SIERRA LEONE - ADAPTIVE CROP RESEARCH AND EXTENSION PROJECT

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

UNCLASSIFIED
AID/BAS-027
July 21, 1978

MEMORANDUM FOR THE BILATERAL ASSISTANCE SUBCOMMITTEE

SUBJECT: Sierra Leone - Adaptive Crop Research and Extension (ACRE)

Attached for your review are recommendations for authorization of a grant to the Government of Sierra Leone in an amount not to exceed Six Million One Hundred Thousand United States Dollars ($6,100,000) to develop a food crop adaptive research and extension system responsive to the needs of rural smallholders.

No meeting has been scheduled for this grant proposal; however, your concurrence or objection is requested by close of business on Monday, July 31, 1978. If you are a voting member, a poll sheet has been enclosed for your response.

Working Group on Bilateral Assistance
Office of Policy Development and Program Review

Attachments:
Summary and Recommendations
Project Analyses
Annexes A, G, I, J, L

UNCLASSIFIED

ADAPTIVE CROP RESEARCH AND EXTENSION

(SIERRA LEONE)

636-0102

PROJECT PAPER

20 December 1977

Project Design Team

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: C (A = ADD, C = CHANGE, D = DELETE)

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2. DOCUMENT CODE: 3

3. COUNTRY ENTITY: Sierra Leone

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 636-0102

6. BUREAU/OFFICE: A. SYMBOL: AFR; B. CODE: 6

7. PROJECT TITLE (Maximum 40 characters): Adaptive Crop Research & Extension (ACRE)

8. ESTIMATED FY OF PROJECT COMPLETION: FY 83

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 78; B. QUARTER 2 (Enter 1, 2, 3, or 4); C. FINAL FY 82

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	874	26	900	4,716	1,384	6,100
(GRANT)	874	26	900	4,716	1,384	6,100
(LOAN)	–	–	–	–	–	–
OTHER U.S. 1.	–	–	–	–	–	–
OTHER U.S. 2.	–	–	–	–	–	–
HOST COUNTRY	–	793	793	–	2,699	3,027
OTHER DONOR(S)	–	–	–	–	–	–
TOTALS	874	819	1,693	4,716	4,083	9,127

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 78 F. GRANT	E. 1ST FY 78 G. LOAN	H. 2ND FY 79 I. GRANT	H. 2ND FY 79 J. LOAN	K. 3RD FY 80 L. GRANT	K. 3RD FY 80 M. LOAN
(1) FN	250	083	–	900	–	1,681	–	1,580	–
(2)									
(3)									
(4)									
TOTALS				900	–	1,681	–	1,580	–

A. APPROPRIATION	N. 4TH FY 81 O. GRANT	N. 4TH FY 81 P. LOAN	O. 5TH FY 82 Q. GRANT	O. 5TH FY 82 R. LOAN	LIFE OF PROJECT S. GRANT	LIFE OF PROJECT T. LOAN
(1)	1,160	–	761	–	6,100	–
(2)						
(3)						
(4)						
TOTALS	1,160	–	761	–	6,100	

12. IN-DEPTH EVALUATION SCHEDULED: MM 09 YY 81

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: G Thompson AFR/DR for Robert Huddleston

TITLE: A.I.D. Office, Sierra Leone

DATE SIGNED: MM 07 DD 18 YY 78

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (1-78)

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PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE)

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2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: SIERRA LEONE

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 636-0102

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7. PROJECT TITLE (Maximum 40 characters): Adaptive Crop Research & Extension - ACRE

8. ESTIMATED FY OF PROJECT COMPLETION: FY 83

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 78; B. QUARTER 2; C. FINAL FY 82 (Enter 1, 2, 3, or 4)

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	1,101	26	1,127	4,109	1,691	5,800
(GRANT)	1,101	26	1,127	4,109	1,691	5,800
(LOAN)	-	-	-	-	-	-
OTHER U.S. 1.	-	-	-	-	-	-
OTHER U.S. 2.	-	-	-	-	-	-
HOST COUNTRY	-	328	328	-	2,234	2,562
OTHER DONOR(S)	-	-	-	-	-	-
TOTALS	1,101	354	1,455	4,109	3,791	8,362

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 78 F. GRANT	E. 1ST FY 78 G. LOAN	H. 2ND FY 79 I. GRANT	H. 2ND FY 79 J. LOAN	K. 3RD FY 80 L. GRANT	K. 3RD FY 80 M. LOAN
(1) FN	250	083	-	1,127	-	1,274	-	1,523	-
(2)									
(3)									
(4)									
TOTALS				1,127	-	1,274	-	1,523	-

A. APPROPRIATION	N. 4TH FY 81 O. GRANT	N. 4TH FY 81 P. LOAN	Q. 5TH FY 82 R. GRANT	Q. 5TH FY 82 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1) FN	1,035	-	841	-	5,800	-
(2)						
(3)						
(4)						
TOTALS	1,035	-	841	-	5,800	-

12. IN-DEPTH EVALUATION SCHEDULE: MM 09 YY 81

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Stanley J. Siegel

TITLE: Director, USAID/Liberia

DATE SIGNED: MM 12 DD 20 YY 77

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

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A. LOGICAL FRAMEWORK MATRIX

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*C. PROJECT TECHNICAL ANALYSIS SUPPLEMENT

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J. 611(e) CERTIFICATION

*K. WAIVERS

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*M. SELECTED REFERENCES

*On file in AFR/DR/CAWARAP

PROJECT PAPER

ADAPTIVE CROP RESEARCH AND EXTENSION (ACRE)

CHAPTER ONE

SUMMARY AND RECOMMENDATIONS

1.1 Grantee and Implementing Agency

The Grantee will be the Government of Sierra Leone (GOSL) and the primary donor agency will be the United States Agency for International Development (USAID). Representatives of the USAID have collaborated with the Ministry of Agriculture and Natural Resources (MANR) and the Ministry of Education (MOE) through Njala University College (NUC) on the design and will maintain a close association in all implementation aspects of the Adaptive Crop Research and Extension (ACRE) project as per implementation responsibilities detailed within this Project Paper (PP) and the subsequent Project Agreement (ProAg) between the GOSL and the USAID.

1.2 Recommendations

It is recommended that authorization be granted for the Adaptive Crop Research and Extension project estimated to cost as follows:

Grant	US$ 6,100,000
Total new AID obligations	(6,100,000)
GOSL Contribution	3,027,000
Grand Total Project Cost	9,127,000

Authorization of this project includes the following waivers (Annex K) and approvals:

1. Procurement source and origin waiver from AID Geographic Code 000 (U.S. only) to Code 935 (Special Free World) for procurement of construction materials;

2. Waiver of the source and origin requirements under AID Handbook 15 and a special determination under Section 636 (i) of the FAA, as amended, to allow the purchase of project vehicles from AID Geographic Code 935 sources (Special Free World).

3. Waiver of the source and origin requirements under AID Handbook 15 and a special determination under Section 636 (i) of the FAA, as amended, to allow the purchase of project motorcycles from AID Geographic Code 935 sources (Special Free World).

1.3 Description of the Project

This project is designed to use effectively and conserve natural resources; to increase small farmer productivity, income, and to increase exports and reduce imports of food crops. Specifically, this project is intended to develop an adaptive crop research and replicable technological delivery system responsive to rural smallholders' needs. The project will be concentrated on small farmers under soils and ecological conditions characteristic of upland agriculture in Sierra Leone. Participant farmers will conduct adaptive research trials and extension demonstrations on their farms.

The project will be implemented through the Ministry of Agriculture and Natural Resources and Njala University College, utilizing to the greatest extent possible existing staff and facilities of both organizations. Direct farmer involvement at the research stage and as the ultimate recipient of tested technology will place selected small farmers as key implementing agents.

While an adaptive research plan can be considered more absolute in nature, the development of a workable and acceptable technology delivery (extension) system is not so easily defined. Within the framework of a pilot extension program various delivery systems will be devised and tested for technical validity, economic feasibility and social compatibility.

A 100-acre site adjacent to the Njala University College will serve as project headquarters for coordination of crop research and extension. Initially the project will concentrate on the most representative upland plains areas with direct involvement by NUC and MANR personnel. Overall policy will be determined by a project steering committee. Long-term projections, most probably realized beyond the five-year life of this project, include the institutionalization of the two research bodies into a national agriculture research and development institute and a national research and development council encompassing all agricultural research and replicable delivery systems for

the entire country (crops, livestock, forestry and fisheries).

USAID and GOSL contributions to the project represent only a portion of total inputs. The project is designed to draw upon and utilize external basic research data and to support ongoing activities within Sierra Leone funded by other donor agencies. All available resources will be utilized fully without placing an undue burden on the GOSL or any one segment within the program. To the degree possible, the project is designed to ensure success even if one or more elements do not attain the anticipated level of support and performance.

Crop and soils research is dependent upon factors which cannot be controlled entirely by human intervention; results are normally based on a series of yields. The adoption and/or adaptation of findings from national and international research centers such as CIAT, IITA, IRRI, ICRISAT and CIMMYT will make it possible to make use of improved technology within Sierra Leone as soon as its relevance and acceptability are determined. The testing of technology delivery systems will be undertaken immediately utilizing the existing but limited research data already available in Sierra Leone.

This project is designed to encourage maximum employment of rural people, to conserve to the extent possible the use of scarce resources and to serve and benefit the small farmer.

1.4 Summary Findings

This project paper represents the collaborative design efforts of personnel from MANR, NUC, and USAID Sierra Leone and Liberia staff. It is expected that this project will make a positive contribution to the rural development efforts of Sierra Leone. Such sentiments are in concert with President Siaka Stevens' most recent expression of interest in USAID's proposed new bilateral program in Sierra Leone, about which he said, "...that with the Agency's (USAID) resumed efforts, a greater contribution will be made in the field of agriculture which is the backbone of our economy."

The project has undergone several analyses to determine the feasibility of undertaking an agricultural adaptive crop research and extension program. The project design has, in fact, been substantially refined and amended since it was originally proposed in 1976. There are risks

in any project which proposes to deliver usable materials and services to the poorest segments of society. Nonetheless, after careful consideration of the financial, technical, economic and social implications we believe that the project can be recommended for AID funding. The design team considers the ACRE project ready for implementation.

The project meets all applicable statutory criteria as evidenced by the project checklist (Annex L) and the Mission Director's certification in accordance with Section 611 (e) that Sierra Leone has the capability to maintain and utilize the project in an effective manner (Annex J).

1.5 Issues

1.5.1 Research - Extension - Farmer Linkages

The ACRE project was reviewed, discussed and approved at the project identification (PID) and congressional presentation (FY 1978 CP) stages. The major design issue, as elaborated by the Deputy Assistant Administrator (DAA/AFR), was that the project must provide functional linkages between research and extension activities to ensure that research results would be utilized by the small farmer. The ACRE design highlights farmer participation in research trials and the pilot extension program. It further stresses adaptive research with the provision that research results be not only appropriate but delivered to small farmers. The continuing evaluation and monitoring system will assure that there are no significant deviations from these objectives.

1.5.2 Miscellaneous Issues

1. Issue: The capacity of the GOSL to support ongoing and initiate new adaptive crop research and extension activities in the post project period.

Resolution: The GOSL will provide in-kind support comprised of staff, land, utilities, laboratory and farm equipment, and local support. The GOSL is aware they will be required to finance the operating cost over the five year life of the project and beyond. They have strongly endorsed the project and have indicated that they will allocate adequate funds to support it. They realize that it will be necessary to increase their contribution to operating costs each year until these costs level off. This is expected to occur in year five. Based on the high priority the GOSL has placed on this project, it is assumed

they will continue to provide the support needed to assure the continued success of the project.

2. Issue: The dispersion of responsibility for agricultural development among two GOSL agencies leading to lack of coordination and weak linkages.

Resolution: The project calls for a commitment from MANR and the Ministry of Education for the active involvement of staff presently under their respective administrative jurisdiction. The organizational structure of the project ensures effective operational relationships between the MANR (including the RRRS) and the NUC (see 4.1.2).

3. Issue: The shortage of appropriately trained and sufficiently motivated extension staff.

Resolution: The proposed project calls for various types of training programs and support. This design will ensure that the research and extension personnel have both the relevant skills and appropriate means to carry out their activities effectively.

CHAPTER TWO

PROJECT BACKGROUND AND DETAILED DESCRIPTION

2.1 Background[1/]

Sierra Leone is primarily an agricultural country although minerals, principally diamonds, account for nearly 70 percent of all exports. The country's priority developmental requirements are to increase agricultural productivity and improve the quality of life in the rural areas. Although approximately 75 percent of the people derive their livelihood mainly from agriculture, the sector accounts for only 30 percent of national income. Small subsistence farms, averaging 4.5 acres, predominate, producing a per capita income of less than $100 a year, about half the national level. Recent growth in agricultural production, some 1.6 percent annually, has not kept pace with population increases. As a result, the already low standard of living for the majority of the population will deteriorate further unless per capita food production can be increased and real rural incomes raised. With importance of the mining sector on the decline, agriculture offers the best opportunity for broadening the economic base of the nation and improving its balance of payments situation.

In its current development plan the Sierra Leone Government gives agriculture the highest priority, directing its efforts in this sector toward food crop production and the small farmer. The plan has been supported by a steady increase in the amount and proportion, presently 32 percent, of the development budget allocated to agriculture. The Government is cooperating with several foreign donors in integrated rural development and other agricultural projects, making a sizeable contribution of its own in terms of personnel and other operating costs.

2.1.1 National Agriculture Strategy

A. National Development Goals

Sierra Leone's development goals as summarized in the National Development Plan (NDP) of 1974/75 -

1/ A comprehensive survey of Sierra Leone's physical, agricultural, and population characteristics and related institutions is presented in Annex B.

1978/79 are:

"- The preservation of political and economic stability;

- The attainment of a higher degree of economic self-sustained growth;

- Increased welfare of the broad mass of population and the achievement of a more equitable distribution of income;

- The achievement of a rapid expansion of productive capacity of the economy as a base for accelerating the pace of economic and social progress; and

- The continuation and intensification of economic cooperation with other African countries."

Within this framework for long-term development, top priority is given to the expansion of agricultural output, which is expected to grow at 5 percent annually. The NDP calls for closing the gap between rice consumption and rice production and the achievement of self-sufficiency in the second half of the plan period. The importance of agricultural breakthroughs in other crops is also recognized for the following reasons:

"- To increase the level of productivity, incomes and living conditions of the rural population;

- To reduce food imports and maximize foreign exchange earnings through expansion of exports and import substitution;

- To increase rural employment through stimulation of investment in agricultural enterprises;

- To provide raw material for industrial/agri-industrial conversion;

- To improve nutritional standards; and

- To increase options for crop production diversification."

B. Agriculture Sector

Sierra Leone's agriculture sector is relatively under-developed and is characterized by a large

number of smallholders who cultivate about 1.3 million acres or 7.6 percent of a total land area of 17.08 million acres (Table E-2), in any one year. About 80 percent of the population, mostly engaged in traditional shifting cultivation (bush-fallow), derive their livelihood from agriculture and related activities. About 300,000 smallholder families (Table E-3) are actively engaged in farming, cultivating an average of 4.5 acres (Table E-3), often in fragmented plots. Large scale plantation farming is a fairly recent development. The few established plantations are state or quasi-state owned and usually oriented toward capital intensive oil palm, cocoa and rubber production.

The agricultural sector produces only one third of the gross domestic product (GDP). About 40 percent of the sector is monetized and it provides less than 20 percent of total exports. Some of the additional readily identifiable factors which may contribute to agricultural inefficiency are discussed in the following sections.

Rice, the staple food, is the most important crop. In 1970/71 808,000 acres (Table C-2) were devoted to rice cultivation by 81 percent of the farmers in the country. About 75 percent of all rice is produced in the uplands (Table C-2), with an average yield of 1,168 pounds of paddy per acre (Table C-6a).

The pattern of farming is mainly subsistence - sedentary in the swamps and shifting in the uplands - with very little marketed surplus, except for cash crops like coffee, cocoa, ginger, benniseed (sesame), piassava and oil palm, which are grown for export.

The natural resource base upon which present day agriculture is built is characterized by several constraints. There is a distinct dry and wet season; monsoonal pattern of rainfall; high temperatures; high humidity, indispersed with periods of devastating dry, hot harmattan winds; soils of relatively low fertility, easily leached and highly erodible; heavy infestation of nematodes; and a high incidence of plant pests and diseases.

Until recently the government has given insufficient attention to agricultural development. The result has been that production increases during the last decade have averaged 1.5 percent per year as compared with population increases of 2.3 percent in the 1970's. The expansion of acreage under cultivation is estimated to have accounted for nearly all of the increase in output.

Livestock is of only minor importance to the average smallholder and involves cattle, sheep, goats, pigs and poultry. Most of the cattle are owned by nomadic herdsmen in the northern region. The national herd/flock inventory for 1970/71 was estimated at the following levels:

TABLE 2-1. LIVESTOCK NUMBERS IN SIERRA LEONE

Province	Cattle	Sheep	Goats	Pigs	Poultry
Northern	186,676	21,215	42,625	84	372,459
Eastern	11,832	11,171	25,341	349	448,044
Southern	8,550	14,688	39,167	6,962	400,775
Western Area	25	217	2,320	9,380	109,099
Sierra Leone	207,103	46,691	109,453	16,773	1,331,187

Source: Central Statistics Office

The cattle (N'dama breed) are raised primarily for meat and are managed under a system of migratory grazing. Sheep and goats are slaughtered mainly to meet ceremonial and special social obligations. The swine and poultry industry is commercialized in the Western Area (Freetown), as well as in the principal towns in the Provinces. Backyard production is found scattered throughout the country to a limited extent.

C. Government Funding

Until recently, the GOSL has not given adequate priority to the agriculture sector. Over the last ten years the actual allocation and disbursement of funds have averaged only about eight percent of the national development budget. Viewed from another perspective, total development expenditures for agriculture, including foreign assistance, have accounted for less than one percent of GDP. Moreover, earnings derived from government marketing agencies (the Sierra Leone Produce Marketing Board, the Rice Corporation, etc.) have been only partially re-invested in the agriculture sector, and private sector investment in agriculture and agribusiness has not been sufficiently stimulated.

However, since 1974 with the launching of the five year development plan, the agriculture sector has been given the highest priority in terms of national policy. Budgetary allocations for the MANR have increased both in relative and absolute terms. Agriculture's share of the development budget has grown from four percent in FY 1969

to 32 percent in FY 1978. Moreover, there are indications that the effectiveness and impact of the MANR will increase as a result of (1) requested salary increases for field staff, and (2) improved management and training offered by the various foreign donor assisted agricultural development projects.

D. Marketing and Transport

Marketing and pricing policies are perhaps the most important factors influencing agricultural growth in Sierra Leone. The present crops pricing system is devised mainly for the purpose of generating tax revenue rather than protecting the smallholders and providing incentives for increased production. This policy has resulted in low farm income in the past and loss of exports.

Both the Rice Corporation and the SLPMB (Annex B) conduct their operations through a system of licensed buyers. Although the MANR has been able to exercise some control on quality through its produce inspection service, the control on pricing has not been successful; and the margin retained by the licensed buyers has been excessive. The cooperative movement has played a limited role in the marketing and pricing system. These short-comings have been further exacerbated by the lack of coordination between the MANR and the Ministry of Trade and Industry, which controls the SLPMB and the Rice Corporation (Report of FAO, 1975).

Because of inadequate farm-to-market road systems and lack of transport facilities very few farmers can sell their marketable surpluses in larger consuming centers. The GOSL is taking steps to ameliorate this situation through several large road and transport projects financed by the World Bank, the EEC, A.I.D., CARE and the German Federal Republic.

E. Crop Production Development Strategy

The Government's development strategy fo the crop sector of agriculture is designed:

"1. To stimulate development from the traditional subsistence type of production to a more productive system of commercial agriculture;

2. To achieve self-sufficiency in staple foodstuffs and other products;

3. To diversify agricultural production with emphasis on food and cash crops in suitable areas;

4. To increase the productivity, incomes and living conditions of the rural population;

5. To maximize foreign exchange earnings through the expansion of export crops and import substitution;

6. To increase rural employment through stimulation of private investment in various agricultural enterprises;

7. To improve human nutrition; and

8. To conserve the fertility of the soil and other natural resources for the benefit of future generations."

The ACRE project will make a direct contribution to all of these objectives as detailed in the next section.

2.2 Detailed Project Description

2.2.1 Project Strategy

The basic strategy of the project is to initiate and develop an agriculture research and extension system which facilitates an increase in smallholder crop production and income. The initiation of the process requires that current farm family agricultural practices, needs and desires be surveyed concurrent with a national assessment of available improved plant material, on-going research, education and extension activities. Potentially useful material and services from the international tropical research centers will also be catalogued.

The two activities, farm level participation and research coordination and design, provide the underpinnings of the ACRE project. All smallholder oriented agriculture programs must involve maximum farmer participation at all stages. Research must be adaptive, available through an outreach mechanism, fully funded and have established long-range objectives.

Agricultural research and extension in Sierra Leone have been complicated by the fact that both the Ministry of Agriculture and Natural Resources and the

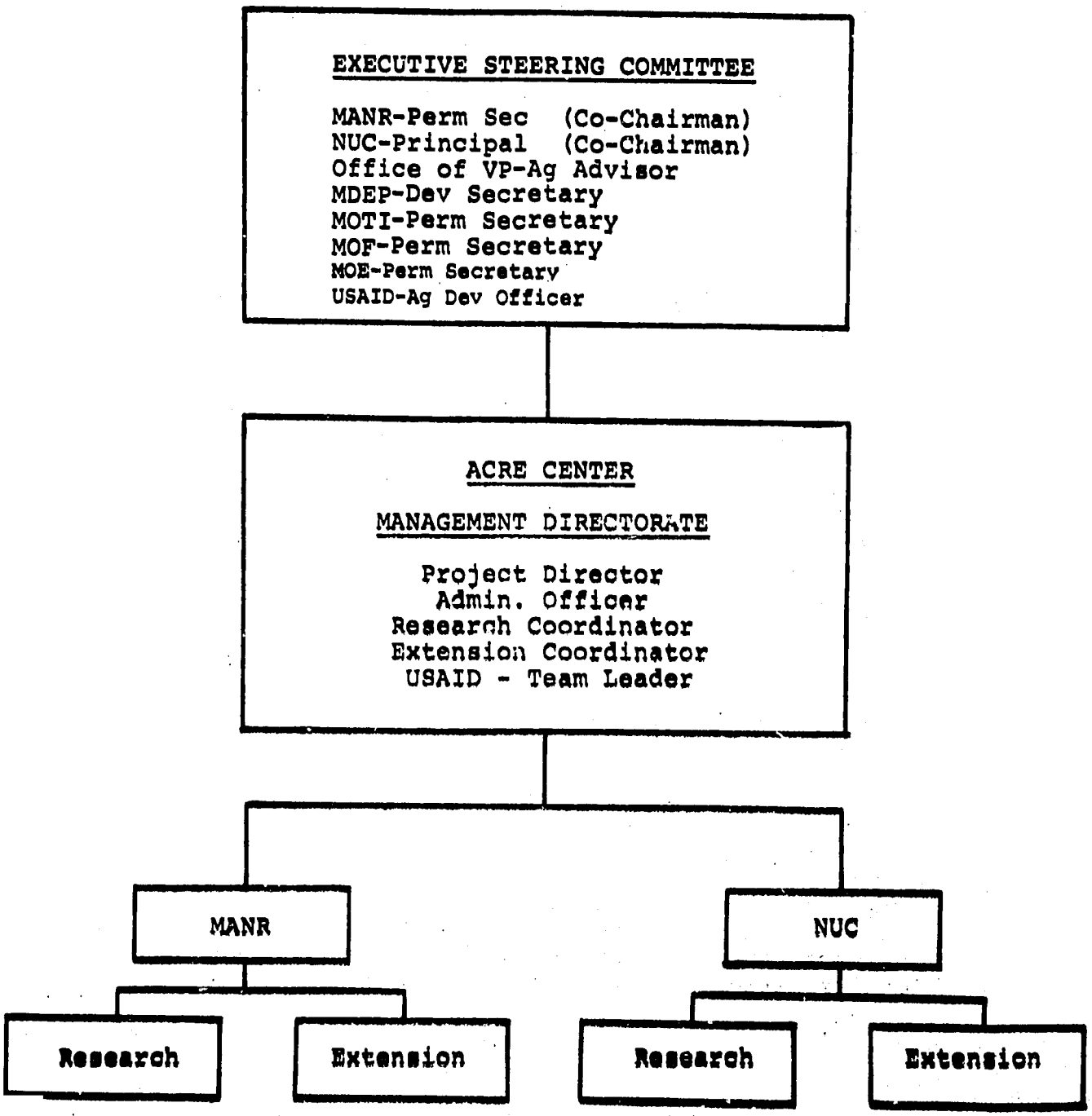
Ministry of Education are involved. Communications were not what they might have been, resources were not maximized, and research had neither the autonomy to proceed nor the necessary coordination. This situation has considerably improved in the past few months, partly, we would like to believe, through the active participation of both ministries in the project design. The project will coordinate the activities of the two central research units, the Rokupr Rice Research Station and the Njala University College. The ACRE management directorate will be established at Njala. The directorate will be responsible to a steering committee and will advise and coordinate research and extension activities (Figure 2-1).

Implementation of the project strategy requires a flexible design allowing modifications to be made in response to new knowledge gained through a continuous dialogue with participating farm families. It also requires a data collection and analytical capability to plan, monitor and evaluate project activities.

The original concept as described in the PID submitted in June 1976 reflected the government's desire to establish a National Institute for Agricultural Research to develop priorities, mobilize funds and coordinate agricultural research throughout Sierra Leone. This concept was supported by recommendations made by two FAO Missions, the "Food and Agriculture Sector Programming Mission" (known as the Ayazi Mission), which visited Sierra Leone in the fall of 1975 to assess the agricultural sector and draw up a strategy for development, and another team (known as the Fada Mission) which visited earlier in 1975.

Rather unrealistically, this approach assumed almost unlimited resources from other donors and the Government of Sierra Leone and did not take into account that the country is facing a critical fiscal situation. The project paper retains the general concept of the original proposals but is directed toward the full utilization of existing resources, thereby minimizing new capital expenditures and recurrent costs. It incorporates the smallholder into the research cycle, concentrates on adaptive research through the use of appropriate international research facilities and delivers research results to the smallholder through a totally integrated research and extension system.

Figure 2-1 ADAPTIVE CROP RESEARCH AND EXTENSION ORGANIZATION



2.2.2. Project Goal: Increased Smallholder Productivity

The project objective or goal as articulated by the GOSL is to "increase smallholder productivity." In contrast to attitudes in the past, there is now an awareness by national leaders that sophisticated, highly-mechanized approaches do not always represent viable production alternatives for achieving this goal and benefitting the small farmer.

This project is accepted at the highest level of government. It involves an action oriented experimental contribution to achieving sustained agricultural production increases through a collaborative effort with existing institutions, development organizations, and small farmers. Implicit in this approach is the recognition that agricultural production increases cannot be achieved in the absence of adequate social and economic incentives for the rural smallholders.

2.2.3 Project Purpose: Develop a Food Crop Adaptive Research & Extension System Responsive to the Needs of Rural Smallholders

END OF PROJECT STATUS

1. Rural smallholders actively involved in the adaptive research and extension process, through delivery and feedback via the extension mechanism.

2. 20,000 farm families directly benefit from improved seed/plant materials, production techniques & storage/marketing techniques.

3. Permanent linkages established between the GOSL research/extension system & international tropical agriculture research institutions such as IITA and appropriate American universities.

4. Long-range food crop research and extension plan/strategy completed and accepted.

2.2.4 Project Outputs

1. Sierra Leoneans trained in food crop adaptive research and extension.

2. Seed/plant materials transferred on regular basis to newly started research trial plots.

3. Research assistantship programs established for senior and/or graduate students at NUC.

4. Long-range research and extension plan/strategy completed and formalized.

2.2.5 Project Activities

Project activities will be concentrated in the upland portions of five "circular" areas of the country (depicted in Figure 2-2). Each of the five project implementation zones will have a radius of approximately 25 miles. The center of the first project area, Njala, will also be the location of the ACRE project headquarters. Rokupr Rice Research Station (RRRS) is the center of the second area. The centers of the third, fourth and fifth areas (Kabala, Makeni, and Kenema) are the headquarters of MANR integrated agricultural development projects (IADP's). The ACRE project will coordinate and collaborate within the five areas with NUC, RRRS, and the three IADP's.

Project activities will be fashioned after the model depicted in Figure 2-3.

A total of thirty research/extension workers will be assigned to work in the five project areas. Each worker will deal directly with ten farmers, three of whom

Figure 2-2

PROJECT AREA

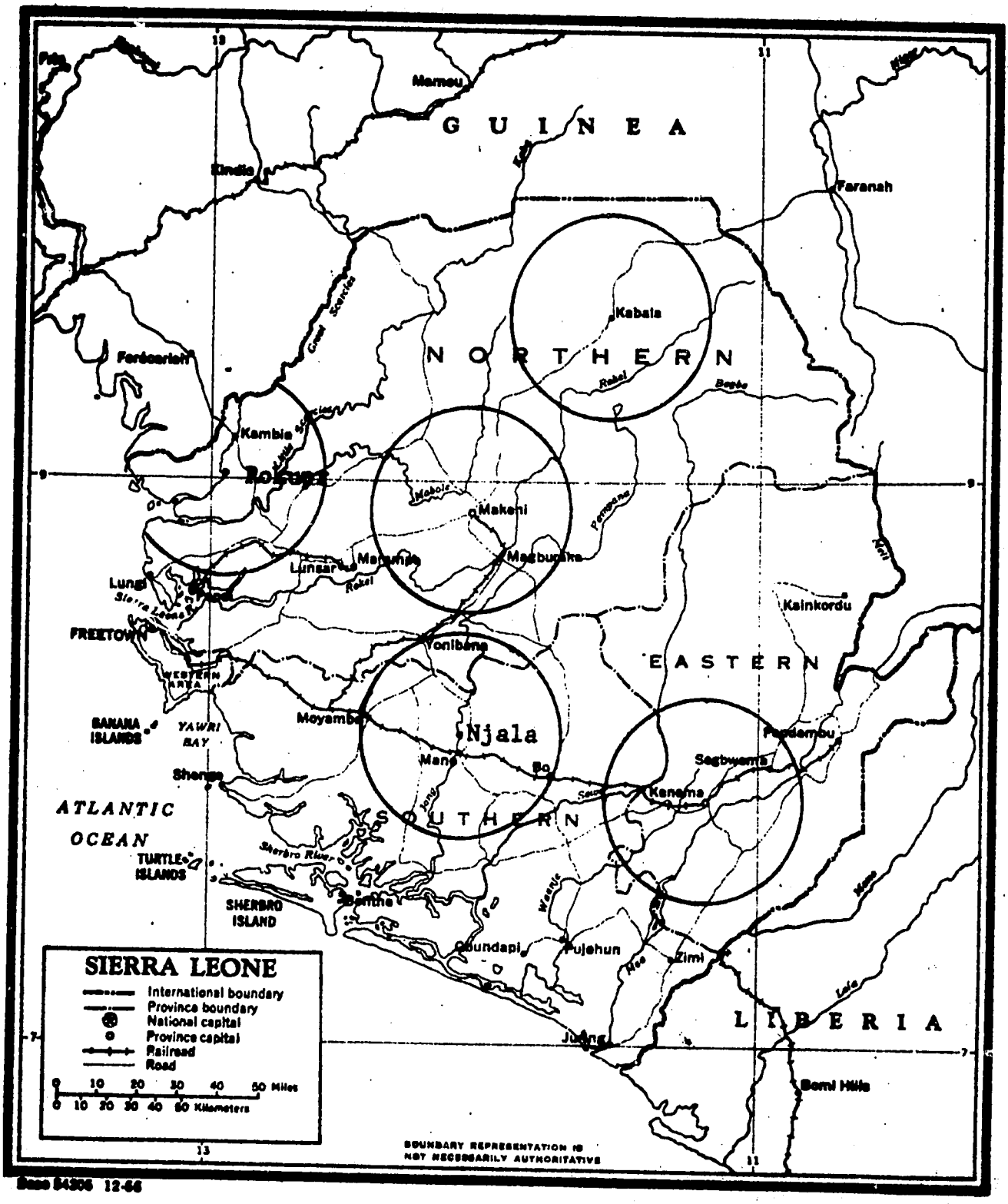
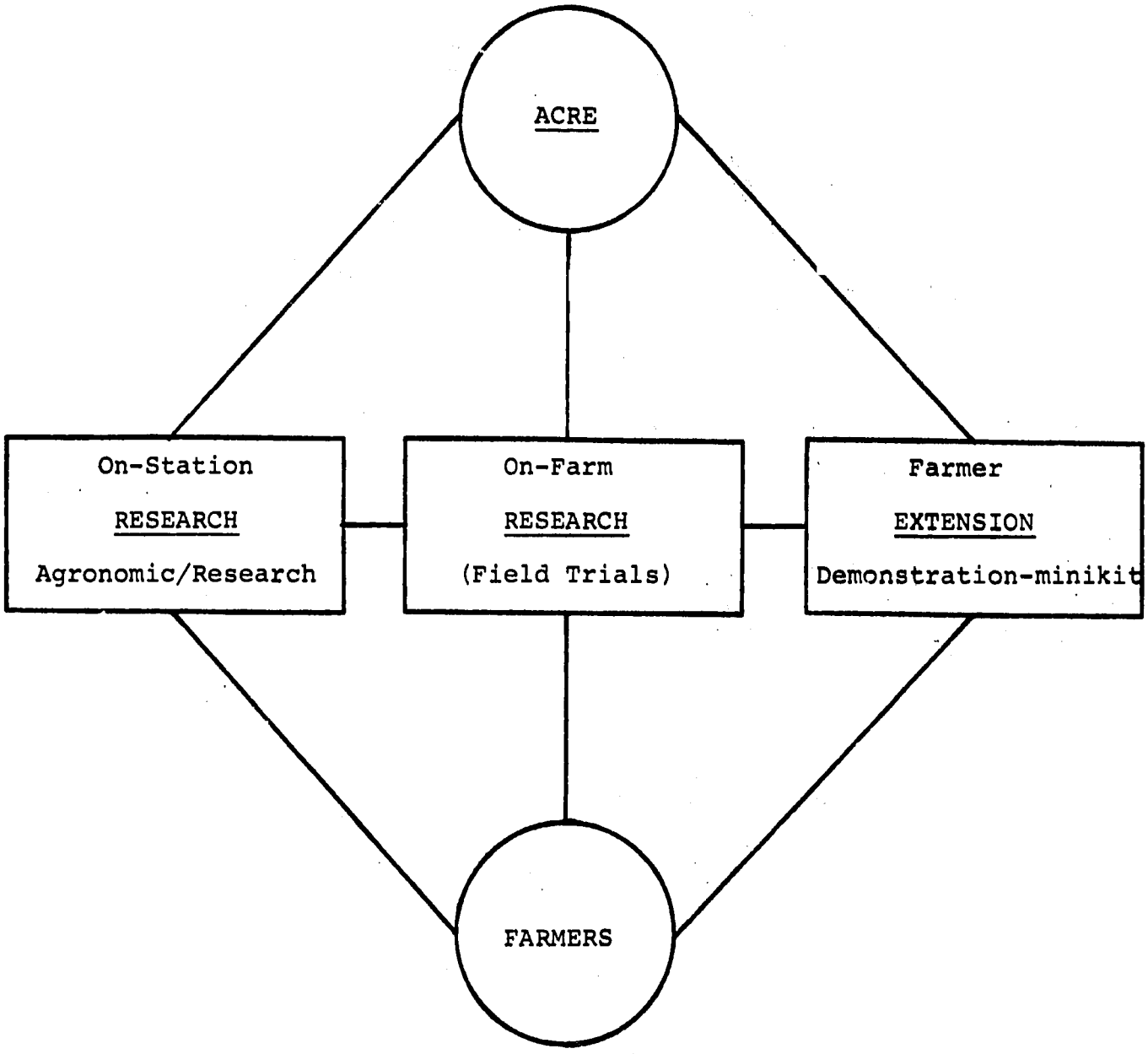


Figure 2-3 **THE ACRE MODEL**



will conduct adaptive research trials and the remaining seven will carry out extension demonstrations on their farms. The project will employ the multiplier concept by using these extension demonstrations as the focal point for reaching a minimum of 100 neighboring farmers at each demonstration by means of field days at which minikits will be supplied.

Combining research and extension activities under the same project will help insure close communication and coordination. As improved practices are identified, they can be relayed to researchers and extension technicians so that modifications can be made, if necessary, to suit local conditions. The process by which this will be accomplished builds on the current practices of small farmers, with innovations being introduced to the farming public only after they have been tested and proven on smallholder lands. Project flexibility allows design and implementation changes in response to new knowledge.

A. Research

Farming in Sierra Leone takes place in five main ecological zones (Annex B). There are major variations in smallholders' cropping systems within each ecological zone, including differences in land preparation, date of planting, planting techniques, and weeding, harvesting and storage practices. Moreover, farmers (even within the same locality) use different systems of intercropping and crop rotation. Such variations result in a wide range of crop yields per acre.

The variations in physiography require the development of different cropping and soil management systems throughout the country. The ACRE project will direct most of its resources and efforts toward the upland areas which appear to have a high agronomic potential and are densely populated. The problem is to find appropriate crop and soil management systems to modify (and perhaps eventually replace) the traditional shifting cultivation (Annex C) and to reduce population pressures on hard-to-manage soils. Demographic and other social and economic factors have led to a situation where a gradual move to more static forms of agriculture is probably required. However, the resulting need for higher productivity can mean increased danger of permanent damage to the topsoil from leaching of soil nutrients and erosion (see Annex C).

Very little technology for the production of improved non-rice food crops has been identified and

tested in the project areas although some limited experimentation with upland foodcrops has been done by Njala University College and Rokupr Rice Research Station. As a consequence, extension technicians' activities have been limited to swamp rice and cash crops, such as coffee, cocoa and oil palm products. The project will place a major emphasis on upland foodcrops, developing technologies appropriate to local conditions. It will also develop, through the extension component, effective and efficient out-reach systems.

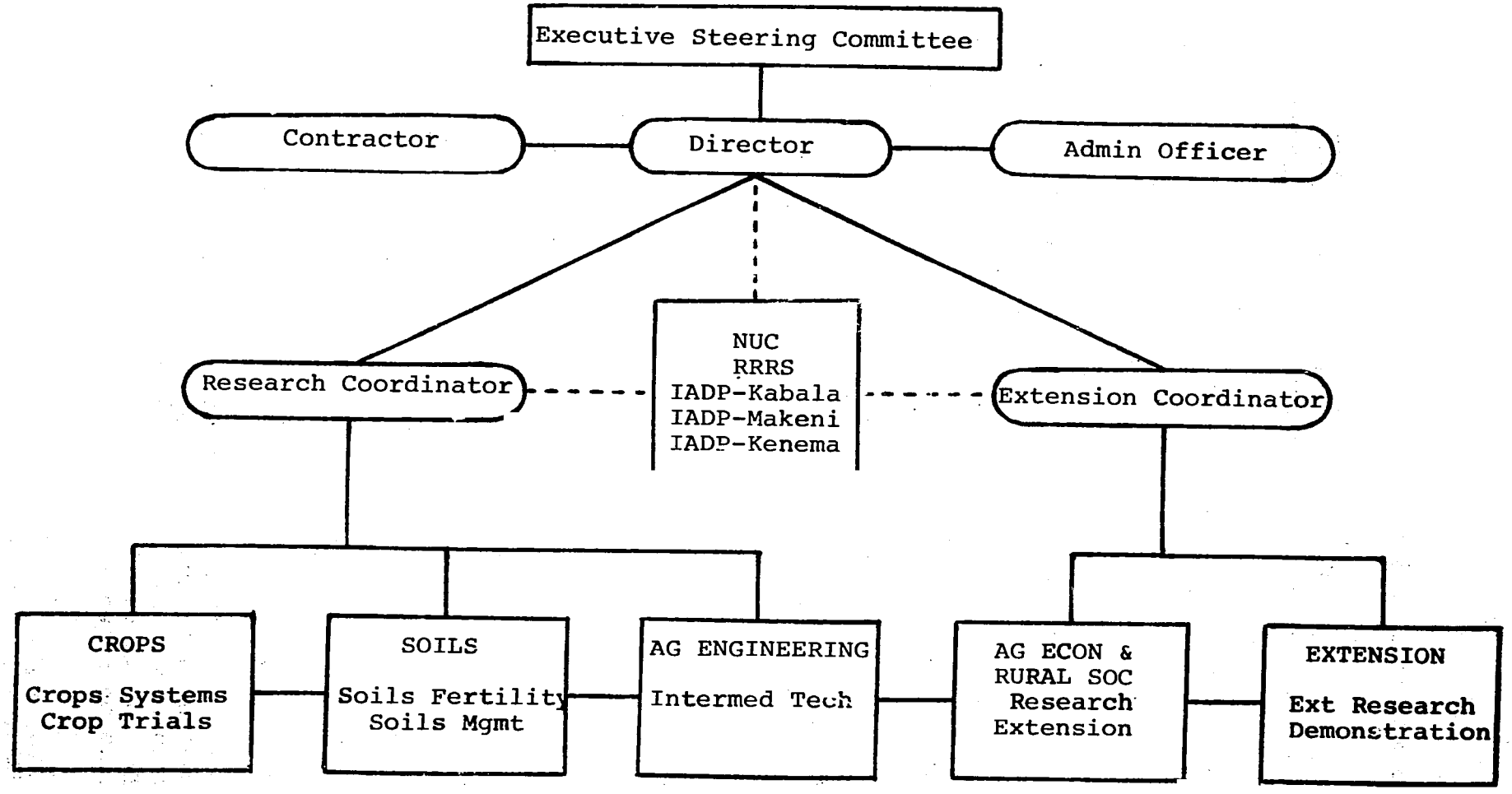
1. Developing Effective Research System

The project will establish a crop production adaptive research and extension center (Figure 2-4) on a 100-acre site adjacent to the Njala University College. There are several reasons for the selection of this location. First, the Njala soils and other physical environmental conditions are characteristic of the predominant upland areas of Sierra Leone. Locating the center at Njala will allow the project to replicate the basic cropping systems found in the project areas and allow for a mutually beneficial interaction with the university. It is expected that university staff will have adjunct positions in the ACRE project and that graduate students will participate in researching special problems addressed by the ACRE program. Njala's central location will minimize travel and communications difficulties. Finally, the UK/ODM-sponsored extension training project will be located there as well. Research will be coordinated with activities at Rokupr Rice Research Station to provide additional coverage in the Northern area.

The project will draw the maximum number of Sierra Leonean staff from the existing ranks of the MANR and the NUC. Recruitment from other GOSL organizations and the private sector may be necessary to fill some of the positions until suitably trained participants return to the project. Project organization is discussed in chapter four (4.1.2).

As per Moseman, "adaptive research involves adjustments, modifications, or changes brought about through systematic research or the methods of science." The project will start with a farm-level data collection and analysis effort designed to gain an understanding of smallholder decision-making, behavior and constraints. Collection will focus on data relating to cropping systems in use within the project area -- farm size, labor and cash inputs, current practices, yields, and net income by crop. Much of the

Figure 2-4 ADAPTIVE CROP RESEARCH AND EXTENSION (ACRE) CENTER



required data is already available or is being generated on a continuing basis by organizations such as NUC, MANR, IADP's, UNDP, EEC, and others. The project research and extension coordinators will jointly organize a system for data collection. The purposes of the effort are threefold:

(1) The information will allow the research institute to replicate the basic cropping systems; innovations will be tested within the context of these systems at the research institute or the sites of one of the other collaborating organizations (Rokupr Rice Research Station, Eastern IADP at Kenema, Northern IADP at Makeni, and Koinadugu IADP at Kabala).

(2) Analysis of this data will identify which practices currently in use by the more productive smallholders may be among those recommended to other farmers or which should be subject to further research.

(3) The data will provide a minimum baseline necessary for measuring overall effects of the project.

It may be necessary to supplement the data obtained from other organizations. The project's research and extension staff will instruct the research/extension workers on data collection techniques and supervise their field collection work. This collection will take place during liaison with farmers conducting trials and demonstrations. They will also consult with farmer leaders and the more productive farmers in the area about the data collection effort, to accomplish a representative input by smallholders. The intensive, farm-level research will take place in approximately 20 representative localities (five farms per locality) throughout the project area. This type of data collection and analysis will continue during the life of the project. It is estimated that data collection will require about two to three hours per week per research/extension worker.

Identifying, testing and modifying traditional practices will be the initial thrust of the research and extension operations. Concurrently, the project will begin crop adaptive research to develop appropriate technology such as:

- Replacing low-yielding local varieties with higher-yielding disease- and insect-resistant varieties (including alternate means of pest control);

- Investigating soil improvement and conservation methods;

- Investigating efficient and economical methods of weed control;

- Modifying the cultivation techniques of upland and swamp rice to include leguminous crops (for the provision of supplementary soil nitrogen and additional vegetable protein for human consumption);

- Modifying traditional cropping systems by intercropping of cash crops (coffee, cocoa, oil palm and bananas) with food crops (upland rice, food legumes, cassava, maize, sweet potatoes, and vegetables);

- Developing cost effective, appropriate mechanical and hand tool technology for smallholder use in food crop production and post-harvest storage, processing, and marketing; and

- Investigating the economics of smallholder food crop production and input/output marketing systems.

The project anticipates that the development of an improved food crop technology tailored to local farming systems will require several years. Further, the project will not attempt to introduce more advanced packages to farmers until reliable marketing systems are established. The project will test advanced technology on the farmer's own lands only when the GOSL and/or the private sector can provide the support necessary for promoting this technology. The project steering committee will facilitate these interventions. The initial research effort will concentrate on finding ways to increase food crop production within the context of current farming systems. This will require long-term experimentation with other crop technologies, various crop rotation, intercropping and multiple cropping systems. The approach employed will in some ways be similar to that of the Farming Systems division of the International Institute for Tropical Agriculture (IITA), where some project research staff members will receive short-term training.

Adaptive research (and extension) will focus and depend on low-cost appropriate technology and know-how generated by local smallholders. Close attention will be paid to the effect of technology on the interaction of different ecosystems with the environment. Alternative (non-chemical) techniques of maintaining and increasing soil fertility and controlling weed-, disease-, and insect-pests will be emphasized.

Soils research will be aimed at improving and expanding management and fertility practices to increase food crop production, food crop yield and quality, smallholder income, protection of soil and water resources, and the preparation of these improved practices for introduction into the national program. The management of soils, with particular emphasis on solving management and fertility related problems on laterite soils, will be emphasized. Soil testing and analysis capability will be increased by a field soils fertility facility at Njala. The development of a 100-acre tract of NUC land and construction of field support buildings will provide minimal but adequate trial facilities on the laterite soils of upland Sierra Leone. No such facility presently exists.

2. Smallholder Participation in Research

The project's research program will maximize smallholder involvement. The basis for the program will be the data collection effort which requires continued and detailed feedback and consultation with a representative sample of farmers and farmer leaders in the project area.

As improved practices are identified, they will be tested under actual smallholder conditions. All necessary materials will be provided by the project and farmers will receive some compensation for their labor and assumed risk. Constant monitoring and supervision of the trials will be handled by the project staff through the project research/extension aides.

One of the real indicators of movement toward project success is how the various food cropping systems are accepted by smallholders. To minimize the possibility that the cropping mixes will be unacceptable or will not take into account certain problems, each step of the process will be carried out in close consultation and after thorough discussions with the rural people. The inclusion of a rural sociology component in the project will specifically address these issues.

B. Extension

One main objective of the project is to help develop an efficient and effective extension system that can be replicated throughout Sierra Leone. Some smallholders assert that extension technicians do not know farming, local conditions, or even the location of farmers fields. This is at least partly correct as many of the

extension technicians have received limited training in agricultural techniques and in extension and communications methods. These problems are compounded by lack of supervision, low salaries, and lack of opportunities for upward mobility.

The MANR is fully aware of the shortcomings of its extension system and perceives this project as an opportunity to develop a system that works. Accordingly, the MANR is willing, through the project, to revamp its operations in this area. Several principles have been worked out with the MANR for restructuring and improving extension operations:

(1) Smallholder involvement in decision-making (e.g. the development, testing and delivery of improved technology) and farmer resource commitments in support of project activities are critical to achieving the project purpose. Farmer involvement and resource commitments can be most readily achieved if: (a) there is effective two-way communication between extension workers and participating farmers; and (b) crop-specific and locality-appropriate extension advice is provided to small farmers.

(2) Directly linking extension operations with the research effort will help insure that improved practices found acceptable to farmers can be introduced into farmer and extension worker training programs. Further, such arrangements will facilitate feedback to the research staff of farmer experience with the improved practices.

(3) Accountability of extension personnel to the local population being served by the project is an important variable affecting the success of the agricultural knowledge transfer/acquisition process.

Implementing these guidelines requires a process through which the extension system is developed from the local level upward. The critical elements in this process are detailed below.

1. Developing Effective Extension System

Project activities will take place in five areas where research trials and extension demonstrations will be selected on the basis of the following criteria:

- Existing local socio-political groupings and their principles of organization;

- Current agricultural production;
- Potential agricultural production of the surrounding area;
- Smallholder population density;
- Relationship to the central road network;
- Existing or past self-help efforts;
- Local reputation for leadership and innovation in agriculture;
- Lack of potentially conflicting institutions (certain educational, commercial, religious, or governmental activities);
- Geographic distribution;
- Evidence of responsiveness to and readiness for the project; and
- Availability of input resources to demonstrate more readily response to production inputs and extension efforts.

The extension technicians will be trained at Makali Induction Training Centre under the MANR/UK-ODM extension training program. They will receive instruction in field data collection, cropping systems, basic agronomic studies, soils fertility and management, and basic extension and communication techniques. Subsequently, they will receive regular in-service training either "on-the-job" or at other centers (Mange, Batkanu, Njala, etc.) depending on the type of training required. This will enable the project, in collaboration with the farmers, to evaluate potential agents, screening out those who are not able to effectively develop a close rapport with smallholders in their assigned area. The extension technicians will be periodically brought back for special project seminars.

With close supervision and periodic training, the successful extension technician will be able to synthesize and apply certain skills learned in formal schooling, work sensitively with local farmers, and use the insights of scientific agronomic and soils research. The personnel once trained will form the pool from which the NUC can select certificate candidates and degree candidates.

This will help ensure opportunity for upward mobility of progressive individuals and help weed out the poorly motivated.

In addition to the basic extension operations, the project will make special efforts to assist other groups within the project area. The first will be for women. Like men, women smallholders participate in the growing of all food crops and most cash crops. They share in responsibility for growing rice, groundnuts, cassava, sweet potatoes, maize, vegetables and other food crops. Women also carry out many other production tasks, such as palm oil processing, and are involved in the marketing of farm produce. Extension workers will contact women and men smallholders. Women smallholders will be provided equal opportunity for participation in the project. Women will also be given equal opportunity for training and employment in the project and in associated government programs such as the MANR Extension Service.

The above approach to developing an effective extension system and program is empiric, based upon current knowledge of the project area, and will be modified as new approaches evolve and operational experience in the area is gained. The various experimental extension techniques methods (discussed in some detail with the MANR/UK-ODM extension training project managers) may include:

- Audio cassette technology;
- Radio farm forums;
- Demonstrations designed for women smallholders;
- Visual (photo-novels and other visual aids) and audio-visual technology;
- Schools and/or young farmer clubs;
- Group interactions (workshops, lecture-discussions, seminars, village demonstrations through village chief, drama);
- Individual farm family/smallholder demonstration through extension worker;
- Demonstrations to train non-project extension workers.

The project will provide a Sierra Leonean staff member who

will be responsible for the extension training and experimental outreach activities.

Supervision and management of extension operations will be the responsibility of the project staff through the established MANR Principal Agriculture Officer (PAO) and the Agricultural Officer (AO); there will be at least one of the latter in each of the five project areas. Existing staff and logistical support will be used to the maximum extent. The project will provide motorcycles, fuel and maintenance for the 30 "project" extension workers. The MANR will pay the salaries of all AO's and extension technicians secunded to the project.

Personnel for the positions of senior-level agricultural officer and extension operations will come from the existing MANR personnel and other qualified personnel in the project area. The project will confer with the MANR to assign and/or hire those individuals which it deems to be qualified. Training for these senior-level positions will be mainly on-the-job and provided by the ACRE research and extension staff in conjunction with the additional funds that have been programmed for short study tours in other countries.

2. Smallholder Participation in Extension

The project's extension program will maximize smallholder involvement. The foundation for the program will come from the data collection effort which requires continued and detailed feedback from smallholders.

Information from the most successful (being technically sound, economically feasible, and socially compatible) research trials will be used in the extension demonstrations. All necessary materials will be provided by the project and participant farmers will be paid about 20 Leones per demonstration for labor and assumed risks. Constant monitoring and supervision of the demonstrations will be the responsibility of project staff in liaison with farmers through project extension workers. Farmers will select the varieties and practices that appeal to them.

At the most opportune times approximately 100 farmers from the surrounding area will attend field days at each demonstration site. Each participant farmer will explain his demonstration to his peers. Each attending farmer will also be provided a minikit containing small packets of improved seed varieties or cultivars, small quantities of production inputs, simple instructions and

record books. Project and non-project extension technicians will provide the necessary technical liaison with smallholders who have received mini-kits.

2.2.6 Institutionalization

This project uses an inter-ministerial, multidisciplinary research and extension approach to solve specific development problems in Sierra Leone. While its initial impact will be to create a semi-autonomous unit (the Adaptive Crop Research and Extension Project Unit) it will be partially dependent upon inter-ministerial collaboration for its staff, facilities and budget. There is a long-term need for the GOSL to give increasing priority and support to the practical, adaptive research and extension this project will provide.

As stated earlier, the MANR and the NUC each presently has its own agriculture research and extension system, resulting in their proposed collaboration in implementation of this project in the farm demonstration centers located in the five geographic areas considered representative of rural Sierra Leone.

During the evolution of the project, these two institutions will work together to develop a comprehensive ten-year national plan for a food crop adaptive research and extension project. This research and extension plan will ultimately determine what institution or institutions should implement the long-range program and the kinds of research and extension programs which should be conducted. The plan's policy and its institutional implications will be determined by the Sierra Leonians within the context of their own requirements.

At this time, we cannot rule out the possibility that some NUC and MANR research and extension functions could merge in one or the other institution to provide for a viable ongoing institution to carry on this effort. Nor can we rule out the possibility that either NUC or MANR will take over the entire effort or the possibility of a new institution being founded. AID and the contract team will closely monitor the evolving situation to encourage the most viable institutional base or bases to carry this adaptive food crop and extension program forward.

2.2.7 Project Inputs

A. USAID

The inputs which will be provided by the USAID include a technical assistance team, participant training and commodities. Specifically, USAID will provide funding for the following:

	TOTAL (US $1,000)
Technical Assistance	$3,737
Participant Training	454
Commodities	741
Construction	735
Support Funds/Other	415
	$6,082

The phasing of the U.S. inputs is discussed in the "Project Implementation" chapter.

The participant training schedule is shown in Table 2-2. Most of the training will be at the Masters Degree level. The project training schedule is front-loaded to the maximum extent judged possible, to maximize the participants' on-the-job exposure to U.S. funded technical assistance staff.

TABLE 2-2. PARTICIPANT SCHEDULING

New Starts	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Long-Term U.S.	6	4	4	-	-	14
Long-Term Africa	2	2	2	-	-	6
Short-Term External	3	3	2	-	-	8
	11	9	8	-	-	28

B. Sierra Leone

The GOSL inputs will include counterpart staff to the U.S. funded team of experts, facilities, local funding for operations of the Adaptive Crops Research and Extension Center, land, land improvement and civil works, construction, staffing, and support for the extension sector of the project. An estimate of the value of these inputs is shown below:

	TOTAL (US$1,000)	TOTAL (Le 1,000)
Salaries	1,382	1,465
Commodities	145	155
Land and Civil Works	542	575
Support funds/other	493	523
Construction	465	493
	3,027	3,201

C. Project Linkages

The ACRE project builds upon on-going projects and current MANR activities in a number of fields. It takes into account planned future activities (in such areas as upland crop research, seed multiplication and extension training) and is expected to have important implications for the manner in which future GOSL agricultural programs are implemented. Generally the project is a logical outgrowth of the work done in the donor-supported area development projects, most notably the integrated agricultural development projects sponsored by the World Bank and the EEC. The project will utilize the extension technician training infrastructure, to be implemented under the UK-ODM/MANR Extension Training project, in developing and implementing the adaptive crop research and extension system. It will also have complementary linkages to other agricultural development projects such as the upland crops research conducted by the FAO/IITA team at Rokupr, the German-sponsored Seed Multiplication project, and the FAO-sponsored Land Resources Survey project.

Over the long term, the ACRE project should influence how extension and research activities are actually carried out on a national scale.

D. Linkages with the Smallholder

A real test of project success is how the techniques developed by it are accepted by farmers. Some suggested indicators of this acceptance are: increases in the smallholders' real income; increases in the smallholders' agricultural knowledge; and an increase in the smallholders' capability to help themselves.

CHAPTER THREE

PROJECT ANALYSES

3.1 Summary Statement

Sierra Leonean farmers are adequately motivated by available cash-cropping models, and by their own desires to provide for their children's schooling and other cash needs, to actively participate and benefit from this project. In general, smallholders lack personal experience in utilizing proven cultivation practives and lack access to extension services. No strong values or strong political interests militate against their experimentation with new ideas. (See 3.4 in this chapter and Annexes B and E.)

The project management, by building its work carefully and sustaining its inputs confidently, can make the project provide useful services and inputs to smallholders. Relations "upward" to GOSL machinery are likely to present more problems than relations "downward" to the farmers participating directly or indirectly in the project.

Regarding Sierra Leonean smallholders, this project recognizes that (1) traditional production systems are usually better adjusted to local ecological, economic and political-economic conditions (and their fluctuations) than was previously believed; (2) traditional smallholders make conscious and recurrent decisions about the use of productive assets, the organization of labor, marketing, savings and investment; (3) experimentation, innovation, and calculated risk-taking are commonplace practices, even in communities not influenced by extension services; (4) in economic and demographic terms most communities for which information is available have been dynamic and have undergone continuous adjustments or changes; and (5) development is unlikely to occur unless it succeeds in building on existing ecological, socio-cultural, economic, and political systems which represent effective and responsive ways of controlling access to productive assets, organization of production, averting risk, and incremental capital formation. Technological innovations and improvements in infrastructure are needed, of course, and changes in existing institutions will occur. The project recognizes that existing local institutions and systems persist because they meet real needs, and new or modified organizational forms and systems will be accepted only if they meet these needs more effectively.

Executed as designed, the project will benefit thousands of farm families previously beyond the reach of government development planning. Sierra Leonean agriculture is still very much a household economy. Women as well as men share in the provision of farm labor, the right to manage farm plots and in decisions concerning household consumption. By ensuring that women have access to project research and extension services, the project can ensure a strong role for women in local development.

Small farm families of Sierra Leone all give testimony to the hard work and resourcefulness of subsistence farmers. The ACRE project will remove some of the obstacles which impede progress toward fulfillment of their development objectives.

All rural and urban consumers of agricultural food products will be indirect beneficiaries of the project. This includes the small farm family, since at very low levels of income, a significant portion of increases in food production tend to be consumed by the family production unit. Likewise, the urban dwellers will benefit from increases in food production by having access to a more reliable supply of food at reasonable prices.

After a thorough review of the technical (3.2 of this chapter and Annex C) and financial (3.5 of this chapter and Annex D) aspects of the project, the expected economic returns to the proposed adaptive research and extension activities of the ACRE project give every indication of being positive and justifying investment by the GOSL and AID.

It is believed that with project-provided resources, GOSL inputs and improved MANR and NUC coordination of research, resources will be adequate for the project. It is the professional judgment of the design team that the project is technically sound (3.2 of this chapter and Annex C). It has been determined that both local and outside technical expertise is available with which to implement the project. Finally, there exists a body of agronomic data and materials of sufficient quality with which to commence and implement an adaptive crop research and extension program.

3.2 Technical Analysis[1/]

3.2.1 Introduction

The farm families of Sierra Leone have certain aspirations or desires which they wish to satisfy. These aspirations may be as specific as a transistor radio or as general as an undefined wish to have an improved level of living. In order to achieve these aspirations, the smallholders have at their disposal inputs such as labor, skills, land, capital, access to credit, etc. They, if knowledgeable, employ these inputs in different enterprises to provide the income required to satisfy each family's desires. Both the level of technology and the technical information available to the farmers, as well as their understanding of the technology, determine the rate at which inputs may be transformed into outputs and to profits or value additions.

The smallholders are faced with the task of allocating the inputs at their disposal among the different enterprises in a way that will maximize their income or achieve other results which will help them to achieve those aspirations that are most important to them. Therefore, it is clear that the smallholder, even at the subsistence level, is a farm manager. He/she must allocate the scarce resources at his/her disposal efficiently among different enterprises in view of 1) the available technology; 2) the prices of the various inputs; and 3) the prices or values to the family of the outputs. The availability of inputs to the farmer, the level of the existing technology, and access to markets are major constraints on his/her ability to meet his/her desires. Other constraints the farmer must face include the inadequacies in the existing marketing system, management problems within the existing land tenure system, and the possible demands on resources caused by the traditional extended family system. If changes are made in these systems the farmers may more easily achieve some of their desires, although it is also possible such changes might make it more difficult to achieve others. Such changes are beyond the control of a single farmer or family and must be made within the tribal system itself or by the government.

In Sierra Leone, the cropping options within the individual smallholder's present management and farm enterprise system are, in general, now based on the long-time traditional and trial and error experience of the rural sector and often include off-farm labor. Some critics feel

1/ Annex C contains supplemental technical information.

that these combinations of enterprises used by the subsistence farmer are sub-optimal, inefficient or irrational. While this may be economically true, it often turns out that these critics did not appreciate or understand the aspirations of the farmer, the constraints imposed on him that are beyond his control, or both the cost of obtaining information and his ability to understand and use new technology, prices of inputs or value of outputs.

The importance of adaptive research and the present technologies gap cannot be overstated. While recognizing the importance of basic research in increasing the level of agricultural technology, it appears that Sierra Leone needs to focus the direction of both adaptive and basic research in fairly specific areas where a breakthrough in the level of technology will have the highest payoffs. This would suggest the identification of priority areas for research based on a careful analysis of available baseline data.

Little transfer of advanced agricultural technology can be accomplished by extension and farmer training investments alone. Extension does not have a high productivity without investment made in research. Farmer training is much like extension as far as productivity growth is concerned. Without research activity it does not produce growth. It may produce other things, including future growth, higher aspirations, a more sophisticated culture, etc.

The potential for high payoff among alternative investments in Sierra Leone is greatest in the establishment of linked research and extension systems. This is true even where the services of scientists are expensive because of limited supply. The productivity of adaptive scientists is importantly determined by the quality of its scientists. Quality of scientists in an emerging country means staff which 1) understand the importance of the need for socio-economic appraisals of alternative proposals from which limited resources can be focused on high priority needs; 2) who have proven good practical judgment in their respective professional areas; 3) who are oriented toward finding practical and relevant solutions to the social/ecological environments in which the rural person lives; 4) have good professional skills so as to ensure that research results are both honestly reliable and capable of adoption by rural people and 5) are sufficiently broad in their view to understand the need for multi-disciplinary and multi-institutional involvements in research plans and

developments. Primarily, Sierra Leone needs research staff oriented toward solving rather than only finding problems.

While some observers may equate the "adaptive" and practical research approach to low quality staff, inadequate facilities and a general dearth of intellectual capital, it is possible to achieve the appropriate mix of theory and practice in several ways. A high cost alternative could be to build a Ph.D.-holding, academically-oriented staff who would provide the overviews and non-specific, indirect inputs to the system while simultaneously building a working staff of applied scientists doing the less academically exciting, day-to-day practical field testing essential to the process.

Another technique (being exploited by this project) is to provide for extensive consultancies during the life of project which are to be used to bring internationally recognized scientists, experienced in the problems identified, to recommend research direction, to evaluate results, and to recommend alterations. By this means, long-term commitments with international research institutions can be structured and Sierra Leone can enjoy the desired level of both direct and indirect inputs in a fashion designed not to cause undue stress on its limited manpower and budget resources.

The above considerations have several implications for the design of the ACRE project. First, it will be as closely integrated as possible to other research being carried on in the country. This will include work at the Njala University College (NUC), the Rokupr Rice Research Station (RRRS), and other institutions and developmental organizations such as the several Integrated Agricultural Development projects (IADP's), especially those headquartered at Kenema, Makeni, and Kabala. Second, communication and interaction will be developed to the maximum extent with regional and international centers. Finally, care will be taken to avoid the extension of new technology to farmers in Sierra Leone that has not been screened and tested under the specific economic and technical conditions that exist in the various areas in the country.

This project proposes to offer assistance to directly help the farmer more fully and rationally realize his/her desires by: 1) making improved technology available to him/her through adaptive crop research and screening,

and by adaption of available technologies and resource management practices; 2) determining improvements and develop the systems dissemination and extension of information to the farmer, in terms understandable and acceptable to him/her; and 3) careful examination and analysis of both the economic and social impact of alternative soils management and cropping systems to determine possible methods of achieving economic advantages over the present system of farm management on an individual holder basis.

It is important to emphasize that the output of this project is not to develop a single enterprise mix for a smallholder or smallholders that is appropriate for all time and circumstances. Rather, the expected output is an on-going capability in the GOSL to identify and communicate opportunities which permit the farmer to adjust enterprise mixes over time as technologies and input and product values change.

If this is to be achieved, the farmers themselves must be able to shift resources from one enterprise to another to take advantage of shifting price/value relationships. They must also be serviced with more efficient and cost-effective information systems which are tailored to assure they are relevant to the real world of the farmer and its constraints as well as considered reliable and trustworthy by the farmer.

3.2.2 Agricultural Research and Extension in Sierra Leone

A. Current Status

Research work on agronomic and horticultural crops is conducted by the NUC, several agencies of the MANR (such as the RRRS), and by several donor-operated projects. This work concentrates primarily on rice and cash crops (cocoa, coffee, etc.): 1) variety trials; 2) effect on crops of soil types, seedbed preparation, fertilizer levels and types, planting dates, methods of cultivation, and methods of disease and insect control; and 3) work on crop rotations, harvesting, storage and marketing.

Livestock is a minor agricultural enterprise, it receives few research inputs. Most of the research on livestock (cattle, sheep, goats, poultry and some swine) is devoted to disease and parasite control, and somewhat less to breeding and livestock improvement. Little research is now performed on range/pasture management.

The Department of Agricultural Economics and Extension of NUC in collaboration with Michigan State University (USAID Contract AID/csd 3625) have during recent years conducted research in agricultural economics on both the micro and macro levels. Some research is being done in rural sociology both by the GOSL and donor projects, but is limited in scope.

Agricultural research performed by the GOSL is increasingly being focused on adaptive and practical activities/projects. On several occasions officials from the MANR and other GOSL agencies have pointedly advised that it was future GOSL policy not to build a large-scale basic investigation type of agricultural research institution.

Research of all types is limited in scope and applicability to the needs of farmers. More investigations are essential but they must be designed in such a way that the significance of the results obtained can be measured and valid information can be published for use by field personnel and extension to farmers. This is impossible under present conditions because of: 1) inadequate staff; 2) deficiencies in the level of staff training; 3) low salaries; 4) staff turnover caused by inability to promote in post; 5) inadequate office and laboratory space; 6) the lack of scientific equipment; 7) insufficient operating supplies; and 8) the lack of opportunity of the officers in charge to defend their budget needs before the appropriate administrative officers in the Ministry of Agriculture and Natural Resources (MANR) and the Ministry of Education (MOE).

Research staff of the MANR appear to be: 1) insufficient in numbers; and 2) not adequately trained to handle expanded research functions. Inasmuch as the RRRS is limited in staff with the level of training required for adaptive research, this project will collaborate very closely with and direct some resources toward the Rokupr Rice Research Station.

Very limited agriculture research is also currently being performed in cooperation with or funded by specific project activities. A brief summary of such activities follows:

Project	Types of Research
Kenema IADP	Agronomic (variety screening, fertilizer). Principal work on coffee, cocoa, oil palm and rice.
Makeni IADP	Agronomic (variety screening, fertilizer, pesticides). Principal work on rice, cocoa and oil palm. Livestock development and methods of increasing wood fuel production for tobacco farmers.
Koinadugu IADP	Agronomic (as above). Principal work on rice, groundnuts, citrus, vegetables (tomatoes and onions).
German/MANR Seed Multiplication Project	Seed production, processing and storage.

Agricultural extension work is conducted by the NUC and the MANR. This work concentrates primarily on rice and cash crops in designated project areas (IADP's, etc.). All extension work in the MANR is under the Division of Agriculture. The extension staff numbers 230 at present including all grades of instructors, implying a national extension worker:farmer ratio of 1:1400 which is clearly inadequate. Agricultural extension of all types is limited in scope and applicability to the needs of small farmers. Design of new extension approaches are essential but they must be designed in such a way that the significance of the delivery results obtained can be measured and benefits to smallholder families verified. This is impossible under present conditions because of: 1) a grossly inadequate staff; 2) deficiencies in the level of staff training; 3) low salaries; 4) staff turnover caused by inability to promote in post; 5) inadequate office space and operating supplies; and 7) the lack of opportunity of the officers in charge to defend their budget needs before the appropriate administrative officers in the MANR and the MOE (in the case of NUC).

Agricultural extension staff of both the MANR and the NUC appear to be 1) insufficient in numbers; and 2) not adequately trained to handle expanded extension functions. Because the GOSL is limited in trained staff required for extension of adaptive crop research results, this project will collaborate very closely with the MANR/UK agricultural extension training project to work toward improvements in this situation.

Perhaps the most crucial factor in the success of an extension program is the extent of popular interest (Lele, 1975). Again, we are faced with evidence that the concept of "farmer participation" is more than a nice theoretical concept, but a vital approach to development which directly relates to agricultural project features. Several methods of inducing local interest and participation have been attempted. The most common method involves the selection of progressive "model" farmers who are to demonstrate new technologies and help propogate their spread to other farmers. While this method has been successful, particularly in increasing production of export crops, certain drawbacks have been noted in food crop production. Model farmers chosen by project management staff or local administrators have not usually been typical farmers. They are often younger, have more land, are relatively better off and have more education. They may not be individuals best suited to popularize innovations. Attention to them may involve neglect of the poorer farmers and arouse suspicions and envy of the model farmer.

Methods which have shown some success in overcoming these negative aspects have emphasized a process of involving large numbers of farmers in the extension process including discussion of individual and group needs, large numbers of demonstrations with many farmers engaged in testing various innovations, systematic group exchanges of ideas and experience regarding the adoption of new innovations. Such methods may engender an atmosphere of mutual learning and self-help. The initial cooperating farmers would be selected by the farmer groups.

Other aspects of extension frequently overlooked are attention to women farmers and women extension agents. Coordination of extension activities is needed to avoid confusing or contradictory guidance to farmers from representatives of different developmental and government agencies.

B. Summary of Current Status

It is clear that a substantial, perhaps surprising, amount of research or data-producing activities have been and are taking place in Sierra Leone in both the technical and social research areas. It is equally evident that, in the absence of a strong central research center, little effort has been or is being made to utilize such information in an effective manner between disciplines and/or between programs or projects. Although the several

donor projects show evidence of understanding the value of multi-disciplinary research, little evidence of such movement is noted in the regular research structure.

C. Ability of Resources to Meet Project Needs

Research and extension resources available to support this project consists of people (both trained and to be trained), office space, access to and use of laboratories and supplies, field test plots and local budget support. The project itself will provide supplementation to the GOSL in all areas. Research and extension facilities and equipment are considered barely adequate for the project purposes even when constructed as project funds provide. Field plots appear to be available in adequate numbers and locations for project needs; although as specific prototype sites are selected, new plots will need to be established. Local budget support, on a declining basis, for life of project, will be provided and is expected to be adequate.

3.3 Economic Considerations

3.3.1 Returns to Research

A significant amount of economic analysis on the returns to agricultural research has been done. The path-breaking research by Griliches (1957) showed handsome returns (35-40%) to investment research on hybrid corn in the United States. Later studies by a number of researchers on a variety of crops reported similar high returns of 21 to 93% to research investment (Evenson, 1975). In yet another study Griliches used an aggregate agricultural production function for the United States to measure the contribution of various agricultural inputs to the increase in agricultural production. One of these inputs was expenditure for agricultural research and extension. Again the social returns for the research and extension input were a multiple of the social costs. Finally, Evenson's and Kislev's work on maize and wheat research shows an average return in 56 countries of more than $200,000 from an investment of $40,000 in Latin America and Asia to $123,000 in North America and Northern European countries to an excess of $200,000 in some African countries. These findings suggest that the returns to research vary significantly from country to country. These studies are complicated by the fact that the research, largely supported by the government, is a public good and the returns from the research cannot be captured directly, i.e., the research produces no revenue. The returns from such research are

not generally private returns but rather largely social returns. Thus, while the magnitude of the returns to agricultural research and extensions are generally high, they are sensitive to the assumptions made when measuring returns and costs and the particular country or area involved (Table 3-1).[2/]

Also, it is obvious that although agricultural research is generally a good investment, proper design is critical. If a crop variety that was susceptible to blight or rust was pushed by the extension system, this could result in crop failure and negative returns to the farmer. Similarly, an adaptive research project that does not have an adequate background of basic research to provide the necessary guidance will not be productive. As indicated earlier, the appropriate mix of non-adaptive and adaptive research, education and extension is necessary to reap the rewards of investment in agriculture research.

The ACRE project is designed to integrate adaptive research and extension activities through a program of continuing farmer feed-back and field trials. With regard to the requirements for more basic research, a sufficient "stockpile" of underutilized plant material, improved or resistant crop varieties, and on-going research (local, foreign and international) do exist. A Sierra Leone effort in basic crop research would be cost ineffective over the near term. The project will identify deficits in the current stock of knowledge and availability of needed material. Should these gaps jeopardize project success, those areas identified will be addressed by the ACRE project or identified for its affiliate organizations.

Since all studies of returns of investment in agriculture research have been done ex post or after the fact, it is not possible to compute a social rate of return to Sierra Leone from the ACRE project. However, any country that expects to improve the level of living, especially among the rural poor, must increase the productivity of its agriculture.

2/ Further substantiation of favorable returns to agricultural research activities in various circumstances can be found in: Arndt, Dalyrmple and Ruttan, editors, Resource Allocation and Productivity in National and International Agricultural Research, University of Minnesota Press, Minneapolis, 1977, Ch. 2-10.

Table 3-1

SUMMARY OF DIRECT COST-BENEFIT TYPE STUDIES OF AGRICULTURAL RESEARCH PRODUCTIVITY

Study	Country	Commodity	Time Period	Annual Internal Rate of Return (%)
Griliches (1958)	U.S.A.	Hybrid corn	1910-55	35-40
Griliches (1958)	U.S.A	Hybrid sorghum	1940-57	20
Peterson (1960)	U.S.A.	Poultry	1915-60	21-25
Ketuson (1969)	South Africa	Sugarcane	1945-62	40
Ardito Barletta (1970)	Mexico	Wheat	1943-63	90
Ardito Barletta (1970)	Mexico	Maize	1943-63	35
Ayer (1970)	Brazil	Cotton	1924-67	77+
Schmitz & Seckler (1970)	U.S.A	Tomato harvester	1958-69	
		With no compensation to displaced workers		37-46
		Assuming compensation of displaced workers for 50% of earnings loss		16-28
Hines (1972)	Peru	Maize	1954-67	35-40[a] 50-55[b]
Hayami & Akino (1975)[c]	Japan	Rice	1915-50	25-27
Hayami & Akino (1975)[c]	Japan	Rice	1930-61	73-75
Herdt and, Ardila, Rosas, & Trujillo (1975)[c]	Colombia	Rice	1957-72	60-83
	Colombia	Soybeans	1966-71	79-96
	Colombia	Wheat	1953-73	11-12
	Colombia	Cotton	1953-72	None
Peterson & Fitzharris (1975)[c]	U.S.A.	Aggregate	1937-42	50
			1947-52	51
			1957-62	49
			1967-72	34

[a] Returns to maize research alone.
[b] Returns to maize research plus cultivation "package."
[c] From papers presented at Conference on Resource Allocation and Productivity in National and International Agricultural Research, Agricultural Development Council, Research and Training Network Program, Airlie House, Virginia, January 26-29, 1975, and which appear as chapter 2 (Hayami and Akino), chapter 3 (Peterson and Fitzharris), and chapter 4 (Herdt et al.) in the present volume.

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Source: Arndt and Ruttan, 1977.

3.3.2 Alternatives to the Proposed Strategy

This project's purpose is to increase rural productivity. It is fair to ask: Is this the best of the alternative strategies available to increase agricultural productivity in Sierra Leone at the time?

An alternative selected by several other donors is to provide grants or loans for area specific or integrated agricultural development schemes. It can be argued, with some strong rationale, that this course of action may have a direct and immediate impact on rural production although experience to date is somewhat inconclusive. Another alternative would be to develop a crop specific program, i.e., rice or cassava production; again persuasive arguments could be made to justify such a proposal.

This recommended activity, the ACRE project, while perhaps not as immediately dramatic and headline catching as the above mentioned alternatives, proposes to address not only the issue of longer term and rationalized, improved rural enterprise mixes involving higher value, more labor intensive practices and crops, but will simultaneously build institutional capability and maturity as well as local skills. This will help assure that the GOSL need not be at the mercy of, or depend on short-term experts' allegations and opinions of, what a proper project or course of action should be for the Sierra Leone rural sector.

It is also possible to examine several alternative strategies for achieving the indicated outputs of this project. In the area of training, the alternatives include the strategy proposed herein, i.e., 1) some training abroad to the M.S. level, some external short-course training, some local in-service training courses, and some on-the-job training working with expatriates from the United States; 2) all training at the local level; or 3) all training abroad.

To actually conduct necessary research, it is proposed that five expatriates, plus short-term consultants, be provided by the ACRE project for periods of up to five years. Alternatives to this strategy would include: 1) more extensive construction of laboratories and purchase of more equipment; 2) support for more training of participants at various levels - B.S., M.S. and Ph.D. - either at home or abroad, with the resulting 5-7 year delay in operations; or 3) the provision of fewer or more technical staff for longer or shorter periods of time.

In the judgment of the design team, each of the above alternatives to the present strategy has one or more flaws. It does not appear to be possible to locally train all participants in the project to the required level of skills. Facilities and expertise do not exist. On the other hand, it is not necessary or economical to train all the required personnel abroad. In-service training can provide some of the needed skills. M.S. degree training will be adequate and no B.S. level training overseas will be sponsored.

The alternative of providing facilities and training for Sierra Leoneans in place of expatriates would delay the start of the farming systems research project and deprive them of on-the-job training that the expatriates would provide. The number of expatriate research staff and the length of time they are provided are based on design team analysis of the needs and how they can be met. Fewer staff would leave important areas unaddressed with probable negative effects on project achievement. More staff would be surplus to needs. The five year time period is considered an absolute minimum and subsequent project evaluations are expected to address the time frame question further.

3.3.3 Impact on Beneficiaries and Income Distribution

It is not possible to determine the economic impact of the project on individual farmer adopters in the prototype areas since the contents of the enterprise mixes are not known. However, since the project is aimed at making the small farmer more productive, there is reason to believe that participating farmers will economically benefit.

New technology is generally adopted initially by a few farmers that are the most innovative. Some alternative means of managing farms that will provide scope for utilizing the managerial abilities of these innovative farmers is needed. The alternative systems include those presently in operation as well as others to be evaluated and tested by the project. Better management in agriculture would increase the efficiency with which the land input is utilized and increase the returns to the smallholders. As a consequence, the income of smallholder families (almost all rural households) would rise and as other farmers learn from the most innovative farmers, new technology and improved farming systems will be adopted, thus offering more attractive on-farm alternatives to off-farm employment and migration to the cities. The labor income from agriculture will

increase, but it is not expected to affect the distribution of income in rural areas. As the income of smallholders rises above that gained from off-farm employment, there will be a tendency for men and women to move back into agriculture from off-farm employment. This will hold the return to labor and management on the farms to the level of off-farm income or possibly somewhat lower if farming is the preferred activity.

The new technology, more efficient enterprise mix, and more efficient use of land and labor will increase the levels of income generally among the population. The project will assist in equal distribution of income.

Of course, the above is predicated on the access of farmers to new technology and the resources required to implement the technology. Credit may be a problem and this will be addressed by the agricultural economics component of the project. The membership of the project steering committee is designed to coordinate and address issues which bear upon project success but which are outside the purview of the project. Membership of the Rice Corporation, Department of Cooperatives, Sierra Leone Produce Marketing Board, and the V.P.'s office is expected to address these ancillary issues as they are identified. The new technologies developed by the project will be widely available to the rural population.

3.4 Social Analysis[3/]

3.4.1 Introduction[4/]

The project purpose is to develop an adaptive crop research and replicable delivery system responsive to the needs of the rural smallholder. These developments

3/ Annex E contains the background information, data and additional discussion of the social issues as presented in this section. We have refrained from reiteration of topics that have been presented elsewhere in the paper.

4/ This social soundness analysis is partially based upon work conducted by the USAID Regional Anthropologist, Dr. Daniel Aronson, REDSO/WA. His work is supported by (a) long familiarity with the published ethnography of the project area and others like it; (b) an on-site study of the project area and areas adjacent to the project; and (c) consultations with experts and officials involved in Sierra Leone agriculture and government.

are designed to benefit rural smallholder families by directly involving them in the implementation of improved adaptive research trials and extension demonstrations on their own holdings. Over 20,000 smallholder families will also directly benefit from the project by receiving mini-kits with improved seeds, technological inputs and knowledge of improved farming practices. Secondary benefits will accrue to (a) peripheral farmers whose participation results from the "demonstration effect"; (b) urban households; and (c) the governmental structure. The latter two will benefit directly through the strengthening of agriculturally-related bureaucracies and indirectly through the increased provision of food surpluses to Freetown and other urban areas. Governmental expenditures for small farmer related activities should increase if project outputs are tangible and cost effective.

This social soundness analysis takes into account the rural social context within which the project will function. It raises possible issues related to individual project components and concludes that issues can be resolved by sensitive project management and personnel. It recommends means of assuring maximum responsiveness to the needs of the beneficiaries. In the judgment of the design team, none of the issues raised here with respect to the relations between the project and the smallholders are serious enough to cause implementation to be delayed nor prevent the full utilization of project outputs.

3.4.2 Project Participants and Beneficiaries

The project areas are predominantly populated by peoples of the Temne and Mende tribes (Rokupr, Makeni and Kabala areas predominantly Temne; Njala and Kenema areas predominantly Mende). Because of the recency of significant changes in the area, the rural society can be described in terms of continuing patterns of "traditional" Temne and Mende culture. With important modifications as noted, project area social, economic and political life are still dominated by institutions successfully adapted to cultural and ecological conditions that have persisted for many years.

The primary contact with smallholders during the first stages of the project is through research/extension aides in the process of assessing the agronomic needs and desires of smallholders and developing a data base from which to evaluate project induced change. Since the research/extension aides will be native to, and live in, their assigned area of responsibility, they quickly become instrumental in

providing the required feed-back to the central research and extension staff of the project.

At subsequent stages of development the central research and extension staff will participate more directly at the farmer/field level. However, the aides remain the primary point of induction between the central project research-extension service and participating farmers. Research trials and extension demonstrations are carried out by farmers on their own land, thus enabling them to become intimately involved in the project. During all stages of project development a continuous dialogue takes place between project staff and participant farming communities to determine steps that can be taken to improve project activities.

The other major point of interaction between the project and the farmer takes place at training. Training programs have been designed to provide frequent and specific periods for farmer feed-back and interaction. At the end of each major element of instruction, time will be alloted in the training schedule for farmers to comment on the subject of instructions and/or program content.

A brief profile of the Sierra Leonean farmer is presented below. From the data one notices the large number of smallholders, the relatively small acreage they cultivate, and the multiplicity of crops cultivated. The existence of a low household income should also be noted.

A. Summary Profile of Sierra Leonean Farmer

1. There are about 286,000 smallholders in Sierra Leone.

2. The average smallholder farms 4.5 acres of land which usually consists of two separate parcels.

3. On one holding a farm family may cultivate as many as 33 different crops (usually in mixed plantings). On the average, one could expect to find from six to 20 different crops grown.

4. Six out of every 100 smallholder heads-of-household are female.

5. The average smallholder is 45 years of age or older. Traditionally, the aged

within a family are respected. All land ownership is attributed to the elder. Only 1.4 percent of land owners are under age twenty-five, indicating that few individuals start or are by custom allowed to start farming at an early age.

6. Seven out of ten smallholders grow rice (either upland or swampland) and six out of ten grow cassava. Only 22 farmers out of a hundred that grow rice have a surplus to sell in the market.

7. About 66 percent of the farmers have excess production of one or more crops. These crops are bartered or sold for cash. To market this surplus produce, 28 percent of the farmers travel at least five miles, but less than ten miles, to market. Another 27 percent travel at least ten miles, but less than 20 miles, to market. About 51 percent of the smallholders will cover this distance on foot, carrying the produce as headloads. The average smallholder who markets produce makes several trips to market (an average of 973 pounds of various foodstuffs), for which approximately 56 Leones (1970/71 prices) is received.

8. The average farm family consists of 7.4 persons (Spencer, 1977). Family size varies in the five project areas: Njala, 6.0; Rokupr, 8.1; Makali, 7.6; Kabala 6.9; and Kenema, 5.4. The average farmer derives his land use rights either through tribal affiliations with a specific tribe and clan or as a member of an extended family unit with established rights on communal land.

9. The average small farmer's productive capability is oriented toward traditional subsistence, shifting cultivation (bush-fallow) systems. Until recently these systems, while not overly productive, have proven to be the most capable

of adjustment to changing ecological, economic, political and social conditions. The farmer is responsive to change leading to economic benefit if government (political-economic) policies are favorable. The farmer is intelligent in spite of the lack of a formal education.

B. Role of Women

Traditionally, women play a crucial role in food production in Sierra Leone. In fact, in some parts of the country, nearly all food production for subsistence purposes is done by women, while the men are occupied with cash crop production. The excess food that women produce provides them with an important source of income since they are often solely responsible for feeding and clothing their children.

The designers of agricultural projects have long ignored the role of women in food production, as well as in other aspects of agricultural production. Extension services have been uniquely oriented towards the male segment of the agricultural labor force. Not coincidentally, extension services have also concentrated primarily on cash crops. Thus, the productivity of men in agriculture has increased, while the productivity of women has stagnated. The implications of a reversal of this trend for food production are enormous.

Credit services in Sierra Leone have also been denied to most women cultivators, largely because it has not occurred to project designers that women might make efficient use of credit. In some areas, proof of possessions or status was a requirement for credit. Also, if signature by the male head-of-household were required, and he had migrated in search of work, the women were denied credit. Alternately, a man may not have been willing to assume responsibility for the credit needs of several wives. Since in polygamous families men and their wives tend to be largely economically independent of each other, it would seem logical that investment opportunities should be offered to both economic entities.

The role of women in agriculture is complex, and constitutes one more element of the complex socio-economic conditions which must be analyzed and dealt with. Women, as an integral part of traditional farm systems, have effects on decisions which appear to have little

relationship to them.

Women in some areas have requested assistance in increasing their productivity in food production. Given the hard work that rural women perform, from carrying water and firewood, to agricultural production in both food and cash crops, to feeding and clothing their children, increasing their efficiency through participation in this project and the results of this project appears to be highly justifiable. Cultural and customary barriers are likely to exist in most areas, if only because it has seldom occurred to project designers or to government officials to address the agricultural production role of women.

This project is designed to take special cognizance of the role of women in agricultural development (see detailed project description). Prospective contractors are encouraged to actively recruit women for staffing positions and project staff will be evaluated against their success in seeing that women truly benefit from project innovations and extension activities.

3.4.3 Replicability and Spread Effects

Traditional agriculture on relatively small-scale, labor-intensive holdings, at present low levels of productivity, is considered to be a low status occupation. Those who have the option of mobility through education or other means tend to leave the traditional farm sector. They migrate to urban areas where they are usually under or unemployed for considerable periods in expectation of full wage employment. Agriculture has not been absorbing its potential of the increase in the total labor force. In fact, the rural areas are releasing labor at higher rates than the urban areas can absorb.

This migratory trend has serious implications for national efforts to meet the expanding demand for agricultural products. By helping the small-scale farmers to increase their real income the project may help to demonstrate that small-scale farming can provide a viable employment alternative. In addition, it is anticipated that the increased use of improved practices and intermediate technologies will increase the productivity of the factors of production and provide incentives to expand the average acreage cultivated. Thus, farm incomes on small holdings may become comparable to those earned by semi-skilled urban dwellers. Such a shift in the structure of small farming will contribute to improving the quality

of life in the rural areas and help stem the present high rates of rural-urban migration.

Social and agronomic spread effects are expected to occur on both individual and collective levels. On an individual basis, spread effects will stem directly from increases in food production, hence in consumption and income, for small farm families. Social spread effects on a collective level will stem from 1) increases in national food production, which should decrease the level of food imports; 2) improvements in income distribution as rural sector incomes increase; and 3) improvements in the quality of life in the rural and urban sectors as incomes and consumption increase. The project may also impact on the rural-urban migration rate through the expansion of off-farm income-earning opportunities in rural areas.

On the national level, Sierra Leone is culturally, politically and economically homogeneous enough to encourage maximum spread of the benefits from this project. The project will be socially in tune with the existing social structure and it will make a positive impact on the under-privileged within the smallholder rural population.

3.5 Financial Analysis and Plan[5/]

3.5.1 Development Budget Analysis of MANR

The 1977/78 approved development budget estimates for the MANR from both domestic and foreign sources total slightly more than $14.6 million compared to $9.5 million in 1976/77. This amounts to roughly 28 percent of the total GOSL estimated development expenditure. Within the MANR total the largest share (94 percent) is for the Division of Agriculture under which fall all crop research and extension activities. The total allocation for research in the Division of Agriculture is approximately $120,000.

Because local cost support is provided, the adaptive crop research and extension project activities will add little to the MANR recurrent development budget during the first few years of this project. The majority of recurrent expenditures will be primarily for personnel costs. However, by the end of the project it is estimated that the increased demands on the MANR budget (as the MANR takes over the ACRE Center) will be in excess of $200,000, or 66 percent higher than current research expenditures.

5/ See Annex D for supplementary details to the project financial analysis and plan.

While in percentage terms this represents a substantial increase, as a proportion of the total MANR budget, the amount is still small. It is the design team's judgment, given the GOSL interest in the proposed project, that the MANR will make the necessary funds available. The project strategy of providing decreasing amounts of AID funded local financing will condition the MANR to assume the required financing responsibilities.

In addition to direct expenditures on research, as project-developed cropping systems are replicated, substantial expenditures for extension will also be necessary. A good share of these funds will be a reallocation of existing funds as outside systems (non-ACRE) are blended into the MANR programs. Nevertheless, some additional funds may be required. The willingness and capability of the MANR/GOSL to provide the funding for systems replication will undoubtedly depend on the benefits which GOSL officials perceive as being derived from the ACRE project. Since the project is predicated on the belief and expectation that more productive systems can and will be developed, it is reasonable to believe that funding for the extension of improved systems (benefit-producing) would be forthcoming, i.e., money will be made available to a successful operation.

3.5.2 Financial Plan/Budget Tables

The following three tables present the financial plan and budget for the ACRE project.

TABLE 3-2 SUMMARY COST ESTIMATE AND FINANCIAL PLAN (US$1,000)

	USAID		GOSL		Total		TOTAL
	FX	LC	FX	LC	FX	LC	
Personnel	3,737	-	-	1,382	3,737	1,382	5,119
Training	454	-	-	-	454	-	454
Commodities	525	216	-	145	525	361	886
Construction, Land and Civil Works	-	735	-	1,007	-	1,742	1,742
Support Funds and Other Costs	-	415	-	493	-	908	908
TOTAL	* 4, 716	*1,366	-	3,027	4,716	4,393	** 9,127

USAID Total Rounded up to 6,100 ** Total project increased to 9,127.

TABLE 3-3 COSTING OF PROJECT OUTPUTS/INPUTS
(US $1,000)
PROJECT YEAR BASIS

Project Inputs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
			Project Outputs			
USAID						
Personnel	939	732	762	853	451	3,737
Participant Training	162	149	143	---	---	454
Commodities	190	196.5	206.5	111.5	36.5	741
Construction	415	170	100	50	---	735
Support/Other	65	120	110	80	40	415
Sub-Total	1,771	1,367.5	1,321.5	1,094.5	527.5	* 6,082
GOSL						
Personnel	212	252.3	277.1	304.8	335.1	1,382
Commodities	16	18.5	23.5	33.5	53.5	145
Land and Civil Works	417	125	---	---	---	542
Support/Other	68	73	90	111	151	493
Construction	465	-	-	-	-	465
Sub-Total	1,178	468.8	390.6	449.3	539.6	3,027
TOTAL	2,945	1,836.3	1,712.1	1,543.8	1,067.1 **	9,109

* Rounded up to 6,100
** Increased to 9,127

CHAPTER FOUR

IMPLEMENTATION

4.1 Administrative Arrangements

4.1.1 General

The Ministry of Agriculture and Natural Resources (MANR) and the Njala University College (NUC) are GOSL agencies directly involved in crop research and extension activities in Sierra Leone. Their commitment to improving the social and economic well-being of small farmers is evidenced by the size and number of on-going developmental activities: integrated agriculture projects, rice production and seed multiplication schemes, agricultural extension training, rice research, agricultural extension, and agricultural education.

The criteria for selecting the MANR and the NUC as the GOSL's implementing agents for the ACRE project gives recognition to their staff competence, current participation in agricultural research and extension, the administrative necessity for a close working relationship between them, the capability to manage, implement and coordinate the project components, and the expected budgetary economies affected through more effective utilization of existing GOSL staff and facilities. Training programs have been incorporated into the project to assure that needed manpower is available as the project expands. Training will also ensure that effective linkages exist between the adaptive research and the extension effort after termination of the project.

The MANR bears responsibility for the planning and implementation of agricultural development programs and projects in Sierra Leone. It falls under the overall direction, supervision and control of a Minister, supported by a career civil servant, the Permanent Secretary (PS). Operationally, it consists of four divisions (agriculture, fisheries, forestry, and veterinary), each headed by a Division Chief. In addition to these four divisions, the MANR organization[1/] includes six administrative and/or support units (planning, development projects, project

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1/ See Annex F for elaboration of the GOSL Organizations.

evaluation, agricultural research, publicity, and administration-accounts).

The Chief Agriculturalist is responsible for the technical linkage between the MANR and the field staff. Each agricultural region is directed by a Principal Agricultural Officer (PAO), supported by several Agricultural Officers (AO's). The AO's subsequently supervise Agricultural Instructors and/or Agro-Technicians (called research/extension technicians or workers in this project) who in turn provide the primary contact to rural smallholders. The Chief Agriculturalist also is responsible at the national level for the Rokupr Rice Research Station and several agricultural research sub-stations. These stations will directly or indirectly participate in the ACRE project.

The NUC, under the Ministry of Education, bears responsibility for the planning and implementation of agricultural education programs and training support to agricultural research and extension programs in Sierra Leone. Organizationally, the NUC falls under the overall direction, supervision and control of a Principal, supported by a Dean for each of the two faculties (agriculture and education)

In a collaborative program with the Division of Agriculture of the MANR, the training of professionals and sub-professionals at degree and certificate levels is being carried out at the NUC. This joint effort was established in January 1976 and is making a positive contribution toward the provision of trained agriculture personnel. It represents a concrete example of the increasing cooperation between the MANR and the NUC in agricultural development.

4.1.2 Project Organization

Because implementation of the project involves inputs by several independent agencies, special measures have been taken at the national and project levels to ensure coordination. Direct responsibility for project implementation at the national level will rest with the MANR and the NUC (MOE). Program documents will be signed jointly by the Ministers of the MANR and the MOE (or in the case of the MOE, possibly the Principal of NUC). The Permanent Secretary of the MANR and the Principal of the NUC will provide policy guidance on a continuing basis. The Chief Agriculturalist of the MANR and the Dean of Agriculture at Njala University College will provide working technical and project level guidance to insure

coordination of GOSL support for the project at the national and provincial levels. This arrangement will ensure that project activities are coordinated.

Because the implementation of the project involves coordination and indirect support from several GOSL agencies outside the MANR and the NUC (e.g., S.L. Produce Marketing Board, Rice Corporation, credit institions), the Office of the Vice-President has concurred in the establishment of a special, though informal, relationship with the project.

A. Executive Steering Committee

At the national level, a project executive steering committee will be formally established. This committee will be co-chaired by the Permanent Secretary of the MANR and the Principal of the NUC. It will analyze the implications of national-level policy and make decisions with respect to the implementation of the project. The committee will ensure adequate levels of on-going technical, logistical and budgetary support to the project. It will meet quarterly to review progress, to review and approve work plans, and to address any important problems or policy issues which have arisen. The committee will include representatives of the GOSL agencies whose operations have a direct or indirect effect on the success of the project. Members of the executive steering committee will include:

- Permanent Secretary, Ministry of Agriculture and Natural Resources (Co-Chairman)
- Principal, Njala University College (Co-Chairman)
- Agricultural Advisor, Office of the Vice-Presidency
- Development Secretary, Ministry of Development and Economic Planning
- Permanent Secretary, Ministry of Trade and Industry
- Permanent Secretary, Ministry of Finance
- Permanent Secretary, Ministry of Education

- Agricultural Development Officer, United States Agency for International Development (Sierra Leone)

Resource persons and organizations available as advisors to the Executive Steering Committee will include:

- Chief Agriculturalist, MANR
- Principal Agricultural Officers, MANR
- Rokupr Research Station Director, MANR
- UK-ODM Extension Training Coordinator, MANR
- German Seed Multiplication Team Leader, MANR
- WARDA Team Leader, MANR
- UNDP Rokupr Team Leader, MANR
- Land Resources Survey Team Leader, MANR
- IADP Managers, MANR
- Agriculture Education Officer, MOE
- Dean of Agriculture, NUC/MOE
- Department Chairmen, NUC
- Cooperatives Department, MOTI
- Sierra Leone Produce Marketing Board, MOTI
- Rice Corporation, MOTI
- National Development Bank
- Paramount Chiefs
- Project Director
- Research Coordinator, ACRE
- Extension Coordinator, ACRE
- USAID Team Leader, ACRE

B. ACRE Center

As detailed in chapter two of this project paper, the headquarters for the ACRE project will be located on a plot of land adjacent to the NUC. The integrated nature of the project requires that the center be established as a semi-autonomous organization instead of being directly responsible to either the MANR or the MOE.

Professionals and staff from the MANR and the NUC will fill most of the project positions. Where suitably qualified personnel are not available, they will be recruited by the MANR and the NUC for assignment to the project. This policy will assure maximum use of the existing staffs and provide for a structural on-going linkage between the two GOSL implementing agencies. It will also encourage continuity of those institutional arrangements which have proven effective.

1. Administration

The project Director will be stationed at the Njala center and will be responsible for all GOSL operations and staff within the project area. In collaboration with the research coordinator and the extension coordinator, the director will be responsible for the disbursement of GOSL project funds and the hiring and dismissal of Sierra Leone project staff. Other areas of responsibility are to ensure:

a. That project staff are properly trained and their work appropriately supervised at all levels;

b. Development of a comprehensive management system in collaboration with the research and extension coordinators;

c. That adequate formal communications take place between the research and extension components of the project and that informal communication channels remain open and effective; and

d. That effective two-way communications exist between the project staff at all levels and the rural smallholders.

The project director will also be responsible for maintaining a dialogue with province, chiefdom, and town officials in the project area. In this

context, and in collaboration with the research and extension coordinators, the director will clearly indicate the project purposes and functions in the extension areas.

Staff assigned to the project will include an Administrative Officer, who will report directly to the project director. This officer will be responsible for fiscal operations and control, budgeting, accounting, and reporting; personnel matters for the project; property management and other administrative matters, e.g. a contract for vehicle maintenance will be drawn up with the NUC motor-pool.

2. Research and Extension

The Research Coordinator and the Extension Coordinator will also be located at the Njala center. They will provide technical direction and support to the respective research and extension staff assigned, secunded or adjunct to the project. These responsibilities will include developing operation plans and directing the conduct of research and extension activities which include personnel activities, project-wide research and extension training programs, identification and subsequent management of equipment, supplies, and logistical support for the project research and extension staff.

Off-site research and extension activities will be coordinated through the existing Principal Agricultural Officers and Agricultural Officers located in areas designated for project field activities. Their primary responsibilities to the project will initially involve the supervision of research and extension operations in their respective areas. They will receive training during the initial stages of project development. Their orientation will include training in management, on-farm research trials, on-farm extension trials, marketing/credit and data collection/analysis. By the end of the project, it is planned that they will absorb full responsibility for all adaptive crop research and extension activities at the field level.

Project liaison with small farmers conducting on-farm research and extension trials will be provided through 30 Research/Extension Technicians assigned to the project. The technicians will report directly to the agricultural officer in charge of their areas. They will be responsible for developing and keeping open an effective two-way channel of communication between the participating smallholders and the center's research

and extension staff. They will receive training in on-farm adaptive research trials, on-farm extension trials, marketing/credit and data collection.

3. USAID Responsibilities

USAID Liberia has designated its Agricultural Development Officer (ADO) stationed in Freetown as responsible for ACRE project monitoring/backstop activities. The ADO will be responsible for:

- Monitoring/evaluation of the project operations;
- Ensuring that management of USAID resources is satisfactory and provided on a timely basis;
- Assisting in the maintenance of liaison with contractors and with host country officials;
- Providing advice and assistance on matters pertaining to the project grant procedures;
- Conducting consultations and negotiations with host country officials on project implementation matters (project agreements, purchase orders, participant training programs).

The ADO and representative(s) of the GOSL will participate in contractor pre-selection and assist the team with their integration into Sierra Leonean society. The ADO will serve as the primary contact for the contractor Chief-of-Party or team leader and be responsible for identifying problems and obtaining necessary decisions from the responsible AID offices on contract and project matters.

4.1.3 Technical Assistance Contractor

To put the necessary technical assistance team in the Field several alternative contracting possibilities exist. A contract with a private U.S. firm or university is a possibility, a Participating Agency Service Agreement (PASA) with USDA, a contract with an international research institution such as IITA is a third possibility, and some combination of the first three is a fourth option. It appears that the most appropriate option is to have a single or a consortium of authorized Title XII institutions and a sub-contract with one or more interantional research centers. The most obvious

international center is the International Institute for Tropical Agriculture (IITA) in Ibadan. Suggested universities are the University of Florida (tropical crops and research administration), North Carolina State University (tropical soils fertility and management), Michigan State University (agricultural economics/farm management in Sierra Leone), and the University of Wisconsin (soils research-extension).

An umbrella contract would assure full coverage of technical project activities. If it were decided to go this route it would be necessary, because of the nature of this project, to make every effort to include a sub-contract with IITA so that its expertise in West African soils, farming systems, crop research, and training activities will be effectively integrated into the ACRE project. Our predisposition toward the Title XII option is based on a number of considerations. Because of the phased nature of the project, the range of skills required, and the probable need for specialized consulting skills on an irregular basis, a backstopping capability of a large pool of skilled and specialized manpower will be required. Based on past experience, it is doubtful that private firms have either the large pool of manpower from which to draw nor do they normally provide the range of backstopping services which will be necessary. The non-IITA international research institutes might have the range of skills available, but they would be relatively unfamiliar with the peculiarities of the West African and particularly the Sierra Leone environment. The USDA, the most logical PASA choice, could probably provide the skills required but would almost certainly need to recruit personnel from outside sources.

Perhaps most important, to USAID and the GOSL, is the need to provide for a structural, on-going linkage between the implementing agency and the GOSL. It is believed that a consortium of Title XII institutions would provide the greatest long-term benefits to the Sierra Leone farmers and the GOSL. Possible problems with university contracts include staff continuity; "academic" staff would not like to be away more than two years and the predeliction of universities for "academic research" as opposed to actual implementation of an operational small farmer oriented program. It is suggested that a Memorandum of Understanding between the chosen contractor and the GOSL be used to facilitate a thorough understanding of the project by all parties. Contractor project proposals will nominate team members by name; downstream substantial

deviation from the published list may be grounds for contract cancellation.

Due to the complexity of the project, the fact that most Land or Sea Grant universities can not legally contract directly with foreign governments and the fact that this will initiate bi-lateral assistance to Sierra Leone, an AID contract is anticipated. The normal USAID competitive procedures will be followed in selecting the contractor. As collaboration between the GOSL and USAID will be essential in selecting a contractor for the project, provision will be made for representatives of the GOSL and the USAID agricultural development officer to directly participate in contractor pre-selection. This will include interviews with prospective team members at U.S. institutions and IITA. Provision will also be made for a project familiarization visit to Sierra Leone and IITA by the prospective contract team leader prior to final selection of the contract team.

The contract team will consist of five full time staff and be augmented with short term consultant services. The chief of party for the contract team will be the counterpart to the Sierra Leonean project director, the other technicians will be responsible directly to the research and extension coordinators who are, in turn, responsible to the project director. The four technicians (agricultural economist, soils scientist, crops specialist and extension agronomist) will be the counterparts to the center's, primarily adjunct, research and extension staff. These counterparts will be professors at the NUC, whose research responsibilities will be directed and funded by the ACRE project, staff at Rokupr and the sub-stations and the MANR Agriculture Officers. Together with their counterparts, they will direct the field activities and conduct the in-service training for the research/extension aides.

AID strongly encourages the use in this activity of minorities and women both as contracting or subcontracting firms and institutions and as individuals. Thus, the contractor is expected to carry out a positive program to identify and use such organizations and persons to the fullest possible extent.

4.2 Implementation Plan

The following analysis is based on reasonable implementation expectations and is divided into four discrete and identifiable segments of project activities.

4.2.1 Project Start-Up, Pre-Contract Activities

Approval of this PP is anticipated by August 1978. USAID intends to initiate the project as soon as possible in order to allow sufficient time for contracting, commodity procurement, and construction. It is important that the start-up schedule be met if project activities are to be undertaken during the year's crop cycle. USAID is requesting authorization to obligate the project in FY 1978.

4.2.2 Implementation Schedule

A. Phase I

This phase will be the period of time between the signing of the initial Project Agreement (ProAg) and the arrival of the technical assistance team. Once the ProAg is signed, representatives from USAID and the GOSL will travel to the U.S. and to IITA for purposes of meeting candidates and contractor pre-selection activities.

After the ProAg has been signed, the GOSL will establish the executive steering committee and appoint the project director. The project director will also be located at the Njala center. The director will serve as the staff arm of the executive steering committee, will be responsible to the committee for implementation of the project and will have overall responsibility to implement and monitor the project.

The project director will begin immediately to recruit the additional members of the headquarters staff and begin coordination with and selection of, the field staff assigned to the project. The executive steering committee will meet at least once prior to arrival of U.S. technicians, and will establish the policy guidelines and recurrent budget necessary for the development of the project implementation plans. Selection of initial participant trainees to the U.S. will also be completed and the names of participants provided to USAID for processing.

Before the arrival of the U.S. contractor technicians, the NUC will arrange for their housing and support at the Njala location. Adequate housing must be available for the

project staff (U.S. and Sierra Leone) prior to their arrival at the headquarters site. Within two months of the signing of the ProAg, the project will contract with an architectural and engineering firm (A&E) who will:

- Design a program for the required project construction. Prepare any additional drawings and specifications not previously prepared by the NUC.

- Prepare bid documents, set contractor selection criteria, and recommend a contractor.

- Supervise construction.

REDSO/WA will negotiate and prepare a contract for the services of a local or a locally based United States A&E firm.

In order to ensure adequate mobility for the team when they commence operations, it will also be necessary to obtain five vehicles prior to the team's arrival in Sierra Leone. Delivery of the vehicles procured from the U.S. would require up to 18 months; therefore, REDSO will try to procure vehicles locally if possible, through outlets in Freetown and Monrovia (whichever cheaper). The project will provide operational funding for these vehicles.

REDSO and the project director will be responsible for initiating procurement action for supplies and equipment essential to the "start-up" phase of the project. This will include a complete reconnaissance land system map of Sierra Leone, compiled by the MANR land resources survey team. They will also provide an indicative land use potential map for four major land types and three management levels. After the project begins, requests will be made to conduct more specific surveys/studies in the fields of hydrology, agro-climatology, land use, and vegetation.

With adequate housing, transportation, and supplies available, it will be then possible for the team to begin effective operations in the Field.

B. Phase II

This is considered to be the "start-up" phase. The full-time technical assistance team will arrive. In addition to conducting routine administrative and

logistic matters relative to project start-up, the project staff (Sierra Leonean and contractors) will be engaged in the following activities:

- Assimilation of land resources survey maps of the project area;
- Survey of the project area to gather the extension baseline data (including familiarization, analysis and continuity);
- Familiarization with the project field areas, initiation of contacts with extension personnel and smallholders in project areas;
- Coordination and familiarization with MANR and NUC divisions and projects;
- Coordination and arrival of consultant technical staff as needed;
- Training of project staff;
- Prepare smallholders and project research/extension technicians for on-farm research trials;
- Initiation of on-farm research trials;
- Collection of existing data and continuation of analysis;
- Identification and procurement of project commodities;
- Participant training actions;
- Procurement of technical publications; and
- Preparation and approval of annual work plans and budget.

C. Phase III

This period will be one of intensive field work for the technical staff. During this phase the project will address the basic problem of securing additional information through research tests, surveys and analysis of on-farm trials. Activities by the GOSL, USAID and the contractor team will include:

- Coordination and arrival of consultant technical staff as needed;

- Annual review and evaluation of project strategy and performance;

- Continuation of detailed analyses of project area by the Land Resources Survey;

- Continuation of on-farm research trials;

- Initiation of on-farm extension demonstrations;

- Preparation and approval of annual work plans and budget;

- Continuation of staff training;

- Agronomic, economic and social analyses of most effective replicable delivery and cultivation practices/techniques made; and

- Executive steering committee approval of staff recommendations.

While specific project activities described above are carried out, the following GOSL activities will be started and/or continued:

- Selection of participant trainees; and

- Establishment of role and responsibilities of other GOSL support in project areas.

Routine AID-contractor actions will continue such as:

- Internal coordination with the GOSL;

- Preparation and approval of annual work plans and budgets;

- Processing of participant trainees; and

- Purchases of supplies and equipment for project operations.

A major external evaluation is scheduled during Phase III.

D. Phase IV

The final phase of this project will be the period when testing of further advanced cropping and replicable delivery system concepts will be completely operational. Staff will continue day-to-day field involvement. Research data will be analyzed to assure accurate appraisals of the impact of project activities on smallholder real income, changes in cultural patterns of project farm families, and impact on the environment. Research results cleared by the executive steering committee will be used in the extension demonstrations.

During the last six months of Phase IV preparation for the continued development of replicable delivery and cropping systems beyond the life of the project will be planned and implemented. The program, drawing on the project's experience, will spell out the procedures and methodologies for adapting project results to other areas of the country and for the continuation of adaptive research and research coordination activities.

A final project evaluation with the participation of all project staff and USAID is scheduled during this phase.

4.2.3 Implementation Dates Activity Sequence

The following are estimated dates for major project events:

MONTH	EVENT	RESPONSIBLE ORGANIZATION
12/77	PP Completed	GOSL, USAID
*0	PP Approved	AID/W
1	ProAg, PIOs Signed	GOSL, AID/SL
2	Phase I	--
2	A&E Work Begins	GOSL, REDSO
5	Construction Starts	GOSL, REDSO
6	GOSL Project Director Assigned	GOSL
6	Initial Commodity Procurement	GOSL, REDSO

*0 = August 1978

MONTH	EVENT	RESPONSIBLE ORGANIZATION
7	Technical Assistance Contract Signed	AID/W, Contractor
11	Construction Completed	GOSL, REDSO
12	U.S. Technicians on Board	AID/W, AID/SL
12	Phase II	--
12	Commodity Procurement Continues	GOSL, REDSO
13	Field Staff Training Begins	GOSL, AID/SL
13	Additional Smallholder Contacts	GOSL, Contractor
13	Initiation of Research Trials	GOSL, Contractor
14	Phase III	--
14	Internal Evaluation Summary	GOSL, AID/SL, Contractor
14	Initiation of Extension Demonstrations	GOSL, Contractor
26	Internal Evaluation Summary	GOSL, AID/SL, Contractor
36	External Evaluation	AID/W, Contractor, GOSL, AID/SL
36	Phase IV	--
48	Internal Evaluation Summary	GOSL, AID/SL, Contractor
60	External Evaluation	AID/W, Contractor, GOSL, AID/SL
60	Contractor Departure	Contractor, AID/SL, AID/W
	Post Project	
84	Post Project Evaluation	AID/W, Contractor, GOSL, AID/SL

4.3 Evaluation Plan

A four-category evaluation system will be adopted to review project progress:

- Formative (on-going) evaluation
- A major Mid-project evaluation
- End of project evaluation

4.3.1 The Formative Evaluation

Internal-continuing project evaluations will be carried out every six months by the contractor's evaluation officer. The purpose of these month-long evaluations will be to reexamine project strategy and to assess actual performance against planned performance as presented in the logical framework and as presented in the implementation plan. Based on the results of these evaluations, which will be reviewed by the executive steering committee, corrective action will be identified. These actions will be reflected in the annual work plans to be prepared by the project team and approved by the executive steering committee. The contractor will appoint one member of its home staff as Evaluation Officer. This individual will make two visits a year to Sierra Leone for the purpose of evaluating the project and activating remedial action by the GOSL, USAID, and the contract team. The evaluation officer will be expected to be the same individual for at least the first three years of the project.

4.3.2 Mid-Project Evaluation

The mid-project evaluation will be conducted at the end of year three. It will be undertaken by a combined team representing, at a minimum, the MANR, NUC, AID/SL, the contractor and an outside consultant. Based on the results of this major evaluation, adjustments will be made as necessary and agreed upon by AID/SL and the GOSL in the basic project design for the final two years of the project. This evaluation will cover all aspects of the project including strategy, approach, implementation and financing. Beginning one month prior to this evaluation, the project staff will: (1) organize data and analyses produced for the previous evaluations into a format that will facilitate use by the evaluation team; and (2) attempt to foresee special information needs of the evaluation team and collect this information for its use.

As in the annual evaluations, the first task of the evaluation team will be to assess actual performance against planned performance. The next task will be a reassessment of the project's environment. It is here that the information necessary to discern causality for performance achievement (or lack thereof) will be obtained.

The evaluation team will reassess the project hypotheses, i.e., the input, output, purpose, goal linkages. The evaluation team will present its findings, conclusions and recommendations to the executive steering committee and USAID for decisions regarding changes in the project objectives and/or strategy. The evaluation is divided into the following functions:

- Descriptive: Level of performance and state of environment;

- Diagnostic: Why objectives were or were not achieved as planned;

- Prognostic: What achievements can be expected with or without changing strategy (level and type of inputs); and

- Prescriptive: What changes should be made.

4.3.3 End of Project Evaluation

This evaluation will be a comprehensive technical, financial, social and economic analysis of the project, matched against project objectives to measure the extent to which project outputs, purpose and goal have been achieved. It will assess causality and analyze the replicability of the project strategy and operations. The approach, methodology, and composition of the evaluation team will be much the same as that of the mid-project evaluation.

4.4 Covenants

The following special covenants are recommended in addition to those normally included in the project agreement.

4.4.1 Establishment of the Executive Steering Committee

The GOSL shall covenant to take action to formally establish the executive steering committee as

described in this project paper (2.2.1 and 4.1.2.A). The document officially establishing this committee shall indicate the minimum number of times it shall meet each year and the circumstances under which special meetings may be called.

4.4.2 Establishment of a Special Account

The GOSL shall covenant to establish a special account through which all GOSL project expenditures shall flow. Such an account will be set up at a banking facility in Freetown which would provide periodic banking services within the project area. The ProAg will clearly indicate the terms and conditions for use of the project funds and the responsible signators on payment vouchers. The agreement will provide for periodic replenishment of the account in accordance with financial requirements of the project. The ProAg will also include the conditions under which changes in the size of the account may occur to meet unexpected project costs. In addition to MANR and NUC expenditures for salaries (Table D-6) and other project related costs, GOSL deposits to the special project account are expected to flow as indicated below.

Project Year	Special Account Deposits
1	$ 141,000
2	$ 92,000
3	$ 114,000
4	$ 145,000
5	$ 205,000

4.4.3 Project Organization and Authority

The GOSL shall covenant to formally approve the proposed organizational structure, staffing pattern, functions, and delegations of authority for the project. In accordance with verbal agreements with the MANR and Permanent Secretary and the NUC Principal, the project director shall be given responsibility for all project operations in the project area related to research and extension. Men and women shall be provided equal opportunity to participate in all positions and activities of the project.

4.4.4 Electrical, Water, and Sewage Systems

The GOSL shall covenant to insure that the Njala headquarters and the ACRE Center are serviced with adequate utilities (electrical, water, and sewage distribution systems) as part of the Njala University Colleg infrastructure. The GOSL shall also covenant to insure that the project facilities at Rokupr are serviced with adequate utilities (electrical, water, and sewage distribution systems) as part of the Rokupr Rice Research Station infrastructure.

ANNEXES

A. LOGICAL FRAMEWORK MATRIX

* B. PROJECT BACKGROUND SUPPLEMENT: NATURAL AND HUMAN PHENOMENA

* C. PROJECT TECHNICAL ANALYSIS SUPPLEMENT

* D. PROJECT FINANCIAL PLAN SUPPLEMENT

* E. PROJECT SOCIAL ANALYSIS SUPPLEMENT

* F. PROJECT ORGANIZATION SUPPLEMENT

G. GRANTEE'S REQUEST FOR ASSISTANCE

* H. PID APPROVAL

I. INITIAL ENVIRONMENTAL EXAMINATION

J. 611(e) CERTIFICATION

* K. WAIVERS

L. PROJECT CHECKLIST

* M. SELECTED REFERENCES

* On file in AFR/DR/CAWARAP

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Project Title & Number: Adaptive Crop Research & Extension (ACRE)
636-0102

Life of Project:
From FY 1978 to FY 1983
Total U.S. Funding $6.1 million
Date prepared: December 1977

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector GOAL: The objective to which this project contributes:	Measures of GOAL Achievement:		Assumption for achieving GOAL targets:
Increased smallholder productivity	1. Per capita increases in production	GOSL and Project Surveys and Evaluations	Project goal is in the GOSL national and political-economic interest.
	2. Per capita net income increases from agricultural and agriculturally related enterprises.	National and import/export accounts.	
Project Purpose:	Conditions that will indicate purpose has been achieved: End of Project Status		Assumptions for achieving purposes:
Develop a food crop adaptive research and extension system responsive to the needs of rural smallholders.	1. Rural smallholders actively involved in the adaptive research and extension process, through delivery and feedback via the extension mechanism.	Annual Report RRRS and MANR: on-site inspection.	WARDA and/or UNDP will continue its involvement with rice in Sierra Leone.
	2. 20,000 farm families directly benefit from improved seed/plant materials, production techniques and storage/marketing techniques.	Records of research coordinator and RRRS. Interviews with extension personnel; records of RRRS.	UK-ODM support to extension training will be effectively implemented at all levels. The GOSL will fund and support any necessary extension/expansion of the system.
	3. Permanent linkages established between the GOSL research/extension system and international tropical agriculture research institutions such as IITA and appropriate American universities.	Annual reports of extension service; interviews; on-site inspection.	No serious socio-cultural and political roadblocks to change/modification.
	4. Long-range food crop research and extension plan/strategy completed and accepted.	Output of plant material production unit; sample survey of smallholders.	Sufficient improved technology/plant material/seed exist to support outreach materials at projected levels. Sufficient market & personal incentives exist to include farmer adoption of improved techniques & plant materials.

Outputs:	Magnitudes of Outputs:		Assumptions for achieving outputs:
1. Sierra Leoneans trained in food crop adaptive research & extension.	1. 28 Sierra Leoneans trained in: (4) Soils (4) Upland crop production (4) Agriculture economics (4) Extension agronomy (4) Plant path., weed control, etc. (3) Rural sociology (2) Vegetable production (2) Cropping systems (1) Intermediate technology	1. Record-Reports	IITA and other international research centers will supplement local seed supplies and plant materials.
2. Seed/plant materials transferred on regular basis to newly started research trial plots.	2. Adaptive research trials at 50 on-farm sites and cropping system analysis at 20 diversified farm sites.	2. Records & inspection	Qualified Sierra Leoneans available for training.
3. Research assistantship programs established for senior and/or graduate students at NUC.	3. 9 students-(3 each) in grains, root crops, vegetable crops.	3. Records of MANR & NUC.	Marketing and price policies will create financial environments supportive of cropping systems modification.
4. Long-range research & extension plan/strategy completed and formalized.	4. One 10-year country wide research/extension plan completed and accepted by GOSL.	4. Records-Reports.	Sierra Leone has financial resources to support GOSL costs of implementation
			Alternative or complementary cropping options developed are sensitive to the management ability of small farmers and protective of the environment.
			MANR and NUC can coordinate ag research activities.

Inputs:	Implementation target target (type and qty.)		Assumption for providing inputs:
A. USAID - $6.1	A.		Inputs are ordered and arrive in timely fashion.
1. Technicians			
a. Team Leader	a. 60 person months	Project documentation	
b. Crops Specialist	b. 48 person months		
c. Agricultural Economist	c. 48 person months	USAID documentation	
d. Soil Scientist	d. 48 person months		
e. Extension Agronomist	e. 60 person months	MANR, NUC documentation	
f. Evaluation Officer	f. 10 person months		
g. Short-term Consultants	g. 72 person months		
2. Vehicles	2. 5-4 WHD; 2 Sedan; 70 motorcycles		
3. Housing	3. 8 houses		
4. Laboratory	4. 1 soils lab, 1 crop building		
5. Office/Work area	5. Small office, field shed		
6. Support Funds	6. Miscellaneous		
B. GOSL - $3.0 million	B.		
1. Staff			
a. Project director	a. 60 person months		
b. Admin. Officer (AID funded)	b. 60 person months		
c. Research Coordinator	c. 60 person months		
d. Extension Coordinator	d. 60 person months		
e. Extension Aids (Ag Techs)	e. 150 person months		
f. Adjunct Staff	f. Miscellaneous		
2. Land	2-7. SEE PROJECT PAPER		
3. Existing research facilities			
4. Trust fund			
5. Participants			
6. Equipment			
7. Utilities			
8. Housing			

Annex B

Project Background Supplement

Natural and Human Phenomena

(on file in AFR/DR/CAWARAP)

Annex C

Project Technical Analysis Supplement

(on file in AFR/DR/CAWARAP)

Annex D

Project Financial Plan Supplement

(on file in AFR/DR/CAWARAP)

Annex E

Project Social Analysis Supplement

(on file in AFR/DR/CAWARAP)

Annex F

Project Organization Supplement

(on file in AFR/DR/CAWARAP)

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

PAGE 01 FREETO 02154 071535Z
ACTION AID-59

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AIDAC

ANNEX G

EO 11652: NA
TAGS: NA
SUBJ: SIERRA LEONE: ADAPTIVE CROP RESEARCH AND EXTENSION (ACRE) PROJECT 636-0102

REF: STATE 160470

1. AMBASSADOR HAS RECEIVED FOLLOWING UPDATED REQUEST FOR ASSISTANCE, DATED JULY 7, 1978, FROM P.J. KUYEMBEH, DEVELOPMENT SECRETARY, IN THE MINISTRY OF DEVELOPMENT AND ECONOMIC PLANNING:

2. QUOTE. AS YOU ARE AWARE, DISCUSSIONS HAVE TAKEN PLACE OVER THE PAST TWO YEARS BETWEEN MINISTRY OF AGRICULTURE AND NATURAL RESOURCES, NJALA UNIVERSITY COLLEGE AND AID REGARDING THE ESTABLISHMENT OF A PROJECT TO DEVELOP A FOOD CROP ADAPTIVE RESEARCH AND REPLICABLE TECHNOLOGY DELIVERY SYSTEM RESPONSIVE TO THE NEEDS OF OUR SMALL FARMERS.

3. THESE DISCUSSIONS PRIMARILY AT THE TECHNICAL LEVEL HAVE RESULTED IN A PAPER ENTITLED ADAPTIVE CROP RESEARCH AND EXTENSION (ACRE) WHICH DESCRIBES A COOPERATIVE EFFORT BETWEEN THE GOVERNMENT OF SIERRA LEONE AND YOUR GOVERNMENT TO ACHIEVE THIS OBJECTIVE. MINISTRY OF AGRICULTURE AND NATURAL RESOURCES AND MINISTRY OF EDUCATION HAVE EXPRESSED ENTHUSIASM AND CONFIDENCE THAT THE INTER-MINISTERIAL COOPERATION OUTLINED IN THE PAPER WILL PROVIDE THE NECESSARY DEVELOPMENT SUPPORT IN FULFILLING CRITICAL NEEDS OF THE RURAL MASSES AT THE VILLAGE LEVEL.

4. BASED ON THE FINDINGS AND RECOMMENDATIONS OF THIS PAPER, I WISH TO SUBMIT THIS FORMAL APPLICATION FOR TECHNICAL ASSISTANCE IN CROP ADAPTIVE RESEARCH AND IMPROVED EXTENSION METHODOLOGY FOR THE TRANSFER OF TECHNOLOGY TO SMALL FARMERS. I ALSO HOPE THAT THE PROJECT WILL LEAD TO THE DEVELOPMENT OF A LONG-RANGE CROP RESEARCH AND EXTENSION PLAN ACCEPTABLE BY GOVERNMENT.

5. I REQUEST YOUR EARLY AND SYMPATHETIC CONSIDERATION OF THIS APPLICATION. UNQUOTE.
.INEHAN

UNCLASSIFIED

Annex H

PID Approval Message

State 214060

(on file in AFR/DR/CAWARAP)

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Sierra Leone, (Njala, Rokupr, Kabala, Makeni, Kenema)

Project Title: Adaptive Crop Research and Extension

Funding: FY 1978-1983 ; total project cost is Dollars 9.1 million of which Dollars 6.1 million is to be provided by AID and Dollars 3.0 million by the Government of Sierra Leone.

Life of Project: Five years starting June 1, 1978.

IEE Prepared by: Howard V. Guiot, Engineer - USAID/L Environmental Officer

Norman L. Sheldon, Agricultural Development Officer, USAID/SL

R. H. Goldman, Agricultural Economist USAID/L

Environmental Action Recommended:

The project is expected to have minor but positive environmental and economic impacts in the implementation area. It is possible that the project will change existing agricultural practices, increase rural incomes and subsequently have an impact on social patterns. Such impacts are planned to be absorbed by the populace in a positive manner as the project design calls for the use of appropriate technology, farmer acceptance, and social and cultural soundness in furtherance of project objectives.

We recommend a Negative Determination with respect to the need for an Environmental Assessment.

Concurrence: Date: 12/20/77

Assistant Administrator's decision: Date:

A. Description of the Project and Its Environment

The proposed activities under this project are of a research, extension and institutional development nature. Through a program of adaptive agricultural research by a multidisciplinary team, it is proposed that improved food crop systems be developed and tested in five distinct regions of Sierra Leone. In the process, data will be generated, research linkages improved and extension systems developed and tested. These processes will require the utilization of, and perhaps change in, the rural environment. The project's adaptive on-station research will make maximum use of existing research facilities and therefore have little or no perceptible impact on the environment. Physical construction will consist of several small buildings (apartment flats, small office, soil laboratory) at the Adaptive Crop Research and Extension Center located adjacent to Njala University College (NUC) in rural Sierra Leone. Water systems, power generation and other infrastructural needs will be connected to the existing facilities. Buildings will conform to existing NUC standards.

The basic premise on which the project is based is that of incorporating the small farmer into all phases of the project's research/extension program. The project emphasizes the use of existing social and physical systems with the expectation that such an approach will enhance farmer acceptance and assure the appropriateness of extension techniques. It is conceivable that on-station crops research might use moderate amounts of chemicals (fertilizers or insect spray). Where they are used, their use and application will conform to AID regulations. It is not anticipated that non-fertilizer chemicals will be used on the on-farm trials or demonstrations as farmers currently have no access to such supplies. Adaptive research and extension will focus and depend on low-cost appropriate technology and know-how generated by local smallholders. Close attention will be paid to the effect of technology on the interaction of different ecosystems with the environment. Alternative (non-chemical) techniques of maintaining and increasing soil fertility and controlling weed-, disease-, and insect-pests will be emphasized. Chemical fertilizer use, if any, must be moderate due to small farmer purchasing power constraints and lack of supply. Agricultural mechanization or processing equipment will likewise be of the "soft" technology or intermediate technological description.

B. Description of Possible Environmental Impacts

1. Land Use

A serious problem in Sierra Leone is a consequence of increasing population pressure and the resultant adverse effect on the land due to the shortening of the bush fallow cycle. The problem is likely to worsen unless traditional agricultural patterns are modified. One step toward modification is the intensification of low land "swamp" rice culture. The Government of Sierra Leone (GOSL) with the assistance of other donors is pursuing the expansion of low land rice culture. The ACRE project will only serve a coordinating role in the area of low land rice culture; its primary area of concentration being upland food crops. Inasmuch as the project can develop environmentally and economically sound methods of continuous or semi-continuous cropping systems (mixed cropping, cover crop, mulch systems) it will have a positive effect on the current decrease in soil fertility and increase in soil erosion. The desired effect of improved cropping systems will be to improve and conserve the land base through erosion control, an increase in ground cover, improved soil fertility and proper management.

2. Water Quality

No effective impact on the ground water supply is foreseen as a result of this project. Surface water quality may improve slightly if effective erosion control systems can be developed.

3. Wildlife and Vegetation Impacts

There are no endangered or unique species of flora or fauna in the impact area. The project will not have a significant or deleterious impact on wildlife or vegetation.

4. Public Health Impacts

Insofar as the project can effectively improve small farmer income and if there exists a positive correlation between income and health, the project may have a slight positive impact on public health.

5. Cultural and Socio-Economic Impacts

The project is designed to be compatible to existing cultural and socio-economic patterns. The project

does intend to focus attention on currently under-privileged members of the community (women) and should also result in a change in cropping systems and improved varieties of plant material. Every precaution will be taken to insure that impacts are not harmful to local peoples and culture. The project does, though, have the objective of changing current practices where beneficial alternatives exist. Such changes will undoubtedly impact upon the people and their culture.

C. Measures Necessary to Minimize Harm and Control Potential Adverse Impacts

1. The project will use "soft" low cost technology, to lessen possible economic, cultural and environmental impacts.

2. The project will involve farmers in every stage of the research/extension process to assure that actual farmer felt needs and desires are addressed.

3. The project will undertake continual monitoring of activities for quick identification of both positive and negative impacts.

4. The project will use only moderate amounts of non-organic inputs. Those used will conform to AID regulations.

5. The minor constructions undertaken at the ACRE center will conform to existing NUC standards and sound engineering practices. All construction activities and architecture will be approved by USAID/Liberia's Chief Engineer.

D. Conclusion and Recommendation

The proposed project is expected to have only a minimal impact upon the environment owing to its limited scope and grass roots approach. Impacts which are expected will be positive, arising from increased farmer income and productivity. It is recommended that an Environmental Assessment not be undertaken.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas	Impact 1/ Identification and Evaluation
A. LAND USE	
1. Change the character of the land through:	
a. Increasing the population	L
b. Extracting natural resources	N
c. Land clearing	L
d. Changing soil character	L
2. Altering natural defenses	M
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
B. WATER QUALITY	
1. Physical state of water	N-L
2. Chemical and biological states	N
3. Ecological balance	N
C. ATMOSPHERIC	
1. Air additives	N

N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

1/ Impacts are of a positive nature unless otherwise listed.

IMPACT IDENTIFICATION AND EVALUATION FORM - 2

	2. Air pollution	N
	3. Noise pollution	N
D.	NATURAL RESOURCES	
	1. Diversion, altered use of water	N-L
	2. Irreversible, inefficient commitments	N
E.	CULTURAL	
	1. Altering physical symbols	N
	2. Dilution of cultural traditions	L-M
	3. Other factors	
	Agricultural techniques	M
	Educational	M
F.	SOCIOECONOMIC	
	1. Changes in economic/employment patterns	L-M
	2. Changes in population	L
	3. Changes in cultural patterns	L
	4. Other factors	
	Agricultural Activity	H
G.	HEALTH	
	1. Changing a natural environment	N-L
	2. Eliminating an ecosystem element	N
	3. Other factors	
	Improved nutrition	L-M
H.	GENERAL	
	1. International impacts	N

IMPACT IDENTIFICATION AND EVALUATION FORM - 3

2. Controversial impacts _____ N

3. Larger program impacts _____ M-H

Annex K

Waivers

(on file in AFR/DR/CAWARAP)

ANNEX J

SIERRA LEONE: ADAPTIVE CROP RESEARCH AND EXTENSION

CERTIFICATION PURSUANT TO SECTION 611 (e) OF THE

FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Stanley J. Siegel, Director of the U.S.A.I.D Mission to Liberia, do hereby certify that in my judgement the Republic of Sierra Leone will have the financial and the human resources capability to implement, maintain, and utilize effectively the subject assistance project. This certification takes into consideration the requirements placed on the Republic of Sierra Leone to maintain and utilize other projects previously financed or assisted by the United States.

This above certification is based on the fact, inter alia, that:

1. In its current development plan the Sierra Leone Government gives agriculture the highest priority, directing its efforts in this sector toward food crop production and the small farmer. The plan has been supported by a steady increase in the amount and proportion, presently 32 percent, of the development budget allocated to agriculture.

2. USAID, in collaboration with the GOSL, has conducted in-depth evaluations of project feasibility and presented a detailed plan for project implementation. These analyses support the economic, social and financial viability of this project.

3. The project is but one component of the GOSL strategy for increasing the productivity of the rural poor. The GOSL strategy is supported by its budget and other donor assistance. This project complements other agricultural activities, and as such, becomes an integral part of the overall rural development strategy.

Signed: _____

Date: 12/20/77

ANNEX 1

PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans): and Security Supporting Assistance funds.

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(B)

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure plus 10%)?	Project is listed in FY 1978 congressional presentation for Africa Programs, page 213. Yes.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U. S. of the assistance?

Yes, all engineering plans, specifications and cost estimates will be approved and verified by AID engineering

Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipien country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No further legislative action required.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

N.A.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U. S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

Yes, all necessary certifications have been approved by USAID/Liberia Mission Director.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?

Project is not currently susceptible of execution as part of regional or multilateral project. However, project does provide for activities complementary to both regional, multilateral and host country projects. The project will encourage development programs in other areas of Sierra Leone.

7. FAA Sec. 601 (a); (and Sec. 201 (f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

(a) The project may indirectly encourage international trade by increasing smallholder income and consumption.
(b) The project will foster private initiative and competition by stimulating smallholder participation in the cash economy.
(c) Cooperatives are expected to eventually have a role in input supply and marketing.
(d) No effect.
(e) Project designed specifically to improve technical efficiency of agriculture through provision of improved plant material and practices
(f) No effect.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U. S private trade and investment abroad and encourage private U. S. participation in foreign assistance programs (including use of private trade channels and the services of U. S. private enterprise).

Project may use the services of U.S. private enterprise for the provision of technical assistance. Project will, to the maximum extent practicable, purchase U.S. made commodities.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U. S. are utilized to meet the cost of contractual and other services.

GOSL will privide inkind or cash contributions to the project in excess of 25% of total project costs.

10. FAA Sec. 612(d). Does the U. S. own excess foreign currency and, if so, what arrangements have been made for its release?

No U.S. owned excess foreign currency.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

1.a) Project is specifically designed to involve and provide needed services and support to Sierra Leonean small farmers. Small farmer activities are labor intensive and project activities will take place in rural areas.
(b) The project will not directly work with cooperatives except as they currently exist and can facilitate project objectives.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph -- e.g., a, b, etc.-- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

N.A.

(1) (103) for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; (103A) if for agricultural research, is full account taken of needs of small

The project will address both the extension and research needs of small farmers exclusively. Project does not promote export crops but focuses on staple food grains, roots - tubers and vegetables. The project will make the small farmer more productive, increase available food surplus and augment family income through cash sales.

(2) (104) for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

N.A.

(3) (105) for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;	N.A.
(4) (106) for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:	N.A.
(a) technical cooperation and development, especially with U. S. private and voluntary, or regional and international development, organizations;	
(b) to help alleviate energy problem;	
(c) research into, and evaluation of, economic development processes and techniques;	
(d) reconstruction after natural or manmade disaster;	
(e) for special development problem, and to enable proper utilization of earlier U. S. infrastructure, etc., assistance;	
(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.	

(5) (107) by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.	N.A.
c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?	The GOSL will provide at least 25% of total project costs (in-kind or in cash). GOSL, by signing the Project Agreement, will legally commit itself to a fixed amount of project support. The 25% requirement has not been waived.
d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?	Grant capital assistance will be disbursed for the project for 5 years. The 5 year project was presented to Congress for FY 1978 with no negative comment.
e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.	1) The project places emphasis on economic and social variables by increasing the income of the rural poor, by specifically working through local institutions and by not disrupting existing social customs. 2) Project designed to increase food production. 3) Project will train farmers, extension agents and research personnel. 4) Improved nutrition will improve health status. 5) See A.7 and B.2 above. 6) Project specifically focuses attention on women as participants in the national economy. Women will participate and their needs will be addressed in all phases of project activity.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.	The project was designed in full collaboration with the GOSL so that it would meet the needs, desires and capacities of its citizens. It utilizes the intellectual resources and encourages institutional development through its close afiliation with existing research and academic institutions and through the development of an autonomous research facility.
g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1) - (3) and - (8). Does the activity give reasonalbe promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?	Yes, Yes, Yes.
h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6) Information and conclusion on possible effects of the assistance on U. S. economy, with special reference to areas of substantial labor surplus, and extent to which U. S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U. S. balance of payments position.	The project will have little effect on the U.S. economy. It will employ U.S. senior technicians and procure U.S. made commodities where their use facilitates project implementation.

2. Development Assistance Project Criteria (Loans only)

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U. S.	N.A.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U. S.) of lending and relending terms of the loan.	N.A.
c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?	N.A.
d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?	N.A.
e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?	N.A.
f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U. S. with U. S. enterprise is there an agreement by the recipient country to prevent export to the U. S. of more than 20% of the enterprise's annual production during the life of the loan?	N.A.

3. Project Criteria Solely for Security Supporting Assistance — N.A.

FAA Sec. 531. How will this assistance support promote economic or political stability?

4. Additional Criteria for Alliance for Progress

(Note: Alliance for Progress projects should add the following two items to a project checklist.)

a. FAA Sec. 251(b)(1),-(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America? — N.A.

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities? — N.A.

AID PROJECT STATUTORY CHECKLISTS

I. Country Checklist

FY1978 Country check list prepared for Sierra Leone CARE Rural Penetration Roads II, Project Number 636-0111.

II. Standard Item Checklist

No special treatment warranted.

III. Project Checklist (See above)

Annex M

Selected References

(on file in AFR/DR/CAWARAP

636-0102

ADAPTIVE CROP RESEARCH AND EXTENSION PROJECT

(Sierra Leone)

636-0102

ANNEXES

600
3

20 December 1977

PROJECT BACKGROUND SUPPLEMENT:

NATURAL AND HUMAN PHENOMENA

An understanding of certain natural and human phenomena characteristic of Sierra Leone and which bear directly or indirectly on such critical factors as crop production, land use, and technology transfer is a prerequisite to understanding the design and implementation methodology of this project.

A. Location

Sierra Leone is a small country (Figure B-1) of 27,925 square miles (73,226 sq. km.). Its compact and roughly circular shape (about 215 miles from north to south and east to west and about 185 miles from northeast to southwest and northwest to southeast) lies between Guinea and Liberia on the southwest coast of West Africa between 6° 55' and 10° latitude north and 10° 16' and 13° 18' longitude west.

B. Physiography

Unlike some other parts of the African continent Sierra Leone has a variable physiography (Figure B-2) ranging from the coastal swamps to the broken interior plateau with the highest mountain (Bintumani, 6,390 ft.) in West Africa. About half of Sierra Leone's land mass lies above 500 feet.

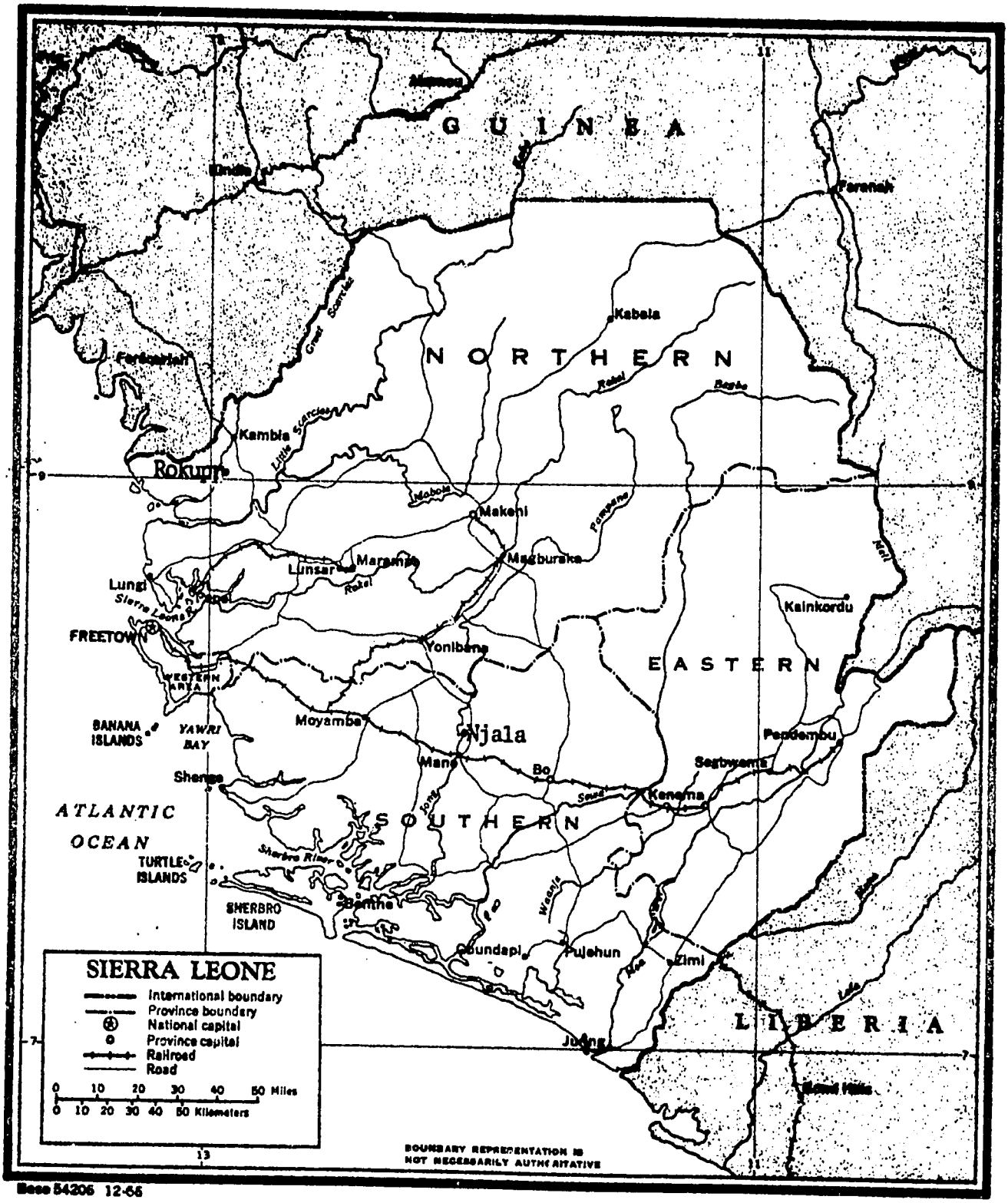
Table B-1. Contour Intervals in Sierra Leone

CONTOUR INTERVAL (feet)	LAND AREA (Percentage)
0 - 500	55.84
500 - 1000	14.73
1000 - 2000	26.97
2000 - 3000	2.06
Over - 3000	0.40
	100.00

The Country is divided into five major land areas:

Figure B-1

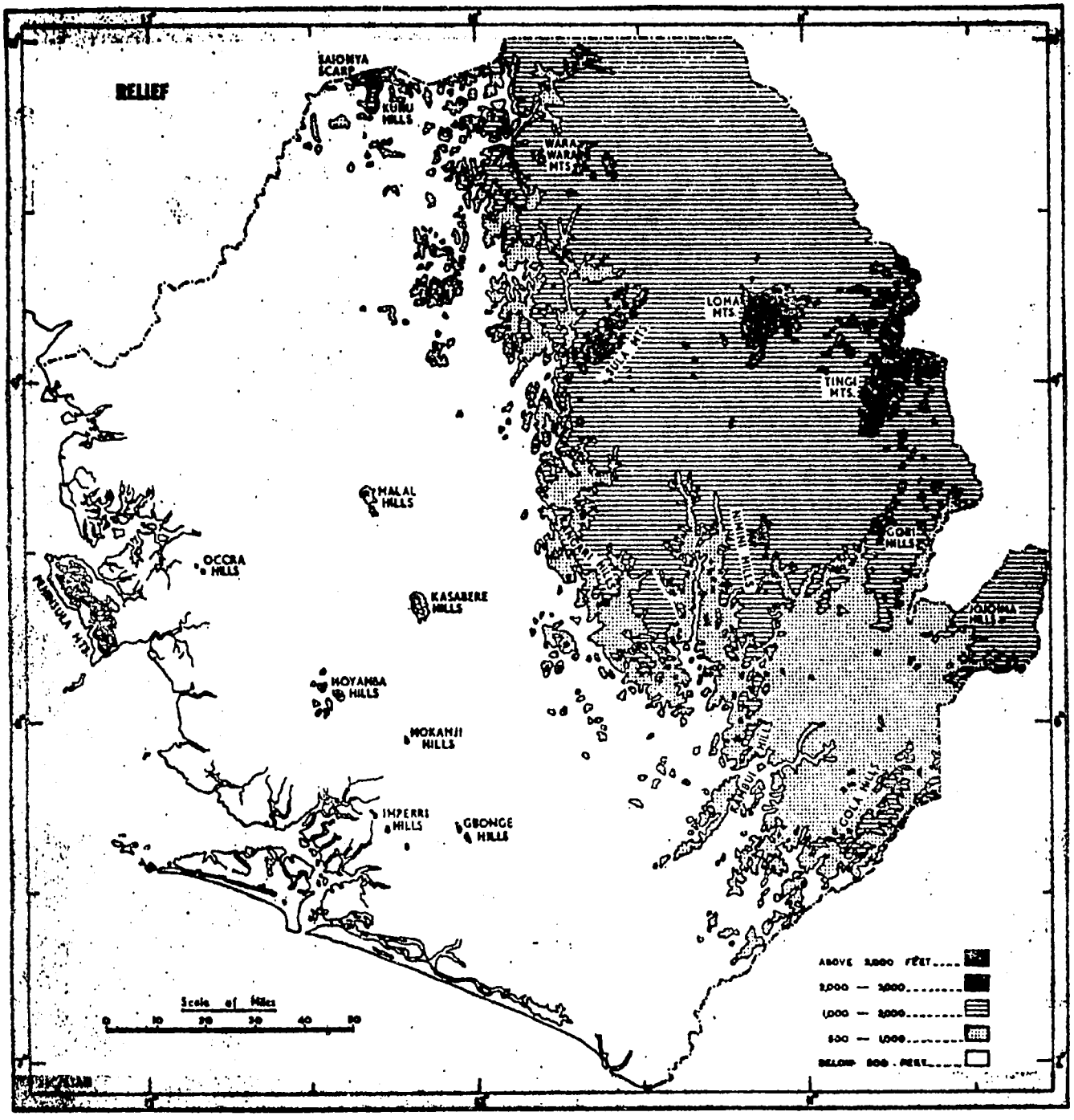
SIERRA LEONE



Source: U.S. Government, 1966

Figure B-2

LAND RELIEF OF SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966

Western Area - Rising above the coastal swamps are the Freetown peninsula mountains with the highest peak about 2,913 feet. This area is rugged with steep mountain sides and narrow valleys with plunging waterfalls. Agriculture is limited to small fruit and vegetable production along scattered narrow stream floodplains.

Coastal Swamps - This region, adjacent to the Atlantic, varies from 15 to 30 miles in width and comprises low lying beach ridges backed by mangrove and fresh water riverine swamps. The mangrove swamps form an intricate pattern along river estuaries and some 30,000 acres have been cleared and are used for rice cultivation. Inland, and adjacent to the Scarcies, Rokel and the Sewa/Woanji rivers, are coastal swamps subject to seasonal fresh water inundation. They are also cultivated for rice (Birchall, 1977).

Inland Plains - This well-drained, slightly undulating land area stretches diagonally from the Guinea border in the northwest where it is about 80 miles wide, narrowing down to about 30 miles wide on the Liberian border in the southeast. Bordered on the west by the coastal swamps, the inland plains gradually rise Eastwards where they become studded with isolated hills (inselbergs), some of which rise to 1,000 feet. The plains are dissected by narrow valley swamps which comprise between 10 and 20% of the total land area. This is an important agricultural region: grain crops include maize, sorghum, groundnuts, cassava, upland and swamp rice and, in the South, coffee and cocoa. High concentrations of wild oil palm also exist (Kater, 1977).

Bolilands - This is a low-lying seasonally flooded area within the interior plain. It stretches some 150 miles South from the Guinea border and attains a maximum width of 30 miles in the center of the country. It comprises poorly drained river floodplains and inland basins, intricately associated with low terraces (Birchall, 1977). Despite low soil fertility these areas are widely used for swamp rice cultivation and mechanised ploughing is frequently employed.

Interior Plateau (Guinea Highlands) - Nearly 7,500 square miles of broken plateau lie between 1,000 feet and 2,000 feet. Steep-sided hills interspersed with undulating footslopes predominate in these areas. Along major rivers and towards the North-east flatter land becomes more common. Valley swamps generally account for less than 10% of the total (Birchall, 1977). Subsistence upland rice farming is the predominant type of agriculture, with cattle also of some importance in this area. However, efforts toward increasing swamp rice production, vegetables, and coarse grain production are making a noticeable impact in the area.

C. Climate

Sierra Leone has a hot, tropical climate with distinct rainy and dry seasons. The rainy season extends from May through November and a dry season from December through April. Rainfall (Figure B-3) varies from under 80 inches in the north to over 200 inches along the coast. The monsoonal nature results in a pronounced single maximum rainfall regime with a peak in July. During this period the sky is mainly overcast and sunshine is rare. The relative humidity is between 95 and 100% at such a time. Local variation in rainfall can be very high and accounts for as much of the variation in crop yields as does soil fertility High rainfall also accounts for the leaching of soil nutrients as well as, on all but gentle or well vegetated slopes the removal of organic topsoil material by sheet erosion.

Dry weather and high humidity occurs during most of the dry season usually with clear skies and relatively high day temperatures The nights are also warm and very humid with heavy dew most often occurring during the night and early morning. Short periods of dry weather with low humidity (Harmattan) usually occur between late December and early February. During this period sudden drops in relative humidity from 100% to 20% are not uncommon. There are usually relatively high diurnal temperatures with low night temperatures causing high evaporation.

Wind in Sierra Leone basically consists of the dry "harmattan" air of desert origin and the humid "monsoon" air from the Equatorial and South Atlantic. The desert air is normally experienced during December, January and February. A haze is then frequent, resulting from dust from the interior on northeasterly winds of low relative humidity. The monsoon air dominates during most of the other months of the year.

March and April have the hottest days with mean monthly maximum temperatures of 86° - 93°F (30°-34°C) inland. July and August have the coolest days with 81°-83°F (27°-28°C). Inland nights are coolest in December, January and February with temperatures as low as 57° - 68°F (14°-20°C).

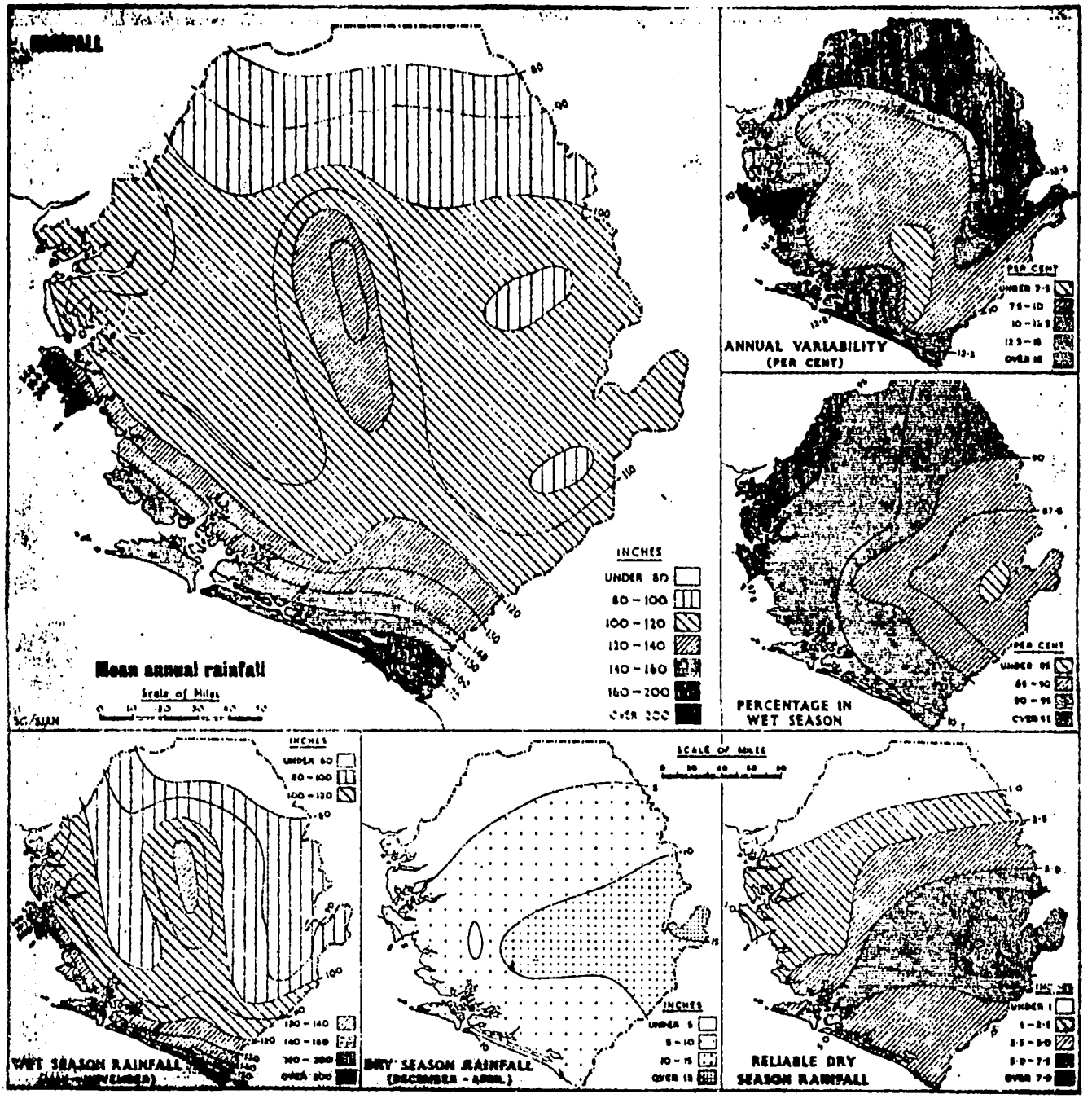
Climatic extremes limit cropping options and as such restricts research to those crops that lend themselves to tropical conditions. High temperatures, high relative humidity, and excessive cloud cover are conducive to bacterial and virus infections in crops. For example, virus of cassava is one of the limiting factors of cassava production in Sierra Leone.

D. Soils

Marked differences in soil chemical and physical properties occur in Sierra Leone and hence the value of the soil for

Figure B-3

RAINFALL IN SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

agricultural use varies considerably from area to area (Kater, 1977). The clayey soils that occur in the tidal swamps along the coast and up adjacent stream estuaries have unique properties which present many management problems. They contain excess sulphur, which may produce extreme acidity if there is too much drainage and oxidation. But under careful management, including proper water control measures, these soils can be utilized for swamp rice production (mangrove swamps).

The well-drained to imperfectly drained alluvial soils that occur on the flood plains of the larger streams (Figure B-4) are among the most productive soils in Sierra Leone (Odell, 1974). They are usually fine-textured (clayey) and have favorable physical properties, but these soils are only fair in available plant nutrients and proper applications of fertilizer are necessary to produce profitable yields. These soils are subject to an occasional brief flooding. Because they are near rivers they can be irrigated during the dry season and can produce more than one crop annually.

In the bolilands the seasonally flooded areas have very acid poorly drained soils often low in organic matter. These are associated with well drained but equally infertile gravelly soils on the terraces. With heavy inputs of fertilizer the Bolilands can be used for swamp rice production and the level, relatively uniform, terrain lends itself to mechanisation. In the interior plains and plateaux a variety of soils occur according to topographic situation. On low stream terraces well drained to imperfectly drained soils, frequently with hardening subsoil plinthite, generally occur. These can be adapted to a wide range of annual and perennial crops provided fertilizer and other improved management practices are used. In the valley swamps poorly drained hydromorphic soils are well suited to swamp rice production, especially if water control is practised. On the steep uplands, gravelly soils are extensive in some areas covering as much as 2/3 of the landscape (Birchall 1977). On hilly areas, common in the plateau, a relatively high proportion of shallow soils occur with limited potential for arable use (Kater, 1977).

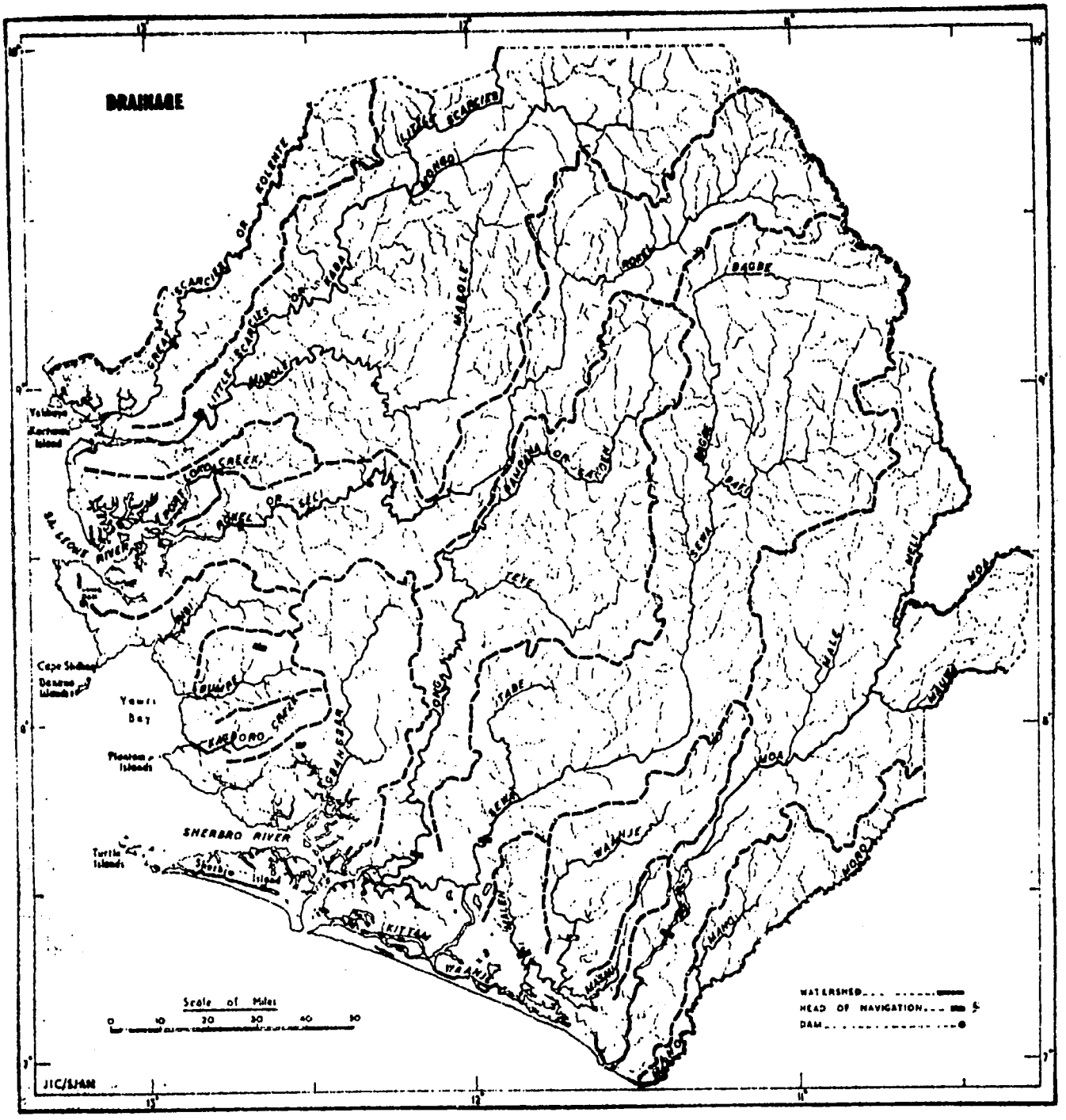
E. Vegetation

The seven major types of vegetation are closed high forests, secondary forest, forest regrowth (farm bush), savanna woodland, tree savanna, grassland, and swamp formations (Kater, 1977). Closed high forest (Figure B-5) comprises about 4% of the total, since the bulk of the original rain forest was cut down to provide farm land.

Forest regrowth is the dominant vegetation type of the Southern half of the country. It is the woodland vegetation which

Figure B-4

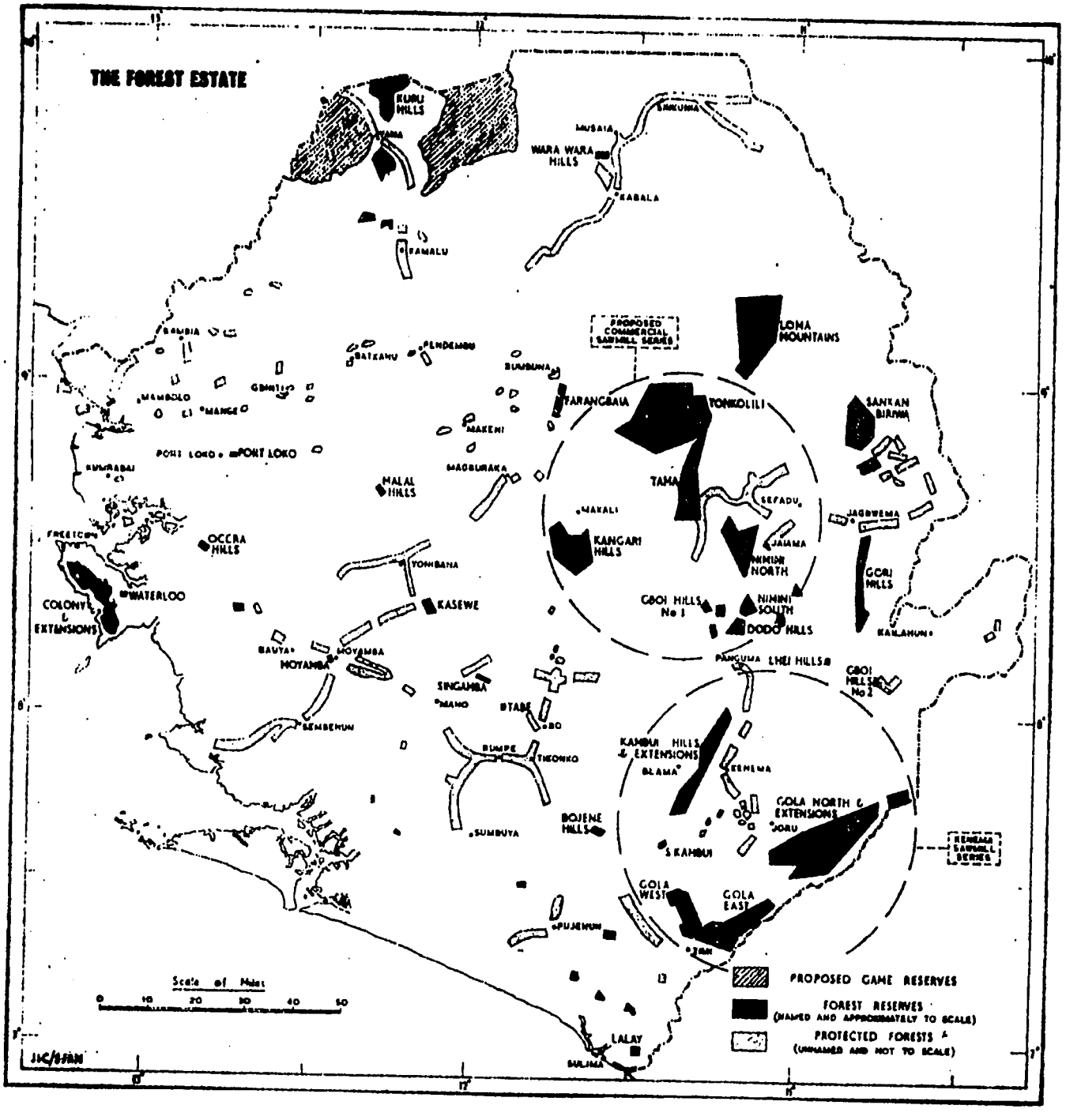
DRAINAGE AND WATERSHEDS OF SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

Figure B-5

THE FOREST ESTATE



Source: <u>Sierra Leone in Maps</u>, J.I. Clarke, 1966.

is periodically farmed by the traditional shifting cultivation or bush-fallowing system. The period of fallow is generally less than fifteen years and decreasing due to population pressures. North of 9° latitude forest regrowth gradually turns to savanna.

Moving Northwards from the forest regrowth zone there is first a derived savanna with tall grasses and scattered oil-palms. This grades into savanna woodland with a fairly closed canopy of trees and an undergrowth of tall grasses and finally in the extreme North-east of the country tree savana (tall grasses with scattered trees) predominates (Kater, 1977).

The swamp formations are mangrove swamp forest, fresh-water swamp forest and swamp and riverine grasslands. Many of these areas have been cleared for swamp rice (Kater, 1977).

Upland grassland is characteristic of the lateritic hardpans, as raised both on the beaches around the Freetown Peninsula and on hill slopes which are steep or have suffered from severe soil erosion. These grasses are sometimes collected for thatching.

F. Crops

Sierra Leone (along with Liberia) is conspicuous among most other West African countries for the importance of rice as a basic food staple. Rice is by far the most important single crop in Sierra Leone (Table B-2). It is cultivated on about 857,051 acres, or 62.73% of the total land area under cultivation by about 81% of the country's farmers. Rice is grown under five clearly distinct agro-ecological growth zones. They are (1) upland, (2) inland valley swamp, (3) mangrove swamps, (4) boliland, and (5) riverain grassland. The exact acreage of rice grown in each of these five agro-ecological zones is difficult to determine since the 1970/71 agricultural census classifies rice acreage into upland and swamp-lands (Figure B-6) only. An estimate of the rice acreage grown under the different agro-ecological zones is shown in table B-3.

Within the context of this project the land utilized for the production of upland and inland valley swamp rice and those farmers involved in rice production under these agro-ecological conditions represents the major resource and clientele mass to which these project research and extension activities will be directed. From within this group will be drawn the specific segments which will be the primary target groups who will directly participate in the on-farm research trials and the pilot technology delivery systems program.

Recognizing the importance of rice as the major crop and primary food staple involving nearly every farmer, any adaptive

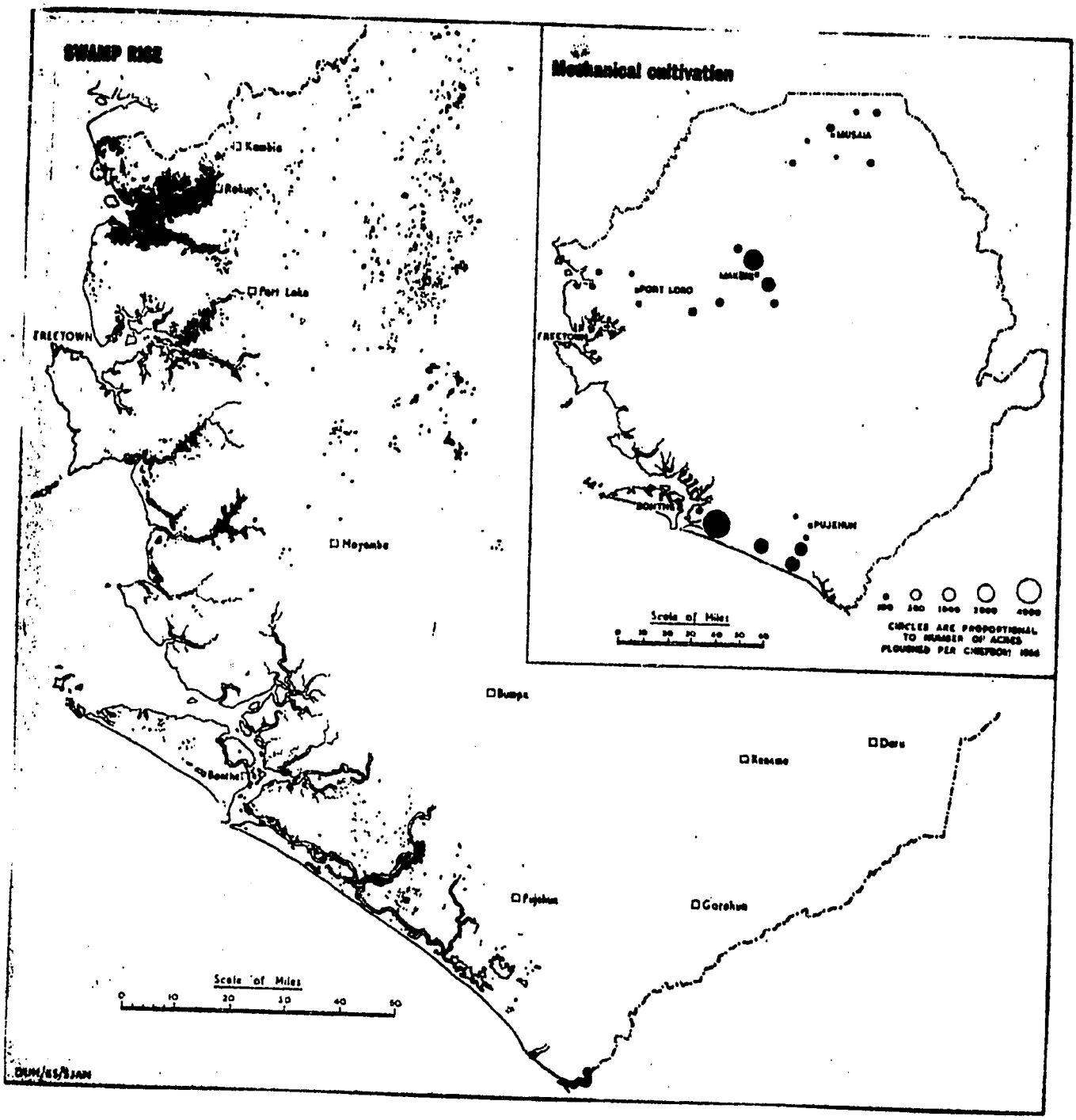
TABLE B-2 ACREAGE UNDER RICE CULTIVATION FOR 1965/66 AND 1970/71

	1965/66	1970/71	Percentage Increased	Growth Rate
Acreage under cultivation for all fields with upland rice as major crop	591,000	649,408	9.9%	1.9%
Acreage under cultivation for all fields with swamp rice as the major crop	152,200	207,766	36.5%	6.4%
Total acreage under cultivation for all fields with rice as the major crop	743,200	857,174	15.3%	3.0%

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

Figure B-6

SWAMP AND MECHANICAL CULTIVATION



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

TABLE B-3 RICE ACREAGE BY AGRO-ECOLOGICAL ZONES

Agro-Ecological Zone	Rice Area in Acres		Total Area (Acres)
	Existing	Additional Potential Area	
Upland	573,600	-	573,600
Inland Valley	144,000	576,000	720,000
Mangrove Swamp	60,000	12,000	72,000
Boliland	36,000	-	36,000
Riverain Grassland	19,200	-	19,200
TOTAL	832,800	588,000	1,420,800

SOURCE: Dr. H. ten Have, FAO Consultant for Rice Research, Sierra Leone

crop (other than rice) research, soil management, farming systems program, land use studies, or technology delivery activities must revolve around rice as the focal point. The project will, within defined limits, support the upland and inland swamp rice research and extension programs through direct input in support of the farmer research trial program and the extension demonstration program at specific locations throughout Sierra Leone.

Other food crops (Table B-4) include tubers (cassava and sweet potatoes), grains (millet, sorghum, and corn), oil seeds such as groundnuts, palm oil, (Figure B-7) and beniseed, and a variety of fruits and vegetables. These crops represent almost 42% of the value of all food crops produced. It is estimated by the World Bank that this category can be expected to grow at an annual rate of two percent, at best keeping up with population growth. Most of these crops are intermixed with upland rice; there is very little monoculture practised. Cassava especially is used as an insurance crop. While most farmers plant it and consume the leaves throughout the year, the cassava tuber is only harvested when the rice supplies are depleted and nothing else is available.

Coffee and cocoa (Figure B-8) comprise the vast majority of Sierra Leone's agricultural exports. Over 90% of the cocoa production and 80% of the coffee production is located in the Eastern Province. Both crops are readily suitable to the natural environment of Sierra Leone, and great increases in productivity and the amount of land under cultivation are possible. The World Bank estimates that annual growth rates of cocoa and coffee production will be 7.4 and 8.8%, respectively.

The production of palm products is also expected to increase throughout and beyond the 1970's due to both the expansion of acreage planted to new higher-yielding varieties and to higher extraction ratios provided by new plants at Wellington and Daru. Most of the new acreages are under plantation schemes set up by the GOSL in the Daru and Gambia areas with aid from the World Bank.

Other export crops -- ginger, piassava (Figure B-8) and Kola nuts -- generate about one million Leones in foreign exchange annually. Future trends in prices and production are difficult to predict for these crops. The market for ginger depends on the major producers such as India. The wild fiber piassava is handled primarily by private traders and responds slowly to price fluctuations. Kola nuts are also handled by private traders and are sold across the northern and eastern borders.

G. Population

The size of the present population (Table B-5 is about 3.0 million, with an annual growth rate of 2.3% per annum and an average density of about 110 persons per square mile.

TABLE B-4 ACREAGE UNDER PRINCIPAL CROPS AND TOTAL PRODUCTION IN 1970/71

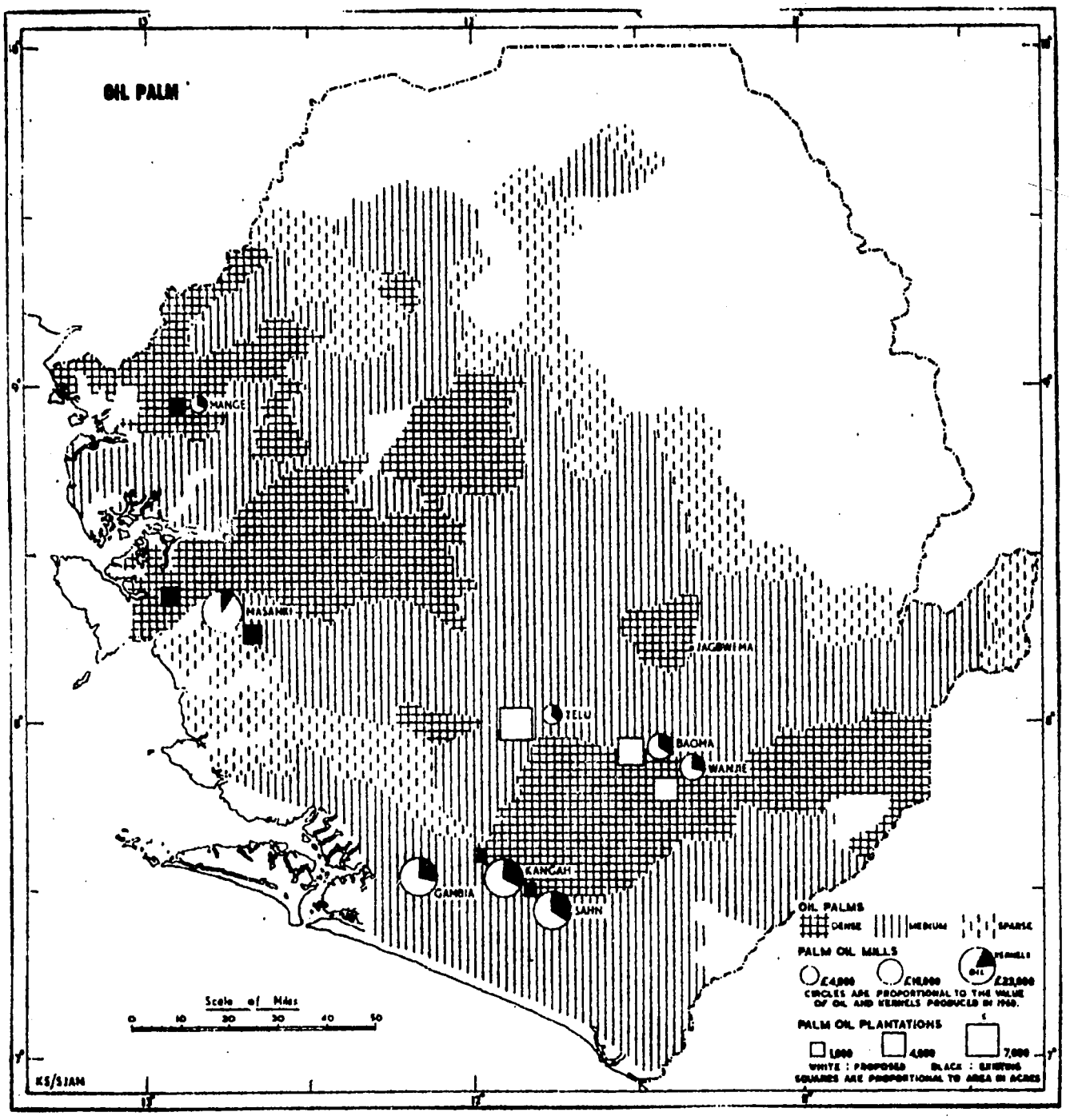
Crop	Acreage Under Cultivation	% Total Acreage	Field/A (Tons)	Total Prod. (Tons)	% Total Production
Rice					
Upland Rice	600,747.13	45.57	.5310	318,975.37	43.58
Swamp Rice	206,810.17	15.69	.5991	123,903.43	16.93
		(71.26)			(60.51)
Grain Crops					
Guinea Corn	11,737.46	.89	.5000	5,868.73	.80
Fundi	3,385.17	.26	.2678	906.55	.12
Millet	14,090.29	1.07	.4464	6,289.91	.86
Maize	25,891.41	1.96	.4018	10,403.16	1.42
		(4.18)			(3.20)
Pulses/Oil Crops					
Groundnuts	34,128.10	2.59	.4371	14,917.39	2.04
Broad Beans	781.89	.06	.4464	349.04	.05
Benniseed	4,430.58	.34	.1786	791.30	.11
		(2.99)			(2.20)
Root Crops					
Cassava	41,180.34	3.12	1.9713	81,178.80	11.09
Cocoyam	10,993.01	.83	1.9713	21,670.52	2.96
Sweet Potato	17,338.60	1.32	1.0557	18,304.36	2.50
Chinese Yams	1,017.89	.08	1.5620	1,589.94	.22
		(5.35)			(16.77)
Export Crops					
Coffee	176,077.80	13.35	.1116	19,650.28	2.68
Cocoa	111,256.38	8.74	.0558	6,431.31	.88
		(22.09)			(3.56)

1/ Note: 70% of total acreage under cultivation is under mixed crops (a combination of crops is cultivated within the same field and which crops may or may not be harvested at the same time.)

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

Figure B-7

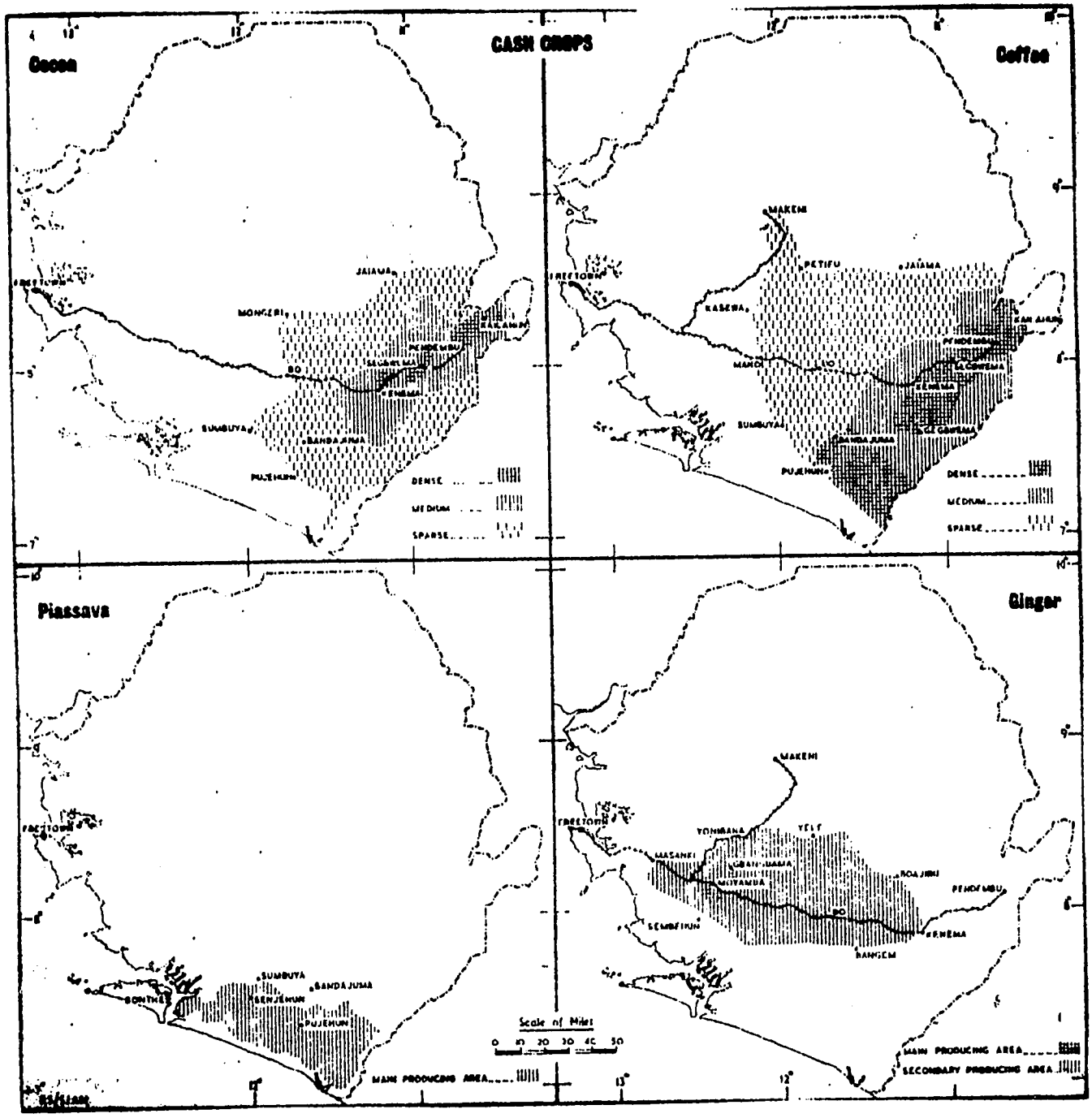
OIL PALM IN SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

Figure B-8

CASH CROPS IN SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

TABLE B-5 PROVISIONAL POPULATION STATISTICS INCLUDING DENSITY AND PERCENTAGE CHANGE BY DISTRICT AND CHIEFDOM

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Bo District					
Badja	4,967	4,415	104	42.5	- 1.0
Bagbo	11,977	12,694	241	51.6	0.5
Bagbe	6,679	7,384	285	25.9	1.0
Baoma	30,278	22,944	414	55.4	- 2.0
Bumpe	26,964	30,180	881	34.3	1.0
Gbo	3,099	3,041	142	21.4	- 0.1
Jaima Bongor	16,189	17,079	389	44.0	0.4
Kakua	39,956	49,719	453	109.8	2.5
Komboya	6,420	6,535	272	24.0	0.1
Lubu	12,945	14,299	233	61.4	0.9
Niawa Lenga	5,976	6,491	207	31.4	0.8
Selenga	3,064	3,752	104	36.1	1.8
Tikonko	22,348	18,393	389	47.3	- 1.4
Valunia	14,406	14,393	777	18.5	- 0.8
Wunde	6,486	6,030	324	18.6	- 0.6
	209,754	217,349	5,219	41.6	0.4

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Bonthe District					
Bendu Cha	3,254	2,901	233	12.5	- 1.0
Bum	12,243	13,027	246	53.0	0.7
Dema	2,963	3,484	142	24.5	1.5
Imperi	6,687	9,486	401	23.7	3.2
Jong	12,503	15,803	389	40.6	2.1
Kpanda Kema	4,845	5,193	233	22.3	0.6
Kwamebai Krim	5,069	5,493	440	12.5	0.7
Nongoba Bullom	10,134	9,537	544	17.5	- 0.5
Sitia	8,559	8,429	389	21.7	- 0.2
Sogbini	3,943	4,048	181	22.4	0.3
Yawbeko	3,045	2,881	259	11.1	- 0.4
	73,245	80,282	3,458	23.2	0.9

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Moyamba District					
Bagruwa	11,996	12,598	725	17.4	0.4
Banta	10,783	18,161	466	39.0	4.8
Banta Mokelle	3,829	5,396	259	20.8	3.2
Bumpe	23,117	24,774	505	49.1	0.6
Dasse	10,599	10,025	479	20.9	- 0.4
Fakunya	12,004	13,823	466	29.7	1.3
Kagboro	20,088	20,731	583	35.6	0.3
Kaiyamba	14,279	16,387	622	26.3	1.3
Kamajei	6,555	6,557	596	11.0	0.0
Kongboro	8,444	8,731	466	18.7	0.3
Kori	17,703	21,941	479	45.8	0.2
Kowa	5,940	6,455	246	26.2	0.8
Ribbi	16,692	18,441	531	34.7	1.0
Timdel	5,396	4,670	479	9.8	- 1.1
	167,425	188,690	6,902	27.3	1.1

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Pujehun District					
Bari	12,020	14,710	453	32.5	1.8
Gallinas Perri	11,364	13,485	751	18.0	1.6
Kpaka	4,136	4,653	350	13.3	1.1
Makpele	9,009	10,660	324	32.9	1.5
Malen	8,701	10,362	298	34.8	1.6
Mano Sakrim	2,840	2,473	246	10.1	- 1.1
Panga Kabonde	16,560	16,516	518	31.9	- 0.0
Panga Krim	2,085	2,306	52	44.3	0.9
Peje	4,533	4,236	298	14.2	- 0.6
Soro Gbema	10,223	14,122	609	23.2	3.9
Yakemo Kpukumu-Krim	3,398	3,194	207	15.4	- 0.5
Sowa	- -	6,060	- -	- -	- -
	84,869	102,777	4,105	25.0	1.7
Sherbro Urban District					
North Ward South Ward York Island Ward	6,894	6,957	10	695.7	0.1
	6,894	6,957	10	695.7	0.1

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Eastern Province					
Kailahun District					
Dia	3,987	5,085	155	32.8	2.2
Jaluahun	22,644	24,458	363	67.4	0.7
Jawi	14,231	18,069	155	116.6	2.2
Kissi Kama	5,966	5,915	230	45.5	0.0
Kissi Teng	19,814	14,015	207	67.7	- 1.8
Kissi Tongi	11,138	12,648	207	61.1	1.1
Luawa	31,757	39,228	466	84.2	2.0
Malema	6,523	10,052	414	24.3	4.0
Mandu	9,162	10,663	285	37.4	1.3
Pejewa	12,948	15,433	440	35.1	1.6
Penguia	4,760	5,583	337	16.6	1.4
Upper Bambara	10,012	11,869	259	45.8	0.2
Yawei	6,294	7,553	285	26.5	1.7
	150,236	180,571	104	48.8	1.7

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Kenema District					
Dama	14,091	16,575	508	32.6	1.5
Dodo	6,121	6,740	326	20.7	0.9
Gaura	9,614	12,269	440	27.9	2.3
Gorama Mende	25,357	19,837	440	45.1	- 1.8
Kandu Leppiama	12,794	11,650	458	25.4	- 0.8
Koya	6,318	6,841	272	25.2	0.7
Langrama	1,371	1,732	181	9.6	2.7
Lower Bambara	30,121	51,905	546	95.1	5.1
Malegohun	6,858	7,488	150	49.9	0.8
Niawa	4,255	5,422	285	19.0	2.2
Nomo	1,287	1,739	401	4.3	2.8
Nongowa	47,675	64,531	521	123.9	2.6
Simbaru	13,895	11,475	326	35.2	- 1.4
Small Bo	16,998	16,715	376	44.5	- 0.2
Tunkia	14,262	17,536	376	46.6	1.8
Wando	16,403	12,440	300	41.5	- 2.0
	227,428	264,895	5,908	44.8	1.4

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Kono District					
Fiama	5,038	7,081	389	18.2	3.1
Gbane	9,773	11,742	389	30.2	1.7
Gbane Kando	2,256	2,546	163	15.6	1.1
Gbense	19,244	58,066	389	149.3	10.6
Gorama Kono	3,953	4,908	440	11.2	2.0
Kamara	15,723	27,288	220	124.0	5.1
Lei	7,373	9,822	466	21.1	2.6
Mafindo	3,623	3,923	259	15.4	0.7
Nimi Koro	29,003	68,679	466	147.4	8.1
Nimi Yema	16,359	26,952	440	61.3	4.6
Sando	33,040	53,077	979	54.2	4.4
Soa	11,189	12,112	453	26.7	0.7
Tankoro	9,950	40,360	363	111.2	13.5
Toli	1,331	1,479	220	6.7	0.9
	167,915	328,035	5,636	58.2	6.3

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Northern Province					
Bombali District					
Biriwa	24,546	25,844	844	30.6	0.4
Bombali Sebora	22,078	37,676	285	132.2	4.9
Gbanti Kamaranka	13,921	15,746	350	45.0	1.1
Libeisa Yghahun	8,384	10,037	430	23.3	0.2
Magbaiamba	6,124	5,773	399	14.5	- 0.5
Makari Gbanti	19,696	25,265	518	48.8	2.3
Paki Masabong	11,277	10,542	205	51.4	- 0.6
Pendembu Gowahun	22,141	24,327	785	31.0	.9
Safroko Limba	16,612	14,485	337	43.1	- 1.1
Sanda Tenraran	12,922	15,903	518	30.7	1.9
Sella Limba	18,763	22,120	401	55.2	1.4
Tambakna	19,784	12,186	2,461	5.0	- 2.0
Sanda Loko	12,528	13,288	453	29.3	0.0
	198,776	(233,192)	7,985	29.2	1.4

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Kambia District					
Gbinkle Dixing	7,450	9,408	389	24.2	2.1
Braimaia	11,199	14,569	518	28.1	2.4
Magbema	25,661	31,642	311	101.7	1.9
Mambolo	27,514	24,240	298	81.3	1.0
Masungbala	12,387	16,175	363	44.6	2.4
Samu	30,958	33,251	570	58.3	0.6
Tonko Limba	22,637	25,827	648	39.9	1.2
	137,806	155,112	3,095	50.1	1.1

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Koinadugu District					
Dembelia Sinkunia	6,857	11,067	914	12.1	4.4
Diang	7,566	9,126	1,077	8.5	1.7
Dembelia Musaia	7,925	9,926	396	25.1	2.0
Kasunko	16,676	17,971	728	24.7	0.7
Mongo	14,799	21,418	1,834	11.7	3.4
Neya	13,669	15,069	1,256	12.0	0.9
Nieni	16,183	19,054	311	61.3	1.5
Sengbe	10,902	11,619	1,210	9.6	1.3
Sulima	14,100	14,945	1,049	14.2	1.3
Wara Wara Bafodea	9,284	10,449	963	10.9	1.0
Wara Wara Yegala	11,100	17,315	311	55.7	4.1
	129,061	157,959	12,121	13.0	1.8

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Port Loko District					
Bure	15,245	19,908	609	32.7	2.4
Buya Romendi	16,308	20,599	474	43.5	2.1
Kaffu Bullom	19,665	27,137	207	131.1	4.0
Koya	36,657	41,484	712	58.3	1.1
Loko Masama	47,853	48,101	741	64.9	0.1
Maforki	31,199	37,575	829	45.3	1.7
Marampa Masimera	49,285	62,020	1,062	58.4	2.1
Sanda Magbolonto	9,578	10,556	544	19.4	0.9
T.M. Safroko	- -	9,162	- -	- -	- -
Dibia	21,673	16,321	541	30.2	1.4
	247,463	292,853	5,719	51.2	1.4

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Tonkolili District					
Bonkolenken	27,871	28,980	868	33.4	0.3
Kafe Simiriria	13,453	12,848	606	21.2	- 0.4
Kalansogoia	11,365	10,604	466	22.8	- 0.6
Kholifa	22,421	31,493	557	56.4	3.1
Kholifa Mabang	6,977	7,597	363	20.9	0.8
Kunike	20,178	24,515	958	25.6	1.7
Kunike Barina	6,691	7,171	414	17.3	0.6
Malal	8,623	9,320	427	21.8	0.7
Sambaia	10,914	12,289	622	19.8	1.1
Tane	12,479	13,666	531	66.7	0.8
Yoni	43,488	47,984	1,191	40.3	0.9
	184,460	206,467	7,003	29.5	1.0

(cont'd) TABLE B-5

District/Chiefdom	Total Population 1963	Total Population 1974	Area (Km^2)	Population Density Km^2 1974	Annual % Change
Total-Districts/ Chiefdoms	1,985,332	2,415,139	67,265	35.9	1.8
Greater Freetown	127,917	274,140	- -	- -	7.2
Western Rural Area	67,106	40,200	- -	- -	- 3.1
Total-Western Area	195,023	314,340	663	474.1	4.4
Total-Sierra Leone	2,180,355	2,739,479	67,928	40.3	2.3

SOURCE: Agricultural Statistical Survey, 1970/71 (Central Statistics Office)

The population is divided into about 12 principal tribes, of which the Temne (in the north) and the Mende (in the south) are the largest. About 80,000 persons are settlers or descendants of settlers from other African territories. Of this latter group, most reside in Freetown and adjacent Western Region. About 80% of the population in Sierra Leone is agrarian and about 7.6% of the total land area of 17,084,800 is under cultivation.

The implications drawn from the presence of a heterogeneous population with different tribal affiliations, customs, religion, social strata, degree of exposure to the modern world, suspicions and prejudices, etc., indicates the need to better understand the smallholder before working with him. Presently, extension techniques in use in Sierra Leone are neither universally successful nor well developed. In recognition of this the project is designed to look at the sociological aspects as related to acceptance of technology and method of delivery.

H. Njala University College (within MOE)

Njala University College (NUC) was founded in 1964 on the pattern of an American Land Grant College in cooperation with USAID and the University of Illinois. Now, together with the Fourah Bay College in Freetown, it constitutes the University of Sierra Leone, and occupies a site in Kori Chiefdom, Moyamba District, Southern Province of about 800 acres on the banks of the River Taia. The site has served as an agricultural center since the establishment in 1910 of an Experimental Station (soils, crops and livestock), and subsequent development in 1924 of a provincial agricultural apprentices' school, which was expanded into a national Primary Teachers Training College in 1939 (Hoffman, 1973). The Njala University College has inherited the physical structures of the three establishments and the use of an additional 2,250 acres of land adjoining the present site and available for development, (Taylor, 1977).

The Njala University College is administratively placed under the Ministry of Education (MOE). The College through its two University Faculties of Agriculture and Education and allied institutes and services, educates students to certificate and degree levels in order to provide agricultural officers and teachers; mainly for the rural communities of the country. Of some 600 plus students registered and in residence, about 20% are foreign students. About 12% of the registered students are female. Most of the Sierra Leonean students are drawn from the rural areas of the provinces speaking Mende and Temne predominately. Instruction is given in English.

The Faculty of Agriculture is comprised of the departments of:

-Agronomy (Crops, Soils etc.)
-Animal Science
-Agricultural Engineering
-Agricultural Economics and Extension
-Home Economics

The Faculty works in close cooperation with the MANR as an arm of Sierra Leone's agricultural research effort and also carries out practical extension work in the surrounding Chiefdoms through the Departments of Economics and Extension and the Department of Home Economics. The Faculty offers courses in General Agriculture and Home Economics at certificate (two year) and degree level (four year).

The Faculty of Education is the largest in the University and comprises the departments of:

-Agricultural Education
-Biology
-Chemistry
-English
-Geography
-Mathematics
-Physics
-Physical Education
-Science Curriculum Center
-Teacher Education

It offers courses at Degree, Diploma or Higher Certificate level in Education. All Departments provide the supplementary courses for the Faculty of Agriculture in addition to their own degree specialties.

The segment of Project ACRE affiliated with the NUC will utilize existing facilities and staff to the maximum extent possible. Project ACRE will concentrate its resources on assisting the Department of Agricultural Engineering, the Department of Agronomy (Division of Crops and Soils), the Department of Agricultural Economics and Extension, and the Department of Geography, to assume an active role in carrying out an adaptive research program for developing improved technology acceptable for the upland areas small land-holder and the delivery of that technology.

I. Rokupr Rice Research Station (Within MANR)

The present rice research facility now known as the Rokupr Rice Research Station (RRRS) was established in 1934

and until 1965 was known as the "West African Rice Research Station." The initial facility consisted of 15½ acres of tidal mangrove swamp for research and 32 acres of upland for offices and residences.

During Phase I (1934-1952) the station served Sierra Leone and was administered by the Sierra Leone Department of Agriculture. During Phase II (1953-1961) the station became a regional research center supported equally by the Colonial Development and Welfare Fund and the four territories (Ghana, Nigeria, the Gambia, and Sierra Leone) but administered according to the regulations of the Government of Sierra Leone. Major research emphasis continued on mangrove and deep water rice with some work started on flooded grasslands. In 1960 trials were started on upland rice at a temporary site a few miles from the station proper.

Phase III lasted between 1962 and 1964 during which the station was the complete financial and administrative responsibility of the Government of Sierra Leone.

Phase IV (1965-1971) found the station integrated into the Faculty of Agriculture, Njala University College. The station was renamed the "Rokupr Rice Research Station".

Phase V (1971 - present) resulted in the Government of Sierra Leone's recognition of "Rokupr" as the station with the overall responsibility for rice research and increased rice production nationwide. It should be noted also that during these periods of development additional land was acquired so that the station today consists of 70 acres of mangrove swamp and 100 acres of upland. Rokupr has semi-autonomous status within MANR with the overall administration charged to an "Interim Committee" with day-to-day running of the station the responsibility of the Director.

Rokupr is the base for the West African Rice Development Association (WARDA) mangrove rice research project. This regional project emphasizes soil science, varietal improvement, entomology and weed control on rice grown under mangrove swamp conditions. This activity is funded jointly by the Ministry of Overseas Development, United Kingdom, and USAID with the U.S. contribution to date of $321,000 funded under AFR/RA Project No. 698-0382.

The United Nations Development Program (UNDP) assistance to Rokupr began in January 1975 with the assignment of an agronomist and pathologist, obtained through a contract with the International Institute of Tropical Agriculture (ITTA) to work on upland rice and associated crops. Under the terms of the UNDP/FAO/IITA project the technical services of a rice extension agronomist are also to be provided along with training and provision of a modest amount of field and laboratory equipment.

In 1974 an interdisciplinary approach to rice research was initiated at Rokupr. For operational purposes, the research is divided into the disciplines of: Varietal Improvement; Plant Pathology; Entomology; Agronomy; and Plant Physiology.

In addition to the above, in conjunction with FAO/IITA, the station is also engaged in a Farmer's Field Trials (adaptive research) program in collaboration with the extension arm of the Ministry of Agriculture and Natural Resources. Four types of trials are carried out:

1. Type A - testing of five rice varieties including a local variety under both improved and local conditions;
2. Type B - The application of nitrogen (N) at six levels of application;
3. Type C - application of P_2O_5 (Phosphorus) and K_2O (potassium) at 0, 40, 80 and 120 kg of nutrient per hectare alone and in combinations.
4. Type D - applications of N, P_2O_5 and K_2O singly or in combinations.

These trials are conducted at approximately 600 farm sites randomly selected and distributed throughout all twelve districts and the Western Area. These trials enable the station to categorize the various soil types of Sierra Leone as well as collect local rice varieties. The trials are conducted under upland, mangrove, inland swamp and boliland conditions.

These trials are extensive and require an enormous input of resources, which are neither available from Sierra Leone nor donors. A limited amount of U.S. project resources will be used to strengthen this activity at a much smaller magnitude than presently carried out, simpler in approach and with greater emphasis on direct farmer participation.

In addition to the five research disciplines, WARDA activities and the Farmer Field Trials, Rokupr's Farm Management Section currently supervises the multiplication and processing of 209 acres of mangrove and inland seed rice. Rokupr's staff complement includes eight scientists with expertise in the fields of plant breeding (varietal improvement), plant physiology, plant pathology, soils science, rice extension, weed control and agronomic research. The ACRE project will include the close collaboration of the Rokupr scientists in adaptive crop research and development of replicable delivery systems.

J. <u>Agricultural Extension Service</u> (Within MANR)

The Agricultural Extension Service is administered by

the Agricultural Division of the MANR (Table B-6). Actual extension staff in the field is extremely limited, resulting in extension worker to farmer ratios of as high as 1:6,500 in some areas. Limited budget, lack of transport facilities, and lack of sufficient numbers of trained staff are some of the past constraints which have prompted the MANR Extension Service to adopt a policy of concentration of scarce manpower and support resources in key rural development projects and programs, thus necessarily limiting activities elsewhere.

The MANR will in FY 1978 launch an Agricultural Technician Training Program in collaboration with a British Overseas Technical Assistance team (Project Manager/Training Coordinator, Training and Personnel Officer, and Extension Adviser) and some personnel support from the British Volunteer Service Overseas (VSO). The object of the program is to establish a training framework within which it will be possible to organize induction training and such specialist training as it is required -- on an in-service basis. The project, together with the continued contribution from Njala University College, will be able to achieve by 1979 the field force of 550 technicians as called for in the Agricultural Section of the GOSL National Development Plan, with an output in the order of 64 technicians (Induction center at Makali: 2 x 32) per year from the project and 40 certificate students per year from Njala University College (Holt, 1976). As facilities and personnel improve it may be possible to increase these figures.

When this level of staffing has been reached, the MANR intends to increase the availability of technicians to farmers in the ratio of 1:500. The total number of technicians then serving in the Ministry will be 900. On a replacement basis alone, and discounting demands of developing agro-industry, the training program would continue to be responsible for training 10% replacements, i.e., 90 technicians per year (Holt, 1976). As this number increases, so also will the demand for sub-professional and professional personnel increase in the ratio of 1:10.

K. Other Institutions and Development Organizations

A Land Resources Survey (LRS) project of the MANR, sponsored by the UNDP with FAO as the Executing Agency became operational in mid-1975 and is planned to last until the end of 1981. At that time, its functions will be fully taken over by a newly created Land and Water Resources Department of the MANR emanating directly from the present Land Resources Survey project. In addition to its institution building objectives the major tasks of the LRS project are: (1) to carry out reconnaissance surveys of the existing land and water resources of the entire country to determine their potential for possible development at the national level, and (2) to undertake similar

TABLE B-6 AGRICULTURAL CIRCLES OF THE MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

		H. Q. Town	Regional H. Q.
Northern Province			
North-Eastern Region			
1.	Bombali North Circle	Kamakwie	Makeni
2.	Bombali South Circle	Makeni	Makeni
3.	Koinadugu North Circle	Gberia	Makeni
4.	Koinadugu South Circle	Kabala	Makeni
5.	Tonkolili Circle	Magburaka	Makeni
6.	Kontobi Circle	Kontobi Town	Makeni
7.	Makali Station	Makali Town	Makeni
North-Western Region			
8.	Port Loko Circle	Port Loko	Port Loko
9.	Kambia Circle	Kambia	Port Loko
10.	Batkanu Circle	Batkanu	Port Loko
11.	Masiaka Circle	Masaida Town	Port Loko
12.	Mahera Circle	Mahera	Port Loko
13.	Katonga Circle	Katonga	Port Loko
Southern Province			
Southern Region			
14.	Bo North Circle	Bo	Bo
15.	Bo South Circle	Bo	Bo
16.	Torma Bum Circle	Torma	Bo
17.	Moyamba Circle	Moyamba	Bo
18.	Pujehun Circle	Pujehun	Bo
19.	Zimmi Circle	Zimmi	Bo
20.	Bonthe Circle	Mattru Jong	Bo
Eastern Province			
Eastern Region			
21.	Kenema East Circle	Kenema	Kenema
22.	Kenema West Circle	Kenema	Kenema
23.	Kailahun East Circle	Pendembu	Kenema
24.	Kailahun West Circle	Daru	Kenema
25.	Kono Circle	Sefadu	Kenema

SOURCE: Ministry of Agriculture and Natural Resources

but more detailed studies at regional and local levels for development pre-implementation purposes.

Two major thematic maps are being compiled from the new imagery available. First the reconnaissance Land System map of Sierra Leone produced from SWA-B & W panachromatic prints at scale 1:120,000, and secondly the reconnaissance Land Use and Vegetation map of Sierra Leone derived from WA-IR Color (false color) transparencies at scale 1:70,000 both with 24 x 24 cm format (Schwaar, 1977). The Land System map is the first systematic and comprehensive representation of terrain conditions in Sierra Leone and will lend itself to qualitative land evaluation studies embracing the entire land area of the country.

This information will lead shortly to the compilation of the Land Use and Vegetation map of Sierra Leone including four major land utilization types and three management levels. Other surveys and studies are also planned in the fields of hydrology, agro-climatology, land use and vegetation. This additional information should be of paramount contribution to the further elaboration and refinement of a national land evaluation system specifically designed for the overall planning of agricultural development and also for related pre-feasibility surveys.

The GOSL and the Federal Republic of Germany (West Germany) have concluded an agreement for the establishment of a four-year Seed Multiplication Project beginning in November of 1976. Technical assistance provided under terms of the agreement include four (expatriate) experts, land reclamation, construction of project buildings, and provision of farm and seed processing equipment. The MANR is providing adequate farmland, plus all operating costs including salaries and emoluments of Sierra Leonean counterparts and project staff. The project is fully integrated within the MANR, where its administrative headquarters is located.

The initial goal of that project is production and distribution of improved seed rice in sufficient quantities on a national level. Improved seed will be obtained from the Rokupr Rice Research Station for multiplication (1) on a 300 acre mechanized project farm to be established near the village of Kobia in Kambia District and (2) by private farmers under contract to the project. A seed processing and storage plant will be included in each of the seed contracting and distribution centers to be located at Makeni, Kenema and the main project farm at Kobia, with the possibility of adding two centers at separate locations later. The project will also establish a seed testing laboratory at the Rokupr Rice Research Station. Later stages of the project could possibly include multiplication and distribution of other needed agricultural seed stock (Neutatz, 1977).

Government organizations responsible for marketing of

agricultural commodity inputs and farm produce (outputs) include the Cooperative Movement, the Sierra Leone Produce Marketing Board (SLPMB) and the Government Rice Corporation, all three of which are under the jurisdiction of the Ministry of Trade and Industry (MOTI). The Government Rice Corporation is responsible for the purchase and marketing of both domestically produced and imported rice at controlled prices. The majority of export crops have been handled by the Sierra Leone Produce Marketing Board, which holds a statutory buying monopoly. Coffee purchases have been particularly buoyant in the last few years.

The Eastern Area Integrated Agricultural Development Project (EAIADP) with headquarters in Kenema, is the first integrated agricultural development project in Sierra Leone. Phase I began in December 1972, under the financial umbrella of IBRD/IDA-SLG Credit No. 323 - S.L. and Phase II began in July 1976 under IBRD/IDA - SLG Credit No. 323 - S.L. The project covers 32 chiefdoms in the Southern and Eastern Provinces, a total area of 4,300 square miles with a population of about 400,000 consisting of some 65,000 farm families. Major objectives are: (1) Provision of supervised credit to swamp rice, cocoa and oil palm farmers, for the adoption of modern agricultural practices; and (2) The build-up of an oil palm complex-estate, plantation, and oil mill at Daru (The Daru Oil Palm Company). Performance under Phase I can be described as encouraging. Targets were realized and loan recovery has been relatively high.

The Northern Area Integrated Agricultural Development Project (NAIADP), with headquarters in Makeni, serves two districts (Bombali and Tonkolili) and ten chiefdoms in the Northern Province. The project covers an area of 1,300 square miles and affects 14,000 farm families. The project hopes to:

1. Construct 20 miles and upgrade 280 miles of crop extraction roads;

2. Construct 200 wells - self-help;

3. Establish five market centers;

4. Develop 6,000 acres of swamp rice;

5. Develop 25,000 acres of upland rice;

6. Develop 10,000 acres of groundnuts;

7. Construct training centers; and

8. Establish seed multiplication farm and establish three pilot cattle ranches.

The project has been in operation for one year and real field operations are limited.

The Koinadugu Integrated Agricultural Development Project (KIADP), with headquarters at Kabala, will be located in six chiefdoms (Mongo, Suliama, Yagala, Sinkunia, Sengbo and Foulasaba) in the Koinadugu District. The project covers an area of 2,000 square miles with a population of 84,000 and about 14,000 household units. About 4,500 farm families are expected to take part in the project, major components of which are:

1. Development of 6,000 acres of swamp rice;

2. Development of 10,000 acres of upland rice;

3. Development of 600 acres of onions;

4. Development of 650 acres of tomatoes;

5. Development of 3,000 acres of groundnuts;

6. Development of 3,000 acres of citrus;

7. Establishment of three cattle ranches;

8. Re-introduction of ox ploughs;

9. Establishment of 20 development centers;

10. Extension of supervised credit to project farmers;

11. Construction and upgrading of 80 miles of feeder roads;

12. Construction of 200 village wells; and

13. Development of an effective marketing unit.

The estimated cost of the project is Le 11 million, of which 73% is expected to come from EDF/EEC.

The Southern Area Integrated Agricultural Development Project (MIADP) will be located in five chiefdoms (Koya, Masimera, Yoni, Khalifa-Mabang and Malal) in Tonkolili and Port Loko Districts. The project covers an area of 1,200 square miles containing 143,000 people or 17,500 household units (7.2/household). About 5,500 farm families are expected to take part in the project. Major project components are:

1. Development of 7,500 acres of inland swamps;

2. Development of 500 acres of river levees;

3. Improvement of cultural practices in the upland;

4. Supervised credit to farmers;

5. Establishment of farm crop storage for cereals;

6. Installation and operation of 14 small rice mills,

7. Construction of 120 miles of feeder roads; and

8. Construction of 100 hand pumped village wells.

Total project cost is Le 8.6 million with a 45% foreign exchange component. The project will primarily focus on rice (upland, swamp and river levees), maize, and groundnut production.

The World Food Programme (WFP) is currently concentrated in the Northern Province - Kambia, Port Loko, Tonkolili and Koinadugu Districts. The main thrust of the project is the granting of food aid and some supervised credit during the development phase of rice swamps. American Peace Corps volunteers have provided the grassroot personnel component for the project while MANR provides general administration, supervision and field assistants. The project has received encouraging farmer response and inland swamp development has been growing steadily. At the end of 1976, more than 6,000 acres have been developed. Average yield, estimated at 40-50 bushels, is the highest amongst local farmers in Sierra Leone. About 25% of project farmers double crop and about five percent produce three crops a year. Double and triple cropping is much more evident in the Koinadugu District. Because of new and now apparent socio-economic factors (a redefinition of the concept of subsistence), a request for a modification of the original components of the project document was forwarded to the FAO. The request was for the extension of the free food ration period to allow each farmer to develop four instead of the original two acres. The request has been granted and the expansion of inland swamps is expected to increase.

The Gambia/Mattru Oil Palm Project was started by SLPMB in 1967 but was effectively taken over by MANR in 1969. Before ADB financing in 1974, the MANR had developed about 2,106 acres of oil palm. The ADB feasibility study supported an alternative, whereby the project components would be:

1. 2,000 acres outgrowers,

2. 8,000 acres estate; and

3. Oil mill of 15 tons/ffb/hour.

Two important factors emerged from implementation of the project:

1. That the land tenure problem has to be approached from a pragmatic angle; and

2. Hand clearing has proved to be more economical (about 32% savings) and dependable than mechanical clearing. (This may well be a lesson for labour suplus areas.)

The Chinese Agricultural Projects (CAP), for the past 10 years the Chinese Agricultural Projects (Taiwan Chinese later replaced by Mainland Chinese) have been involved in agricultural development in Sierra Leone. Major emphasis has been on inland swamp rice, boli rice cultivation, and vegetable production. This component of CAP is carried out in all the four sections of the country (Southern, Eastern, Northern Provinces and Western Area). A nucleus estate is usually accompanied by an outgrowers scheme. Farmers are given credit in kind. Basically this component of CAP is for demonstration purposes. Farmers are encouraged to adopt intensive cultural practices -- the use of modern inputs (fertilizers, pesticides, etc.) and a viable system of crop rotation. As of date, over 300 acres of demonstration farm have been developed. Two of the sites developed - Makali and Mange Burch are currently utilized for agro-technician training.

The Chinese have also started work for the establishment of the Mamunta Sugarcane Complex in Mamunta, Tonkolili District, Northern Province. The project will be located in a 5,000 acre site and will consist of:

1. 3,350 acres of sugarcane plantation (nucleus);

2. Sugar mill with a capacity of 400 tons/day;

3. Molasses plant with a production capacity of 6,000 liters/day of industrial alcohol; and

4. It is also hoped that through demonstration effect, outgrower production will be encouraged.

With an assumption of a per/acre production of 40 tons (range is 39-78 long tons/acre) and a sugar extraction rate of 10%, annual production of sugar from the 3,350 acres nucleus estate is estimated at 13,000 tons.

The Palm Kernel Mill is an agro-industrial project that utilizes palm kernels for the production of oil and a palm kernel cake - both items are exported to Europe. The mill has been in operation for about 3½ years. Capacity utilization is about 90% -- one of the best in the country. Annual throughput is 22,000 tons of kernel with a relative recovery efficiency of 90% (oil and cake) and 43% (oil). Exports of oil and cake are itemized below:

		1974/75	1975/76	1976/77
Tons -	Oil	11,175	9,047	8,486
	Cake	12,173	10,559	10,241
Value Le	Oil	6,057,606	3,452,600	5,141,029
	Cake	1,043,017	1,387,184	1,737,217

Sierra Leone is still exporting about half (25,000 - 30,000 tons) of its palm kernel production. The intention of the mill is to expand capacity in order to absorb all local production of Kernels.

There are also smaller projects in the country that have a cushion effect on foreign exchange. For example, the Rokel Tobacco Company encourages farmers in the Makeni Area (Northern Province) to grow and cure tobacco. Production of cured tobacco from 1974-76 as follows: 1974 - 113 tons, 1975 - 164 tons, and 1976 - 259 tons. The three year trend portends well for increases in local tobacco production.

Annex C

PROJECT TECHNICAL ANALYSIS SUPPLEMENT

A. Cropping Systems in Sierra Leone

Most cropping systems in Sierra Leone include upland rice grown in a mixed cropping system (Table C-1) which usually includes maize, millet, cassava, sorghum (Tables C-2 and C-3) etc. Swamp rice on the other hand, is usually grown in pure stands. Inland valley swamp rice is grown widely in the country with greatest importance in the northern regions of the country while other swamp rice production systems such as the bolilands are region specific.

The largest farms occur in the bolilands where mechanically cultivated farms average about 15 acres. The smallest farms occur in the upper Moa Basin where coffee and cocoa are important crops. Farm size (Table C-4) is relatively uniform across regions and within regions as demonstrated by the low standard deviation on farm size for most farming systems (Spencer, 1977).

These figures refer only to farm size actually cultivated. Most farmers in fact control much larger acreages and practice a bush-fallow (shifting cultivation) system for upland crops. Table C-5 shows that the average age of bush felled for upland rice is about ten years. This indicates that farmers in practice control over 40 acres of land (Spencer, 1977).

There is considerable concern on the part of technicians and policymakers regarding the probable deterioration of soil resources by the apparent pressures (decrease in the fallow period) on the traditional shifting cultivation system in Sierra Leone. The response of the smallholder operating near the subsistence level, and practicing shifting cultivation, when under pressure to increase food production, has been to use more of his fallow land. This involves either an extension of the cropping period or a reduction in the number of years of fallow. As population pressure increases, the necessarily increasing intensity of land use can eventually lead to attempts at continuous cultivation. On the soils where shifting cultivation is practiced this normally means a rapid loss in productivity, the initiation of serious erosion problems, and further deterioration in the ability of the land to support the existing population.

It is in this situation that 'revitalization' of agriculture becomes essential, if serious social problems involving food relief and population movement are to be avoided. Here the introduction of appropriate improved technology is vital to enable

TABLE C-1 METHOD OF CULTIVATION OF SELECTED CROPS IN SIERRA LEONE - 1970/71

Crop	Pure Stand	In Mixtures as The Major Crop	In Mixtures as The Minor Crop	Total
Upland Rice	- -	600,747.13	- -	600,747.13
Swamp Rice	170,126.30	36,682.07	- -	206,808.37
Guinea Corn	526.05	- -	11,211.41	11,737.46
Cocoyam	10,512.98	- -	480.03	10,993.01
Cassava	37,023.40	524.90	3,631.84	41,180.14
Groundnut	15,885.29	18,242.84	- -	34,128.10
Pepper	2,245.98	- -	- -	2,245.98
Benniseed	- -	- -	4,430.58	4,430.58
Sweet Potato	15,594.41	1,744.19	- -	17,338.60
Broad Bean	268.77	- -	513.12	781.89
Chinese Yam	1,017.89	- -	- -	1,017.89
Fundi	3,385.17	- -	- -	3,385.17
Millet	3,746.50	- -	10,343.79	14,090.29
Maize	3,259.27	- -	22,632.14	25,891.41
Total Acres	263,592.01	657,941.10	53,242.91	974,776.02
%	27.0	67.5	5.5	100.00

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-2 MAJOR CROP ACREAGES BY DISTRICT - SIERRA LEONE

Administrative Division	Total Crop Acreage	Upland Rice	Swampland Rice	Groundnuts	Cassava	Coffee	Cocoa
Southern Province	(332,676)	(233,935)	(36,193)	(2,547)	(5,439)	(28,356)	(875)
Bo	120,115	90,519	16,513	2,547	326	4,049	79
Bonthe	18,291	10,623	3,427	- -	1,877	1,563	121
Moyamba	144,848	99,620	11,851	801	45	19,021	362
Pujehun	49,422	33,173	4,402	1,354	3,191	3,723	313
Eastern Province	(499,485)	(140,909)	(50,393)	(2,591)	(2,859)	(147,646)	(114,381)
Kailahun	163,930	39,399	13,515	677	278	41,563	56,849
Kenema	276,797	71,601	24,908	1,492	1,308	104,701	57,293
Kono	58,758	29,909	11,970	422	1,273	1,382	239
Northern Province	(446,080)	(224,726)	(119,297)	(26,766)	(25,872)	(49)	- -
Bombali	85,513	46,737	7,038	14,408	2,080	11	- -
Kambia	73,480	18,811	44,099	916	4,615	- -	- -
Koinadugu	68,602	28,728	18,004	8,221	1,408	- -	- -
Port Loko	137,160	64,409	42,981	1,414	17,769	38	- -
Tonkolili	81,325	65,991	7,175	1,807	- -	- -	- -
Western Area	8,107	1,178	928	66	2,801	28	- -
Sierra Leone	1,286,348	600,748	206,811	34,125	36,971	176,079	115,256

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-3 NUMBERS AND PERCENT OF SMALLHOLDERS GROWING INDIVIDUAL CROPS

Crops	Smallholders Growing	Percent
Upland Rice	198,790	69.47
Cassava	171,733	60.02
Oranges	168,817	59.00
Okra	147,069	51.39
Cassava Leaf	144,583	50.53
Bananas	133,854	46.78
Pepper	130,937	45.76
Jakato (round eggplant)	120,590	42.14
Kola Nut	114,190	39.91
Maize	102,827	35.94
Coconut	97,200	4.64
Eggplant	92,933	32.48
Coffee	92,338	32.27
Plantain	84,497	29.53
Palm Oil	83,943	29.34
Benniseed	83,358	29.13
Guinea Corn	81,850	28.61
Pumpkin	79,760	27.87
Potato Leaf	76,325	26.67
Pineapple	75,876	26.52
Plantas	71,911	25.13
Broad Beans	70,802	24.74
Tomato	69,179	24.42
Yams	62,687	21.91
Groundnuts	53,831	18.81
Paw-Paw	53,634	18.74
Sweet Potato	53,163	18.58
Cocoa	51,999	18.17
Mangoes	51,786	18.09
Millet	50,125	17.52
Cocoyam	45,704	15.97
Cotton	37,803	13.21
Egussie	35,633	12.45
Fundi (Millet)	33,030	11.54
Lemons	30,557	10.68
Blackeyed Beans	29,137	10.18
Limes	21,853	7.63

(cont'd) TABLE C-3

Raffia	17,579	6.14
Nut Oil	15,435	5.37
Onion	14,021	4.90
Grapefruit	13,406	4.68
Bambia Groundnuts	11,831	4.13
Chillies	10,699	2.74
Melons	[illegible],648	3.37
Guava	9,445	3.30
Sweet Limes	8,924	3.12
Breadfruit	8,765	3.06
Palm Fiber	8,508	2.97
Piassava	8,217	2.87
Pigeon Peas	7,577	2.65
Tomato Gourd	7,379	2.58
Lettuce	5,819	2.03
Ginger	5,800	2.02
Green Beans	5,000	1.75
Sugar Cane	4,189	1.46
Shallots	3,740	1.31
Swampland Rice	2,989	1.04
Beetroot	2,933	1.02
Cabbage	2,395	.84
Tobacco	2,101	.73
Cucumber	2,053	.72
Bamboo Tree	1,514	.53
Chinese Yams	1,298	.45
Carrots	697	.24
Other	3,065	1.07

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-4 NUMBER OF HOLDERS REPORTEDLY GROWING CROPS IN 1969/70 BY NUMBER OF CROPS AND SIZE OF HOLDING

Size of Holding	Total No. Holders	1	2	3	4	5	6	7	8	9	10
.1 acre less than .5 acre	21,204	453	347	148	924	1,348	1,011	810	2,669	597	1,162
.5 acre less than 1 acre	16,819	220	928	1,075	705	577	1,849	1,328	1,120	1,219	289
1 acre less than 3 acres	66,269	2,343	1,561	2,880	2,607	3,014	3,680	1,971	4,203	4,335	3,380
3 acres less than 5 acres	57,355	1,239	1,719	2,053	1,138	1,812	2,459	2,693	2,404	2,034	4,433
5 acres less than 7 acres	37,938	1,100	338	526	1,590	1,427	1,691	1,620	1,666	3,507	1,457
7 acres less than 10 acres	30,730	192	271	916	1,333	1,194	583	1,618	821	600	1,051
10 acres less than 15 acres	20,012	385	122	- -	687	- -	343	522	1,009	686	366
15 acres less than 50 acres	7,614	108	294	140	- -	415	133	525	- -	134	740
Total	257,941	6,045	5,630	7,738	8,934	9,785	11,749	11,087	13,894	13,112	12,883
%	100.00	2.35	2.18	3.00	3.48	3.79	4.55	4.30	5.39	5.08	4.99

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

(cont'd) TABLE C-4

11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1,804	1,468	2,526	547	844	832	500	1,593	349	287	488	- -	324	- -	- -
475	303	291	859	1,438	500	662	212	102	1,062	210	630	25	- -	- -
2,341	3,579	2,864	2,542	2,955	4,165	2,627	2,525	949	1,851	3,372	564	1,289	816	199
2,772	2,022	2,577	1,949	2,194	3,174	1,602	1,732	1,951	1,695	2,179	331	1,255	1,856	3,108
1,237	2,773	1,543	1,629	3,008	1,351	1,008	815	1,026	2,037	435	1,510	896	912	210
1,580	1,304	1,434	3,642	1,537	1,269	1,796	1,613	2,394	1,480	719	856	652	700	261
1,245	259	1,408	2,784	1,052	620	2,129	739	727	1,432	596	521	396	628	106
306	- -	494	631	68	- -	911	268	201	336	528	- -	514	458	115
11,760	11,708	13,137	14,583	13,096	11,921	11,235	9,502	7,699	10,230	8,527	4,412	5,351	5,370	3,999
4.56	4.54	5.10	5.66	5.08	4.62	4.36	3.68	2.98	3.97	3.31	1.71	2.07	2.08	1.55

(cont'd) TABLE C-4

26	27	28	29	30	31	32	33	No Crops
- -	- -	- -	- -	- -	- -	- -	- -	173
- -	- -	- -	- -	- -	102	- -	- -	638
523	1,107	280	- -	108	- -	697	- -	937
708	891	670	907	1,064	- -	135	486	107
356	958	321	273	399	136	- -	- -	123
542	102	- -	- -	265	- -	- -	- -	- -
708	542	- -	- -	- -	- -	- -	- -	- -
245	- -	- -	- -	- -	- -	- -	- -	- -
3,082	3,600	1,271	1,180	1,836	238	833	486	1,973
1.19	1.40	.49	.46	.71	.09	.32	.19	.77

BLE C-5

AVERAGE AGE OF BUSH FELLED (YEARS) FOR UPLAND RICE BY REGION IN SIERRA LEONE, 1974/1975

Region	Age of Bush (Years)
1. Scarcies	8.7
2. Southern Coast	14.9
3. Northern Plains	6.7
4. Riverain Grasslands	10.6
5. Bolilands	11.5
6. Moa Basin	8.2
7. Northern Plateau	11.8
8. Sourthern Plains	8.6
Sierra Leone	9.8

SOURCE: Spencer, 1977

productivity to be increased. Apart from this need to provide relief where productivity falls below the subsistence level, there is a rather different question--of the transition from a subsistence level agriculture to something more productive. There are many examples of this having been successfully initiated by the introduction of a cash crop which can be added to, or incorporated within, an existing small farmer system e.g. groundnuts and oil palms in Nigeria, cocoa in Ghana, Nigeria and elsewhere (Greenland 1975). There are also many examples of dramatically unsuccessful attempts to initiate large scale production in the areas of shifting cultivation by introducing machinery and "advanced management techniques". There are basic, technical reasons, as well as social and economic ones, underlying the success and failure of these different pathways to greater agricultural production. The technical reasons for success and failure are not difficult to appreciate, and this supplement to the technical analysis attempts to pinpoint them within the brief context available.

B. Shifting Cultivation in Sierra Leone

1. Definition of Shifting Cultivation

Before discussing the features of 'shifting cultivation' which determine whether it is a stable or destructive process, it is necessary to define the practice. Greenland has very adequately defined the process in the following paragraphs. Cultivation systems may be arbitrarily divided into four phases (Table C-6). The first, Phase I, which is of minor importance in Sierra Leone, and involves movement of homes as well as fields of the cultivators, is largely confined to semi-arid and arid areas, and offers little opportunity for intensification of arable production except in the rather special and limited conditions where irrigation can be introduced.

Phase II and III involving relatively settled homes, but 'shifting' of fields, are of greater intrinsic interest in terms of their potential for increased arable production. Here all (Phase II) or part (Phase III) of the cultivated land is allowed to revert to natural bush, and the restoration of the fertility of the soil under the natural vegetation is the key to the success of the system. The FAO of the United Nations has recommended that the term "natural fallow cultivation" systems be used for these practices, rather than shifting cultivation.

The difference between Phase II and Phase III agriculture arises from the inclusion of some continuously cropped land in Phase III. This land will usually be manured in some way e.g. with household refuse. Where the soil is inherently capable of sustaining continuous production, continuous cultivation

TABLE C-6

THE PHASES OF LAND CULTIVATION

Phase I	Phase II	Phase III	Phase IV
Simple shifting cultivation	Recurrent cultivation	Recurrent cultivation with continuously cultivated plots	Continuous cultivation
(Dwellings and cultivated area shift together)	Cultivated area shifts more frequently than dwelling. May be complex with several field types.	Always complex with several field types.	May involve alternate husbandry with planted and cultivated pastures or fallow crops.

has been practiced for many years. However, Phase IV agriculture is not a prerogative of the developed countries, and is not dependent on such sophisticated inputs as fertilizer and pesticides. Productivity on these better soils can usually be increased by introduction of improved techniques.

Within Phases II and III the intensity of recurrent cultivation varies very considerably. The intensity of use is dependent on soil and climatic factors, and where population pressure does not force a change, these are attuned to the length of time required for soil fertility to be restored. Where population pressure causes the ratio of the length of the fallow to crop period to be reduced, an artifically accelerated rotation is produced, which may lead to soil degradation.

2. Features of Shifting Cultivation in Sierra Leone Associated with Stability of the System

The greatest potential for increasing production in areas currently under shifting cultivation lies in the application of technology to Phase II and Phase III agriculture. If this is to be done, it is essential that those factors which have enabled shifting cultivation to persist for many hundreds of years in areas where crop production and arable farming is essentially a hazardous undertaking are properly appreciated.

No agricultural system can persist that does not maintain soil fertility. This involves some restoration of plant nutrients to the surface soil, and usually replenishment of organic matter and physical condition. By resting a soil under a natural fallow the nutrients are restored by cycling from the subsoil, and organic matter by the addition of litter and root material from the vegetation. The process is considerably more effective in forested areas than in savanna grassland, and consequently the soils in tropical forest areas tend to be considerably more productive than those of the savanna. Where intensive use leads to replacement of forest by savanna a marked loss of productivity follows. Consequently, emphasis should be rightly given to the need to preserve the forest areas and prevent further invasion of these areas by grasses.

An important aspect of the restoration of soil organic matter levels is the addition of nitrogen to the system by biological fixation of atmospheric nitrogen. The forest provides an environment where this proceeds relatively rapidly. In grassland areas, except with certain species such as Pennisetum Pupureum (elephant grass), the nitrogen accretion, and corresponding organic matter increase in the soil, is rather low. It must also be recognized that any increase in soil organic matter depends not only on carbon and nitrogen additions, but can also be restricted if

phosphorus and sulphur, which form an integral part of the organic material, are not also added to the soil (Greenland, 1975).

The physical condition of the soil also tends to deteriorate during cultivation. The deterioration is associated with the effects of tillage and direct exposure of the soil to rainfall. The loss of much of the faunal population of the soil is also very important, since the coarser pores are largely dependent on the activity of worms and other soil inhabiting creatures. The most damaging effects on soil physical conditions are produced by rain drop impact, and subsequent erosion. Exposure of the soil to the direct action of erosive storms, leads to the dispersion of the surface soil, sealing of larger pores, slow water entry and consequently increased runoff and erosion (Greenland, 1975).

The physical protection of the soil in Sierra Leone is dependent also on the very incomplete clearing, which is all that can be achieved with simple tools. Tree stumps cannot normally be cleared, and regenerate actively. Also oil palm trees and others which provide useful fruits and other materials are usually preserved. Thus, even immediately after clearing, the soil has some protection from residual trees, and is still bound by the roots and stumps left in place. Such clearing, while being helpful in terms of protection against erosion, obviates strongly against any conventional mechanical cultivation being pursued subsequently. The degree of disturbance by hand hoeing is much less than by ploughing, and has a far smaller effect on the faunal population in the soil. This means that the surface structure is normally far better than if mechanized tillage is used.

Shifting cultivation in Sierra Leone is normally practiced with mixed cropping. This may involve 20 or more different species being sown in mixed stand, and the individual species are often represented by many varieties, maturing at different times. This practice spreads the harvesting work, provides some degree of insurance against intermittent droughts and pest attack, and most importantly in the current context maintains a vegetative cover over the soil for most of the year. It is, of course, also a system which makes mechanization extremely difficult.

Mixed cropping has a number of advantages:

a. It reduces susceptibility to disease and pests, and therefore reduces the yield risk.

b. It allows the adaptation of planting to changing soil conditions.

c. It allows cultivation to be adapted to the light and shade requirements of individual crops. Both vertical and

horizontal variations of cultivation are facilitated. Thus, for example, medium-height cassava plants grow under bananas, and on the ground vegetables are found.

d. In smallholder farming a varied food supply is usually sought. Over and above this, the household tries to assure a continuous supply of fresh food, since there are insufficient storage facilities and the storage losses are high. Both aims naturally lead to phased planting and mixed cropping.

e. A further advantage of mixed cropping, which it shares with phased planting, is the soil cover provided. Where there is a vertical arrangement, the rain, for example, falls from the bananas on to the cassava and then on to the beans, and only then does it reach the soil.

By virtue of these advantages, mixed cropping often produces higher total returns per acre and per year in quantity of product than monocropping.

As well as the cover provided by the mixture of crops and the regeneration of vegetation from the stumps and roots left in the ground, erosion is further minimized because where runoff does commence, the small plot size interspersed amongst areas of natural fallow will normally prevent any build-up of runoff water into stream flows of sufficient size to create gullies.

These then are the major factors combining to make 'shifting agriculture' a relatively stable system in Sierra Leone. It breaks down if the cropping period is extended, so that the stumps and roots from which the natural vegetation regenerates are killed, and the numbers of viable seeds in the soil are reduced, because then when the land is abandoned it may remain bare and so liable to severe erosion before a vegetative cover is reestalished. A reduced fallow period will usually be less physically damaging, but nutritionally a declining cycle commences, wherein yields fall in each successive cropping period. The further disadvantage is that it is difficult to "intensify" the system by introducing mechanization. It is geared to a low productivity, and conditions in which the supply of land is relatively unlimited.

3. Effects of Clearing and Burning on Soils

Clearing and burning are the only means under the shifting cultivation system by which Sierra Leonean smallholders can incorporate into the soils some of the nutrients accumulated in the vegetative cover during fallow and clean the land in readiness for cultivation. The effects of burning on soils are as follows (Mouttapa*, 1974):

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* Regional Soil Resources Officer, FAO Regional Office for Africa Accra (Ghana)

a. Certain of the nutrients stored during fallow in the standing vegetation and litter are transferred into soil as ashes in the forms of carbonates, phosphates and silicates. During the burn most of the nitrogen, sulphur and carbon in the vegetative cover are lost as gases, but not that in the soil humus. Analysis of soils after burning shows a substantial increase in the exchangeable cations in the soil and a corresponding rise in the pH. In savanna, the amounts of nutrients released on burning are much less than in forest though dependent largely on the density of the woodland.

b. The direct effect of heat on the soil is negligible except locally where the wood is piled up and temperatures may reach 100° C and 60° C at the five and ten cm depths respectively. Usually, burning of savanna barely affects the surface soil at a depth of five cm, although the surface temperature may be as high as 500° C for three to five minutes.

c. Burning leads to an initial decrease in the microbiological soil population which redevelops to a level greater than before in forest soils, but has relatively little effect in savanna soils.

Under the traditional shifting system of cultivation, the only period during which the land is without a vegetative cover is immediately after the burn. The erosive effect of the first rains, which in general are progressive, is mitigated by the following features:

a. Clearing is seldom done over extensive, unbroken tracts of land; hence, whole watersheds are not bare at any given moment and intervening areas of fallow vegetation check the run-off; and

b. The root systems, which are resistant to burning, stabilize the surface soil.

Once the first crops are established, the soil remains fairly well covered until the next fallow. The traditional system of cultivation, at best, may not be conducive to excessive erosion, although repeated cycles of cropping followed by only short fallow periods may induce severe erosion.

The results of fertilizer trials and soil analyses indicate in general that the decrease of soil fertility under the traditional system of cropping depends on the type and length of fallow. The following broad conclusions can be drawn from the results of various fertilizer trials carried out in West Africa:

a. Forest lands: Nitrogen response is 0 to 10% after a long fallow; on land more intensively cropped followed by a very short fallow the response is over 40%. Phosphate response depends as much on the inherent properties of a soil as on its cropping history.

b. Savanna lands: Nitrogen response is between 10 to 40% on most savanna soils, even on lands not intensively used. Phosphate response is an inherent soil characteristic, it tends to increase with cropping and shortening of the fallow. Response to potash, lime and micronutrients are always stated to be rare under traditional farming practices.

Very few studies have been made on the changes in the chemical composition of soils under shifting cultivation, but the following very broad conclusions can be drawn from the study of Nye & Greenland (1960).

a. Humus: It is generally found that humus in areas of soils cultivated for many years by shifting cultivation is still relatively high; a low level of humus is only found in areas subjected to repeated grass burning.

b. Total soil nitrogen: Lands cultivated after a long fallow are reported to have enough total nitrogen to sustain two good crops, while the amount in savanna land is often only just enough for one crop.

c. Phosphorus: In both forest and savanna areas, there is evidence of a pronounced fall in the amount of extractable phosphate following cultivation.

d. Exchangeable cations: There is no large decrease in the amount of exchangeable cations in the soil after a single cropping period of one to two years.

Data on the amount of soil nutrients lost through leaching under traditional cultivation are scarce. However, the results of lysimeter studies carried out in different parts of Africa under improved techniques of cultivation enable the following broad conclusions to be drawn:

a. Most of the major nutrients are found in the drainage water in variable amounts depending upon the rainfall and inherent soil characteristics.

b. Among the cations, the highest concentrations are those for calcium and magnesium; those for potassium are somewhat lower.

c. The loss of phosphorus is generally very small.

The effects of long cultivation of soil by traditional

methods but with radical fallow periods can be summarized as follows (Mouttap[illegible], 1974):

a. The nutrients removed from the superficial soil layer by annual and perennial crops are returned to the soil only in amounts very much less than would have been restored after a long fallow. There is therefore a steady drain on soil fertility through successive cycles of cropping and short fallows heading to rapid depletion of N and P initially and subsequently K and micronutrients. The organic matter content of the surface soil decreases rapidly and with it the base exchange capacity.

b. The forest regrowth is considerably impaired and leads to the establishment of man-made savanna.

c. Because of the poor growth of crops and progressive degradation of the natural vegetation the soil becomes increasingly exposed to erosion and compaction.

4. Increasing Production from the Modification of Shifting Cultivation

Yields of crops produced under shifting cultivation in Sierra Leone are usually very low (Table C-6a). Upland rice yields are commonly close to 1,100 pounds per acre, maize yields average 1,100, and cassava yields less than 5,000 pounds per acre, when the potential for these crops in the same areas is known to be of the order of 8,000 pounds per acre for maize and 20,000 pounds per acre for cassava. Thus, even without any change in the frequency of land cultivation a very substantial increase in productivity should be possible.

Traditional shifting cultivation works, at a very low level of productivity, because it observes the basic essentials of a stable agricultural system. It can be modified or replaced by continuous management systems if they similarly observe the essentials of maintenance of nutrient levels, maintenance of physical condition, and avoidance of erosion and an uncontrollable build-up of pests and diseases.

Although the view is sometimes expressed that this is not possible in the tropics, there is good evidence to show that high levels of continuous production are possible. In fact, indigenous Phase IV agriculture demonstrates clearly that it is not difficult on soils of sufficient inherent quality. At IITA in Ibadan, Kang's results (unpublished) show that with adequate management high yields of maize (around 5,400 pounds per acre) can be sustained on a continuing basis. The real question is not whether it is possible, but whether it is economic (Greenland, 1975).

TABLE C-6a ACREAGE AND YIELD OF SELECTED CROPS

Crop	Pure Stand (Acres)	Major Crop In Mixture (Acres)	Minor Crop In Mixture (Acres)	Total (Acres)	Average Yield Pounds/Acre
Upland Rice	- -	600,747	- -	600,747	1,168.20
Swampland Rice	170,126	36,682	- -	206,808	1,318.02
Guinea Corn	526	- -	11,211	11,737	1,100.00
Cocoyam	10,512	- -	480	10,992	4,336.86
Cassava	37,023	524	3,631	41,178	4,336.86
Groundnut	15,885	18,242	- -	34,127	961.62
Pepper	2,245	- -	- -	2,245	627.22
Benniseed	- -	- -	4,430	4,430	172.92
Sweet Potato	15,594	1,744	- -	17,338	2,322.54
Broad Bean	268	- -	513	781	982.08

SOURCE: Agricultural Statistical Survey, 1970/71 (Central Statistics Office)

The problems and risks of arable agriculture in Sierra Leone are considerable, since while high yields can be sustained, the inputs required except in the very best soils are substantial. Consequently, the most satisfactory form of land use is usually production of perennial crops, such as cocoa and coffee. However, local population and economic pressures make it essential in many of these areas for food crops to be produced as well as, or instead of, the cash crops represented by the perennials.

In eastern Nigeria an indigenous system has developed in which food crops (primarily yams (Dioscorea sp) and cassava) are grown under an almost continuous canopy of wild oil palm (Greenland, 1975). The improvement of food crops adapted to such intercropping, or undercropping, is a subject which has received little attention. The system allows virtually continuous cropping to take place with little erosion risk. The extent of leaching losses of fertilizers in such situations are often thought to be severe, but few direct measurements of such losses have been reported. The standing tree crops may well recycle a substantial proportion to the surface soil.

Another method of combination of food cropping with planted perennials is the taungya system. Taungya, which literally means hill (taung) cultivation (ya), is of Burmese origin and describes the method of raising forest trees with agricultural crops on the same piece of land (Enabor, 1974). Essentially, taungya is a form of multiple use of forest land. In many countries the system may actually be a quasi-multiple use since the agricultural use to which the land is put does not generally continue throughout the rotation of the forest crop, but is confined to that period which ends with the closing of the canopy of the forest crop (King, 1968). The significance of the taungya system probably rests on the fact that it is an attempt to reconcile the increasing demands for virgin arable land (only available within the forest reserves) by shifting cultivators with the need to conserve and develop the forest estate in order to meet the rapidly increasing requirements for forest products in the tropical developing countries. The taungya system thus provides an excellent opportunity for the maximum utilization of land resources, while at the same time effecting the desired control of traditional shifting cultivation (Enabor, 1974).

By the strip cropping technique a long slope can be divided into a series of nearly horizontal planes with crops grown on some of them to intercept run-off water. In West Africa, this technique has met only with a limited success in reducing run-off and erosion losses. This is because the run-off losses are primarily controlled by the least intercepting row crop which nullifies the effect of intercepting strip. Three times out of five, the run-off losses at Sefa, Senegal, for alternating strips of rice and groundnuts or rice and sorghum, were within the range

of the figures measured for the individual crop (Fournier, 1967). On the other hand, the effect of alternating a cultivated strip with an undrained strip under forest fallow were encouraging (Jurion & Henry, 1969). This system of strip cultivation was particularly successful on soils with slopes of less than 15%. In addition, contour hedges, at a vertical interval of 1.5 m with a ridge 0.5 m high and 1.5 m broad and planted with Flemingia rhodocarpa, proved effective in controlling run-off losses.

Regarding the practise of stubble mulching, the concept of soil depleting and soil conserving crops needs to be revised in the light of present day technology. The soil under improperly managed leguminous crops may deteriorate faster than that under properly managed cereals. Considering the channel system concept of water infiltration, the highest infiltration can be maintained by keeping a continuous stubble cover on the ground. Mulches, in the form of any good cover, not only intercept the rainfall and minimize its direct impact but also decrease the run-off velocity. Mulches are also known to improve the soil structure by stimulating biological activity. Experiments conducted in Northern Nigeria by Lawes (1962) indicated that the relative efficiency of water infiltration under mulched plots was 89 to 98% as compared to that of 52% for bare, hoed soil. The effect on run-off losses of mulching maize grown on various slopes, as investigated at IITA, showed that mulching was as good as forest fallow in controlling soil erosion and run-off losses. Mulching also maintained the structure of the surface soil and preserved its infiltrability. Mulching, therefore, is a promising method of managing soil and water resources in the tropics under intensive cultivation.

Indiscreet tillage and exposing a structurally unstable soil to high intensity tropical storms can result in crust formation at the soil surface and cause a reduction in infiltration rate, thus increasing run-off and erosion losses. Since the role of tillage as a weed control measure has diminished since the introduction of herbicides at an economic cost, conventional operations such as ploughing require critical appraisal as regards their effect on soil and water management in the tropics. A system of minimum tillage, also termed 'mulch tillage' or 'trashy farming', ensures enough vegetation cover on the ground with the least amount of soil disturbance (Lal, 1974). Though the practice of minimum tillage has been widely practised in most of the temperate countries, it is still in the experimental stages in the tropics, where it is needed rather urgently. The results of the experiments conducted at IITA with zero tillage have been extremely encouraging. Continuously maintained vegetative cover of partially decomposed crop residues not only improved the available water storage capacity of the surface soil but also greatly decreased run-off and soil losses compared with ploughing. The infiltration rate of the soil under zero tillage remained high. Further-

more, owing to the favorable soil temperature and moisture conditions under zero tillage, biological activity, particularly that of earthworms, was extremely high.

Two alternatives to shifting cultivation already exist in Sierra Leone: these are swamp rice and other irrigated crops, and permanent or semi-permanent tree crops. The third alternative, continuous arable cropping, or continuous cropping broken by grass legume leys or planted fallows, is not yet a well-tried workable alternative in most areas where shifting cultivation is practised and the great variety of soils in which shifting cultivation is found implies a large number of different local solutions to the problems raised.

Ill-considered transfer of technology from temperate countries to Sierra Leone can lead to disastrous consequences. The use of the zero tillage technique, with enough crop residues on the soil surface, offers an attractive compromise between shifting cultivation and permanent land use on the pattern of temperate countries (Lal, 1974). Minimum tillage techniques, with the use of commerical fertilizer could help to maintain a high production capacity of the soil and also permit more intensive use of the land. This clearly implies that in most tropical soils the application of the methods of temperate zone large scale mechanized agriculture should be reconsidered in the light of a scientific technology of land use, based on soil conditions in the tropics.

5. Socio-Economic Considerations of Shifting Cultivation

In the shifting cultivation system the cost of mechanization, construction of proper erosion control measures, and adequate fertilizers, is often greater than the value of food crops produced. The systems that have been an economic success are almost always those where a cash crop has been involved, such as cotton, tobacco or groundnuts. The transition from shifting cultivation to continuous management in these areas will necessarily be slow, and it will usually be best achieved by introduction of improved varieties and appropriate technology into the existing system, rather than by any attempt to replace it by larger scale mechanized agriculture.

The scale of cultivation is determined not by the total amount of labor theoretically available over a year but by the labor available for meeting peak requirements. This principle applies to shifting cultivators, who rely only on hand labor and the labor of their house-hold, even more than to small settled farmers using animal power, as these can usually employ additional hired labor. Labor requirements of the shifting cultivator are, however, evened out by his growing many different crops and several

cultivars of each, and phasing their planting even at the expense of yield.

Most of the crops grown on the homestead are consumed by the household; many have no market value at all. A small part of the crop may be sold (Table C-7) when there is a surplus, together with any cash crops grown and forestry products collected for sale (Tables C-8 and C-9). The proceeds of sales are significant and of interest, small though the cash income may be.

Transport of the crops (Table C-10, C-11 and C-12) takes up much time. For example, a small family of four, planting annually one acre of maize, rice, groundnuts and bananas with an average distance of one mile between the hut and plot, spends annually about 120-140 man-days on transport (assuming a load of 75 - 100 pounds and 4 -5 journeys per man-day), (Jurion, 1967).

Finally, the price of farm produce is of paramount importance. It is well known that the demand for agricultural products is generally inelastic. For small-scale farmers there are added difficulties in disposing of small quantities of output at irregular intervals. They can obtain better prices usually only by combining to form an organization for marketing their products.

It must be stressed that the technical, social and economic factors involved are very closely interwoven. It must be remembered that the shifting cultivator is more concerned with producing an adequate food supply for his family, rather than with any particular enterprise or degree of economic efficiency, rate of return in monetary terms and/or the measurement of other economic performance indicators. This does not imply that economic considerations are not relevant. Even without assigning money values to inputs and outputs, the problem of allocating available resources so as best to achieve the production targets in mind is an economic one.

The information on the economic performance of shifting cultivators in Sierra Leone shows that in normal years they are generally able to cover their food requirements adequately and in good years they may have a surplus which is usually invested in objects of value. These can be exchanged, or sold for food in years when production is insufficient. Within this context the following conclusions are drawn:

a. Given the conditions under which shifting cultivators work and the means at their disposal, their economic performance is surprisingly high. The rise in population and the demand for greater output emphasize the deficiencies of this type of cultivation both in terms of land use and production.

TABLE C-7 NUMBER OF HOLDERS REPORTED SELLING CROPS

Administrative Division	Total Number Holders	Number Reported Selling Crops	Percent Selling Crops
Southern Province	(91,320)	(68,579)	- - -
Bo District	33,789	25,841	76.48
Bonthe	7,718	6,427	83.27
Moyamba	32,474	22,369	68.88
Pujehun	17,339	13,942	80.41
Eastern Province	(97,317)	(64,642)	66.42
Kailahun	23,475	16,061	68.42
Kenema	42,082	29,977	71.23
Kono	31,754	18,604	58.59
Northern Province	(90,185)	(53,783)	59.64
Bombali	17,798	8,213	46.15
Kambia	14,720	10,491	71.27
Koinadugu	16,111	6,385	39.63
Port Loko	26,515	20,433	77.06
Tonkolili	15,041	8,261	54.92
Western Area	(7,321)	(3,298)	45.05
Sierra Leone	286,137	190,302	66.51

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-8 AVERAGE VALUE IN LEONES OF CROPS SOLD/BARTERED BY HOLDER (WESTERN AREA EXCLUDED)

Administrative Division	Holders Reported Selling Crops	All Crops Quantity (CWT)	Average Weight Marketed Holder (CWT)	Value of Crops	Average Return/ Holder
Southern Province	(68,579)	(447,169)	6.52)	(2,445,442)	(35.66)
Bo District	25,841	146,919	5.68	703,869	27.23
Bonthe	6,427	68,571	10.67	340,174	52.93
Moyamba	22,369	148,743	6.65	847,795	37.90
Pujehun	13,942	82,936	5.95	553,604	39.71
Eastern Province	(64,642)	(774,079)	(11.51)	(5,185,008)	(80.21)
Kailahun	16,061	226,446	14.10	1,707,809	106.33
Kenema	29,977	176,151	5.88	1,471,837	49.10
Kono	18,604	341,482	18.36	2,005,362	107.79
Northern Province	(53,783)	(627,947)	(11.68)	(2,898,303)	(53.89)
Bombali	8,213	54,568	6.64	272,263	33.15
Kambia	10,491	168,289	16.04	760,816	72.52
Koinadugu	6,385	37,136	5.82	187,771	29.41
Port Loko	20,433	231,781	11.34	987,691	48.34
Tonkolili	8,261	136,173	16.48	689,762	83.50
Sierra Leone	187,004	1,819,195	9.73	10,528,753	56.30

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-9 QUANTITY AND VALUE OF CROP PRODUCTION

Crops	1965/66 Production (1,000 Tons)	1965/66 Value (Le 1,000)	1970/71 Production (1,000 Tons)	1970/71 Value (Le 1,000)
Rice	393.9	32,063	442.9	38,089
Millet	6.3	252	6.3	252
Maize	10.4	354	10.4	351
Pigeon Peas and Cow Peas	0.8	40	0.8	40
Sorghum	5.9	201	5.9	201
Cassava	75.4	4,222	81.2	4,547
Sweet Potatoes	18.3	2,050	18.3	2,050
Groundnuts	13.8	1,159	14.9	1,162
Palm Kernels	54.4	3,460	66.1	4,297
Palm Oil	46.4	11,322	49.9	13,822
Benniseed (Sesame)	0.8	72	0.8	61
Coconuts	1.9	132	1.9	132
Coffee	18.2	4,892	19.7	6,178
Cocoa	5.9	1,586	6.4	2,007
Ginger	1.1	370	- -	- -
Kolanuts	3.5	604	4.0	686
Piassava	4.7	339	4.1	344
Mangoes	3.5	200	3.5	263
Citrus Fruits	48.5	2,624	48.5	2,624
Bananas and Plantains	14.7	879	14.7	879
Other Fruits	25.0	3,545	25.0	3,545
Tomatoes	8.4	1,033	8.6	2,890
Beans	0.3	29	0.3	29
Other Vegetables	18.4	1,281	20.6	1,432
All Other Crops		6,000		6,000
Total		78,709		91,881

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-10 METHOD OF CONVEYING AGRICULTURAL PRODUCTS TO MARKET
(Expressed in Percentages)

Administrative Division	Headloads (by foot)	Truck	Foot and Truck	Other (Canoe, etc.)
Southern Province	16.5	9.4	7.2	0.8
Eastern Province	14.8	15.2	3.5	0.4
Northern Province	17.6	4.8	6.0	0.8
Western Area	2.1	0.3	0.6	---
Sierra Leone	51.0	29.7	17.3	2.0

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE C-11 METHOD OF TRANSPORT, DISTANCE COVERED, AND TIME TO MARKET FOR SELECTED DISTRICT MARKET TOWNS

District	Major Market Town	Usual Method of Transport	Frequent Distance Covered (Miles)	Frequent Time Taken (Hours)
Bo	Koribondo	Foot, truck	10 - 20	11
	Sumbuya	Foot	5	1
	Serabu	Foot	5	1
Bonthe	Gbangbatoke	Foot	10 - 20	3 - 4
	Bonthe	Canoe	30 - 40	3 - 4
	Mattru	Foot	5	1
Moyamba	Mano	Foot	10 - 20	2 - 3
	Kangahun	Foot	5 - 10	1
	Rotifunk	Foot	5 - 10	2 - 3
Pujehun	Yonni	Truck	5	1 - 2
	Pujehun	Truck	10 - 20	1
	Koribondo	Truck	10 - 20	1
	Bo	Truck	40 - 50	1 - 2

SOURCE: Agricultural Statistical Survey, 1970/71 (Central Statistics Office)

TABLE C-12 DISTANCE IN MILES AGRICULTURAL GOODS TRANSPORTED TO MARKET BY HOLDER

ea		Less Than 5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	Over 70
uthern Province	37,162	7,739	10,429	14,664	1,617	1,069	1,065	- -	499	80
stern Province	37,195	10,543	15,568	6,071	2,987	883	481	403	- -	259
rthern Province	32,061	12,756	5,209	8,716	3,292	1,460	254	- -	120	254
stern Area	3,298	2,296	- -	712	20	- -	270	- -	- -	- -
erra Leone	109,716	33,334	31,206	30,163	7,916	3,412	2,070	403	619	593
Percent	100.00	30.39	28.44	27.49	7.21	3.11	1.89	.37	.56	154

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

b. Contrary to popular belief, the small farms of shifting cultivators are complex enterprises, often composed of several micro-units of nearly equal complexity.

c. In order to obtain the information needed for an economic appraisal, close liaison will be needed between agricultural economists, rural sociologists, and agronomists.

d. Farm income (Table C-7) is composed of income in kind (the food produced and consumed on the homestead, collected products and the amenities) and cash income from the sale of products and possibly of labor in the form of external work. As it is impossible to attempt to estimate the quantities of the scores of varieties of products produced, there is an inherent danger of over simplification through the selection of a few crops of commerical value.

e. In order to express total family production and consumption in one meaningful figure, it is common practice to calculate the value, in terms of farm gate prices in local currency, of the principal crops of commercial value. The lack of a criterion of values poses an immediate problem in that the earnings of some well-defined social groups of the country are seldom given. The problem is compounded by annual differences in local prices and variations in international rates of exchange. An alternative method which appears promising, although to our knowledge has seldom, if ever, been used in studies of shifting cultivation, would be to convert the output into grain equivalents. This method has been used for measuring productivity in the study of subsistence agriculture (Clark, 1964).

f. The farming costs incurred by shifting cultivators are mainly seed and labour; most tools are home made and only a few are acquired by barter or purchase. It is not difficult to fix a unit cost of seed, but it may be very difficult to estimate the quantity used. In costing labor, it is relatively easy to measure total time but difficult to establish time spent on individual crops.

g. In this case it is not appropriate to use opportunity costs which implies that family labor input has a value assigned to it based on current wage rates. Therefore, the only meaningful figure for assessing economic performance is the value of the farm income (as defined in d. above). Once the time spent on raising crops is measured and output is expressed in one figure one can calculate the return to labor.

h. In most cases, to try to calculate interest on the capital of shifting cultivators is as absurd as to try to

calculate 'rent' on the holding.

i. Another figure of interest which should be calculated is the proportion of the crops sold relative to that consumed on the homestead and the cash income and its source.

Now that concrete, though incomplete, proposals are being made to improve or modify Sierra Leonean farming systems, it is judged appropriate to examine proposals for improving existing methods and thus reach by progressive means a level of productivity which will not irreversibly upset the food production capacity of Sierra Leone. Within this context, the project will address the issue of cropping systems in the following fashion:

a. First, the project will thoroughly test and examine the suitability of the recommendations to the farmers. At best the proposals will contribute only to a slow process towards improving the current system but at least they will involve the farmers more deeply in the possible changes. At present technical advice is mainly transmitted to farmers through demonstration plots in farmer's fields but most of the operations are conducted by research and extension workers. The project will have the farmer himself, under technical supervision, doing all the operations with all the limitations that it implies. By so doing, experiments will become a community effort and through their complete involvement the farmer and his fellow smallholders will more readily understand and absorb. This kind of research trials and extension demonstrations on farms will be organized so that the effects would be widespread. An essential preliminary condition is that those in charge of the program will be thoroughly familiar with traditional techniques in order to know what to retain, what to improve and what to discard.

b. Second, the project will investigate the pattern of shifting cultivation as an entity, covering the whole cycle of a shift and not piecemeal. It is unsatisfactory to tackle each aspect (soil, crops, tillage, weeding and social) individually. Studies will be undertaken in diverse environments to give us the most comprehensive knowledge. In this way it will be possible to learn the full technical reasons that may justify the traditional shifting and cropping methods.

C. Summary and Conclusions

The traditional farming system in the absence of heavy population pressure, is a technically sound method of soil management well adapted to the local ecological environment; it provides a way of making good use of the farmers' limited resources of labor, capital and market facilities; it maintains the soil fertility to

a certain level, conserves the soil against erosion and controls the amount of soil borne pests and diseases and pernicious weeds. The demographic pressure on land, socio-economic changes, introduction of cash crops and new techniques of cultivation, have shortened considerably the fallow period and to some extent have modified the traditional practices of cultivation. The consequences are steady decrease of soil fertility leading to poor crops and progressive deterioration of the environment. The fertility of the land, thus degraded under years of continuous traditional cropping with short fallows, has proved to be very difficult to restore.

Shifting cultivators in Sierra Leone, who for centuries have been following a sound and successful system of agriculture well adapted to the existing conditions, can be forgiven if they could not foresee the consequences of their increase in numbers and the reduction of their living space caused by the inroads of civilization. They are incapable of solving completely by themselves the problem posed by the declining yields that are the result of the shortening of the fallow periods that circumstances have forced upon them. Instead of financing sufficient research into the possibilities of sound modifications and semi-permanent use of land, the government in the past has generally not addressed the problem. This futile lack of policy is now giving way to a better understanding of the situation. The problem which faces the administrator and his agronomist is not so much that of 'abolishing shifting cultivation' as of creating social conditions in which there is an incentive to utilise resources efficiently without detriment to the basic fertility of the soil. The answers to such a problem cannot be discovered ready-made by interpolating facts derived from temporate zone experience into a tropical context. To understand what constitutes economic motivation in any system of production we need to consider the social context in which that system operates.

In order to establish a sound basis for further improvement or replacement of the system, the social aspects of the problem should be kept in mind. To find, a priori, the best technical solution is certainly necessary and of great value, but as it is extremely difficult, if not impossible to turn a traditional farmer nearly overnight into a modern farm manager, this ACRE project foresees a transition period including appropriate transitional methods. During this period the task will be not to impose the best technical solution on the people but to have at hand the best technical solution which is acceptable to the people.

There are valid reasons of technological, sociological, and economic nature for the farmer's reluctance to change to a sole cropping system. This reluctance highlights one of the

fundamental problems of extension workers. Unfortunately, most farmers remain unconvinced of the value of recommendations demonstrated by such individuals. Until these workers can suggest changes that have a convincing return, and yet do not involve big changes in farming methods, it is unlikely they will ever be truly effective in their work. It is suggested that once the farmer has adopted an innovation that does not conflict too much with his present traditional outlook, e.g. improvement of his returns from inter-cropping, it will then be easier for the extension worker to suggest more radical changes.

PROJECT FINANCIAL PLAN SUPPLEMENT

A. Cost Coefficients

1. Technical Services (Table D-1)

Cost per staff year ranges from $66,735 to $97,180 which is based on recent USAID/Liberia and Sierra Leone experience. The contract overhead is 100%.

2. Participant Training (Table D-2)

A figure of $1,100 per month (State 78-270256) of U.S. long-term training is used. For long-term training in Africa a base figure, reflecting current costs, of $500 per month is employed. External short-term participants are costed at $2,100 per month (State 78-270256). Participants are fully funded at inception. Numbers in parentheses represent new starts.

3. Commodities (Table D-3)

a. Vehicles

Base costs are $11,000 per 4-wheel drive vehicle, $15,000 per 5-1/2 ton truck, and about $2,100 per motorcycle (local procurement).

b. Extension Supplies

An estimate of costs for extension demonstration supplies in pilot areas (local procurement).

c. Research Supplies

An estimate of costs for research trial supplies at the Rokupr RRS and Njala (local procurement).

d. Field Equipment

An estimate of costs for field equipment to be located at the project center at Njala (local procurement).

4. Local Costs

a. Construction (Table D-4)

All construction costs are based on recent experience

TABLE D-1 U.S. INPUTS - TECHNICAL ASSISTANCE (U.S.DOLLARS)

Position	Year 1		Year 2		Year 3		Year 4		Year 5	TOTAL
Research Administrator	97,180		69,780		67,390		70,780		80,780	385,910
Crops Researcher	96,535		69,135		66,735		80,135		-	312,540
Soils Researcher	96,535		69,135		66,735		80,135		-	312,540
Extension Agronomist	96,535		69,135		66,735		70,135		80,135	382,675
Agricultural Economist	96,535		69,135		66,735		80,135		-	312,540
Administrative Officer	3,500		3,500		3,500		3,500		3,500	17,500
Short-Term Consultants	111,190		66,130		69,860		70,560		70,560	388,300
100% Overhead	255,500		231,500		238,100		238,100		117,500	1,080,700
	(853,510)		(647,450)		(530,455)		(564,745)		(352,475)	(2,958,635)
Inflation/ Contingencies (10%)	85,351	(13%)	84,163	(18%)	116,248	(23%)	159,521	(28%)	98,693	543,976
TOTAL	938,861		731,613		762,038		853,001		451,168	3,736,681

TABLE D-2 U.S. INPUTS - PARTICIPANT TRAINING (U.S. DOLLARS)

Training	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
U.S. Long-Term	(6)* 118,800	(4) 105,600	(4) 105,600	--	--	(14) 330,000
Africa Long-Term	(2) 24,000	(2) 24,000	(2) 24,000	--	--	(6) 72,000
External Short-Term	(3) 18,900	(3) 18,900	(2) 12,600	--	--	(8) 50,400
TOTAL	(11) 161,700	(9) 148,500	(8) 142,200	--	--	(28) 452,400

* Indicates number of "new-start" participants.

TABLE D-3 U.S. INPUTS - COMMODITIES (U.S. $1,000)

Item	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Landrover (5 plus 5 replacements)	55	--	60	--	--	115
Trucks (2)	--	30	--	--	--	30
Motorcycles (70)	25	45	45	45	--	160
Soils Laboratory Equipment	--	25	25	--	10	60
Extension Supplies in Pilot Areas	10	10	20	20	10	70
Research Supplies*	20	20	20	10	10	80
Njala Center Field Equipment	40	60	30	30	--	160
Office Equipment/Supplies	40	6.5	6.5	6.5	6.5	66
TOTAL	190	196.5	206.5	111.5	36.5	741

*Farmer Field Trials - Rokupr and Njala

TABLE D-4

U.S. INPUTS - CONSTRUCTION (U.S. $1,000)

Construction	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Houses (Njala) (7)*	255	—	—	—	—	255
House (Rokupr)	40	—	—	—	—	40
Soils Laboratory	—	50	50	—	—	100
Crop Building	20	30	—	—	—	50
Research Center Bldg.	85	85	50	50	—	270
Design & Supervision	15	5	—	—	—	20
TOTAL	415	170	100	50	—	735

* Indicates Number of Units

by other donors (WARDA, FAO/IITA and the IADP's). The cost of field staff houses for technicians and consultants are estimates based on current costs of pre-designed houses.

b. Support Funds and Other Costs (Table D-5)

Extension support to pilot areas includes estimates for POL, farmer payments, and other costs. The cost of mini-kits is an estimate based on minimum costs. Support funds are estimated for on-farm research trials based on recent experience. Research support funds at MANR/NUC are estimated costs for special research activities conducted by students and other non-project personnel in direct support of project activities. In the second project year AID covers about 62% of support funds and other costs. In succeeding years the level of support is reduced ultimately to $40,000 in year five.

B. Calculation of GOSL Contribution

1. Salaries and Overhead (Table D-6)

Based on expected grades of project counterpart and administrative staff the average cost per year for a research scientist is Leones 7,000 including overhead and emoluments (travel per diem, allowances, etc.). The majority of scientific staff will spend 3/4 time on project activities and ¼ time with teaching at the NUC. A Sierra Leone inflation factor of 15% is added starting in 1976/77.

2. Commodities (Table D-7)

a. Extension Supplies

Roughly the reciprocal of the AID contribution using the same budgeting rationale stated in latter part of A.4.b.

b. Research Supplies

Roughly the reciprocal of the AID contribution using the same budgeting rationale stated in latter part of A.4.b.

c. Field Equipment

Roughly the reciprocal of the AID contribution, using the same budgeting rationale stated in latter part of A.4.b.

d. Office Equipment and Supplies

Roughly the reciprocal of the AID contribution,

TABLE D-5 U.S. INPUTS - SUPPORT FUNDS AND OTHER COSTS

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Extension Support to Pilot Areas (POL, Farmer Payments, etc.)	10	20	15	10	5	60
Mini-kits	5	10	15	10	5	45
Research Trials (On-Farm)						
Njala	10	20	20	15	5	70
Rokupr	10	20	20	15	5	70
Research Support (MANR/NUC)	20	40	30	20	10	120
Other Costs	10	10	10	10	10	50
TOTAL	65	120	110	80	40	415

TABLE D-6

GOSL INPUTS - SALARIES AND OVERHEAD (LE 1,000)

Positions	Annual Salary & Emoluments 1976/77		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Center Headquarters								
Director	9.0		10.9	12.0	13.2	14.5	15.9	66.5
Research Coordinator	8.0		9.7	10.7	11.7	12.9	14.2	59.2
Extension Coordinator	8.0		9.7	10.7	11.7	12.9	14.2	59.2
Crops Researcher	7.0(5.25) 1/	(9M) 2/	6.4	7.0	7.7	8.5	9.3	38.9
Soils Researcher	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Farm Mgmt. Specialist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Extension Agronomist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Crops Systems Specialist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Rural Sociologist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Agricultural Economist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Intermediate Technologist	7.0	(9M)	6.4	7.0	7.7	8.5	9.3	38.9
Administrative Officer	5.0		6.0	6.7	7.3	8.0	8.9	36.9

TABLE D-6 (cont'd)

Positions	Annual Salary & Emoluments 1976/77	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Research Assistants (6)	1.2 (7.2)	(6) 8.8	9.6	10.6	11.6	12.8	53.4
Secretaries (5)	1.0 (9.5)	(5) 11.5	12.7	13.9	15.3	16.8	70.2
Clerk/Typists (5)	1.0 (5.0)	(5) 6.0	6.7	7.3	8.0	8.9	36.9
Drivers (5)	.6 (3.6)	(5) 3.7	4.0	4.4	4.8	5.3	22.2
Watchmen/Messenger/ Laborers (6)	.6 (3.6)	(6) 4.4	4.8	5.3	5.8	6.4	26.7
Field Staff							
Senior Extension Officers (5)	6.0 (30.0)	(5) 36.3	40.0	44.0	48.3	53.1	221.7
Clerk/Typists (5)	1.0 (5.0)	(5) 6.0	6.7	7.3	8.0	8.9	36.9
Extension Instructors (30)	1.3 (39.0)	(20) 31.2	(30) 51.9	57.1	62.8	69.0	272.0
		195.4	232.4	255.4	280.9	308.8	1,273.0
Contingency @ 15%		29.3	34.9	38.3	42.2	46.4	191.0
Total Leones (Le 1,000)		224.7	267.4	293.7	323.1	355.2	1,464.1
Total Dollars (U.S. $1,000)		212.0	252.3	277.1	304.8	335.1	1,381.3

1/ Indicates 3/4 salary (9 months)
2/ Indicates number of staff months per year
3/ Exchange rate One Leone (Le 1.00) = U.S.$ 0.94 (November, 1977)

TABLE D-7 GOSL INPUTS - COMMODITIES (US $1,000)

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Extension Supplies in Pilot Areas	5	10	10	10	20	55
Research Supplies*	-	5	5	15	15	40
Njala Center Field Equipment	-	-	5	5	15	25
Office Equipment/Supplies	10	2.5	2.5	2.5	2.5	20
Technical Publications	1	1	1	1	1	5
TOTAL	16	18.5	23.5	33.5	53.5	145
TOTAL (Le 1,000)	17	19.7	25	35.6	56.9	154.2

*Farmer Field Trials - Rokupr and Njala

using the same budgeting rationale stated in latter part of A.4.b.

e. Technical Publications

An estimate of the cost of required technical/scientific publications and periodicals.

3. Land and Civil Works (Table D-8)

An estimate of the value of land, civil works (roads, fences, etc.), and installation of infrastructure for utilities.

4. Support Funds and Other Costs (Table D-9)

With the exception of transportation costs for participant trainees, these costs are roughly the reciprocal of the AID contribution, using the same budgeting rationale stated in latter part of A.4.b.

5. Construction (Table D-10)

An estimate of the cost of construction for local staff housing.

TABLE D-8 GOSL INPUTS - LAND AND CIVIL WORKS (US $1,000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Land, Njala Headquarters (50 acres)	100	-	-	-	-	100
Land, Njala Research (100 acres)	100	100	-	-	-	200
Land, Rokupr Research (50 acres)	100	-	-	-	-	100
Land, (3 IADP's) Research (150 acres)	50	25	-	-	-	75
Civil Works, Njala (Roads, Fences, etc.)	22	-	-	-	-	22
Utilities Installation (Water, Electricity, Sewage)						
Njala	41	-	-	-	-	41
Rokupr	4	-	-	-	-	4
TOTAL	417	125	-	-	-	542
TOTAL (Le. 1,000)	442.1	132.5	-	-	-	574.6

TABLE D-9 GOSL INPUTS - SUPPORT FUNDS AND OTHER COSTS (US $1,000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Transportation for Participants	12	10	9	-	-	31
Extension Support to Pilot Areas: POL, Vehicle Repair and Insurance, Farmer Payments, etc.	5	5	10	15	20	55
Mini-Kits	1	2	5	10	15	33
Research trials (On-Farm)						
Njala	2	5	5	10	20	42
Rokupr	2	5	5	10	20	42
Research Support (MANR/NUC)	-	-	10	20	30	60
Utilities, Running Costs and Maintenance (electricity, water, sewage)						
Njala	12.5	12.5	12.5	12.5	12.5	62.5
Rokupr	1	1	1	1	1	5
Maintenance/Security						
Njala	12	12	12	12	12	60
Rokupr	.5	.5	.5	.5	.5	2.5
Insurance/Legal Expenses	10	10	10	10	10	50
Other Costs	10	10	10	10	10	50
TOTAL	68	73	90	111	151	493
TOTAL (Le.1,000)	72.1	77.4	95.4	117.7	160.1	522.7

TABLE D-10 GOSL INPUTS - CONSTRUCTION (US$1,000)

Construction	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Houses, Senior Staff	(3)*105	--	--	--	--	105
Houses, Senior Support Staff	(10) 200	--	--	--	--	200
Houses, Junior Staff	(16) 160	--	--	--	--	160
TOTAL	465					465

* Indicates Number of Units

Annex E

PROJECT SOCIAL ANALYSIS SUPPLEMENT

A. People and Government

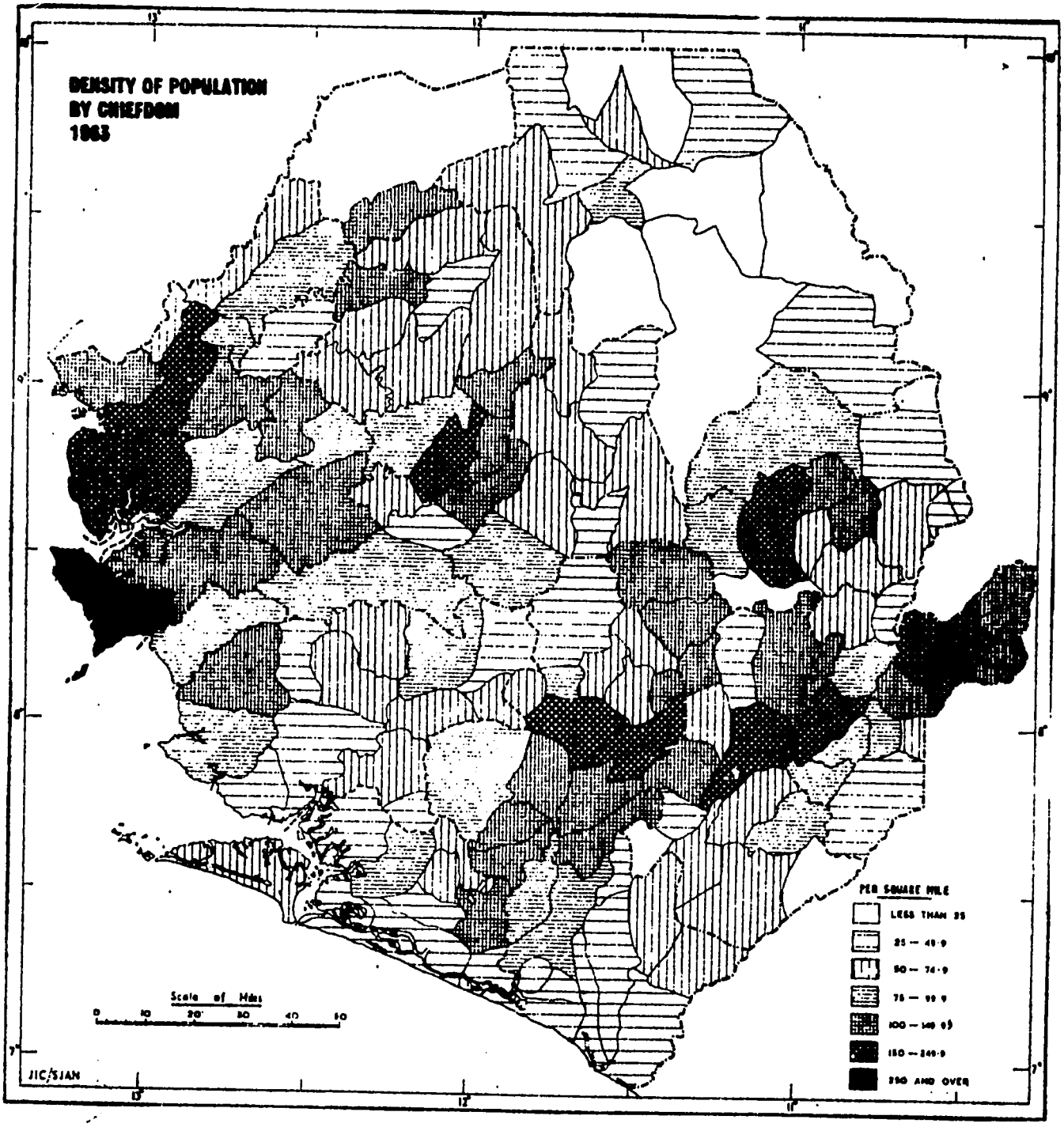
The rural people of Sierra Leone presently number about 2.4 million or about 80% of the total population (Figure E-1). Temne constitute about 30% of the country's population and Mende about 30%. The remainder of the rural populace (Figure E-2) is primarily made up of the Limba, Koranko, Kissi, Loko, Sherbro, Susu, Gallina (the only people who have a written language of their own), Mandingo (pastoral Muslims from the North), Fula (Muslim, mostly cattle farmers in the North), Kono and Kuranko (skillful hunters) tribes. Although the Temnes and the Mendes maintain distinct cultural unities, they are in fact very similar in economy, social organization, and culture to the peoples around them.

The unit of governance (Table E-1) in rural Sierra Leone is the chiefdom. In the country as a whole there are 148 chiefdoms (Figure E-3). Each chiefdom varies considerably in terms of size and wealth, but they are basically identical in terms of internal structure. Each is ruled by a hierachy descending from a Paramount Chief (who is assisted by a speaker) at the apex, through a number of Section Chiefs (and their speakers), to the village chiefs and headmen at the base. Paramount Chiefs are elected for life, unless deposed, by a form of electoral college called Chiefdom Councils. The Chiefdom is a crucial emotional focus for the vast majority of Sierra Leoneans; it is the arena in which local political prizes are won and lost, where taxes are paid and justice meted out, and where rural development schemes may ultimately succeed or fail. Extended family, exogamous kin-groups and the paramount chieftaincies form, with the binding force of initiation societies, a social nexus closely mirrored by hierachy of hamlet, village and rural centers. There are about 29,000 non-urban settlements (Figure E-4 and Figure E-5), including the rare isolated impermanent homestead.

Below the section or "clan" chiefs are the village or "town" chiefs - in fact the chiefs of settlements which may consist of as few as four houses. It is the town which is the major unit of reference for individual farmers. Within it most of their friendships are formed, their relationships to outside agencies are organized, and their economic life pursued. Land around the town that is not yet assigned to individual descent groups (or large "families") for productive purposes is allocated by a decision-making process involving the senior men of the town.

Figure E-1

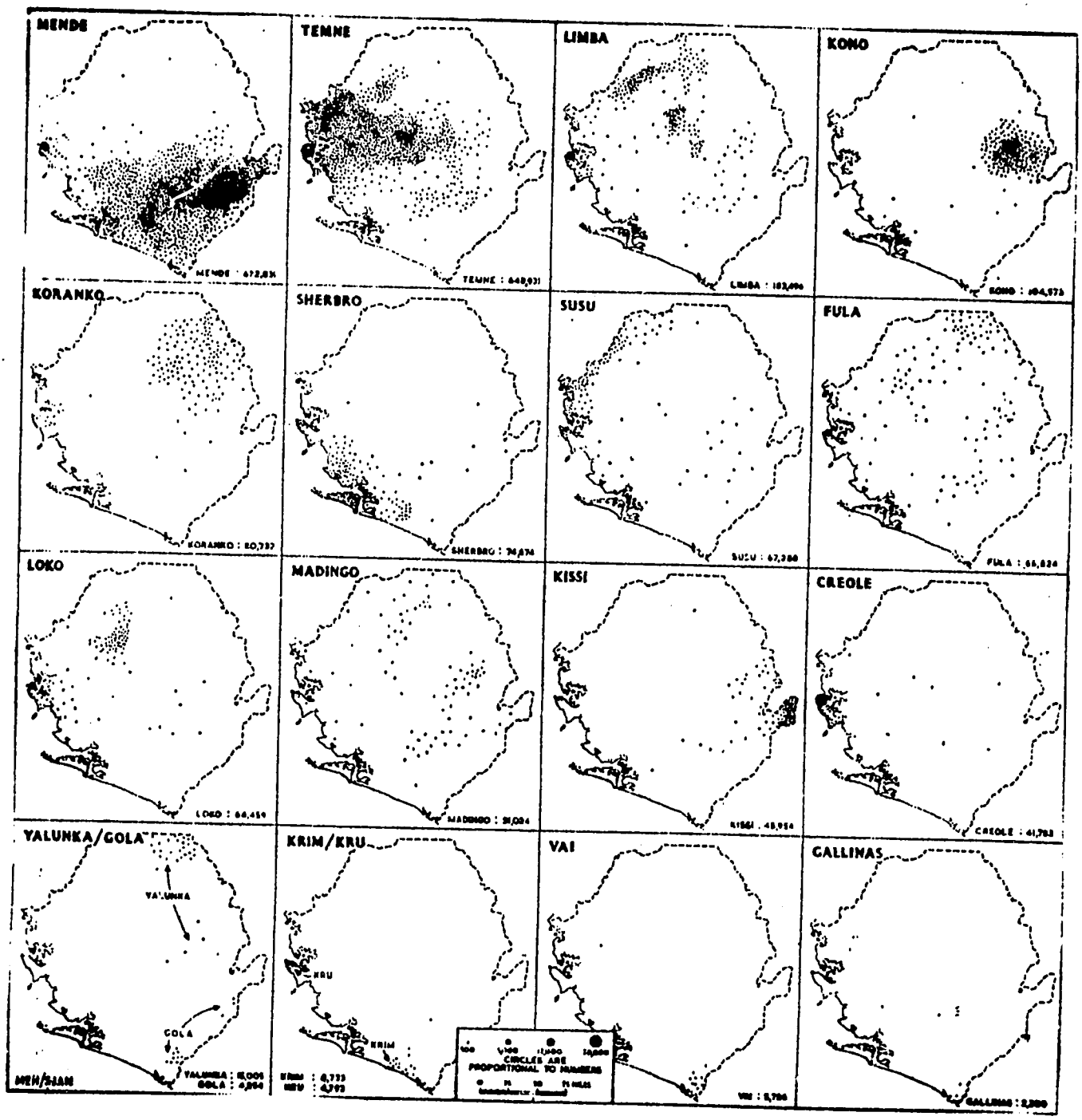
DENSITY OF POPULATION BY CHIEFDOM



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

Figure E-2

PREDOMINANT ETHNIC GROUPS OF SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966

TABLE E-1 POLITICAL DIVISIONS IN SIERRA LEONE

3 Provinces (Resident Minister - Provincial Secretary)

1 Area (Western: Freetown Pinensula)

148 Chiefdom Councils

4 Rural District Councils

Provinces	Headquarters	District	Headquarters	Number Chiefdoms
Southern	Bo	Bo	Bo	15
		Bonthe	Bonthe	11
		Moyamba	Moyamba	14
		Pujehun	Pujehun	12
Northern	Makeni	Bombali	Makeni	13
		Kambia	Kambia	7
		Koinadugu	Kabala	11
		Port Loko	Port Loko	9
		Tonkolili	Magburaka	11
Eastern	Kenema	Kenema	Kenema	16
		Kono	Koidu	14
		Kailahun	Kailahun	14
Western Area	Freetown			

SOURCE: Central Statistics Office

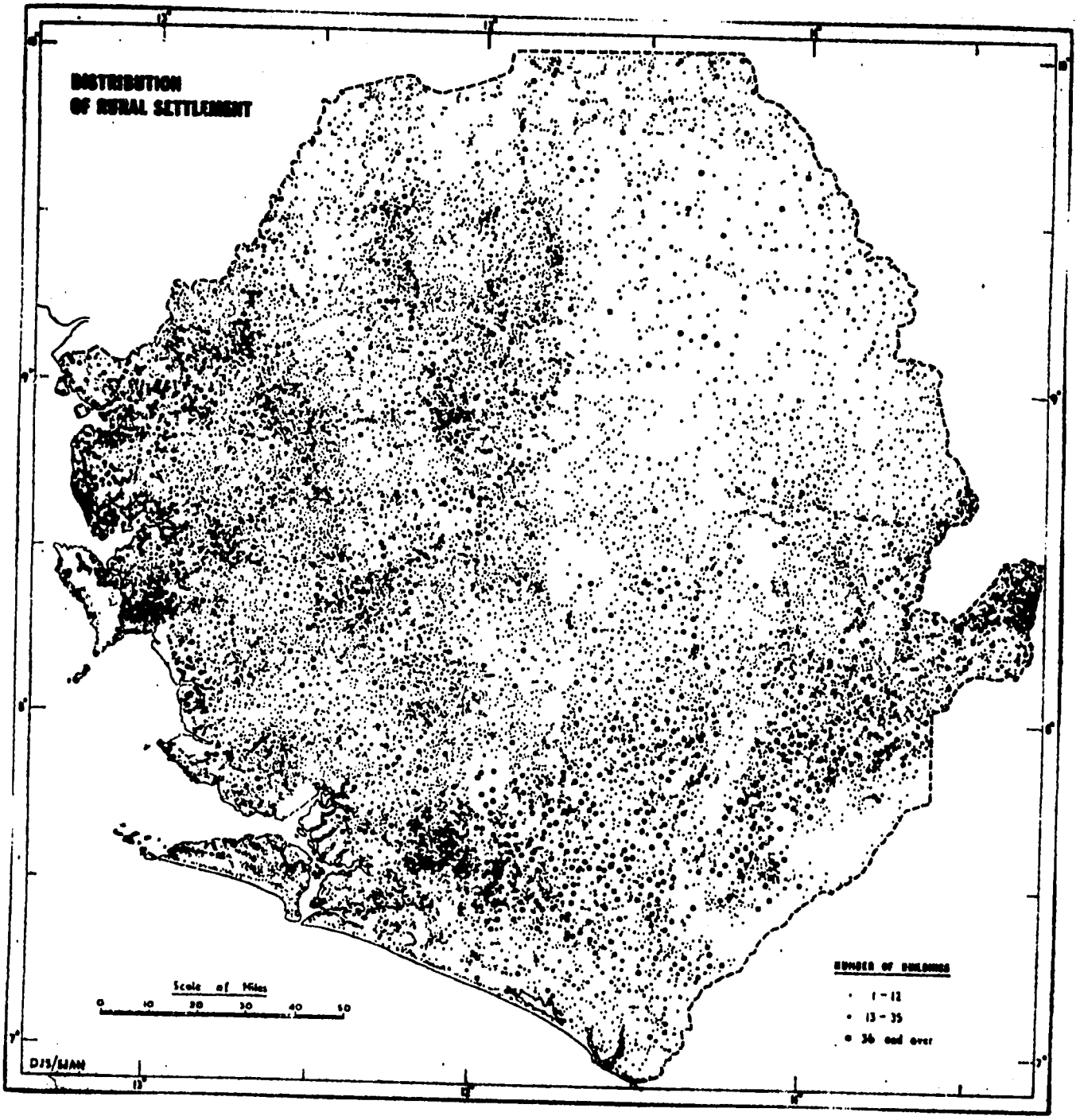
Figure E-3

CHIEFDOMS OF SIERRA LEONE

Source: Sierra Leone in Maps, J. E. Clarke, 1966.

Figure E-4

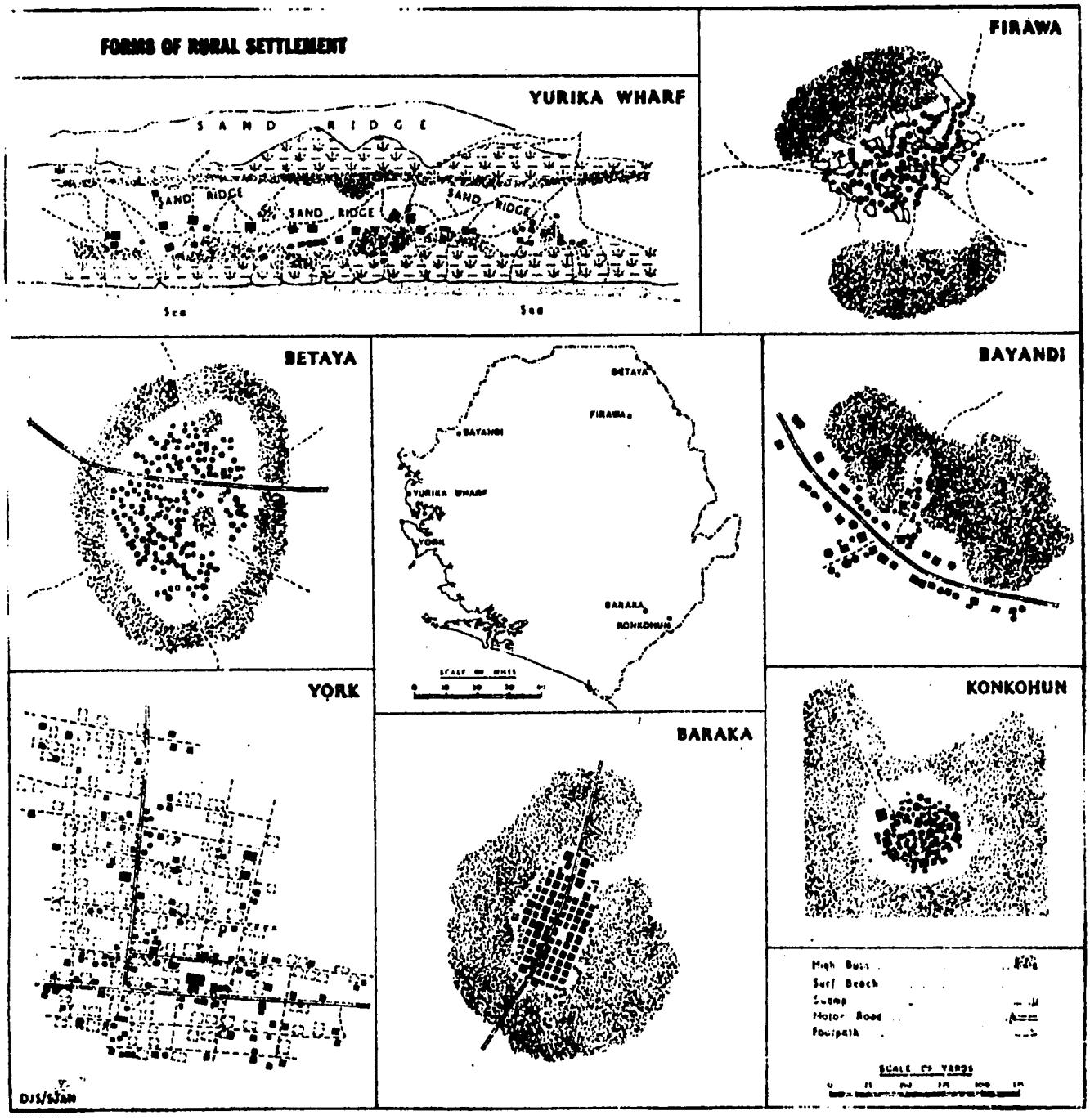
RURAL SETTLEMENT IN SIERRA LEONE



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

Figure E-5

FORMS OF RURAL SETTLEMENT



Source: Sierra Leone in Maps, J. I. Clarke, 1966.

Effectively, however, land-holding and production units are at a lower level (Table E-2). Larger towns may be divided into quarters, the core members of each of which are related by blood or history. Towns and quarters are in turn composed of shallow descent groups, each with its farmlands generally controlled by a lineage head. But in turn, the land is assigned to individuals, who for all practical purposes own it. Individual household leaders make decisions on all aspects of production, and their children inherit the land. Only in special circumstances - the extinction of a family, war or major migration - do higher levels of authority exercise residual rights to deal with family land.

The individual farm family (both male and female members) is the production and consumption unit. Occasionally, a set of brothers or a father and adult sons and wives or daughters may cooperatively work a field, but in general the nuclear household does so. Individual tasks may be carried out by a voluntarily-joined reciprocal work group that moves from farm to farm, but this cooperative labor does not alter the basic definition of the one family, one farm economic structure. The one substantial exception to the family farm is the additional, personally-owned, field that various individuals - usally wives of the family on the land acquired from their fathers family - may work for additional <u>personal</u> profit.

The farm is an upland rice farm (Gibbs, 1965) which averages about 4.5 acres (Table E-3 and E-4). Using a system of rotational bush-fallowing and a technology of the machete and hoe, smallholders clear new fields each year. Clearing (in fact, re-clearing - there is little virgin forest), felling, and burning take place at the end of the dry season, from February to April. Planting may begin in May or early June, weeding chores are at their peak in June/July, and the harvest depending on seed varieties lasts from October to December. Men fell trees, women weed, and men and women clear, brush, plant and harvest. Men also devote a good deal of time to fencing the gardens against groundhogs, while children stand vigil, especially during early growth and near harvest, primarily against bird pests.

Around this dominant rice-growing schedule, secondary activities fall into place. Cassava may be interplanted with rice or more often, grown on the same plot the next year. Women grow garden vegetables close to home, and there may be a few fruit trees as well. Groundnuts grown in small quantities by women for sale, are planted before upland rice and harvested during the slack between rice weeding and harvesting. Sugar cane can be planted over the whole rainy season. Coffee, cocoa, and improved palms are all grown by scattered farmers and again the labor demands fall into place around the rice calendar.

TABLE E-2 SUMMARY OF LAND TENURE (USE) SYSTEM OF CROP FARM LAND, SIERRA LEONE, 1970/71, ACRES AND PERCENT

TOTAL LAND AREA	17,084,800	(100.00%)
CULTIVATED LAND	1,318,346	(7.71%)
I. Individual Ownership 1/	395,455	(29.99%)
A. True Ownership		
Purchased	5,427	(.41%)
B. Restrictive Ownership		
1. Bequeathed	349,402	(26.50%)
2. Rented	40,625	(3.08%)
II. Communal Ownership 2/	922,890	(70.01%)
A. Family Ownership	660,375	(50.10%)
1. Bequeathed	387,285	(29.38%)
2. Family Member	272,716	(20.69%)
3. Other	372	(.03%)
B. Chiefdom	262,515	(19.91%)
1. Member	58,421	(4.43%)
2. Stranger Lease	39,763	(3.02%)
3. Clansman	14,762	(1.12%)
4. Other - usually associated with Chiefdom Lands		
a. Squatters	6,171	(.47%)
b. Special Government	111	(.008%)
c. Friends	70,901	(5.38%)
d. Loaned	24,652	(1.87%)
e. Pledged	13,880	(1.05%)
f. Leased	1,851	(.14%)
g. Other	31,998	(2.43%)

1/ Land owned under Individual Ownership has two interpretations: True Individual Ownership - refers to land owned such that some form of title or deed is in the possession of the owner and the owner has the freedom to dispose of the land as he wishes.

Restrictive Individual Ownership - refers to land owned by its current occupiers in ownerlike possession where no title or deed is present but the occupier behaves in a manner purporting to be that of title or deed. This is land owned freely but only within customary rights by the occupier and can be disbursed to another member of the family but not to a stranger. The titles are implicitly vested in the community as a whole through the Paramount Chief or certain large family groups acting as custodians and they allow others to occupy and use land under their control.

2/ Land under the Communal Ownership category is of two types: Chiefdom and Family. Holders of such lands recognize that land use right is because of membership within the community or family, a history of use recognized by the community or family needs.

SOURCE: Agricultural Statistical Survey, 1970/71 (Central Statistics Office)

TABLE E-3 AVERAGE ACREAGE UNDER CULTIVATION PER FIELD, PER HOLDER AND THE AVERAGE NUMBER OF FIELDS PER HOLDER BY DISTRICT

Administrative Division	Total Acreage Under Cultivation	Total Number of Fields	Total Number of Holders	Av. Acreage Per Field	Av. Acreage Per Holder	Av. Number Fields Per Holder
Southern Province	(332,675.8)	(149,692)	(91,320)	(2.22)	(3.64)	(1.64)
Bo District	120,114.7	47,285	33,789	2.54	3.55	1.40
Bonthe	18,291.1	9,499	7,718	1.92	2.37	1.23
Moyamba	144,847.8	58,567	32,474	2.47	4.46	1.80
Pujehun	49,422.2	34,341	17,339	1.44	2.85	1.98
Eastern Province	(499,485.1)	(192,201)	(97,317)	(2.60)	(5.13)	(1.97)
Kailahun	163,930.1	54,149	23,475	3.03	6.98	2.31
Kenema	276,796.7	90,737	42,082	3.05	6.58	2.16
Kono	58,758.3	47,315	31,754	1.24	1.85	1.49
Northern Province	(446,079.9)	(186,939)	(90,185)	(2.39)	(4.94)	(2.07)
Bombali	85,513.0	50,806	17,798	1.68	4.80	2.84
Kambia	73,480.4	28,062	14,720	2.62	4.98	1.91
Koinadugu	68,602.3	36,130	16,111	1.89	4.26	2.25
Port Loko	137,159.5	52,840	26,515	2.59	5.17	1.99
Tonkolili	81,324.7	19,101	15,041	4.26	5.41	1.27
Western Area	8,107.2	12,592	7,321	0.64	1.11	1.75
Sierra Leone	1,286,348.0	541,424	286,137	2.38	4.49	1.89

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

TABLE E-4 SIZE OF HOLDING AND PERCENTAGE OF TOTAL
(Based on 1970/71 Census Sample)

Size of Holding	Percentage of Total Holdings
1 acre - less than .5 acre	8.22
5 acre - less than 1 acre	6.52
1 acre - less than 3 acres	25.69
3 acres - less than 5 acres	22.24
5 acres - less than 7 acres	14.71
7 acres - less than 10 acres	11.91
10 acres - less than 15 acres	7.76
15 acres - less than 50 acres	2.95
	100.00

SOURCE: Agricultural Statistical Survey of Sierra Leone, 1970/71 (Central Statistics Office)

Special note must be taken of swamp rice at this point given its increasing importance in the production patterns of Sierra Leone. Traditional swamp rice producers choose swamplands where little felling or stumppulling is necessary, broadcast-sow some of the same varieties of seed as are used on upland, and plant and harvest the swamp before and after the upland crop is in. The extra labor in the swamp does not reduce family members participation on the combined family farm, but it does reward them with an income (in rice). In some cases, it allows the woman of the family two basic options - to contribute all the more to family welfare or to sell for building up her own means of financing herself out of an unhappy family situation. By providing her with options swamp rice gives her at least a medium of "liberation". Nonetheless, a variety of factors including the unreliability of swamp waters, the arduous and dirty swamp labor, the greater vulnerability to pests and the greater need for joint management of a fully-worked swamp, have served as constraints to development of the new improved swamp rice production by both male and female farmers.

Agricultural labor demands provide the rhythm of the year. The slack season after weeding (which is also the "lean" season with food reserves nearly depleted) and especially the post-harvest months provide the time for heightened social, religious, political, and craft activity. The rural people have few markets and little inclination for commerce according to Gibbs, who notes that "Mandingo" traders from Guinea, and Lebanese provide most of the trade goods and purchase rice and kola for export from the area.

The rural society is not entirely homogenous, of course. Formerly, slaves formed a politically disinherited underclass, though in economic terms they were not much worse off than freemen. Now as before, among all farmers there are distinctions of luck, enterprise, and intelligence that produce greater incomes for some people. Indeed, to become a rich and socially prominent man is an active aspiration of all. Such a "big man" will have many wives whose labor ensures his wealth, has a somewhat more sophisticated house and wardrobe, may have a few sheep, goats and N'dama cattle both as stored wealth and for important ceremonial slaughter, and may have a few clients as partly-paid laborers on his farms.

Most importantly, however, his wealth qualifies him for political leadership - in the first instance because people bring their quarrels to him, and then because decisions affecting his quarter or his town cannot be made without consulting him. This highly personalized leadership/following pattern is repeated up through the hierarchy of chiefs and into the national life of Sierra Leone. For example, a local chief may not hold influence over a rural man who works on an important man's farm and who is thus "protected" by his absentee patron.

It is this pyramid of political leadership which cuts across towns and clans to form the wider network of society. One of the traditional institutions which embodies this political power is the Poro. A "secret society" which extends across cultural and linguistic boundaries, Poro both controls ambition and political initiative and provides an arena for political achievement for the male populace. Individuals could strive for higher and higher titles in the association, and receive religious sanction for their leadership activities. Poro is still active in all of Sierra Leonean society, but the relations between secular and Poro leadership are not revealed to non-initiates. The predominant counterpart "secret society" for women is the Bundo. For the ACRE Project, one can simply assume that project activities will be closely scrutinized by these country-wide organizations. Society leaders will seek to insure that their interests and those of their organizations are not jeapordized by the ACRE Project's implementation.

Education (Figure E-5) in Sierra Leone is rather expensive. Although the government provides the basic personnel and facilities, a high percentage of school age children do not go to school. There is a substantial opportunity cost of schooling that must be borne by the family when a child's labor is diverted from productive use on the farm to schooling; an investment in human capital for which a return is not readily apparent or immediately realized.

B. Change in Rural Sierra Leone: The Context for Project Innovations

The impact of Westernization has been slowly building in rural Sierra Leone since the turn of the century. Christian and Islam mission influence and money have recast the framework of ideas and relationships throughout Sierra Leone. Wage labor possibilities by the 1920's on the coast and much more recently in the iron mines and diamond fields inland have enabled youths to become more independent and have encouraged the individualization of family farm enterprises discussed above. New crops (sugar cane, coffee, cocoa, groundnuts) have filtered into rural areas in a more or less unplanned way, although Mandingo traders have sponsored some swamp rice and coffee experimentation for the commerce that might ensue.

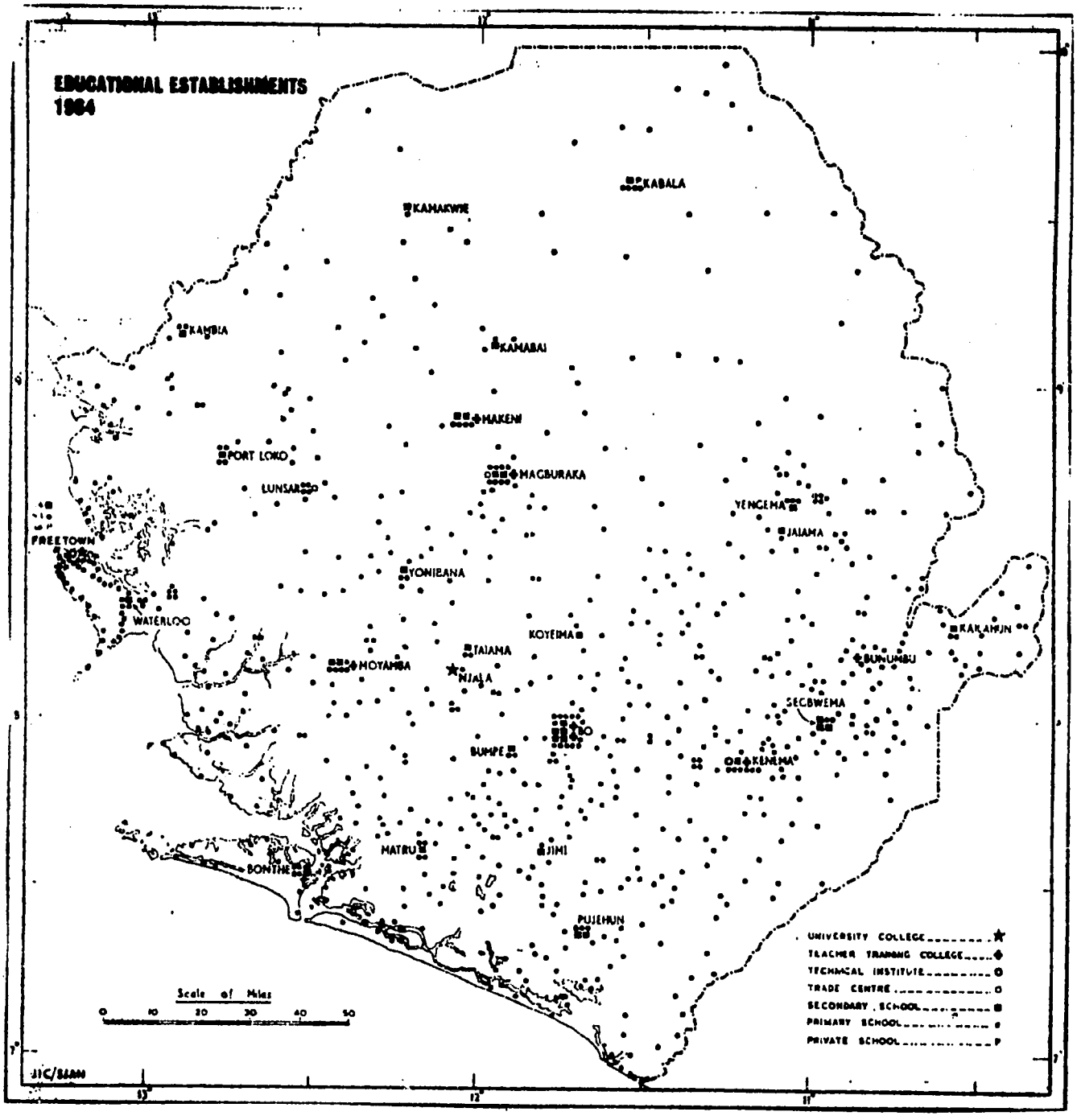
However, change is still steady and slow, rather than disorganized or massive. But slow change does not mean change resistant farmers. Until recently constraints to change were identified as the lack of:

1. Viable options for food crops and cash crops in terms of proven seed varieties and plant materials;

2. Marketing structures;

Figure E-6

EDUCATIONAL ESTABLISHMENTS



Source: Sierra Leone in Maps, J. I. Clarke, 1966

3. Governmental infrastructure and commitment to small-farmer development; and

4. An economy that provides more than a minimum per farm family in cash plus barely enough food to survive physically until the next harvest.

In spite of these constraints, rural smallholders have added small quantities of a variety of export and food crops to their farm and have adjusted work schedules, cultivation techniques, and market relationships accordingly. Motives for such changes have been largely acquisitive and economic, with farmers adopting practices that they perceive to be economically advantageous and taking place quite independently of any development programs (Currens, 1976).

The available evidence, for rural Sierra Leone as for most of the peasant farming communities of West Africa, is that farmers (a) are aware of, and have experimented with, a large number of extensive innovations, albeit on a small scale, (b) will adopt more extensive innovations if risks can be minimized and if gains to be made are demonstrable, and (c) will adapt if changes are not accompanied by political or cultural threats that are perceived to effect any purely financial gains. Nonetheless, in the long run culture and political organization may change dramatically.

Continuing communication with farmers and increasing knowledge of local conditions will help guide project initiatives, but there is a need for flexibility in project design and implementation. The project should permit redirection of its activities resulting from farmer-inputs, new information and changes in the social situation.

Tendencies toward "social engineering" will be avoided in the project. People in the area will be permitted to make their own synthesis of project innovations within their socio-cultural framework as they will be integrating a complexity of factors not fully identifiable in any social analysis. It is important that the project design facilitate healthy synthesis by being compatible with, and building on, the local social/cultural strengths.

One note of caution is that rural people do not necessarily yet have the relevant experience to think through the major consequences of adopting modern technology. Participating farmers are vulnerable for they see some of the benefits and none of the problems of modern technology. A cultural assumption in the area is that all technology is good to have. It is important for the project to help develop a critical assessment capacity in relation to modern technology, just as it is important to help develop means in collaboration with farmers, which broaden farmers' capacities to shape the direction of project activities and agricultural development generally.

C. Project Innovations

In this context the proposed innovations can be analyzed for the probable ways in which they will be perceived by beneficiaries and in which they will impact on them:

1. The Pace of Intended Interventions

As in all economic systems, there are relatively more efficient and relatively less efficient producers, who correspond to relatively better off and relatively worse off groups. The project will start from the existing and known system with simple interjections and move to more complex systems and interjections as the progress and attitudinal environment transform to acceptance of greater changes. The division and utilization of labor, for example, is based on cultural as well as technical factors. Effecting change heavily influenced by sociological factors is apt to be slow. It will require that significant evidence of benefits be realized before farmers will be willing to commit themselves to new techniques, particularly those requiring considerable cash outlays. The research component of the project has been specifically designed to take the existing social environment and the economics of the proposed technology into account in determining the feasibility of innovations to be introduced. The research and extension components of the project will first focus on staple food crops grown under mixed cropping conditions which are of major importance to the small farmer. This project will insure that members of the target group are involved in identifying their needs and in planning/designing approaches to problem solution.

Farmers are willing to trust that reasonable income can be made in improved food crops production. Even in remote areas farmers know that "new seeds" are potentially beneficial and that advice and other external aid can be of use. Nonetheless, the detailed implementation of the crop cultivation technology, soils management technology, and extension advice will be new to nearly all smallholders participating in this project. Reluctance on the part of farmers to move forward quickly on all of these fronts is therefore to be anticipated by the project and special efforts at pre-enlistment communication and animation will take place. Calendars of the scale of effort and expenditure and probably return will be constructed at the level of individual farmer to show him exactly what to expect and what the consequences of his choices may be. Farmers who participate in the research trials and extension demonstrations with successful results will be excellent recruits for participation in animation/demonstration activities, their farms will present more convincing displays

of the beneficial aspects of project outputs than will the traditional experiment station.

2. The Feasibility of Particular Crops

The food crops required for subsistence in Sierra Leone are cereals (rice plus maize), cassava, sweet potatoes and other root crops, various legumes, some fruits and vegetables, and a source of cooking oil.

(a) Upland rice: Experts at WARDA, UNDP, MANR/IADP's, NUC, and others now do not completely agree on the economics of "advanced" upland rice. During early phases of project implementation, if these differences have not been resolved, the necessary controlled testing will be carried out to determine the feasibility of various economic approaches to upland rice development. In any case, farmers throughout the project area are not expected to abandon their upland rice farms no matter what project management recommends as to possible alternative allocations of their time.

(b) Maize: Although rice is the cereal of preference, there is some suggestion that maize growing is expanding. Maize has several advantageous characteristics; it is potentially high yielding, it is relatively bird proof, it can provide a hungry gap green cob crop before rice harvest and its stover provides good dry season livestock fodder. It has disadvantages: poor storage qualities, attraction to monkeys and high fertility requirements.

(c) Cassava: Like upland rice, cassava is extensively grown throughout the country. The leaves are consumed daily with rice (when available) and the roots are primarily eaten during the "hungry season". The importance of cassava is undisputed and the potential for increases in per acre yield and disease and pest resistancy appear to be high.

(d) Sweet potatoes: In addition to consuming the tubers of sweet potatoes and yams, the tips of the vines of these plants are eaten as a green vegetable.

(e) Pulses: The principal foodcrop legumes are cowpeas and groundnuts. Both crops plus other edible pulses have excellent potential for increased per acre yield and disease and pest resistance. Groundnuts also have good potential for cultivation as a cash crop.

(f) Vegetables: Vegetables of some importance and potential include onions, chili peppers, okra and possibly tomatoes. While maize, cassava and rice are important in the entire project area, pulses and vegetables appear to benefit from a comparative advantage in the north around Kabala. Among the upcountry regions, Kabala has the highest potential for developing into a surplus

producer of vegetables for the principal urban markets.

(3) The Costs of Intended Interventions

(a) Crucial aspects of project success and their details must be communicated early and simply to farmers. Nearby, in mechanized farming projects in Liberia, credit and "costs" escalated to the point at which 80% of the crops was "owed" to the project; the farmers were thus badly burned. Post project costs must be estimated if farmers are to clearly understand who will pay for extension, transport, storage, and other costs. It is on this problem of institutionalisation that at least one of the on-going agricultural projects is now foundering.

(b) Kenema IDA project farmers do not receive any part of their seasonal loan until a substantial portion (40%) of the pre-input work has been completed. A major bottleneck has thus arisen in which farmers must borrow to cover initial costs at high rates of interest that diminish their actual returns from the project. This project will alleviate this problem by direct payment to participant farmers for services rendered.

(c) A major problem for Sierra Leonean farmers is the need for personal credit before the harvest. This service is currently performed by Lebanese and Mandingo traders, who profit both from markups on the goods credited and from low valuations given to the rice pledged in return. Although it is not a responsibility or constraint for this project, an alternative form of personal credit must be found for the average smallholder. Project agricultural economists will be participating in the solution of credit problems.

4. Processing and Marketing

The small farmers are also at a considerable disadvantage with the marketing system. They generally have little choice with respect to when or to whom they must sell their cash crops. These crops are head loaded to the village market mostly by women as surpluses become available and when funds are required by the household. It is anticipated that these constraints can be ameliorated through development of improved on-farm storage systems and improved techniques for increased farm production. Development of techniques for on-farm storage systems is of particular importance because of the multiple impact it could have. If the farmers could store their food crops throughout the year, the effects of the hungry season on the family would be lessened. Income would also increase because cash crops could be sold when it is to the farmers' advantage rather than immediately after harvest when prices are lowest.

This increased independence from outside influences and its visible benefits should in turn provide an incentive for increasing production. Project agricultural engineers and entomologists will address storage problems.

Another important assumption underlying projected benefits relates to the ability of the marketing mechanism to provide sufficient price incentives so that incremental production increases are sustained over and beyond the length of project. However, the most important improvements in food crop marketing in the short-run can and must be made on the farm by developing techniques for increasing production and for improving the quality and quantity of food crops that can be brought to the market. It follows, therefore, that the incentives expected from the marketing system in providing stable and fair product prices must follow or coincide with increased production. To assist farmers in increasing their marketed production throughout the year and in reducing wastes and losses, the research and extension components of this project will focus on developing and disseminating new techniques in bagging, on-farm storage and basic food processing. The degree of incentives and motivation the farmers will have to adopt such new techniques will be primarily determined by the nature, cost and profitability of these techniques as they are researched by the project.

One of the farmers' major complaints is that they are forced to pay taxes and loans immediately upon harvesting their crops, when their rice is then assigned its lowest value. The project will review the possibility of enabling the chiefdom level co-ops or farmer groups to store and to process foodcrops, once leadership and finance have attained a certain minimum level. Co-ops in the control of the farmers could become a major means of transferring added value to smallholders.

Annex F

PROJECT ORGANIZATION SUPPLEMENT

This supplement provides a brief rationale for the technical assistance skills proposed for the project, job descriptions for the individual contract team members funded by USAID and supplemental information regarding project organization.

A. Rationale for Proposed Technical Assistance Skills

1. Overall

As has been pointed out in this paper, there is a limited agricultural research and extension base as well as a limited capacity within Sierra Leone to conduct agricultural research and extension programs. Consequently, to mount any directed research and extension effort it is necessary to provide a reasonably complete package of personnel. In developing this project the technical, administrative and management skills required to achieve the specified outputs have been identified. This identification included a careful analysis of how these skills would be utilized to accomplish project outputs. Following is the rationale behind each of these decisions.

2. Specific

a. Research/Extension Administrator - Chief of Party

The complexity of the project and the need for a single contact point between the activity, senior GOSL staff, other donors and AID necessitates a team leader - Chief of Party (COP). The possibility that the team leader could provide one of the other skills required, in addition to overall responsibility for the project operation, was considered but rejected on the grounds that this would likely mean inadequate attention to either administrative or technical details. It is suggested that the individual will probably have an agricultural economics background with experience in planning.

Position: Research/Extension Administrator

Location: Njala, Sierra Leone

Reports to: USAID Project Manager and ACRE Center Project Director

Qualifications:

Academic

Ph.D in Agriculture required. Degree in Agricultural Eonomics

or Farm Management preferred but not essential.

Experience

Administrative/management experience in agricultural research in Land Grant University system or equivalent experience with the USDA or AID required. Overseas experience with major responsibility in agriculture and research administration required.

Personal

Must have demonstrated inter-personal and personnel management skills. Must have demonstrated leadership ability. Must have demonstrated mature judgement in setting priorities. Must be oriented toward "problem solving". Must be willing to travel under difficult conditions. Must be able to work with and train host country counterparts in an understanding and patient manner.

Expected Duties

1. Will serve as Senior Officer/team leader for a 5-person adaptive crop research and extension team.

2. Will provide required contact/coordination with USAID/ Liberia and Sierra Leone on all related matters.

3. Will provide inter-division and inter-department coordination of Adaptive Crop Research and Extension programs/results/ recommendations within the MANR and the NUC and other GOSL or private agencies as required.

4. Will provide professional and technical leadership for the Adaptive Crop Research and Extension staff.

5. Will be responsible to advise the GOSL ACRE Project Director to identify, establish, systematize and train GOSL staff to operate effectively and efficiently on the ACRE Project.

6. Will initiate required program documentation for AID, in areas of commodity procurement, participants, etc.

7. Will secure GOSL/USAID approvals for project staff and consultants.

8. Will prepare annual work plans and budgets for GOSL/ USAID approvals.

9. Will serve as advisor to the GOSL ACRE Project Director on research and extension related issues as requested.

10. Will perform other duties as requested by the GOSL and USAID as agreeable to all parties.

b. Crops Researcher

Current agriculture in Sierra Leone revolves primarily around a few basic crops -- rice, maize, cassava, groundnuts, and others. Given the low yields obtained, there is an obvious need for an adaptive agronomic research program on these crops. However, staff, organizational and funding limitations indicate it will be some time, unless external assistance is provided, before the required work will be carried out. At the same time, it is recognized that, as income earners, some of the traditional crops seem to have only limited potential. Therefore, investigations on the suitability of other crops such as vegetables and cash crops as component crops in a cropping system are justified. There are a very few Sierra Leoneans with training in this area but they are engaged in other projects or research activities. It is not judged appropriate or feasible to expect a Sierra Leonean to provide the total necessary skills at project inception.

Position: Crops Researcher

Location: Njala, Sierra Leone

Reports to: Research Coordinator

Qualifications:

Academic

Ph.D with major in agronomic science highly desired. MS degree coupled with extensive and successful research experience may be considered.

Experience

A minimum of at least one (two-year) overseas assignment with major responsibility in agronomy research (and extension), preferably in a region having similar climate to Sierra Leone.

Personal

Must have exceptional skills in interpersonal relationships and be able to work effectively with other project staff, government officials and local farmers. Must have an empathy for and an understanding of the constraints to acceptance of new technology by rural people in developing countries due to social/cultural problems and traditional use of land and land tenure problems. Language skills not essential but must be willing to learn local lingua franca-Krio.

Duties

1. To evaluate available experimental data, extension

programs and existing farming practices for the production of the traditional field crops in Sierra Leone.

2. Investigate, through field trials, alternate cropping systems including improved varieties of traditional crops and related crop species and modified management practices designed to increase production.

3. Demonstrate through the use of field plots the improved practices and varieties arising from the research program.

4. Consult and coordinate with scientists from other projects and institutions involved in agronomic research to maximize benefits of research efforts and avoid duplication.

5. Consult with the GOSL ACRE Project Rural Sociologist and Agricultural Economist concerning the socio/economic feasibility of recommended production practices.

c. Soils Researcher

Current cropping systems in Sierra Leone are primarily the shifting cultivation or bush-fallow systems. Due to the high risk of permanent loss of soil resources caused by socio-economic pressures on the shifting cultivation system, this project must focus efforts on improved soil fertility and management practices.

Position: Soils Researcher

Location: Njala, Sierra Leone

Reports to: Research Coordinator

Qualifications:

Academic

Ph.D with major in soil science highly desired. MS degree coupled with extensive and successful research experience may be considered.

Experience

A minimum of at least one (two-year) overseas assignment with major responsibility in soil research (and extension), preferably in a region having similar climate to Sierra Leone.

Personal

Must have exceptional skills in interpersonal relationships and be able to work effectively with other project staff, government

officials and local farmers. Must have an empathy for and an understanding of the constraints to acceptance of new technology by rural people in developing countries due to social/cultural problems and traditional use of land and land tenure problems. Language skills not essential but must be willing to learn local language.

Duties

1. To evaluate available experimental data, existing farming and soil management practices and extension programs for the production of the traditional crops in Sierra Leone.

2. Investigate, through field trials alternate soil fertility and management practices relating to improved soil fertility and management designed to increase production of improved and traditional crop varieties and to improve and conserve soil resources.

3. Demonstrate through the use of field plots the improved soil fertility and management practices arising from the adaptive research program.

4. Consult and coordinate with scientists from other projects and institutions involved in soils research to maximize benefits of adaptive research efforts and avoid duplication.

5. Consult with the GOSL ACRE Project rural sociologist and agricultural economist concerning the socio/economic feasibility of recommended soil fertility and management practices.

d. Agricultural Economist

The project is aimed at developing cropping systems which can be managed by farmers to produce greater incomes. Even if technically sound systems are developed they must be compatible with management skills and capability, and must provide adequate incentives to encourage and justify adoption. In determining the consistency of systems to both criteria, a farm management specialist will be critical.

Position: Agricultural Economist

Location: Njala, Sierra Leone

Reports to: Research/Extension Administrator

Qualifications:

Academic

Ph.D Agricultural Economics with a strong interest and qualifications in Farm Management Economics including microeconomics, production economics, economic statistics, and institutional economics requested. A MS degree in Agricultural Economics with extensive experience in the subject field would be acceptable.

Experience

A total of four (4) years of research experience including one year of experience in less developed countries. Experience in survey/statistical research is essential.

Personal

Must have demonstrated inter-personal skills and the ability to work effectively as a team member. Must be able to work with and train host country counterparts in a patient and understanding manner. Must be able to work and travel under difficult conditions

Expected Duties

1. To evaluate and help determine priority areas for technical agricultural research and to assist in the identification of candidate cropping systems that seem worthy of study.

2. In concert with the rural sociologist to identify socio/economic constraints to farming systems and farm enterprise mixes and analyze the economic feasibility of technically appropriate strategies designed to increase productivity.

3. In concert with the rural sociologist to analyze the impact of institutional changes in size of farm unit; mix of enterprises; type of management, access to inputs and market, etc., of the individual farm family.

4. Will work with the extension agronomist to insure that extension field staff are kept up to date on economic information relevant to farm management.

5. Will perform requested analysis of input delivery, marketing, transport and other costs associated with rural enterprises to be considered in cropping systems.

6. To consult and coordinate with economists of the MANR and other GOSL agencies concerning related studies and activities in the area of input delivery and marketing economics.

e. Extension Agronomist

There is a real need in Sierra Leone to develop

effective techniques for delivery of improved technology to rural smallholders. Investigations of various technology delivery systems are justified. There are a very few Sierra Leoneans with training in this area but they are engaged in other projects or activities. It is not judged appropriate or feasible to expect a Sierra Leonean to provide the necessary skills at project inception.

Position: Extension Agronomist

Location: Njala, Sierra Leone

Reports to: Extension Coordinator

Qualifications:

Academic

PhD in extension agronomy requested. A MS degree with extensive field experience would be acceptable.

Experience

At least one assignment overseas working in extension agronomy in a region with climatic conditions similar to that of Sierra Leone.

Personal

Must have demonstrated inter-personal skills and the ability to work effectively as a team member. Must be able to work with and train host country counterparts in a patient and understanding manner. Must be able to work and travel under difficult conditions.

Duties

1. In concert with the rural sociologist and field extension staff develop a system of communications between project staff and participant farmers to: (a) inform and instruct farmers in the principle and techniques of sound soil and crop management as identified by research activities, and (b) to obtain feedback from farmers concerning attitudes and experience with new cropping systems; (c) to analyze alternate methods of communications between project staff and farmers.

2. In concert with the rural sociologist to translate technical aspects of research activities and findings into language and ideas appropriate for communications to the rural smallholders with their particular cultural perceptions and literacy levels.

3. To coordinate the delivery of information/instructions

provided by the varied technical specialists to the rural small holder families through the extension staff and act as a focal point for two-way communications between project staff and participant farmers.

4. To advise field extension workers in methods of instruction/demonstration and presentation of project-provided information.

5. To evaluate and help determine priority areas for on-farm extension demonstrations and to assist in the identification of candidate agronomic technology delivery systems that seem worthy of study.

6. Consult and coordinate with extension specialists from other projects and institutions involved in agronomic extension to maximize benefits of research and extension efforts and avoid duplication.

7. Work with the project researchers to insure that research field staff are kept up to date on technology delivery information relevant to an integrated adaptive crop research and extension system.

f. Administrative Officer

The project's contract staff and local technicians will be fully occupied with technical matters. Therefore, it is essential to have an administrative officer to handle non-technical services and project details. This position will be staffed by a Sierra Leonean local hire, though it will be funded by USAID.

The administrative officer is a senior level position. The incumbent will be expected to handle routine accounting, personnel, general services and executive officer type functions. The administrative officer reports to the ACRE project director.

B. Supplemental Organization Charts

The next few pages contain organization charts related to the ACRE project and the two GOSL agencies (MANR and NUC) which will implement the project. These charts will assist the reader in understanding the established structure of the MANR and the NUC and the planned structure of the ACRE program.

Figure F-1 MANR ORGANIZATION CHART

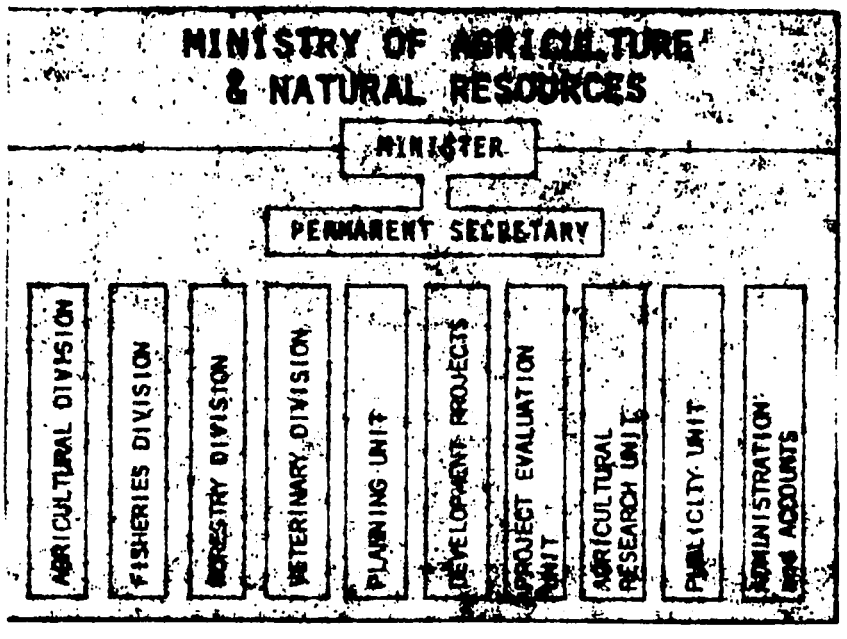
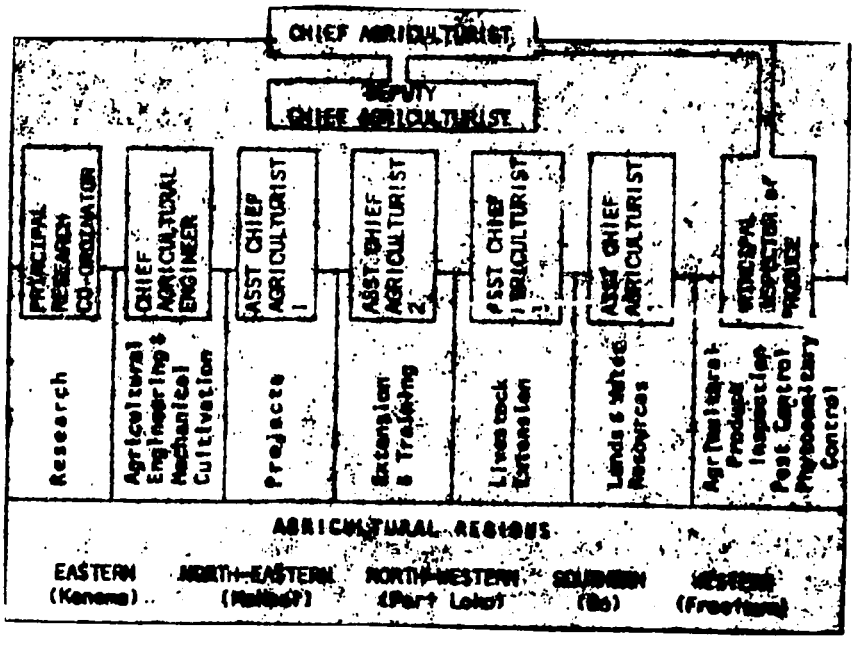
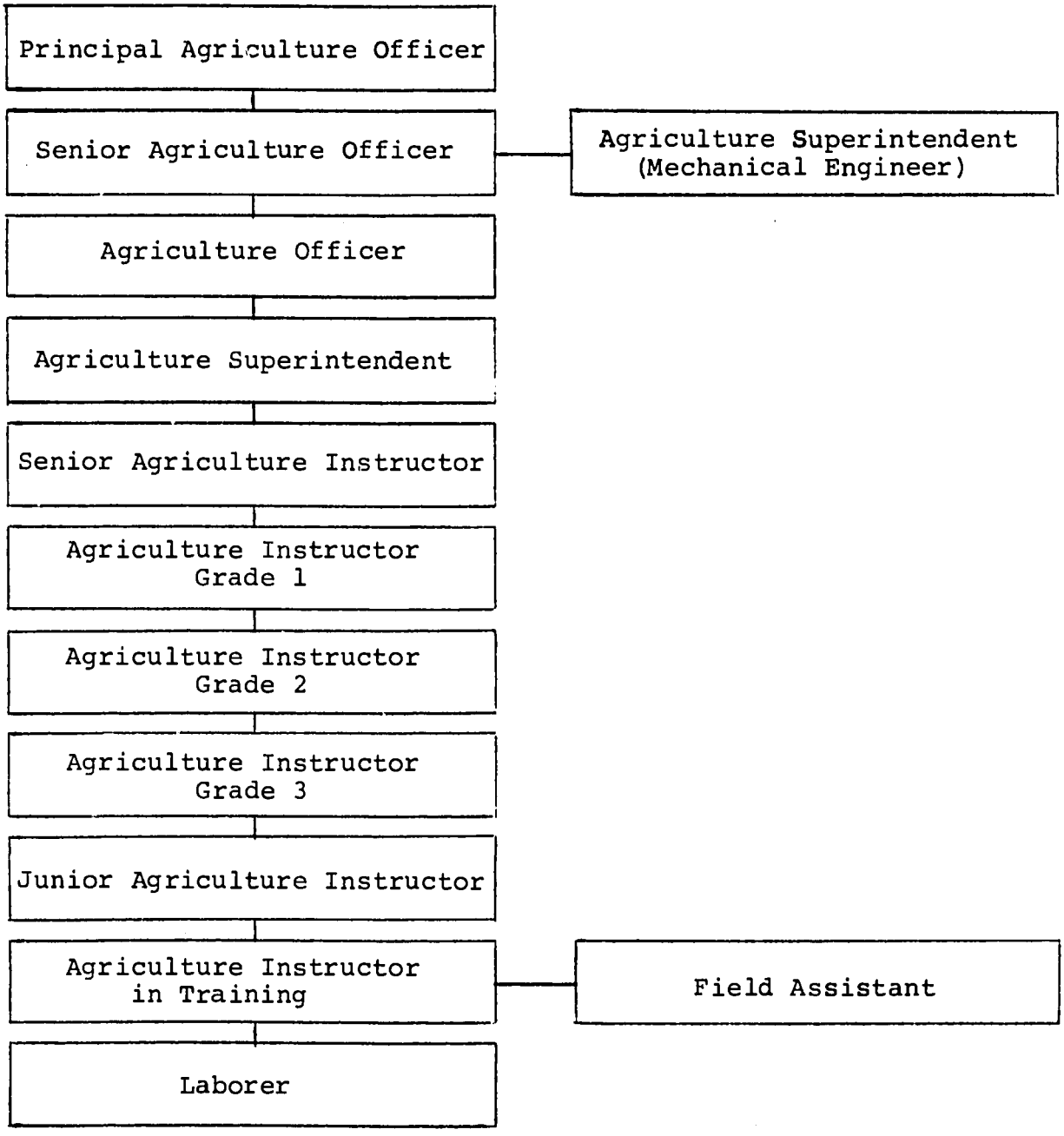


Figure F-2 MANR DIVISION OF AGRICULTURE ORGANIZATION CHART



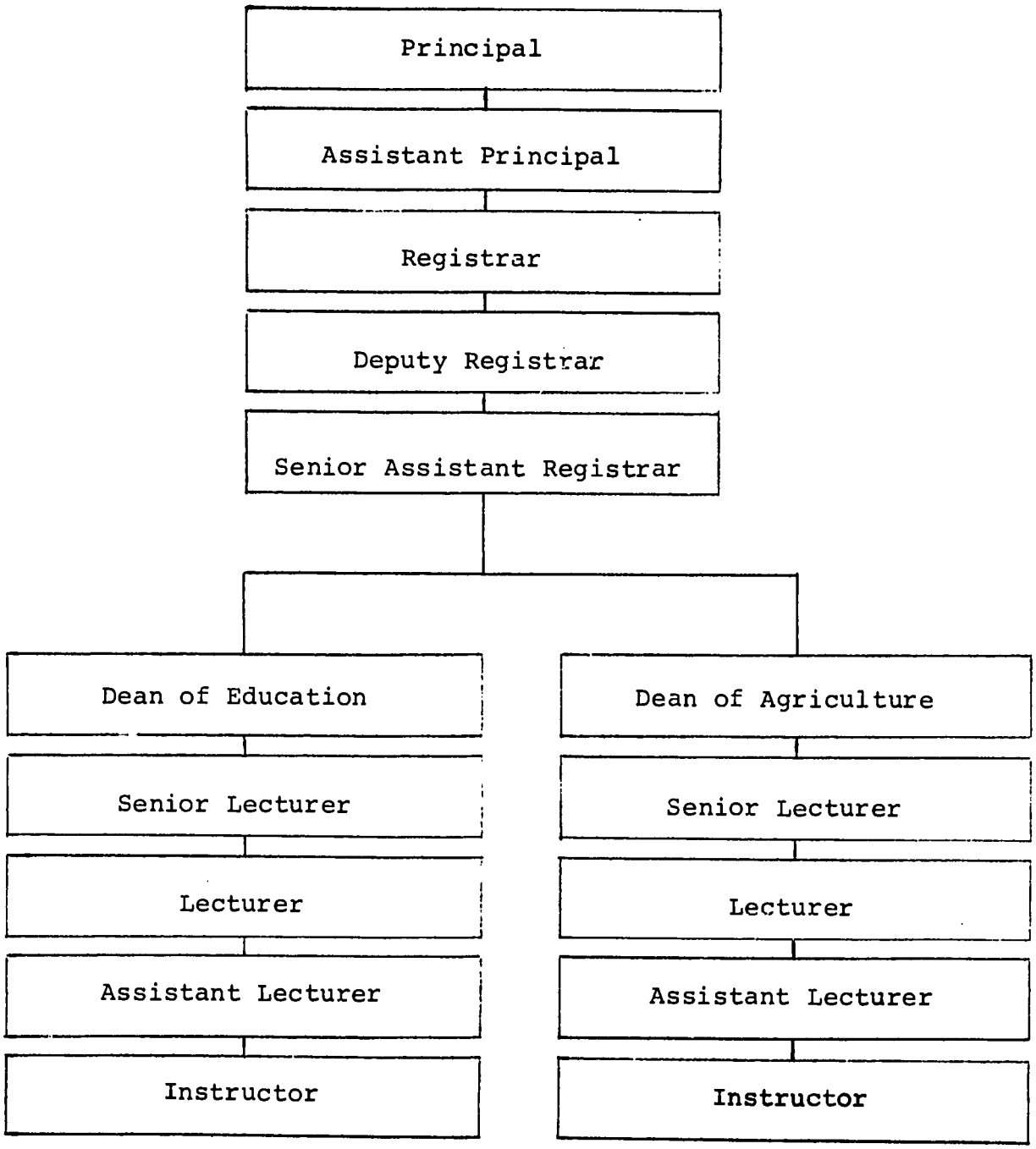
Sources: Agriculture in Sierra Leone, MANR, 1976.

Figure F-3 MANR AGRICULTURE REGION ORGANIZATION CHART



Source: Ministry of Agriculture and Natural Resources

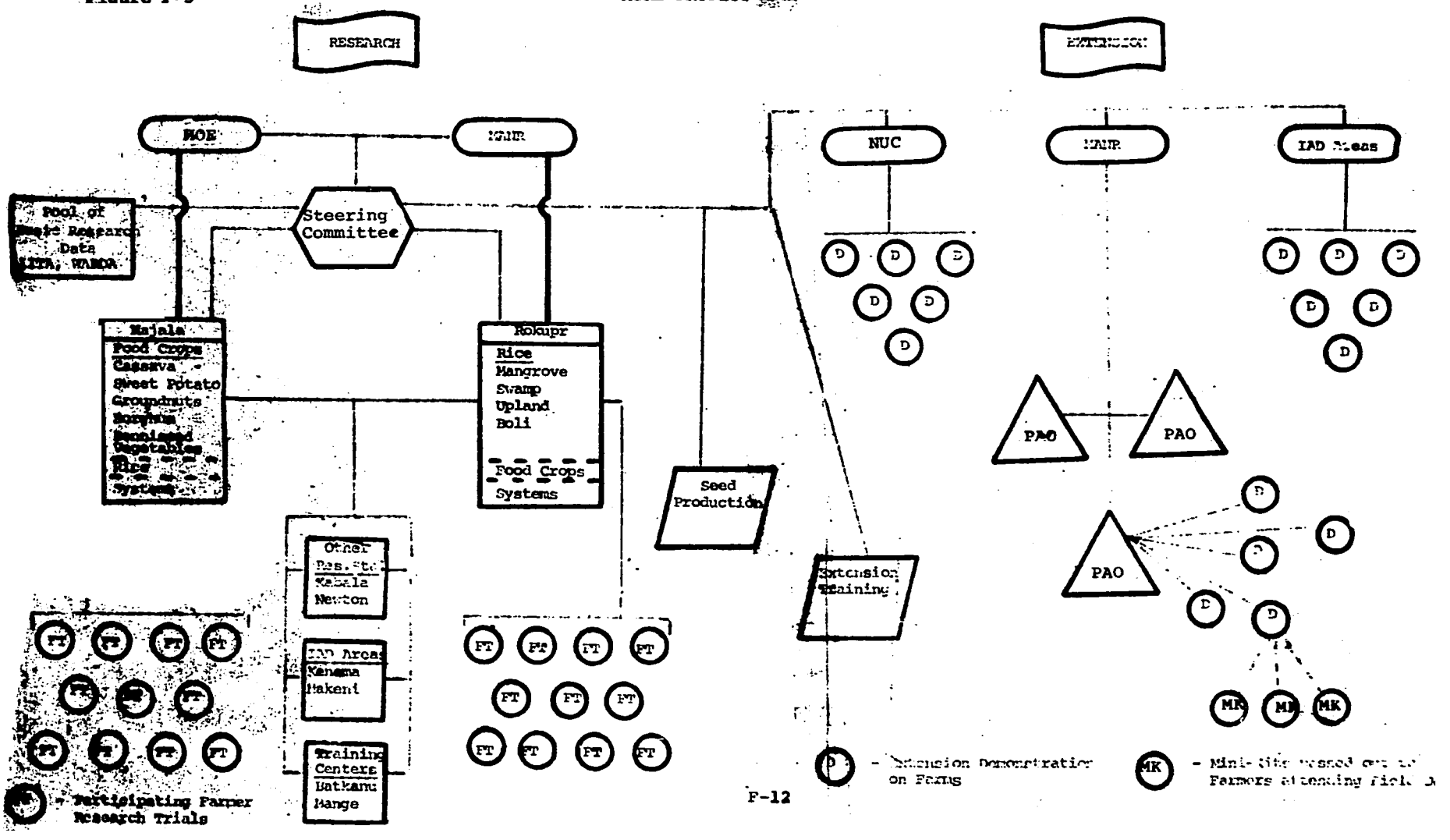
Figure F-4 NUC ORGANIZATION CHART



Source: Njala University College

Figure F-5

ACRE PROJECT LINKAGES



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DEPARTMENT OF STATE

Annex H

TELEGRAM

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R 280221Z AUG 76
FM SECSTATE WASHDC
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INFO RUTAIJ/AMEMBASSY ABIDJAN 1709
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TAGS:

SUBJECT: SIERRA LEONE PROJECTS
REF: MONROVIA 3917

1. SINCE FRESHWATER FISH CULTURE PID APPROVED, SCOPE OF WORK FOR DESIGN TEAM COMPLETED AND PRELIMINARY RECRUITMENT UNDERWAY WE PLAN PROCEED TO ASSEMBLE DESIGN TEAM. BECAUSE FY 78 PROJECTS PRP'S MUST BE IN AID/W MID OCTOBER, TEAM PREPARING ARRIVE SIERRA LEONE AROUND MID SEPTEMBER. DETAILS PID APPROVAL FOLLOW SEPTEL.

2. SIERRA LEONE RURAL DEVELOPMENT PLANNING PID AND SIERRA LEONE/AG RESEARCH AND LIBERIA AG RESEARCH PID'S ALSO APPROVED. DETAILS FOLLOW SEPTELS. URGENTLY REQUEST BLAIR ALLENS SCOPES OF WORK FOR THESE PROJECTS IN ORDER ASSURE OUR WORK SCOPES WHICH ARE NOW BEING WRITTEN CORRESPOND WITH MISSION'S REQUESTS. PLEASE ADVISE AS TO GOL AND GOSL RECEPTIVITY AND THOUGHTS ABOUT COORDINATING THE TWO RESEARCH PROJECTS AT DESIGN AND IMPLEMENTATION PHASES. DETAILS ON BRIGHTS VISIT FOLLOWS SEPTEL. FYI: AID/W EXPLORING PROCEDURES FOR USING COLLABORATIVE ASSISTANCE APPROACH (SEE PD-56) FOR THE TWO RESEARCH PROJECTS, HOWEVER WE CONCERNED THIS APPROACH COULD DELAY DESIGN TEAM, AS COMPARED TO USING IQC FIRM FOR DESIGN. OUR PRESENT OPINION IS TO CONSIDER COLLABORATIVE APPROACH AFTER PRP DESIGNED.

3. AID/W BELIEVES DESIGN OF THE TWO RESEARCH PROJECTS SHOULD BE UNDERTAKEN BY ONE TEAM AS SKILL REQUIREMENTS FOR BOTH ARE IDENTICAL AND PROJECT OBJECTIVES AND TECHNICAL NEEDS ARE SIMILAR. JOINT COORDINATION OF THE IMPLEMENTATION PHASE SHOULD BE CONSIDERED BY THE DESIGN TEAM WHICH WOULD PROVIDE AN OPPORTUNITY FOR BOTH COUNTRIES TO COOPERATIVELY ADDRESS SIMILAR PROBLEMS. KISSINGER
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UNCLASSIFIED
Classification

FORM 10-412
REV. 6/73

WAIVERS

A. Waivers Required

1. Procurement source and origin waiver from A.I.D. Geographic Code 000 (U.S. only) to Code 935 for procurement of construction materials.

2. Waiver of the source and origin requirements under A.I.D. Handbook 15 and a special determination under Sections 636(i) and 604 of the FAA, as amended, to allow the purchase of project vehicles from A.I.D. Geographic Code 935 source (Special Free World).

3. Waiver of the source and origin requirements under A.I.D. Handbook 15 and a special determination under Sections 636(i) and 604 of the FAA, as amended, to allow the purchase of project motorcycles from A.I.D. Geographic Code 935 source (Special Free World).

B. Justification for Source Waiver for Construction Materials

Construction materials will be used in building a crops research field station and laboratory, a soils field laboratory, seven houses for A.I.D.-financed senior technicians at Njala and one house for A.I.D.-financed short-term consultants at Rokupr. The total cost of construction, including materials, is estimated at $345,000.

Materials such as cement, reinforcing material, roofing, window frames, plumbing systems, electrical systems, etc. are normally imported from the United Kingdom and Europe. For the most part, these are manufactured to standards (size, threads, units of measure, etc.) different from and incompatible with U.S. specifications. Similarly, electrical materials and supplies are 220 volts, 50 hertz, contrary to standard U.S. specifications. It is essential that facilities be constructed using fixtures and materials for which replacement parts and service facilities are readily available in Sierra Leone.

It would be impractical to purchase U.S. items in the small quantities needed when private dealers in Sierra Leone are equipped only to service and repair equipment made in the United Kingdom and Europe. Moreover, considering shipping costs and the small quantities involved, U.S. delivered prices would exceed by about 60 percent prices for comparable items procured in Europe or locally. The long lead time required to procure from the U.S. could also delay project implementation in construction if housing for A.I.D.-financed senior technicians was delayed. The severe shortage of housing in Sierra Leone makes it imperative that construction begin at the earliest possible date.

C. Justification for Waiver of Source and Origin Requirements for Vehicle Procurement

The need for the vehicle waiver is based on the lack of spare parts in Sierra Leone for U.S. manufactured vehicles with resultant long down-time as parts are obtained. There is currently no dealer in Sierra Leone representing any U.S. auto manufacturer and to our knowledge none foreseen in the near future; consequently, American cars and trucks would have no warranty backup, no adequate service/maintenance facilities, and no source of technical expertise to support them.

The only vehicles of U.S. manufacture in Sierra Leone are several in the motor pool of the U.S. Embassy in Sierra Leone. While these vehicles have provided good service, there have been serious problems in securing spare parts. The need for spares and service for project vehicles will be considerable due to the anticipated heavy use of these vehicles — minimum of 20,000 kilometers per year, 90 percent of which will be on dirt and low standard roads.

For the A.I.D.-financed staff, vehicle breakdowns would seriously hinder the performance of duties. The lack of service and spare parts for U.S.-manufactured vehicles also present a risk to the health and lives of the persons required to operate the vehicles.

Therefore, a waiver permitting the procurement of two five to eight-ton stake body four-wheel drive diesel engine trucks, and five long wheel base four-wheel drive nine passenger capacity station wagons (plus replacements at mid-project) from Code 935 country is considered justified and necessary. The total cost of vehicles, including spare parts, is $100,000.

D. Justification for Waiver of Source and Origin Requirements for Motorcycle Procurement

The need for this waiver is based on the fact that the U.S. does not manufacture this type of lightweight motorcycle. Lightweight Japanese-made motorcycles, such as the Honda, are currently being sold in Sierra Leone, and therefore, are assured of warranty backup, and adequate service and maintenance facilities. There is no American-made counterpart to this type of motorcycle.

The need for spare parts and service for these motorcycles will be considerable. The motorcycles will be operated by the extension and agricultural agents upcountry on secondary and tertiary dirt roads. The average life of a motorcycle is approximately two years and heavy use of these motorcycles in the project area is anticipated.

The lack of project motorcycles would seriously impede project activities as many of the roads in the project area are almost non-existent and are accessible only to this type of vehicle.

A waiver is, therefore, requested to purchase locally 70 lightweight motorcycles and spare parts from a Code 935 country based on the non-availability of the needed type of motorcycles from U.S. sources and standardization and compatibility of motorcycles already in country. The total cost of motorcycles, including spare parts, is $160,000.

Annex M

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PROCESS:	ACTION:	DATES:	INITIALS:
CATALOGUE	✓		
ABSTRACT	✓		
FICHE	✓		

COMMENTS: 10/3/78 letter sent

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