural Research and Extension project was awarded to Louisiana State University Agricultural Center under the cost reimbursement, level of effort, collaborative assistance mode. The major contract provisions include the following points:

- A. A long-term level of effort of approximately 210 work months of technical assistance.
- B. Short-term technical assistance from 2 to 18 months.

- C. Regularly scheduled reporting to USAID and AID/W including;
1. A detailed 2-year work plan containing specific scheduling of all project inputs with a detailed annual budget.
  2. A semi-annual report itemizing progress, problems, solutions and action required to accomplish project objectives as viewed against the work plan.
  3. A monthly report of cumulative actual expenditures in the same line item detail as the budget in the work plan.
- D. Long and short-term training comprising approximately 457 months.

### Contract Performance

The evaluation team does not give the LSU administration very high marks in the area of recruitment of project advisory staff, response to team problems, timely procurement of commodities and judicious use of TDY specialists to study and advise on specific problem areas. The review team found few Chief-of-Party LSU or project reports which could be used in evaluation. Complete documentation is lacking.

The long-term level of effort specified in the contract is behind schedule with a total of 125 months completed as of September 30, 1983. The shortfall in total effort completed to date was caused by a delay in the start of the project and difficulties in fielding an appropriate technology agricultural engineer and in filling the extension liaison position when the term of the original specialist was not renewed. This situation is being corrected with an agricultural engineer in place and active recruitment underway for the extension liaison position. The team strongly feels that the extension liaison position must be filled immediately with a field-oriented extension agronomist.

There is no evidence in the USAID project files that the contractor has fulfilled its obligations in furnishing the required reports. There does not appear to have been a detailed work plan submitted for approval within 90 days of arrival of the chief-of-party as specified. A work plan for the period July, 1982 - July, 1984 was submitted but without the required detailed line item budget expenditure estimates. Monthly actual expenditure reports were not submitted to the USAID Controller as specified although reports are being submitted to AID/W. Two progress reports were submitted but they did not fully meet the criteria of identifying problems and outlining a clear course of action as called for in the contract. Additional progress reports were obtained from individual team members during the course of the evaluation which proved helpful to the evaluation team.

The Chief-of-Party should prepare an amended work plan immediately to account for changes in project personnel and the extended PACD. The contractor should also furnish monthly actual expenditure reports as specified in the contract.

The handling of participant training appears to have been somewhat less than satisfactory. Student placement was sometimes slow and there was confusion over procedures for application. It also appears that sufficient effort was not always made to place participants in schools other than LSU. Details of the training program and recommendations appear elsewhere in this report.

Short-term technical assistance has not been used by the project to date. The reasons for this situation are unclear because the PP, contract and plan of work call for technical consultants in a variety of subject areas. Consultants can complement the mix of skills of the technical assistance team effectively, especially in the areas of livestock, analytical lab, fisheries, physical infrastructure and a host of other areas. Judicious use of consultants can also help in formulating the overall research program. The Chief-of-Party in consultation with the TA team, USAID and CARI should develop a schedule of consultants for use during the remaining year of phase I.

#### USAID Performance

The evaluation team has had great difficulty in finding quarterly, biennial or annual reports with which to track the project's progress. There appears to be no concise records of equipment procurement, inventories and financial statements. The contract between LSUAC and USAID requires semi-annual reports.<sup>1/</sup> We recommend these be procured and copies maintained in USAID/Monrovia files for the purpose of audit and review.

The evaluation team detected great dissatisfaction on the part of the Liberians with the performance of some of the first LSUAC staff and relations with some of the present members could be improved. The USAID Project Officer should have pursued these problems with more vigor early in the project. This action could have minimized disruptions. Continued monitoring and assessment of the interactions among and between Liberian and the Technical Assistance team by the USAID Project Officer is required.

Master plans for facility development (laboratories, offices, housing and maintenance) should be completed before the end of the current project through joint efforts of the advisors and CARI staff. Construction of facilities already designed and approved should proceed at once.

<sup>1/</sup> Reporting as described here refers to contractor reports. Financial reports and project implementation reports are prepared quarterly by USAID. Receiving reports for commodities are filed with USAID GSO.

## Financial and Budgetary Analysis

The financial inputs from AID were planned to include expenditures for the following items: Technical services, on-campus assistance, participant training, commodities, other costs, construction and items for contingency and inflation. The contract with LSUAC was executed to include funds for all technical services including long and short-term specialists as well as for participant training. Construction for the technical assistance team housing was through a direct AID contract. Commodities were to be procured through AID but the contractor with assistance from CARI was to develop commodity specifications and the detailed listing of commodities to be purchased. Total AID expenditures was to be \$4.209 million but was increased in August, 1982 for an additional \$778,000 to increase the life of project funding to \$4.997 million and to extend the project by one year, to September 30, 1983.

The project implementation schedule has been delayed from the beginning because of implementation problems. The project authorization and project agreement were signed several months later than anticipated and the contract with LSUAC for technical services was completed more than a year later than planned. Early difficulties with recruiting technical advisory staff and delays in constructing staff housing further slowed project implementation, eventually requiring the project extension.

Because of these earlier cited delays, and difficulties in filling vacant positions in the TA team, the planned input of 228 long and short-term person months of technical assistance is behind schedule. Approximately 125 person months of technical assistance has been provided to date. Another reason for the shortfall in technical assistance effort is the virtual absence of short-term consultants utilized by the project to date whereas 18 person months were provided for in the PP. Unless the long-term vacancy is filled and extensive short-term specialists are employed, the technical assistance level of the effort will be below target.

Participant training is a large component of the project with 447 person months planned. Again, delays were experienced for the reasons cited above, and approximately 157 person months of the total planned have not been allocated.

Commodities were to comprise approximately 15 percent of total AID expenditures. Approximately \$476,000 has been accrued for commodity expenditure to date from a total planned \$740,000. Commodity procurement has also lagged behind schedule. Supplies and equipment for the analytical laboratory were not ordered until November, 1982 and a second order placed in June of 1983. Early commodity purchases consisted entirely of vehicles for project advisors, furniture for advisor housing, a generator for staff

housing and miscellaneous items. Farm equipment and laboratory equipment and supplies ordered in June of 1983 had not been delivered at the time of this evaluation. A procurement plan has been lacking and the contractor should move quickly in conjunction with USAID and CARI to develop a plan to program funds for commodities needed for the remaining period of phase I.

The GOL was to provide a total of \$9.377 million over the life of project, primarily in the form of personnel (\$5.168 million) and equipment, services and supplies. A review of the CARI budget indicates that the GOL contribution is being met in accordance with the grant agreement. The timeliness of CARI inputs is more difficult to measure. Three new laboratories were in the final bidding stages at the time of the evaluation. These facilities are badly needed and are necessary to house the lab equipment being provided by the project. The CARI is in the process of renovating the rice mill to house the appropriate technology workshop. The CARI has also started to furnish office supplies and incidentals through the normal CARI requisition and procurement system.

The illustrative financial plan from the grant agreement amendment and the most recent quarterly USAID financial report are included in the appendix for reference.

## CONCLUSIONS AND RECOMMENDATIONS

The CARI has made considerable progress in establishing itself as a viable institution for conducting applied and adaptive research for Liberia. Several weaknesses remain, however, and one of the most serious is the lack of an overall master plan for the development of the institute and for the overall research program.

The failure of CARI to develop institutional linkages within county extension organizations is another serious shortcoming of the project. This deficiency can largely be traced to the preoccupation of the previous Chief-of-Party with petty administrative matters. Most of the projected outputs for the extension activities have not been achieved.

More work also needs to be done in systems research using a multidisciplinary approach. We recognize that this is long duration research which is difficult to organize and implement but efforts should be and are beginning to be expended in this direction.

The primary purpose of the project was to build an administrative structure for research and a good start has been made despite some rather difficult obstacles in the first year of the project. Probably the greatest accomplishment of the project has been the training and placement of several competent Liberian researchers who are the pillars of the research program. When others return from participant training in the coming year the extremely small professional staff will receive much needed augmentation.

The procurement of commodities has been slow and was not well organized. A procurement plan apparently was not developed at the project outset and commodities are only now being received. Several critical pieces of equipment and supplies were only recently ordered. For example, equipment and supplies for the analytical lab were ordered late in the second year after the advisor's arrival.

Overall implementation of the project by the contractor and monitoring by USAID have been substandard. Reporting requirements have not been strictly followed and numerous personnel problems severely hampered achievement of project objectives. On the brighter side, however, is evidence that relations between Liberian staff and the new chief-of-party are very good.

Given adequate financial support from the GOL and the implementation of the recommendations made in this report during the remaining period of phase I, most of the outputs envisioned in the project paper will be achieved.

## Recommendations for Phase I

The sporadic activity of the project as noted earlier was caused by a number of factors that the evaluation team feel have been somewhat ameliorated. Therefore, several recommendations are suggested below that if accomplished before the end of phase I, September 30, 1984, will help to achieve project objectives. The recommendations are attainable and will provide a solid foundation for initiation of phase II.

### A. CARI Administration

1. Revise the organizational structure of CARI so as to be more responsive to the needs of the Departments and the Research Program.
2. LSUAC Project Team plan and submit an amended work plan for USAID approval for remainder of phase I.
3. MOA appoint a permanent Director to head CARI.
4. LSU employ an administrative assistant for the LSUAC COP.
5. USAID purchase remainder of equipment and supplies needed for phase I.
6. Review financial constraints and propose solutions.
7. MOA implement a review of the triplicate committee structure surrounding CARI for its effectiveness.
8. Prepare a master plan for the development of the station facilities.
9. CARI, USAID and LSUAC program phase I funds remaining.

### B. Research

1. LSUAC technical assistance team, CARI staff and LSUAC submit reports as required in the project agreement.
2. Continue development of research library.
3. Continue development of present research program that evolved from program in operation prior to phase I.
4. Develop a formal, detailed proposal for a substation at ULCAF.
5. Prepare and publish a long range research strategy.
6. Prepare a specific work plan for appropriate technology workshop including functions, staffing and equipment needed.



### C. Extension

1. LSUAC and CARI fill vacant extension liaison officer position.
2. Implement the field day program with a seminar series.
3. Publish a research and extension newsletter.

### D. Staff Training

1. Utilize the remaining 157 months of long and short-term training available in phase I.
2. Exert a special effort to employ additional Liberian research staff.
3. Develop and install a special procedure to reward research staff who conduct quality research.
4. Develop for MOA approval a promotion plan that will provide a structure for research staff advancement that rewards achievement with step promotion and salary increases.

### E. Short-Term Consultants

1. LSUAC and CARI are to develop a plan to secure short-term consultations in the following suggested areas: Library, infrastructure design, development and maintenance, large and small ruminants, inland fisheries, farming systems, research design and biometrics.

### Recommendations for Phase II

Highest priority in phase II should continue to be the recruitment and training of key research scientists with major research efforts being built around rice, cassava and legumes. The latter for use in soil enhancement in rotations and as a protein food source. Priority must also be given to research in the areas of agronomy, soil fertility, plant protection, agricultural economics and engineering for appropriate technology. An interdisciplinary farming systems research program should be developed and strengthened.

### A. CARI Administrative Structure

1. CARI should be given operational autonomy sufficient to conduct and expand the agricultural research program that will meet the needs of the Liberian economy.
2. Funds that are budgeted to CARI should be appropriated and

transferred to CARI in the most expeditious manner to assure a timely flow of resources.

3. CARI should be organized as recommended in the text of the evaluation so as to provide for a balanced approach to research and services. Support operations should be placed under the administrative officer and the library should be taken out of the research and extension activities.

#### B. Research Activities

1. A research substation should be established at the College of Agriculture and Forestry where a different soil type and agro-climatic conditions exists. The Dube site should be included under the CARI program of work and similar adaptive research should be conducted at all sites. Also the team recommends that faculty in the College of Agriculture and Forestry be considered for short and long-term training as appropriate for conduct of the CARI research program.
2. Research Capabilities. The team recommends a restudy of the following disciplines in terms of the need for staffing: soil fertility, plant pathology, entomology, weed control, vertebrate pest control, agricultural engineering, animal science (food and feed technology inclusive of small and large ruminants), agricultural economics, fisheries and biometrics.

#### C. Extension/Outreach Activities

1. The team recommends that an Extension Coordination Division be established. This division will serve to coordinate vegetative, seed and fish propagation. It would also coordinate and maintain linkages with outreach organizations.

#### D. Training and Staff Development

1. Six hundred and seventy-five months of long and short-term training is needed with the areas receiving priority described in section B-2 above.

#### E. Library

1. Continued development of the library to support the research effort.

#### F. Physical Infrastructure Development

1. A complete renovation and expansion of the following facilities should be undertaken: Staff housing, administration building, utilities (water, electricity, and communications), laboratory and office space, dormitory and conference facility.

**APPENDIX**

Annex 1. Illustrative Project Finance Plan from Grant Agreement Amendment, \$100.

**Agricultural Research and Extension**

**Project Number 669-0135**

	Prior Increments (AID)	Current Increments (AID)	Future Year Anticipated	AID	Total	GOL
<b>AID Totals</b>	<b>4,209</b>	<b>788</b>	<b>0</b>	<b>4,997</b>	<b>6,984</b>	
Technical Services	1,746	315	-	2,061	-	
On Campus Assistance	88	16	0	104	-	
Participant Training	794	155	-	949	-	
Commodities	565	175	-	740	220	
Other Costs	230	67	0	297	1,596	
Construction	425	60	-	485	-	
Contingency (10%)	241	0	-	241	-	
Inflation	120	0	-	120	-	
Personnel						5,168

1/ Funds Available  
Appropriation - 72-1121021.3  
 BPC GDAA-82-21669-AG-13

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USAID/LIBERIA  
PROJECT TITLE: Agriculture Research and Extension  
PROJECT NO: 669-0135  
FINANCIAL STATUS AS OF September 30, 1983

OBLIGATIONS BY FY AND EARMARKINGS BY INPUT	PURPOSE	OBLIGATIONS	EXPENDITURES			PIPELINE
			CUMULATIVE DISBURSEMENTS	ACCRUALS	TOTAL ACCRUED EXPENDITURES	
		\$	\$	\$	\$	\$
<u>72-1101021.3</u>						
<u>Technical Assistance</u>	Closed MODs	252,000.00	252,000.00	-0-	252,000.00	-0-
<u>Commodities</u>	Closed MODs	191,385.50	191,385.50	-0-	191,385.50	-0-
<u>Other Costs</u>	Closed MODs	418,614.50	418,614.50	-0-	418,614.50	-0-
Sub-Totals FY-80		862,000.00	862,000.00	-0-	862,000.00	-0-
<u>72-1111021.3</u>						
<u>Technical Assistance</u>						
PIO/T - 10003	Contr. LSU	821,000.00	667,710.86	153,000.00	820,710.86	289.14
PIO/T - 10038	Contr. W.V. Zolia	2,975.00	2,975.00	-0-	2,975.00	-0-
Sub-Totals		823,975.00	670,685.86	153,000.00	823,685.86	289.14
<u>Commodities</u>						
PIO/C - 10025	Local Shelf Items	6,310.00	1,403.25	-0-	1,403.25	4,906.75
PIO/C - 10026	U.S. Shelf Items	6,075.00	4,828.01	-0-	4,828.01	1,246.99
PIO/C - 10034	Various Items - (SECID)	96,000.00	768.13	90,000.00	90,768.13	5,231.87
PIO/C - 10036	Chevy Truck	24,000.00	597.31	20,000.00	20,597.31	3,402.69
PIO/C - 10037	100 KW Generator	11,100.00	10,268.80	-0-	10,268.80	831.20
PIO/C - 10039	Furniture	35,000.00	-0-	30,000.00	30,000.00	5,000.00
30153N	PO P830085	1,730.00	1,728.00	-0-	1,728.00	2.00
30157N	PO P830030	15,000.00	3,195.06	8,000.00	11,195.06	3,804.94
Closed PIO/C		44,901.61	44,901.61	-0-	44,901.61	-0-
Sub Totals		240,116.61	67,690.17	148,000.00	215,690.17	24,426.44

USAID/LIBERIA  
PROJECT TITLE: Agriculture Research and Extension  
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FINANCIAL STATUS AS OF September 30, 1983

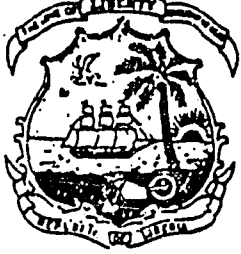
OBLIGATIONS BY FY AND EARMARKINGS BY INPUT PURPOSE		EXPENDITURES				
		OBLIGATIONS	CUMULATIVE DISBURSEMENTS	ACCRUALS	TOTAL ACCRUED EXPENDITURES	PIPELINE
		\$	\$	\$	\$	\$
<u>Other Costs</u>						
30462N	Agip Cooking Gas	367.50	-0-	350.00	350.00	17.50
30464N	Petro-Chemical	2,650.00	-0-	2,650.00	2,650.00	-0-
20028N	Misc. Costs	20,500.00	20,500.17	-0-	20,500.17	(.17)
20155N	Contr. Stanley Consul.	20,225.00	17,125.00	3,000.00	20,125.00	100.00
20197N	A. Young-Reimb. Costs	15,000.00	7,988.68	-0-	7,988.68	7,011.32
30117N	Proj. Support Costs	109,000.00	18,958.16	1,500.00	20,458.16	88,541.84
Closed MODs		40,772.68	40,772.68	-0-	40,772.68	-0-
Sub-Totals		208,515.18	105,344.69	7,500.00	112,844.69	95,670.49
Unearmarked		393.21	-0-	-0-	-0-	393.21
Sub-Totals FY-81		1,273,000.00	843,720.72	308,500.00	1,152,220.72	120,779.28
<u>72-1121021.3</u>						
<u>Technical Assistance</u>						
30113N	Contract LSU	2,197,716.00	-0-	110,000.00	110,000.00	2,087,716.00
<u>Commodities</u>						
PIO/C 20039	Lab Equipment	42,967.33	-0-	20,000.00	20,000.00	22,967.33
PIO/C 20035	Spectrophometer	38,300.00	-0-	-0-	-0-	38,300.00
PIO/C 20037	Farm & Field Equip.	101,032.00	-0-	50,000.00	50,000.00	51,032.00
Sub-Totals		182,299.33	-0-	70,000.00	70,000.00	112,299.33
<u>Other Costs</u>						
30118N	Proj. Support Costs	26,000.00	-0-	-0-	-0-	26,000.00
30166N	Royal Stationery Store	910.00	75.00	-0-	75.00	835.00
30193N	Transp. Services	200.00	-0-	-0-	-0-	200.00
30210N	Texaco	552.35	-0-	550.00	550.00	2.35
30221N	Misc. Support Costs	5,000.00	1,360.60	-0-	1,360.60	3,639.40
30331N	ICA	840.00	-0-	800.00	800.00	40.00
30344N	Cubic Communications	400.00	-0-	400.00	400.00	-0-
Closed MODs		315.00	315.00	-0-	315.00	-0-

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USAID/LIBERIA  
PROJECT TITLE: Agriculture Research and Extension  
PROJECT NO: 669-0135  
FINANCIAL STATUS AS OF September 30, 1983

OBLIGATIONS BY FY AND EARMARKINGS BY INPUT	PURPOSE	EXPENDITURES			PIPELINE
		OBLIGATIONS	CUMULATIVE DISBURSEMENTS	ACCRUALS	
		\$	\$	\$	\$
Unearmarked		447,767.32	-0-	-0-	447,767.32
Sub-Totals - FY-82		2,862,000.00	1,750.60	181,750.00	2,678,499.40
<b>GRAND TOTALS</b>		<b>4,997,000.00</b>	<b>1,707,471.32</b>	<b>490,250.00</b>	<b>2,197,721.32</b>

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REPUBLIC OF LIBERIA  
MINISTRY OF AGRICULTURE  
MONROVIA, LIBERIA

COMMENTS ON THE CARI EVALUATION

1. The Ministry of Agriculture can not agree with the statement at the bottom of page two giving CARI full autonomy. This action would have the effect of taking the agricultural research functions of the Ministry totally outside of the Ministry in much the same manner as the activities related to forestry have been removed and placed with FDA.

The Ministry position is that a close working relationship must be developed and maintained between research and extension. Both of these functions are currently coordinated within the Ministry. We concur completely with the statement on page 35, paragraph two, that there is insufficient linkage between CARI and extension and we are working to improve this relationship. If autonomy is given to research, then there is a very high probability that the necessary linkages will not be developed. Retaining research within the Ministry does provide the necessary administrative structure so that when sufficient resources are available to mobilize extension, as has been previously discussed with USAID and other donors, then a coordinated research-extension system will be forthcoming. We foresee the day when extension identifies



problems, CARI works on solutions, and extension carries this knowledge to the farmers. Separate, autonomous units are not likely to function in this manner.

The Ministry fully recognizes the need for their research organization to function with sufficient freedom to encourage the kind of independent thinking necessary for problem solving. For this reason we have and continue to support the idea of semi-autonomy. We are gratified that our good progress in this direction was recognized on page three, par. three. Many of the delays also mentioned in that paragraph are common to all of government and we are doing our utmost to give CARI special treatment.

2. We concur strongly with the recommendation on page 22 relative to the establishing of a Socio-Economic Department and to the desirability of having the farming systems research done in an interdisciplinary manner. We believe that more economic evaluation is needed not only of proposed changes resulting from CARI research but also of current farmer practices to provide a base for comparison. We believe that a Department charged with this function would clarify the work responsibilities of the economists at CARI. We also hope that such a classification would help bring about the inter-departmental (ie. interdisciplinary) cooperation necessary for farming systems research.

3. We concur with the statement made on page 32, paragraph two that the handling of participant training has been less than satisfactory. We hope that the recommendation made at the bottom of page 27 calling for immediate action will be followed.

We would like to recommend one modification in the academic training programs. We are aware that graduate program can include provisions for the degree candidate to do the research for the degree in the home country. This is particularly true of doctoral programs. While this adds to the cost of the training, it does increase the amount of Liberian research done and more quickly increases the number of scientists active at the experiment station. Also, because of the need for major professors to be present at the research site for atleast short periods of time, this type of program would also increase the senior researchers awareness of and involvement in the CARI program. For these reasons, we believe the increased cost would be justified.

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