

PD-APP-106

PROJECT NUMBER 660-0066/15 KIRSHASA

INERA SUPPORT PROJECT

EVALUATION CONSENTS... (small text regarding consent and administrative info)

REGULAR EVALUATION SPECIAL EVALUATION

KEY PROJECT IMPLEMENTATION DATES			ESTIMATED PROJECT FUNDING		PERIOD COVERED BY EVALUATION	
Start	End	Phase	A. Total	B. US	From (month/year)	To (month/year)
7/77	7/81	83	5,000	3,850		10/82

ACTION DECISIONS APPROVED BY MISSION OR AREA OFFICE DIRECTOR

A. Are there any? (checked items)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
See attached		

REVIEW OF DOCUMENTS TO BE REVIEWED PER ABOVE DECISIONS			ALTERNATIVE DECISIONS ON FUTURE OF PROJECT	
<input checked="" type="checkbox"/> Project Paper	<input type="checkbox"/> Implementation Plan	<input type="checkbox"/> Other (Specify)	A. <input type="checkbox"/> Continue Project Without Change	
<input type="checkbox"/> Project Plan	<input checked="" type="checkbox"/> R&T		B. <input type="checkbox"/> Change Project Scope and/or	
<input type="checkbox"/> Logical Framework	<input type="checkbox"/> F&S	<input type="checkbox"/> Other (Specify)	<input type="checkbox"/> Change Implementation Plan	
<input checked="" type="checkbox"/> Project Agreement	<input type="checkbox"/> F&S		C. <input type="checkbox"/> Suspend/Cancel Project	

PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Name and Title)

Wilson Lane, USAID Project Officer
 Cit. Mandundu, INERA Project Director
 Deanna Omond, Evaluator, USAID
 Michael Trott, Evaluator, USAID

12. Mission/Area Office Director Approval

Signature: *W. Podol*
 Type Name: Richard Podol, Director
 Date: 27 Dec 82

USAID/USAID
 Tahishiku-Kabundi, Evaluator, USAID
 Dr. Salumu, Director, INERA Research Division

SUMMARY OF RECOMMENDATIONS

The two major recommendations of the evaluation team are:

- 1) extend the PACD until December 31, 1984;
- 2) at the end of project activities phase the legume and soil activities into a follow on project. The following is a more detailed list of recommendations and suggestions.

BEST AVAILABLE DOCUMENT

I. RECOMMENDATIONS OUTSIDE THE SCOPE OF AID'S ACTIVITY

A. Malvngu Station and INERA

1. An attempt should be made to increase the integration between the project activities and the activities of INERA in order to increase collaboration between the two groups.
2. The station should more closely supervise the maintenance operation to ensure that priority operations are performed.
3. Decisions made by the Director which concern project activities should be made only after consultation with those personnel directly involved.
4. INERA should appoint a specific number of counterparts to work in the legumes program and these counterparts should be used only for project research.
5. INERA should develop long-term plans in which objectives are established based on GOZ priorities and considering the limited funding normally available. INERA must finally decide what they can and cannot afford and plan/program accordingly.

II RECOMMENDATIONS REQUIRING IMMEDIATE ACTION

Personnel

1. The consultants should immediately increase the level of participation of the counterparts in the planning and management functions, delegating responsibilities and evaluating their performance. The goal of this exercise is to improve both the counterparts' research skill and management skills.
2. The consultant should include counterparts on trips to other research stations and conferences. This will give the counterpart exposure to other programs and create avenues of communication for research results. For the present, such trips should be centered on the stations of INERA where legumes research is also being carried out.
3. Each counterpart should receive a job description to decrease misunderstandings of job responsibilities.

4. Where individuals must be split between sections, a schedule with the time available for each section must be developed to insure adequate training is provided and to provide a basis for planning. These schedules should be produced as far in advance as feasible to allow for the planning of activities.
5. The project administrative officer should begin immediately to work more closely with station personnel; transferring information on sources of supply, amounts and types of supplies necessary for the project activities and information on orders due-in. A start in the right direction was made by the present COP who moved the project supplies into a store on the station (of necessity, the project items remain separated from the station supplies but are located in the same building). Also, payment of personnel funded by the project are now paid through the station. This trend should continue.
6. It is recommended that the academic advisors for those participants returning in 1984 be written and advised that the participants' curriculum should include management courses. In any future projects, some management education should be planned with the technical.

B. Communications

1. To improve communication between the two groups, it is suggested that:
 - a) scheduled discussions be held at least once a week with the counterparts to discuss planning for the week, research work performed, results from tests and management problems.
2. The meeting held by the COP prior to the Friday meeting should include all the counterparts and all MASI team members to coordinate the planning and discuss problem areas. Presently, only the counterparts generally attend with little or no participation from the administrative officer or other technicians.
3. There is a need for a scheduled planning/problem solving meeting between key station personnel and the MASI team. These need not and should not be frequent, perhaps once or twice a month, but they are necessary. The agenda of such a meeting, while flexible, should nevertheless focus only on items directly involving the team and the station.

4. USAID should insure that copies of the MASI quarterly report and evaluation are sent to INERA, the station and the MASI team.
5. Where information of mutual interest is received by one section, that material should be circulated to all sections concerned.
6. Circulate research data and reports to the other research stations in Zaire.
7. Contact and start working with other research stations in Zaire who are performing legumes research (Gandajika, M'Vuazi, Kiyaka, Yangambi, etc...).
8. Trials outside the station should be well planned and coordinated with the appropriate officials. Trials should be conducted using good agronomic techniques, including prior seed testing, surveillance during the growing season and transmission of results to the cooperating agencies.

Equipment and Machinery

1. Establish a chemical reordering system done in conjunction with the Zairian staff.
2. Insure redundancy in the laboratory equipment by purchasing those instruments which do not already have a backup.
3. Make operational all lab machinery and/or electrical systems.
4. Equipment should be brought to operating capacity by ordering the appropriate parts and/or assembling equipment.
5. One of two mulchers should be immediately reduced to a size commensurate with the power of the Ford tractor.
6. Pressure should be put on MASI to obtain the missing parts immediately.
7. Extra project vehicles over and above those required for the U.S. consultants and administrative officer should be pooled with the station vehicles. The tractor has already been placed under the operational control of the station. If the project continues for more than two years, new vehicles will be required for project personnel.

D

Project Extension

1. The project should be extended until the return of all participants plus at least six months. This extension should provide for one soils technician and one legumes technician. The emphasis of the training should focus on research planning and management, including personnel, supply and financial management.
2. There is currently a need to hire an expatriate who can transmit management and programming skills to the current group of Zairian counterparts. Someone with these skills should be hired to work with the returned participants as well as the counterparts already at the station.
3. As a condition of the extension, insist that INERA hire the laboratory technicians.

If possible, other station personnel not directly related to the project should be provided some short-term management training, for example participation in the USDA research management courses which are presented from time to time. This would not only provide some valuable training, but may get them more interested in the project and thereby improve the relations between the station and the project.

5. Continue contacts with other development organizations and international research institutions and use off-station trials when applicable but only if enough time and logistical support is available.
6. Should the project be extended for 2 years, it is recommended that a short-term consultant be contracted to review/repair project vehicles and more importantly to set up a spare parts reorder system.

III. PROJECT FOLLOW-ON

A. General

1. Zairian counterparts should be included in the first steps of the project, including initial project procurements of goods.
2. In the future, planning for agriculture research projects should include close cooperation with those organizations directly responsible for carrying out the activities.

3. In order not to undermine the progress made in the project, INERA should be encouraged to pay those primes and benefits due their professionals and insure that their pay is equal to that of others in the Department of Research. The general dissatisfaction with the pay tends to sap the initiative of the counterparts to apply themselves to the research activities.
4. In any future longterm project, the logistics system for the project should be integrated to the extent possible with the logistics system of the counterpart organization. Where no system exists, provisions should be made for the establishment and management of a system.
5. In the future, projects which include vehicles and machinery should provide for a consultant in the area of maintenance management. The consultant would be charged with setting up a parts supply and reorder system, directing the assembly of project-purchased equipment and providing instructions in their operation and maintenance and most importantly, imparting a knowledge of maintenance to the counterpart.

Technical

1. Short-term consultants should be used to supplement rather than substitute for long-term consultants.
2. Reestablish a documentation center with current soil and agronomic reference materials.
3. Each counterpart and expatriate should have one opportunity each year to attend a professional conference.
4. Reestablish a legumes research program at Camajika.
5. For a national legumes program, four PhD level Zairians will be needed in the following areas: agronomy, plant breeding, plant protection, microbiology.

Not less than 10 Zairians trained at the M.S. level will be needed. The lower-level support staff will be determined as needed.
6. The program emphasis during the first term was agronomic, whereas the current program emphasis is varietal testing. In the future, efforts should be made in both areas, as well

as plant breeding and plant protection. Thus three experts, an agronomist, plant breeder and plant pathologist should be hired. After the first two years, a fourth expatriate, a microbiologist, should be added to the team.

7. Soil activities should have a limited scope of reference: it should function as a support unit to crops research. Activities should include soil analysis, soil management and soil fertility. There should be two divisions within the soils section, soil analysis and soil management with soil fertility being contained within soil management.
8. The soils lab should be moved from the Mulungu Research Station to Kinshasa.
9. A soil fertility and/or soil management specialist should be placed at each station that O91 establishes. The soil scientist would work in conjunction with the plant scientist to establish appropriate rotations, cropping sequences, fertilizer rates, etc.. This field work would be conducted on the station while the soil analytical portion would be conducted in Kinshasa. In order to fill these stations an additional two to four Masters level and two PhD candidates should be trained in soil management, soil fertility and/or soil analysis.

13. SUSTAINABILITY OF THE LEGUME AND SOIL ACTIVITIES

A. Introduction

This was a special evaluation performed to assess the sustainability of the legume and soil research activities conducted at the Mulungu Research Station and associated off-station work by analyzing the components of sustainability including organizational, personnel and financial. The sustainability of the project within three different timeframes 1) PACD 1 October 1983 2) extension of project until 31 December 1984 and 3) a follow-on project, will be summarized below.

B. PACD 1 October 1983

Are research activities sustainable after PACD of 1 October 1983? NO

1. Organization

Organizationally, the legume and soil divisions are basically sound. However, little management capability has been developed among the counterparts for various reasons. The totality of the results of low management skills will be to detrimentally affect the day-to-day operations of the organization and thus the long-term sustainability.

2. Personnel

Personnel numbers are generally satisfactory to assure sustainability of project activities. This assumes participants will be returned to Mulungu and that DERA will hire five of the seven soil lab technicians presently employed by the project.

Personnel abilities were found to be generally satisfactory and are considered to be the least significant factor in the sustenance of this project. However, counterparts will return without the benefit of initial professional guidance. This could affect future experimentation.

3. Finance

Presently, INERA can meet only its payroll costs and some operational costs. Funds for investment and exchange transaction are non-existent. Unless the GOZ substantially increases INERA's budget and/or reorganises to perform only priority research activities, the recurrent costs of the project will be prohibitively expensive for INERA to fund. Therefore, project activities are not sustainable due to lack of financing.

C. Extension of Project Until 31 December 1984

Are research activities sustainable after an extension of the PACD to 31 December 1984? NO

1. Organisation

Extension of the project would allow management training and management supervision of counterparts and returned participants. This would increase the project's chances of sustainability.

2. Personnel

Extending the project would allow returned participants additional time to be supervised in design, implementation and analysis of experiments. This is of great professional value for newly trained scientists, particularly ones who will have to work in a semi-isolated work environment.

3. Finance

Funding of recurrent costs is again the major deterrent to sustainability. However, by 1985 the additional costs of the project to INERA will be even greater than in 1983. Recurrent costs will be approximately Z 575,000 and \$ 59,000 minimally per annum.

D. Follow-on Project

A follow on project will not guarantee sustainability of activities over the long-run but it will markedly increase the chances. First and foremost, INERA must be in a position sometime in the future to finance research if these activities are ever to be sustainable. In part this will require INERA to streamline its organization, but governmental support will also be necessary. The organization and personnel components could be further strengthened in a follow-on project.

In summary, the organizational and personnel components of sustainability can be developed to a point where the project is sustainable on those grounds, given some additional training. The financial component, however, will continue to be the major problem to sustainability. Specific findings and recommendations will be found in the following text:

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Evaluation
Team Members

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IMERA SUPPORT PROJECT (660-0064) EVALUATION

I. INTRODUCTION

The purpose of this evaluation was to determine the sustainability of this USAID funded soils and legumes research program. As defined in the scope-of-work for this evaluation, for an organization to be sustainable it must have an appropriate organizational structure, appropriate quantities and quality of personnel, and a supporting financial base. During this evaluation, each aspect of sustainability was assessed and analysed. The report will be divided into chapters: Organizational Structure, Personnel and Finance.

The duration of this evaluation was from 10 November to 3 December 1982. Portions of the evaluation took place at the research station and part was done in Kinshasa.

CHAPTER ONE: Management and Support Capabilities of the Research Units
and the Mulungu Station

I. METHODOLOGY

The legume research and soils testing sections are an integral part of the INERA organization, dependent on the station and INERA headquarters for their financial, logistics and administrative support. Any assessment of sustainability must therefore include an assessment of the station and INERA. In this portion of the evaluation, such an assessment is made, addressing those areas of interest applicable to each organization.

Each level is addressed separately, considering three possible scenarios for the future of the project, as stated below.

- 1) The project terminates at the present PACD of 1 October 1983.
- 2) The project PACD is extended to December 31, 1984 or 6 months after the return of the last participants.
- 3) The project activities are included in a follow-up project.

The legume and soils sections are first addressed to determine if viable sections will be established and operating by project termination, given adequate financial, logistics and administrative support from INERA. This assessment is followed by an evaluation of the Mulungu Station to determine if the station can support the activities of the sections given that the two sections are established and operating. Finally, the same question is asked of INERA. Each of the above questions are responded to in the respective summaries for each scenario.

The above evaluations were made based on a review of project and INERA records, including relevant reports, on-site observations and discussions with project and INERA personnel.

Symbols used throughout text: D: Discussion
R or r: Recommendation

II. EVALUATION OF THE PROJECT ACTIVITIES (SOILS AND LEGUMES RESEARCH SECTION)

A. INTRODUCTION

1. Evaluation: The objective of this section of the evaluation is to determine if a legumes research and a soils section will have been established by the end of project. The focus is on the administrative aspects of the operations. The assumption is made for the purpose of making the above determination that the sections are adequately supported administratively and financially by the station. The evaluation was complicated by the fact that most of the participants were out of town. Assessments for the most part were based on conversations with station/project personnel.

2. General Organization: The INERA support project consists of two activities; the legumes research section and the soils section. The MASI Chief of Party heads what has been labeled the project legumes (PL) office. The two sections are located under the PL office. The COP also serves as the technical consultant to the soils section whereas the legumes research section has a full-time technical consultant. In addition, the project brings in short-term technical consultants from time to time. The present MASI team arrived in 1981, replacing the original team assigned to the project. Within the organizational structure of the research station, the project legumes office is situated in the "Bureau de Recherche" (See the Malungu Station organizational chart pg. 84). As discussed in part III, the PL office acts as a semi-autonomous organization within the station.

B. GENERAL FINDINGS AND RECOMMENDATIONS

1. Competence of Participants

Findings: The technical competence of the participants was found to be generally good. The participants sent to the U.S., while they were unable to be observed or interviewed, are expected to be well qualified in the technical sense, based on reports from station/project personnel and the

type of education being received. Those participants and lab technicians who have remained at the station seem to have benefited from working with technical consultants, although not to the extent one would expect (for reasons described later). They have also benefited from short-term training they have received at IITA.

On the managerial side, the finding is not so positive. Few of the individuals have received any management training or experience in management. Those who have had the opportunity to fill in for the director or who have held other positions have performed satisfactorily, but not exceptionally. Fortunately, there are individuals who many consider potentially capable managers given training and experience. As these individuals will become the managers of the programs, it is vital that they receive the necessary training.

Along these lines, it was noted that four of the participants do not return until July 1984 or well past the October 1983 PAOZ. The participants will return with a great deal of technical knowledge but only limited practical experience in research and management. Under the present schedule, there will be no technical consultants to coach the returning personnel in either management or research. Should the participants fail to receive this training, it is doubtful that the project activities could be performed at an acceptable level.

E1. The project should be extended until the return of all participants plus at least six months. This extension should provide for one soils technician and one legumes technician (consultants). The emphasis of the training should focus on research planning and management, including personnel, supply and financial management.

E2. To the extent possible, those counterparts unable to receive U.S. training should be sent to relevant short-term courses presented in

French to supplement the on-the-job training. This procedure would not only improve their technical capabilities, but would also show that the project and station are interested in their education. This, along with other recommendations, will hopefully increase the morale and initiative of those counterparts remaining at the station.

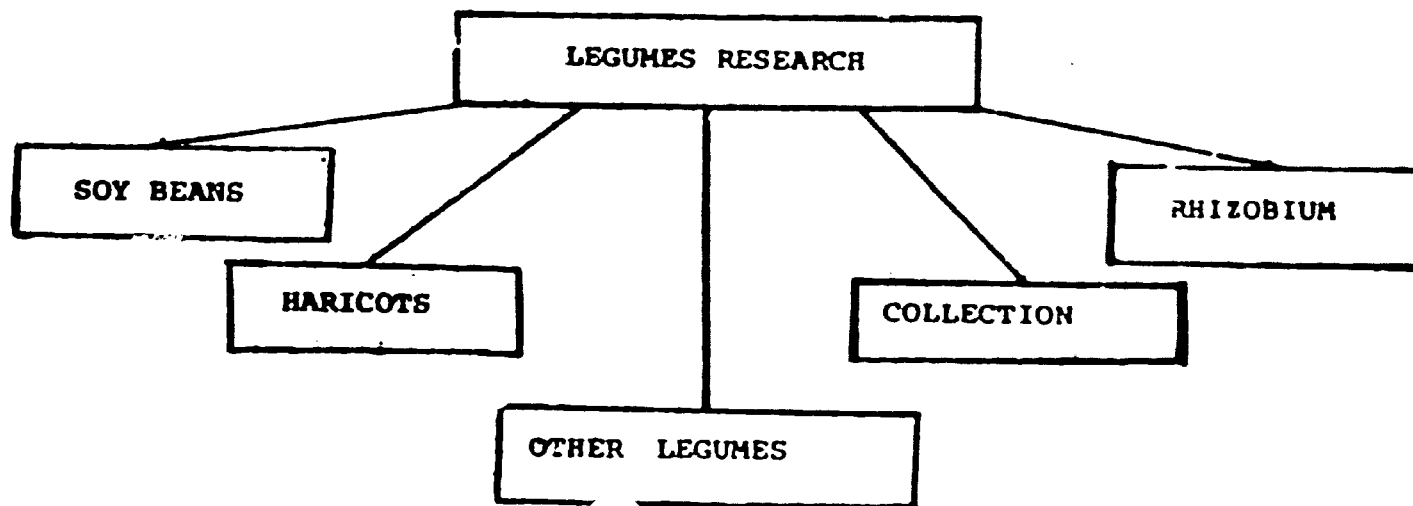
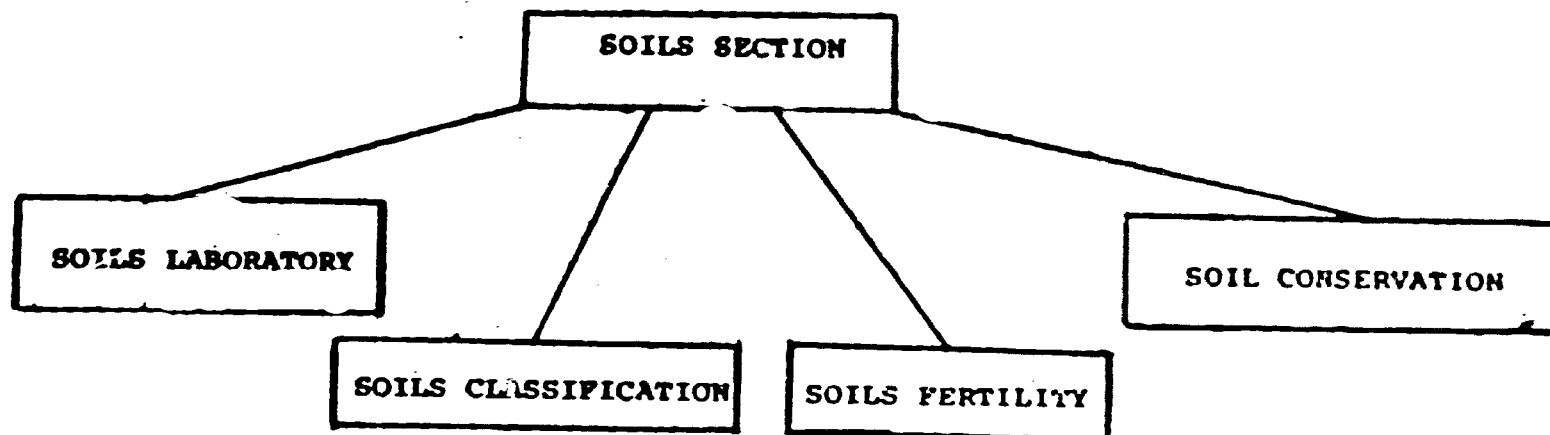
23. The present consultants must begin immediately to include the counterparts in more of the planning and management aspects of the operations to insure that some management expertise and institutional knowledge are established prior to project termination.

24. The academic advisors for those participants returning in 1984 should be advised that the participants' curriculum should include management courses. In any future projects, some management education should be planned with the technical.

25. In order not to undermine the progress made in the project, INERA should be encouraged to pay those allowances and benefits due their professionals and insure that their pay is equal to that of others in the Department of Research. The general dissatisfaction with the pay tends to sap the initiative of the counterparts to apply themselves to the research activities.

C. SOILS SECTION

1. Organization An organizational chart (Pg. 5a) of the soils section is provided. As originally envisioned, and as reflected on the chart, a soils classification element would be included. However, neither Zaire nor the project have personnel sufficiently qualified to perform the soil mapping required. Further no qualified counterpart was ever provided by INERA for schooling in soil classification in the U.S. As discussed in more detail elsewhere in the evaluation, soil classification is not considered a vital activity for Zaire. Considering the cost of such a service, the fact that no expertise exists and the service's limited usefulness, it has



Originally the soil organization was to be comprised of 3 divisions: soil fertility, soil classification and soil analysis. Currently there are two divisions - soil analysis (soils lab.) and soil management (soil conservation/soil fertility):

been suggested that the soil classification element be dropped from the organization.

2. Personnel Staffing:

Finding: The soils section is considered sufficiently staffed with professionals in the proper mix of expertise to fully operate the section (land classification excluded) should most of the participants return. It is estimated that the laboratory could perform at a satisfactory level with as few as three soil scientists. Should all the participants return and the present counterparts remain, there would be five professionals available at the station.

D. LEGUMES RESEARCH

1. Organization

An organizational chart for the legumes sections is provided on Pg. 52.

No position descriptions for key personnel have been developed.

El. Position descriptions should be developed for each position and the counterparts rotated through those positions.

2. Personnel staffing

Finding: If all the participants return and at least two full-time counterparts remain with the project, the research unit will be capable of performing legumes research at a substantive level. Any less than five will begin reducing the team's capability. Three scientist are considered the absolute minimum, provided the proper mix of specialists remain.

3. Availability of Counterparts

At present, some of the counterparts are with the legumes program only part time. This makes it difficult to plan research activities and provide instruction. It is recognized that the station has other responsibilities and that there are insufficient professional personnel with the participants away to meet all these activities. It is therefore necessary to split individual's times between activities.

11. Where individuals must be split between sections, a schedule with the time available for each section must be developed to insure adequate training is provided and to provide a basis for planning. These schedules should be produced as far in advance as feasible to allow for the planning of activities.

B. SUMMARY

Question: Given adequate administrative and financial support, will a viable legumes research section and a soils section be established and operating by the end-of-project?

Scenario I (PACD Oct. 1, 1983).

No. Managerial training definitely and technical training perhaps will not be sufficient at the October PACD of 1983 to support the activities. Four participants are not even due back until July 1984, while the technical support ends at the PACD. There may also be problems in fully equipping and stocking the lab at that time.

Scenario II (Project extended to return of participants + six months)

Yes. The two sections can be viable entities at this point in time providing the minimum number of counterparts are on hand and the management training provided and successful.

Scenario III (Follow-on project)

Yes. There should be little problem in establishing the section should a follow-on project be adopted. This would also allow additional participant training which would insure sufficient personnel.

III. AN EVALUATION OF THE MULUNGU STATION

A. INTRODUCTION

In this section, an assessment is made of the Malungu station to determine whether it is capable of adequately supporting the project activities, given that the research units are established and operating. The emphasis will be on the managerial as opposed to the technical aspects of the support.

B. FINDINGS AND RECOMMENDATIONS

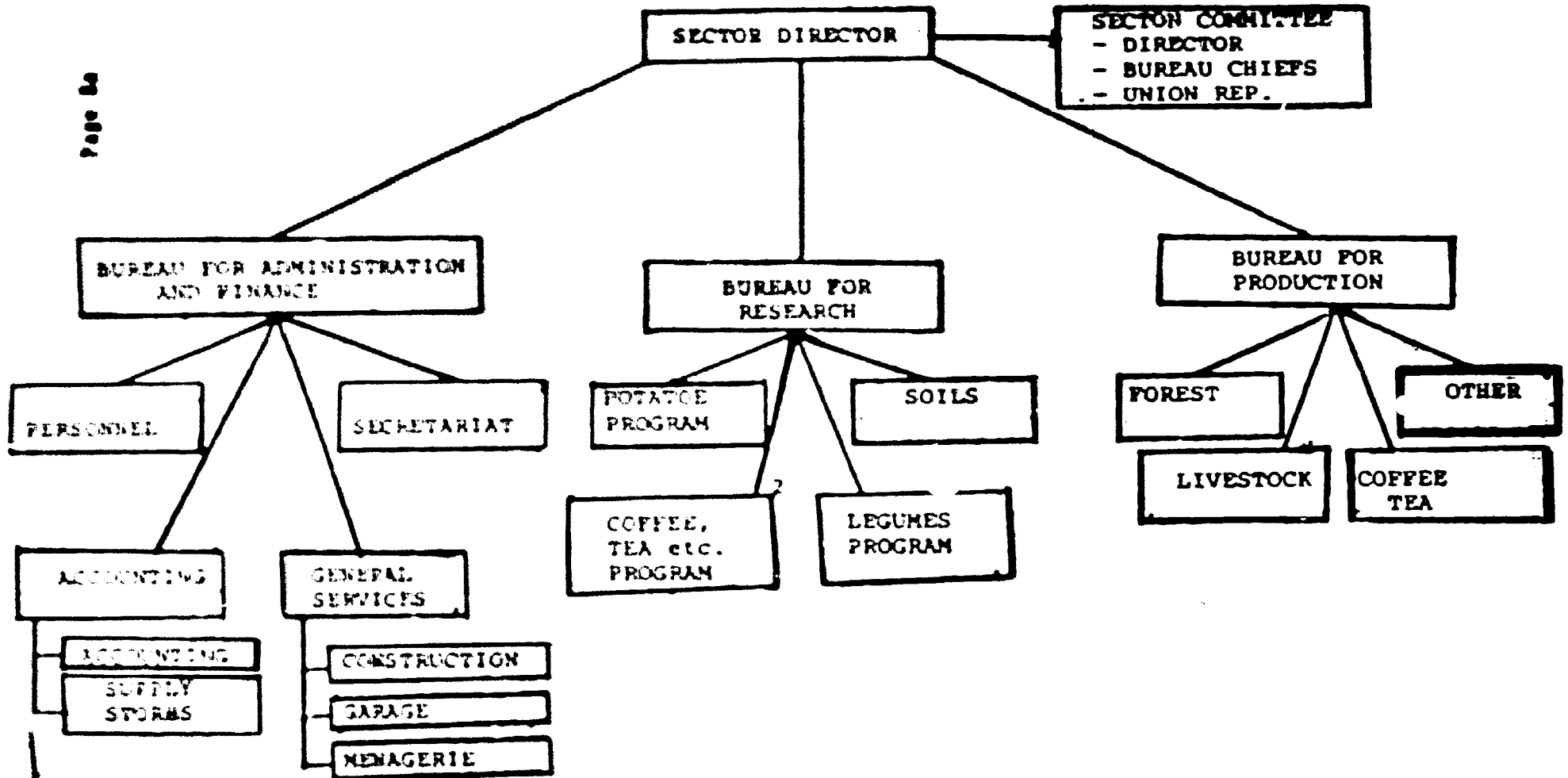
i. Organization. Finding: The basic physical structure of the organization (see organizational chart) is considered adequate for the most part. There is a potential problem in that director of the station wears four hats at one time. He is not only the director of the station, but also chief of the "Bureau de Recherche" and the "Bureau de Production" along with heading the potato program. At the present operational level, this does not appear to be a significant problem, except that some bias toward the potato program would be expected. However, should the operations expand, it may well become a management problem. Also, if the participants for the legumes or soils units are not good managers and therefore require assistance from the director once the technicians depart, the same situation will arise.

One will note on the organizational chart that the soils and legumes sections exist as separate entities directly under the Bureau de Recherche. In fact, the two sections presently exist as subparts of the Project Legumes office headed by the MASI Chief of Party. The FL office represents a semi-autonomous organization within the station with separate lines of communications and control, a separate administrative/logistics system and a separate source of funding (both project and counterpart funds). Inherent in such a structure is the potential for conflict and conflict was found to exist at the station. This conflict has existed apparently since the start of the project with several ups and downs in its intensity. The primary causes are a combination of poor planning, poor communications and personality related issues. Each of these causes will be discussed fully below and recommendations made on how to minimize the problems.

Of course, once the project is concluded, the structural bases of the problem will be removed. However, it need not exist in the present organization and must be resolved should the project continue for any length of time. Otherwise establishment of viable research units will be seriously jeopardized.

I N H R A

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1. Directs the operations, research of Mulungu plus 2 other small stations.
2. In a maintenance state only.

2. ADMINISTRATION

Finding: The administration of the station was found to be highly centralized in the office of the Director, with some limited delegation to the chief of the administrative/finance bureau. Although in modern organizational theory the administration of the station would be considered too centralized, the theory does not apply so well to the present Zairian context.

Regrettably, this centralizing tendency simply aggravates the conflictual situation previously discussed as the existence of a semi-autonomous organization disrupts the line of command.

3. COMPETENCE OF PERSONNEL

This aspect was rather difficult to judge in that the activities normally performed by such an organization were seriously curtailed by limited funding. In general, however, the competence of the Mulungu staff was judged to be at a satisfactory level to support the research activities.

In the case of the administrative/finance office, both the chief and assistant have over 25 years' experience with INERA. This is important in that they have worked under the Belgian logistics system and have some knowledge of how such a system operates. The Director himself has been with INERA since 1973 in management positions. Other staff employees have similar ranges of experience.

On the other hand, there was very little management expertise found in the vehicle maintenance and management area. The garage is poorly organized, work is not planned and no system for the resupply of spare parts exists. It is recognized that funding places a severe strain on the maintenance operation, but this does not excuse the poor support provided. While making the evaluation, 6 of the 7 INERA vehicles were down. In addition, the generator for the station needs rebuilding. Despite the availability of spare parts, this important operation had not been performed. Given the frequent power failures, one would expect this to be a priority job. These and other similar problems cannot all be blamed on funding problems, but relate directly to management and supervision.

21. In the future, projects which include vehicles and machinery should provide for a consultant in the area of maintenance management. The consultant would be charged with setting up a parts supply and reorder system, directing the assembly of project-purchased equipment and providing instructions in their operation and maintenance and, most importantly, imparting a knowledge of maintenance to the counterpart.

22. The station should more closely supervise the maintenance operation to ensure that priority operations are performed.
23. If possible, other station personnel not directly related to the project should be provided some short-term management training.

This would not only provide some valuable training, but may get them more interested in the project and thereby improve the relations between the station and the project.

STAFFING LEVEL

Finding: At the professional level, staffing is adequate for the present. If operations expand, another bureau chief or at least a program head will be required to reduce the responsibilities and span of control of the Director to a reasonable level. At the technician and field worker level, some personnel presently funded by the project must be picked-up by INERA. These personnel have been included in the budget estimate provided elsewhere. Most of these personnel were to be provided originally by INERA but inadequate funding prohibited their support.

Recommendation: INERA should begin action now to fund those personnel necessary to maintain the research activities. These requirements include:

Lab technicians	5
Extensionist	2
Agronome	1
Field workers	20 ¹
Sentinels	2

¹ It may be possible for INERA to simply shift field workers to project activities as opposed to hiring additional personnel.

It is also recommended that an additional supply person be hired should funding be at a level sufficient to meet supply requirements. It is doubtful that the present staff could handle all the normal station requirements plus the additional project requirements.

5. LOGISTICS

(I) **Finding:** The level of logistics support across the board is considered inadequate to support the INERA station, such less the project activities. This inadequacy is by and large related directly to the lack of funding. However, some blame can be placed on the absence of an established reorder system, standard vehicle/equipment management procedures, etc

Of course, with so little funding, one really doesn't need much of a system. Regrettably, an opportunity has been missed in helping to establish support systems by totally separating the project and station functions. Had the project and station support been more integrated, the station personnel would have not only had the opportunity to exercise the system, but would have been more knowledgeable of project requirements. As it stands now, the requirement to provide supplies to the project activities will simply be dropped on the station with little or no overlap in experience. Finally, the recent consultant work on administrative support, while very good, did not attempt to develop a system that could be easily adapted to the station.

One bright spot noted at the station was the maintenance of the supply store. Good accounting and inventory procedures were in place, as the store was well organized. In fact, the procedures were far better than those of the project.

R1. The project administrative officer should begin immediately to work more closely with station personnel, transferring information on sources of supply, amounts and types of supplies necessary for the project activities and information on orders due-in. A start in the right direction was made by the present COP who moved the project supplies into a store on the station (of necessity, the project items remain separated from the station supplies but are located in the same building). Also, payment of personnel funded by the project are now paid through the station. This trend should continue.

R2. In any future longterm project, the logistic system for the project should be integrated to the extent feasible with the logistics system of the counterpart organization. Where no system exists, provisions should be made for the establishment and management of a system.

(2) Finding: The station's maintenance support is very limited. This is true for both vehicles and farm equipment as well as laboratory equipment. For the former, there is a good mechanic available. However, as discussed earlier, the management is very poor and the funds are limited. There is also no parts supply or reorder system established. In the latter case, INERA has sent an individual for training in electronics so that there is some capability at the station. However, for complex repairs, there is no support available either at the station or in the area. It is therefore important that sufficient redundancy exist in the major items of equipment to allow the broken items to be returned to the manufacturer for repair.

R1. Should the project be extended for 2 years, it is recommended that use be made of a short-term consultant to review/repair project vehicles and more importantly to set up a spare parts reorder system.

- R2. Insure sufficient redundancy exists for the major items of laboratory equipment.

(3) Finding: There were several complaints of poor vehicle/equipment support. In the case of INERA vehicles, the primary problem is the number of items deadlined for maintenance. They do have tractors available but these are not only old but require a lot of maintenance. The project-provided tractor on the other hand is in excellent condition, the primary problem being with the implements. In one case, the tractor cannot pull the mulcher as the implement is too large. The plow and planter are missing parts. A list of these missing parts were provided to MASI last May but have yet to arrive. The COP has requested a status report on these items but to no avail. Needless to say, this brand new equipment simply rusting away does not speak well of USAID. Finally, it was discovered that much of the problem with the nonavailability of farm equipment was simply a problem of poor communications which will be discussed later.

In the case of vehicles, some of the INERA vehicles could be running with a few spare parts and good management. However, this particular problem cannot be totally resolved until some new vehicles are received. On the other hand, four of the six project vehicles were running. Another was undergoing relatively minor repairs and the second needed some major work. Presently, the project vehicles are assigned to the project personnel (COP, Admin. Officer and 1 to 2 technicians). If the station requires use of a project vehicle, they must request the vehicle from the COP. Such support is provided the station on an as-needed basis only. The fact that the project has vehicles available whereas the station does not, does cause some friction. However, the situation is created by funding problems within INERA, not the project.

- R1. One of the two mulchers should be immediately reduced to a size commensurate with the power of the Ford tractor.
- R2. Pressure should be put on MASI to obtain the missing parts immediately.
- R3. Extra project vehicles over and above those required for the U.S. consultants and admin. officer should be pooled with the station vehicles. The tractor has already been placed under the operational control of the station. If the project continues for more than two years, new vehicles will be required for project personnel.

6. COMMUNICATIONS

Finding: Second only to funding, communications has been and is the major problem at the station. This problem exists at all levels, from USAID-INERA down to the MASI team. The problem is most acute however between the station and MASI team and within the team. One can trace the problem back to the planning stages of the project. Most of the coordination was apparently done between USAID and DOA with little coordination between DOA, INERA and the Station. This has led to a lack of understanding of the project at the INERA/Station level and thereby a general lack of interest in the project. Further, there was apparently little attempt made by the first team to read the station personnel into the project. This was very evident in conversations held with the personnel.

Aid to the above a general feeling of mistrust that resulted from and aggravated the communications problem. For instance, there was very little explanation as to why this and that was done by the project personnel, especially as regards the counterpart fund. The fact that the project maintained a separate storage area in Bukavu and in one of the houses at the station did not help. There is still some suspicion by the station personnel that items are hidden away somewhere in Bukavu. This situation is not helped by the strained communication between the project administrative officer and the Director and the Chief of Administration. In most cases, had the concerned officers simply communicated, many of the little problems would not have grown out of proportion.

One very explicit example of the poor communications deals with the scheduling of people and equipment. It was stated that the legumes project rarely received its full complement of people and often did not get the equipment. In examining the scheduling procedure, it was found that the agronomist for the legumes section had been submitting a requisition each Friday for the following week's requirement. These requisitions were then considered at the Friday afternoon planning session. The project technical consultant was unaware of this process. It was suggested that he review the requisition and sign the request prior to submission to insure that the proper amount of personnel and equipment were ordered. It was also suggested he attend the planning sessions when it was particularly important that he receive certain support. To compound this problem, it was discovered that when changes are required in the schedule, the decisions are made by the station without consultation with the individuals/sections involved. This plays havoc with one's ability to plan and accomplish tasks.

As concerns meetings, there is only one scheduled meeting at the station, the Friday afternoon planning sessions open to all. Normally this meeting is preceded by a meeting of the counterparts with the chief of party. The counterparts then represent the project at the Friday afternoon

session. While useful, these Friday afternoon meetings are not conducive to problem and information exchange at the Director - COP level as they are too long and involve too many people. The COP therefore rarely attends these gatherings. The primary method of communications between MASI and the Director normally takes place in the form of written notes passed back and forth. As small as the organization is, this represents a very poor "primary" means of communications.

It was also found that mutual items of interest (letters, reports, etc.) are only occasionally circulated among the key offices. Many people are therefore uninformed of actions that might affect their operation. Similarly, it was discovered that the station rarely if ever receives copies of the MASI quarterly reports or copies of evaluations. This latter point was a complaint voiced by several individuals.

The communications link between the station and INERA is via radio and the mail system. The latter is slow which is a real handicap for an organization as highly centralized as INERA. Of course, USAID has the same problem. It was also noted that radio messages sent to the PNS office were often not passed to USAID.

- R1. There is a need for a scheduled planning/problem solving meeting between key station personnel and the MASI team. These need not and should not be frequent, perhaps once or twice a month, but they are necessary. The agenda of such a meeting, while flexible, should nevertheless focus only on items directly involving the team and the station.
- R2. The meeting held by the COP prior to the Friday meeting should include all the counterparts and all MASI team members to coordinate the planning and discuss problem areas. Presently, only the counterparts generally attend with little or no participation from the administrative officer or other technicians.
- R3. Decisions made by the Director which concern project activities should be made only after consultation with those personnel directly involved.
- R4. Where information of mutual interest is received by one section, that material should be circulated to all sections concerned.
- R5. USAID should insure that copies of the MASI quarterly report and evaluation are sent to INERA, the station and the MASI team.

8. PERSONALITIES

Finding: Although some form of personality related problems will occur in any organization, the situation at the Mulungu station is serious. The problem is closely related to the problem of planning and communication discussed earlier and like those problems has existed for some time. Some marginal improvements have occurred since the arrival of the new team, but the problem remains at an unacceptable level. Should the project be extended, action must be taken to resolve the problem.

Recommendation: The purpose of this recommendation is to suggest how the problem might be resolved or at least minimized. What is proposed is that a planning session be held in Kinshasa with INERA, USAID, the Director and MASI. The purpose of the session would be to (1) Clearly state the objectives of the project and the tools by which we hope to attain the objectives. (2) Plan and program those actions necessary during the remaining life of the project to insure that the objectives are met. (3) Clearly establish the duties and responsibilities of both the organizations and personnel so that each can be held accountable. However, a team-building type approach should be used, emphasizing the mutual benefits to be derived from a successful project. This planning session must then be followed by scheduled review sessions maybe once a year and including the same participants. If conditions do not improve, changes in personnel will become necessary.

C. SUMMARY

Given that the research units are established and operating, can the Mulungu station support their activities at a satisfactory level?

Scenario 1 (Project terminates in October 83). The station can in no way support the project activities. The primary constraint is funding, both in terms of local and foreign exchange. Sustainability is doubtful considering the lack of capacity of the station to logistically support the project. This limited capacity stems from the communications problem experienced and the lack of management expertise especially in maintenance.

Scenario 2 (Project extended thru 1984). If all recommendations are followed and the results are reasonably successful, the project will be sustainable as concerns organization and personnel. Funding will still be the primary problem.

Scenario 3 (Activities included in a follow-on project). As with the second scenario, if recommendations are followed with some success, the activities should be sustainable on organizational and personnel

grounds. The scenario would allow additional time to follow the recommendation as well as provide funding to insure research is carried out during the life of the project. However, at the end of the project, the same questions on funding would arise. One can not read that far in advance to determine the availability of such funds.

IV. EVALUATION OF INERA

A. INTRODUCTION

The Mulungu station depends entirely on INERA for its direction and funding. It is therefore vital that one assess INERA's ability and willingness to support the station and project activities. This assessment is complicated by the recent switch of INERA from the Department of Agriculture to the Department of Research as the organization and procedures may well change. However, the priority placed on food crops is expected to continue since such priorities originate in the executive council and not in the Departments.

B. GENERAL FINDINGS AND RECOMMENDATIONS

1. **Organization:** INERA is a large, rather unwieldy organization consisting of 20 research stations and some 5000 personnel. Financial resources are expended primarily for salaries with little remaining for operating costs, investment, and research. It is an organization that despite resource constraints attempts to do all things at once - or at least to maintain the capability to do all things. The combination of limited resources and overextension results in a basically ineffective organization in terms of its purpose of performing agricultural research. INERA must therefore rely on outside assistance to perform any substantive research.
2. **Finances:** INERA has for some time been severely limited in its funding. The limited funding is slowly destroying the operational capability of the organization, not to mention its ability to carry out substantive research programs. As an example of the funding constraints, the 1982 budget request totaled 44,828,439 Zaires for operating costs and another 15,249,317 Zaires for equipment for a total of 60,087,957 Zaires. They have been allocated only 21,000,000 Zaires. Added to that total is approximately 3,700,000 Zaires in revenues from the sales of products produced at the stations. Total funds then equal 24,700,000 or 41% of that requested. Salaries (as budgeted) account for 84% of the total funding. As with the station, little is left for operating expenses and research and none for capital expenditures. They have also been allocated nothing for foreign exchange transaction. The funds are provided to INERA in monthly allotments, which occasionally arrive late. This seriously erodes the ability of INERA to plan and budget funds for activities and requires more work to administer.

At this time it is impossible to say what the move to the Dept. of Research will mean in the area of funding. However, there will be significant pressure on the department to equalize the pay scales, which will significantly increase INERA's salary costs. Therefore, even if more funds are allocated, the majority of the increase will probably be used to meet the payroll costs. One would hope, however, that some foreign exchange

would be allocated so purchases can be made for vital items of equipment/supply.

3. Planning and Programming. At present, INERA and its research stations plan only on a yearly basis. These plans are developed at the station level and submitted for approval to INERA. INERA then reviews and where necessary modifies the plans, finally publishing them in approved form. These plans generally reflect only the schedule of activities to occur in on-going research for that year. The one year plans, while useful, simply do not allow for the long-term type planning and programming necessary in research programs. The absence of long-term planning produces doubts and insecurity among the researchers and inconsistencies in the type and intensity of research. Further, there appears to be no real setting of long-term goals and objectives by INERA and little consideration in their planning of the limited resources they must plan and operate with. Until such plans are developed, the feelings of insecurity and the inconsistencies in research will continue.

6. INERA should develop long-term plans in which objectives are established based on GOZ priorities and considering the limited funding normally available. INERA must finally decide what they can and cannot afford and plan/program accordingly.

7. Project coordination and planning: During the assessment of the project, it was discovered that most of the planning and organizing for the project occurred at the USAID - Department of Agriculture level. INERA was essentially left out of this phase of the project, despite the fact that the project was to assist INERA. Additionally, DOA would know very little about the particularities of the station. The process simply circumvented those offices that the project was designed to assist and with whom the project personnel would work. One recognizes that certain rules of protocol must be followed; however, this does not prevent coordination with other relevant organizations.

8. In the future, planning for agriculture research projects should include close cooperation with those organizations directly responsible for carrying out the activities.

9. INERA's willingness to continue with the project activities: There appears to be a sincere desire on the part of INERA to continue the project activities after project termination. This does not mean that the activities would continue exactly as envisioned by the project. There could well be changes in the number of personnel performing the research and the location of the research activities.

In the case of legumes research, INERA was already performing research at other stations prior to the project. The project was seen as a means of strengthening INERA's research capability in the legumes area. It therefore stands to reason that the activities would continue. The soils lab is a more difficult problem. The services of the lab are certainly needed in Zaire, especially for the purpose of supporting the research

activities. The desire to continue the services of the soils lab is evident, but the costs may be prohibitive in light of the funding constraints. The chemicals are especially expensive and often require foreign exchange. So despite the need and desire of INERA to continue with the soils lab, the operating costs may overwhelm INERA's ability to fund the services. It is somewhat doubtful that analyses performed for private companies would cover the expenses.

G. SUMMARY

Can INERA provide the support necessary to continue the project activities?

Scenario I and II. (Project continues up to 2 years). Although there is a desire to continue the project activities on the part of INERA, the limited funding available provides insufficient funds to support the station, not to mention the costs of the new activities. However, INERA will no doubt continue some legumes research, though probably at other stations where research has been performed for some time using the newly trained personnel to supplement the existing staffs. The soils lab, however, will be impossible to sustain under the present funding. The services are simply too expensive and require use of nonexistent foreign exchange.

Scenario III. (Follow-on project). If funding is supplied under a follow-on project, the lab can certainly continue for the life of the project. Likewise the legumes research can be carried out as planned. However, the same question of funding will arise at the end of the project unless major changes occur. Additionally, if the research program is to be effective, INERA must begin planning/programming for the long term, performing only what it can afford within the established national priorities.

CHAPTER TWO: PERSONNEL**A. LEGUMES[§]****I. MATERIALS AND METHODS**

In order to receive the greatest amount of information in the least possible time, visits were made to the experimental fields, the laboratories and off-station trials in farmers' fields and at development projects. The following areas were the foci of this portion of the evaluation.

1. Personnel in the legumes division: their quality, quantity, effectiveness and their collaboration with other members
2. The internal structure of the legumes division

INTERVIEWS:

1. Cit. Mumdudu, Station Director
2. Cit. Munganga, Ing. Tech. A₁
3. Cit. Kabanguka, Ing. Agr. A₀
4. Cit. Murandikira, Extension Agent A₁
5. Cit. Kinyvakyahli, Agronomist A₂
6. Cit. Chikunjo, Agronomist A₃
7. Dr. Quyen Nguyen, Division Chief, Legumes, MASI
8. Mr. R. McDonald, Administration, MASI
9. Mr. P. Michaelson, Machinery Consultant, MASI
10. Mr. Steve Meek, Chief of Party, MASI
11. Dr. H. Graets, Soil Scientist, MASI

The three counterparts (Ing. Agronomes A₀) were all away from the station for training during the evaluation.

SITE VISITATIONS

1. Nyangoni: a) the diocese's project, COOI, directed by Abbé Balogamire Koko Akantzi and Abbé Matandiko Kalonga b) the project SOJA directed by R.R. Frère Mathay Bese.
2. Luena, the project VIPAM (Project Village Pictete pour l'Agriculture Moderne) directed by the R.R. Père Andre-Lacoste
3. Mushwehwe
4. Muresa
5. Experimental Fields at the Mulungu Station
6. Demonstration fields at several locations
7. Laboratories on station
8. Storehouse on station

§ This section is a translation from the original French copy. The French version is attached.

II. RESULTS AND DISCUSSIONS

1. Organization

- a. Dr. Quyen Nguyen, Division Chief
 Duties: - the direction and planning of the legumes research
 - supervision of the field work
 - training of Zairian counterparts
 - correspondence with the other international centers and exchange of germplasm
 - contact with outside groups in Zaïre for distributing seed
- b. Ingénieurs Agronomes
- A₀ Cit. Musungayi (Beans)
 - Cit. Kabanguka (Job terminates soon)
 - Cit. Bouwau (other legumes and the Legume Collection - official)
(potatoes - unofficial)
 - Cit. Elukesu (Soybeans)
 - A₁ Cit. Munganga (Plant Protection)
 - Cit. Murandikira (Extension Agent)
 - A₂ Cit. Kinywakyahali
 - A₃ Cit. Muhugura (Execution of Field Work)
 - Cit. Tabero
- c. Twenty field workers (the numbers increase and decrease according to the work load).

The structure of the legumes organization is borrowed from INERA and is judged to be satisfactory.

2. Personnel

a. Quantity

Upon the return of the participants, the legumes division will be composed of three scientists with MS degrees and three Ingénieur Agronomes. There will also be one returning participant whose area of study is rural sociology (extension). Presently, the work is distributed so that each counterpart is responsible for a different legume culture. For example, Cit. Musungayi takes care of beans while Cit. Elukesu is occupied with soybeans. According to the Division Chief, there are insufficient numbers of counterparts to do all the work. However, upon the return of the participants, the legumes program will be sufficiently staffed.

b. Quality

Although academically well trained, the majority of the Zairians received their field training while working on this project with the expatriate. According to the Division Chief, the counterparts are now capable of designing, implementing and analysing experiments. This is evidenced by the number of trials which have been carried out by the Zairian staff. At the end-of-project, counterparts will be sufficiently trained to be able to continue the program without the aid of an expatriate.

3. Off-Station Trials

D: Research activities outside of the station seem to suffer from a lack of prior planning, lack of appropriate execution, lack of site visitations during the growing season and lack of follow-up. This opinion was expressed by several project directors who collaborate with INERA on the off-station legume trials. Furthermore, results of the trials were not conveyed to the project directors. There are also problems with the off-station trials. Seed which has been received from other research stations is being distributed without first being tested on-station. The risk from inappropriately planned and executed trials off-station, is a loss of confidence of participants, both farmers and development organization officials. When confidence is lost, transmission of good agricultural practices, including improved seed, becomes more difficult in the ensuing contacts.

R1. Trials outside the station should be well planned and coordinated with the appropriate officials. Trials should be conducted using good agronomic techniques, including prior seed testing, surveillance during the growing season and transmission of results to the cooperating agencies.

4. Management

D. The management of the legumes division suffers from a serious lack of planning and coordination, not only within the legumes group but also between the legumes division and the other divisions. For example, the scheduling of field workers for the following week is determined at the DNER/ Friday afternoon staff meetings which are attended by the Zairian staff of the legumes division. Each week a counterpart submits a request. However, the Division Chief was not aware of this mechanism and believed that field workers were arbitrarily assigned. This lack of planning exists not only for work conducted on-station but also work conducted outside the station. The Division Chief had decided not to conduct off-station trials this cropping season but the message was never relayed to the participants who had already prepared the fields for planting.

Another serious problem between counterparts and the consultant is communications. Lack of communication between the two groups was discovered to be hindering the training process. On the one side, the consultant is not including the counterparts in the planning and management process to the extent required. For instance, only the consultant has been making contact with other institutions to obtain seed. Also, results of trials are rarely discussed according to the counterparts. On the other hand, the counterparts are often absent or late, rarely make proposals for trials and they are loath to make field observations. Actual time in studying and/or carrying out research activities would be estimated to be quite low.

Furthermore there was a lack of collaboration. This lack of collaboration was found to exist between expatriates, between Zairians and between Zairians and expatriates. This lack of collaboration exists because of an

atmosphere of suspicion and a lack of confidence between the respective parties. The result is that work is impeded.

R1. To improve communications between the two groups, it is suggested that: a) scheduled discussions be held at least once a week with the counterparts to discuss planning for the week, research work performed, results from tests and management problems and b) All members of the team, including at least one of the agronomes should attend the MASI planning session held prior to the the Friday afternoon INERA planning session.

A2: The consultant should immediately increase the level of participation of the counterparts in the planning and management functions, delegating responsibilities and evaluating their performance. The goal of this exercise is to improve both the counterparts' research skills and management skills.

R3. The consultant should include counterparts on trips to other research stations and conferences. This will give the counterpart exposure to other programs and create avenues of communication for research results. For the present, such trips should be centered on the stations of INERA where legume research is also being carried out.

3. Facilities and Equipment

The facilities are sufficient for the research which is being conducted. The materials ordered by the project ought to be sufficient for the work of the legume division. However, the division uses very little of the equipment which was purchased because parts do not match, has yet to be assembled, spare parts are missing, or equipment was broken during shipping and has yet to be replaced. The management of these materials is virtually non-existent. There is no programming for spare parts, the parts are scattered

around the station and no storehouse or parts list exists. It has only been recently that all the spare parts have been collected into one location.

E1. Equipment should be brought to operating capacity by ordering the appropriate parts and/or assembling equipment,

E2. A management system should be devised for cataloging and maintaining spare parts.

6. Accomplishments of the Project

a. Training

The principle accomplishment of this project has been training of the scientists in American Universities, at I.I.T.A. , and by the expatriate staff. This training has greatly increased the capacities of the researchers at INERA to conduct research at the Mulungu Research Station, but the quantities are insufficient for a national legumes research program.

b. Seed

There has been quantitative and qualitative increases in the germplasm stocks in Zaire as a result of this project. Some of this seed is presently being distributed to development groups in Zaire.

c. Collaboration with other Groups

Due to the collaboration between the legumes program and other development organizations, improved soybean varieties are being distributed throughout Zaire. Furthermore, working relations have been established between this legumes program and other legume programs worldwide. These relationships will facilitate the transfer of germplasm for varietal testing.

7. Constraints to the Project

a. Lack of planning and management of the program, materials and equipment

b. Lack of collaboration and communication

c. Lack of planning and follow-up of off-station trials

4. Lack of initial planning at start-of-project. The result has been that responsibilities and lines of communication have not been well defined,

8. Sustainability of the Legumes Project

A. Organisational Structure

D. Although the actual organization of the legumes division is satisfactory, the manner in which the organization is directed reduces its effectiveness. The research activities are poorly organized, jobs to researchers are not well distributed or defined and there is a lack of coordination with the other INERA research efforts. For example, there is a counterpart assigned to legumes who works almost exclusively with the potato project. If managed and directed well, the organizational structure which has been established could function well. Moreover, this organization needs to be reinforced by numbers of trained Zairians who can conduct and manage research.

E1. Each counterpart should receive a job description to decrease misunderstandings of job responsibilities.

E2. One Zairian ought to be trained to the PhD level in legumes. Upon this person's return, he would be responsible for the program of legume research on the station, coordinating efforts with other legume research programs in the country, coordinating efforts with development organizations in the country and continuation of contacts with international organizations.

E3. For a national program, four PhD level Zairians will be needed in the following areas: agronomy, plant breeding, plant protection, microbiology. Not less than 30 Zairians trained at the M.S. level will be needed. The lower-level support staff will be determined as needed.

R4: The program emphasis during the first team was agronomic, whereas the current program emphasis is varietal testing. In the future, efforts should be made in both areas, as well as plant breeding and plant protection. Thus three experts, an agronomist, plant breeder and plant pathologist should be hired. After the first two years, a fourth expatriate, a microbiologist should be added to the team.

R5: There is currently a need to hire an expatriate who can transmit management and programming skills to the current group of Zairian counterparts. Someone with these skills should be hired to work with the returned participants as well as the counterparts already at the station.

IFI. ANALYSIS OF THE SUSTAINABILITY OF THE PROJECT

1. Scenario I: PACB, October 1, 1983

a. Personnel

The number of personnel that has been trained and who will return will be sufficient to sustain project activities at their current level. However, the returned participants will not benefit from expatriate guidance in experimental design and analysis as well as management. Furthermore, contact with other development organizations and international institutions may be lost. Currently, all this correspondence and contact is done by the expatriate. If the expatriate leaves before the participants return, the information may not get transferred to the returned participants.

b. Organization

As the structure of the legumes division is integrated with INERA, there is a danger that legumes will be relegated to a lesser position while potatoes gain in importance. If this happens, the legumes program will suffer as time, effort and personnel are directed towards potatoes.

2. Scenario II: Extension of PACB through December 1984

By December 1984, all participants will have returned and benefited from working under an expatriate advisor for the duration of one year to five months.

a. Personnel

By extending the project for this additional time, returned participants will have the guidance of an expatriate. More importantly, the expatriate can transfer the responsibilities of communicating with other development projects and international research organizations to the Zairians.

b. Organization

During this transition phase, the actual structure of the legumes division ought to be integrated so that collaboration is increased between the expatriates and the Zairians. Increased collaboration would increase research planning, and distribute duties more equitably among the researchers. Furthermore, increased integration should occur between DNERA and the project to assure support of the project by the INERA staff.

R(Scenario I and II): The project should be extended until December 1984.

3. Scenario III: Continuation of the Project

It is believed that the only true sustainability of research activities will come with an integrated system of the research sector. In order for this to transpire, research activities will have to be extended into the foreseeable future. Stations should be located at diverse agro-climatic regions. Additional funds and personnel will be needed to implement this program. Also attention will have to be paid to the manner in which the organization is established so that the organization allows for an integration of Zairian and expatriate personnel.

IV. RECOMMENDATIONS AND CONCLUSIONS

1. The program should be continued as there is a large increase and interest in legume production
2. Expatriate technicians should be selected very carefully and their jobs should be designed precisely.
3. An attempt should be made to increase the integration between the project activities and the activities of INERA in order to increase collaboration between the two groups.
4. Use off-station trials when applicable but only if enough time and logistical support is available.
5. Employ a chief of party trained in management in order to transfer management skills to the Zairians.
6. Continue contacts with other development organizations and international research institutions.
7. Continue project six months past PACR of October 1983 to allow on-station supervision of returned participants by an expatriate.
8. Contact and start working with other research stations in Zaire which are performing soybean research (Gandajika, M'Vauxi, Kiyaka, Yangambi, etc.).
9. Circulate research data and reports to the other research stations in Zaire.
10. Establish a documentation center
11. Establish a legumes research program at Gandajika
12. INERA should appoint a specific number of counterparts to work in the legumes program and these counterparts should be used to for project the research.
13. Material benefits to the Zairians working on the project should be increased.

BEST AVAILABLE DOCUMENT

B. SOILS

I. METHODOLOGY

A. General

Throughout the evaluation, sustainability of research activities was assessed against three timeframes of project support termination. These three reference points are 1) PACD 1 October 1983, 2) Extension of PACB until December 31, 1984 and 3) Continuation of project activities for a period of not less than five years.

B. Specific

1. Interviews.

- a. Steve Mack, Chief of Party and Soils Laboratory Technician, MASI
- b. Cit. Matungulu, Counterpart Soils
Cit. Mandjalis, Counterpart Soils
- c. Dr. H. Graetz, Soil Scientist, MASI
- d. Laboratory Technicians
Cit. Mashahuri
Cit. Musakamba
Cit. Muganga
Cit. Muhogera
Cit. Christene

2. Reports

- a. Quarterly reports on soil analysis
- b. Description of soil analysis
- c. Experimental designs of field trials

3. Site Visitations

- a. Greenhouse
- b. Field trials
- c. Terraces-Nyamununy
- d. Mushweshwe Marsh Experiment
- e. Soils Laboratory
- f. Documentation Center

II. RESULTS

A. Organization

1. Description

The soils section was originally designed to include three components: soil fertility, soil classification and soils analysis. However due to the lack of expatriate personnel and Zairian counterparts, only one division is

currently operational - soil analysis, which includes both soil testing and soil fertility trials. There is one full-time expatriate advisor for the soils lab. However, the majority of his time is occupied as Chief of Party. Since the first expatriate team departed, expatriate expertise in soil management and soil fertility has been provided by short-term consultants who spend six months on the station,

Two counterparts manage the laboratory and technicians. Neither counterpart is trained in soil analysis. Their area of expertise is soil classification. Besides managing the soils lab and fertility trials, both counterparts are responsible for certain administrative duties and reports that INERA requires. Up to 50% of their time is spent on administrative duties. For example, one counterpart has served as Acting Director of the station when the Director was on leave.

There are seven lab technicians who are employed by the project and three lab technicians who are employed and paid by INERA. The dossiers of the lab technicians who are employed by the project have been sent to Yangambi where they are currently awaiting concurrence of official employment by INERA.

There are three Zairians being trained in the U.S. to the Master's level, one each in the following disciplines: soil chemistry, soil analysis/soil fertility and soil fertility. One participant will return December 1983 and the two others August 1984. No candidates with sufficient English language skills could be found to send to the States for training in soil classification.

2. Organizational Effects on Project Results

a. Technical Assistance

The lack of longterm soil classification and fertility specialists as

well as a concomitant lack of soil counterparts has precluded the effective establishment of the soil fertility and soil classification divisions. The result is that only one division has been established, soil analysis.

b. Laboratory Technicians

Personnel levels are adequate to handle the current sample load which ranges between 450 to 2500 samples/year depending on the type of analysis. However, because the project funds the majority of the laboratory technicians, upon project termination, the soil analysis section will lose the majority of its trained personnel unless INERA funds these positions. As a result of this reduction in personnel, the soil lab would only be able to function at approximately 30% capacity.

c. Participants

Upon the return of the participants, sufficient numbers of scientists will exist to run the laboratory and conduct soil fertility work in the greenhouse and the experimental fields. If only one participant returns, activity levels would increase only marginally due to insufficient quantities of personnel. (This assumes that counterparts currently working at Mulungu will continue to work there). However, the project could function and even expand if only two of the three participants were to return. With the presence of all three returned participants, the number and level of activities could be significantly expanded although all of this expansion will occur in the soil analysis and soil fertility sections. The soils program will still be without a soil classification and soil mapping section.

B. Soil Laboratory

1. Technical Aspects

The technical competency of the counterparts and the laboratory technicians is the least limiting factor in the sustainability equation. The

counterparts seemed to have adequate academic backgrounds but lacked practical experience in designing, implementing and analyzing experiments. The majority (five out of six) of the soil fertility/soil management experiments being conducted on and off-station were designed by expatriate technicians. One counterpart, with the aid of a expatriate technician scientist designed a Leucacia mulch experiment while the other counterpart, with the help of his major professor at Yangambi, has designed a soil moisture experiment as his PhD topic. Furthermore, it was reported that counterparts had difficulties translating farmers' problems and needs into appropriate areas of research. Without continued assistance from expatriate advisors, there are serious questions as to the ability of the current staff to design appropriate experiments.

This lack of experience is also in part due to the lack of continuous expatriate personnel to act as advisors. The first team of soil scientists was unable to establish much of a program as equipment and supplies arrived late. Since the first team departed, there has been only one full-time soils specialist whose responsibility was to establish the laboratory. He has also acted as Chief of Party for most of this duration. Two short-term consultants have provided expertise in the areas of soil fertility/soil management. As a result, training for the counterparts has been minimal. There has also been a concurrent lack of a longterm coordinated research plan as each short-term consultant has implemented his own set of experiments. Counterparts felt that short-term consultants provided little training and in general were insufficiently acquainted with tropical soils to be truly effective.

Finally, as alluded to before in this report, the two counterparts have been trained in soil classification/soil management. They both worked with Dr. Carroll, the soil classification specialist before his departure.

Since the technical plant of the project changed from a focus on soil classification to a focus on soil analysis/soil fertility, counterparts have had to work in areas other than their expertise.

Soil laboratory technicians appeared to be performing soil analyses appropriately and with enough precision. This observation was corroborated by both expatriate soil specialists. Soil technicians have been taught to do all the different types of analyses. Although not completely cognizant of the meaning of the soil analyses, they exhibited a sincere interest in learning as demonstrated in their interest in a course which Dr. Graetz was teaching, entitled "Plant and Soil Relationships".

The technical capacities of the returned participants is unknown. However, the respective schools which they are attending and their initial progress reports indicate that performance should be good. A major factor in their technical success upon their return will be the amount of experience they will have received in designing, implementing and analyzing experiments.

There is a technical problem in the soils lab which must be addressed. There are no soil fertility correlations. Analyzing a soil for nutrients gives an estimate of the nutrient supplying capacity of the soil, but it does not necessarily describe at what quantities a particular nutrient will be limiting or toxic to plant growth. In order to determine whether a particular soil can supply a specific nutrient in low, moderate or high quantities, soil fertility correlations must be conducted. As of yet, U.S.-correlations have not been made. Until these correlations are made, the data gathered from the soil nutrient analyses will be of limited value.

2. Management

A serious constraint to the continuation of this project is the lack of management skills. Management skills have not been developed due to the

lack of expatriate technicians and initial project planning. The best example of this is management of chemical stocks. As designed in the project, chemicals and equipment were bought at the start of project and there were no plans or allowances made for replenishing depleted stocks. The Zairians were not given the experience of tracking chemical usage for the purpose of reordering chemicals or scientific supplies. For a soils lab to work smoothly and efficiently, management of stocks is essential.

There also appeared to be a low level of productivity in the lab. Technicians seemed to be only marginally employed. Several factors may have accounted for this observation: 1) Both counterparts (supervisors) were concurrently in Kinshasa, thus supervision was minimal; 2) Distilled water is produced in the laboratory by boiling and condensing water. The quantity of water which can be produced on a daily basis is low and does not suffice for daily needs. Since most analyses require the use of distilled water, this can become a limiting factor in the number of samples which can be analysed daily. 3) Chemicals are also in limited supplies. Some analyses cannot be run at all and others are being run on a limited basis to stretch chemical supplies that are left. 4) Certain pieces of equipment are not working, such as the flame spectrophotometer, due to mechanical problems while other machines, such as the water distiller, are not working because the electrical current is inappropriate for the machines. The lack of properly operating equipment further reduces the number of samples which can be processed. Between the lack of chemicals and equipment, less than 50% of the chemical analyses can currently be performed. 5) Electrical failures are frequent which completely stops all activity. 6) The number of physical determinations is declining. The majority of the samples which have been analysed for physical properties is to be used as data for a PhD thesis of one of the counterparts. Since the majority of these samples have

been analyzed, there are very few other samples to be run.

For the reasons discussed above, labor productivity was marginal. However, if these problematic factors could be eliminated, labor productivity could still be improved. Currently if a technician puts a sample on to boil, shake, centrifuge, etc., they generally watch the process rather than starting a new batch of samples. (I did however, see one exception to this observation). After taking care of the logistical and managerial problems in the lab, the next step to increasing labor productivity is to work on time management with the technicians.

III. DISCUSSION

a. Scenario I: PACD, 1 October 1983

On technical grounds the soil lab and soil fertility/management trials are sustainable at current levels given that the following assumptions are met: 1) chemicals can be ordered (A_1) and INERA hires the laboratory technicians (A_2). If either assumption does not hold true, sample analyses will decrease due to reduced personnel or reduced reagent levels. Similarly, fertility and management experiments will become more difficult to interpret as supporting soil analysis data becomes unavailable.

Conceivably, activities could increase with the returned participants. For this to occur A_1 and A_2 must hold true plus 1) the returned participants must have good management skills, 2) at least two of the three participants will return to Mulungu, 3) the returned participants can design, implement and analyze relevant experiments without assistance, 4) machines which are out of commission will either be fixed or replaced.

b. Scenario II: Extension of PACD until December 31, 1984

By prolonging termination date, and recruiting a soil scientist to serve in an advisory position, the returned participants could benefit from

management and scientific guidance. Conceivably this additional guidance could benefit from management and scientific skills of the returned participants, thereby assuring the sustainability of the soil activities on a technical/managerial basis after end-of-project. For example, during the transition period, the advisor could in conjunction with the returned participants, develop a format for ordering chemicals. At project termination, the same assumptions made above will have to hold: 1) chemicals can be purchased, 2) INERA will hire the lab technicians, 3) two of the three returned participants will stay at Mulungu, and 4) laboratory equipment must be functioning properly.

R1. Extend the project through December 1984.

R2. As a condition of the extension, insist that INERA hire the laboratory technicians.

R3. Insure redundancy in the laboratory equipment by purchasing those instruments which do not already have a backup.

R4. Establish a chemical reordering system done in conjunction with the Zairian staff.

R5. Make operational all lab machinery and/or electrical systems.

c. Scenario III: Continuation of project activities

D. The technical and managerial sustainability of the soil division would be ensured with the continuation of this project or a follow-on project if a suitable soil science advisor/manager could be hired. The additional time factor involved would allow returned participants as well as laboratory technicians to work with seasoned professionals and would allow more Zairians to receive technical training in the States.

R1. Extend the project to December 1984 and then phase the project into the new Applied Agricultural Research Project (660-0091) which is currently

under consideration. The following modifications should be made in the soils program.

ra. Soil activities should have a limited scope of reference: it should function as a support unit to crops research. Activities should include soil analysis, soil management and soil fertility. There should be two divisions within the soils section, soil analysis and soil management with soil fertility being contained within soil management.

Developing a soil classification/soil mapping capacity in Zaire will mean a substantial investment for both USAID as well as the GOZ.

First, this project, 064, has developed no soil classification/mapping capabilities either in the training of counterparts nor in the organization of the soils unit. Thus project 091 would have to start at a baseline of zero. Secondly, data from soil maps are used to make land use decisions. However in a country where the agricultural practices are still very traditional, farmers are not going to make their land use decisions based on soil maps. Furthermore, many important soil management decisions can be made from physio/chemical measurements derived from the soil lab. Thirdly, to establish a soil mapping capacity for Zaire, it will require not only trained scientists, but trained soil mappers. Since soil mapping is more of an art than a science, a good year of supervised field training would be required for competency. Several soil mapping expatriate technicians might be needed. Fourth, the Belgians mapped a portion of Zaire, and although their system of soil classification is different from the U.S. system, the

maps can be used. (About 20% of the land surface of Zaire was mapped).

This resource ought to be taken advantage of.

rb. The soils lab should be moved from the Mulungu Research Station to Kinshasa. In order for a soil lab to function properly and efficiently,

it must have access to a continuous source of electricity. Furthermore, certain types of goods(chemicals) and services(repair technicians) are more available in Kinshasa than other locations in Zaire such as Mulungu and Yangambi. Also there are connecting flights between Kinshasa and many other locations in Zaire. Because of this, soil samples from almost any location in Zaire could be transported to Kinshasa for analysis. Placing the laboratory at Kinshasa would greatly facilitate logistical support of the soils lab.

rc. A soil fertility and /or soil management specialist should be placed at each station that O91 establishes. The soil scientists would work in conjunction with the plant scientist to establish appropriate rotations, cropping sequences, fertilizer rates, etc. Thus field work would be conducted on the station while the soil analytical portion would be conducted in Kinshasa. In order to fill these stations an additional two to four Masters level and two PhD candidates should be trained in soil management, soil fertility and/or soil analysis.

12. Current soil documentation should be provided.

13. Each counterpart and expatriate should have one opportunity/year to attend a professional conference.

14. Zairian counterparts should be included in the first steps of the project, including initial project procurements of goods.

15. Short-term consultants should be used to supplement long-term consultants, not in lieu of.

CHAPTER III: FINANCES

I. GENERAL

The following budgets and tables denote the recurrent costs of the legume and soil research activities. In figuring recurrent costs, numerous assumptions have been made. These assumptions should be noted for each chart or table.

The recurrent cost estimates do not take into account eventual replacement costs for worn out machinery and laboratory equipment. Furthermore, estimates of needs and costs were kept conservative. Thus the recurrent costs shown represent a minimum. Actual costs could be higher. Finally, none of these costs are presently budgeted or payed for by INERA.

A. Itemized Recurrent Costs

<u>MAINTENANCE</u>	<u>Z's</u>	<u>\$</u>
1. Facilities Materials ^{a/}	15,897.8	-0-
2. Vehicles Spare Parts	32,772 ^{a/}	1,600 ^{h/}
3. Lab Machinery ^{a/}	-0-	-0-
4. Farm Machinery ^{h/}	-0-	<u>3,200</u>
TOTAL	48,670	4,800
 <u>ENERGY</u>		
1. Electricity ^{a/}	34,951.5	-0-
2. Fuel ^{b/}	53,043	-0-
3. Water ^{a/}	<u>1,826</u>	<u>-0-</u>
TOTAL	89,820	-0-
 <u>PERSONNEL</u>		
1. Salaries ^{c/}	32,375 (1983)	-0-
	194,250 (1984)	-0-
	291,375 (1985)	-0-
2. Training ^{a/}	1,611	-0-
3. Pensions ^{a/}	4,872.7	-0-
4. Transportation ^{a/}	12,958	-0-
5. Per Diem	9,014	-0-
6. Indemnity ^{a/}	1,769	-0-
7. Health ^{a/}	<u>8,520</u>	<u>-0-</u>
TOTAL (Without Salaries)	38,745.7	-0-
 <u>REPLACEMENT ITEMS</u>		
1. Chemicals (soil analysis) ^{d/}		328/100 samples
2. Lab Equipment ^{a/}	3150	2897
3. Chemicals (nut. work)	-0-	1621
4. Legumes	<u>-0-</u>	<u>4000</u>
TOTAL (without 1.)	3150	8,518
 <u>AG INPUT</u>		
1. Seed ^{a/}	720	-0-
2. Lim ^{a/}	1,015	-0-
3. Fertilizer/Pesticides	<u>-0-</u>	<u>800</u>
TOTAL	1,735	800

<u>ADMINISTRATION</u>	<u>Z's</u>	<u>\$</u>
Supplies	<u>3,837</u>	<u>-0-</u>
TOTAL	3,837	-0-

- a/ Costs were taken from actual expenses incurred by the project for the duration of October 1, 1981 through September 30, 1982. Any costs which appeared to be superfluous to project sustainability were not included (e.g. fuel costs for maintaining a logistics person in Bukavu).
- b/ Table 1: Quantity of fuel consumed by the project for a 1 year duration
- c/ Table 2: Personnel Costs
- d/ Table 3: Cost of Soil Chemical Analyses for 100 Samples
- e/ Table 4: Soil Laboratory Replacement Equipment Requirement
- f/ Table 5: Chemical Costs for Nutrient Solution Work in the Greenhouse
- g/ Table 6: Recurrent Costs for Agronomic Supplies
- h/ Costs including freight were estimated by Peter Michaelson, Consulting Mechanic for MASI. Maintenance parts will be needed for 1983, 1984 and 1985. After 1985 it is estimated that vehicles will be beyond maintenance and new vehicles will have to be purchased.

B. Total Recurrent Costs of the Project that INERA Would Have to Fund in 1983, 1984 and 1985

<u>Type of Expense</u>	<u>PACD 10/1/83^{§§}</u>		<u>1984^{§§§}</u>		<u>1985</u>	
	<u>Z's</u>	<u>\$</u>	<u>Z's</u>	<u>\$</u>	<u>Z's</u>	<u>\$</u>
1. Maintenance	13,993	1,380	64,368	6,348	74,022	7,300
2. Energy	25,823	-0-	118,787	-0-	136,605	-0-
3. Personnel	43,514	-0-	245,492	-0-	350,303	-0-
4. Replacement	905	9591	4,163	44,116	4,787	50,734
5. Ag Inputs	498	230	2,294	1,058	2,638	1,217
6. Administrat.	<u>1,103</u>	<u>-0-</u>	<u>5,075</u>	<u>-0-</u>	<u>5,836</u>	<u>-0-</u>
TOTAL	85,836	11,201	440,179	51,522	574,191	59,251

§ All figures represent a best estimate and were computed on a conservative basis. Thus totals represent a minimum which will be needed to sustain the project at its current level (includes 3,000 soil analyses/year).

§§ All costs are based on 1981/1982 prices. 1983 prices include a 15% increase computed for inflation. Because of the 1 October PACD, INERA would be responsible for recurrent costs only in the 4th quarter, and as such the table reflects only 4th quarter costs.

§§§ 1984 and 1985 have each been increased by 15% to include inflation factor.

C. Current Mulungu Station Yearly Budget[§]

Requested	3,146,013 Zaires/Year-1982
Actual	1,466,000 Zaires/Year-1982
-Salary Sup.	1,200,000 (100,000 Zaires/Month)
-Research Exp.	240,000 (20,000 Zaires/Month)
-Receipts of sales	24,000 (2,000 Zaires/Month)
-Miscellaneous	2,000

§ This level of support from INERA Headquarters to the Mulungu Research Station has been constant for several years

Table 1: Quantity of Fuel Consumed in a One Year Duration
(October 1, 1981 - September 30, 1982)

<u>Usage</u>	<u>Gasoline(l)</u>	<u>Diesel(l)</u>
Project Vehicles	2617	2386
Counterparts	1033	120
Ag Machinery	107	-0-
Logistical Support	560	-0-
Other Use	21	191
Hospital	260	320
INERA	335	660
Generator	-0-	1062
Water Transport	-0-	365
Ag. Prod.	-0-	985
Plowing	<u>-0-</u>	<u>2225</u>
TOTAL	4933	8314

<u>COSTS</u>	<u>Gasoline</u>	<u>Diesel</u>
	4798 l @ 5.5 Z/l = 26389	8314 l @ 2.8 Z/l = 23,279.2 Z
	135 l @ 25 Z/l = <u>3375</u>	
	29764 Z	

Note: The project would have used more fuel if supplies had been available. For the purpose of this calculation it will be assumed that fuel availability will remain scarce for the foreseeable future and that rates of consumption will continue at the 1981-1982 level.

TABLE 2: Additional Personnel Costs of the Project

<u>SECTION</u>	<u>1983</u> ^{a/a}	<u>1984</u> ^{a/b}	<u>1985</u> ^{a/c}
<u>Legumes</u>			
- Extensionists (4)	2,000	12,000	18,000
- Agronomes (2)	1,825	10,950	16,425
- Laborers (20)	12,360	74,160	111,240
<u>Soils</u>			
- Lab Technicians (8)	13,250	79,500	119,250
<u>General</u>			
- Sentinels (2)	1,440	8,640	12,960
- Admin Ass.	1,500	9,000	13,500
TOTAL	\$32,375	\$194,250	\$291,375

a/a 1983 Salaries Double

a/b 1984 Salary Increase 50%

a/c 1985 Salary Increase 50%

TABLE 3: Cost of Soils Chemical Analyses for 100 Samples

Total Cost of 100 Samples is	\$360.46 (1981 Prices-See Attachment)
Inflation Factor for 1982 of 15%	\$ 54.00
Total Cost of 100 Samples is	\$414.00
* Freight Cost is Approximated at 100% of Chemical Cost	
	\$414.00
<hr/>	
Total Cost of 100 Samples Plus Freight is	\$828.00

* Shipping costs of chemicals seems to be higher than costs for other commodities, thus shipping costs were estimated at 100% of commodity value.



MASI DEVELOPMENT SERVICES
 DIVISION OF MULTINATIONAL AGRIBUSINESS SYSTEMS INC.
MASI/USAID INERA SUPPORT PROJECT

MEMORANDUM

To: Deanna Osmond, Chief of Evaluation Team
 From: Steven Mack, Chief of Party *S Mack*
 Date: November 18, 1982

Subject: Cost of Soils Chemical Analyses

The current set of analyses includes organic carbon, pH, phosphorus, total nitrogen, exchangeable bases, calcium, magnesium, exchangeable acidity and aluminum. The following figures represent the amounts of chemical necessary for 100 samples and the price for these chemicals as quoted from the 1981 Fisher Scientific Catalog.

<u>CHEMICAL REAGENT</u>	<u>AMOUNT REQUIRED</u>	<u>COST U.S.</u>
Acetic acid, glacial	580 ml	8.99
Ammoniac liquer*	1.2 l	23.28
Ammonium chloride	140 grams	2.04
Ammonium fluoride	1.2 grams	0.11
Ammonium hydroxide	700 ml	9.31
Ammonium molybdate	3 grams	0.13
Boric Acid	40 grams	0.63
Cupric sulfate	87 grams	6.02
Diphenylamine	1 gram	0.24
Disodium EDTA	7.72 grams	0.71
Eriochrome black	40 grams	9.52
Ethanol	950 ml	12.87
Ferrous sulfate	454 grams	17.48
Hydrochloric acid, conc.	2 ml	0.03
10 N	70 ml	0.99
0.1 N	1.2 liters	8.34
Methyl red (0.2%)	200 ml *	3.04
Phenolphthaleine	1 gram	0.20
Phosphoric acid	2 liters	53.20
Potassium chloride	1650 grams	27.56
Potassium cyanide	4 grams	0.28
Potassium sulfate	1.74 kilos	51.85
Sodium fluoride	80 grams	6.40
Sodium Hydroxide 50%	2 liters	26.80
0.1 N	1.2 liters	8.88
pellets	136 grams	4.76
Stannous chloride	1 gram	0.09
Sulfuric acid	12.3 liters	73.06
Triethanolamine	120 ml	3.14
	Total	360.46

* not available from Fisher

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TABLE 4: Soils Laboratory Replacement Equipment Requirements

<u>EQUIPMENT</u>		<u>\$/QUANTITY</u>	<u>\$/yr</u>
1. Pipets (volumetric)	1 ml	55.98/18	18.66/6
	5 ml	55.98/18	18.66/6
	10 ml	55.98/18	18.66/6
	25 ml	89.10/18	29.70/6
	.5 ml	65.76/18	21.92/6
Total		822.80	8107.6
2. Pipets (graduated)	1 ml	26.24/12	13.12/6
	10 ml	34.13/12	17.06/6
Total		60.37/12	30.18
3. Burets	100 ml	55.33/1	
Total (2/year)			110.66
4. Volumetric Flasks	25 ml	55.80/12	27.90/6
	50 ml	57.24/12	28.62/6
	500 ml	61.72/6	61.72/6
	1 l	64.20/6	64.20/6
Total			182.40
5. Plastic Sacks (6 oz.)	300/box	10.50/box	105.00
6. Grease Pencils (1 Case of 144)		36.45/case	
1 case will last 10 years			3.65/yr
Total			3.65
7. Soap			31502/yr
8. pH Electrodes		50.000/electrode	
3 pairs of electrodes/yr			1500.00/yr
Total			1500.00

9. Graduated Cylinders	100 ml	61.68/24	15.40/6
	250 ml	283.00/36	47.20/6
	1 1	74.72/8	74.72/8
Total			<u>\$137.32</u>
10. Spectrophotometer Tubes 1 case (36 tubes)		60.00	10.00/6
	Total		<u>\$ 10.00</u>
11. Erlenmeyer Flasks	250 ml	86.88/12	43.44/6
	500 ml	69.76/8	52.20/6
	1 1	63.66/6	63.33/6
Total			<u>\$159.30</u>
12. Funnels (short stem)	65 mm	46.56/24	7.50/6
	100 mm	76.32/24	19.10/6
Total			<u>\$ 26.70</u>
13. Buffers	pH4	65.90/6	65.90
	pH7	106.70/6	106.70
Total			<u>\$172.60</u>
14. Aspirator Bulbs		18.90/12	9.45/6
Total			<u>\$ 9.45</u>
15. Stirring Rods		12.25/72	2.04/12
Total			<u>\$ 2.04</u>
16. Spatula		35.10/12	17.55/6
Total			<u>\$ 17.55</u>
GRAND TOTAL			\$574.02
Inflation Factor 15%			\$610.12
Freight (60% of total)			\$306.37
TOTAL EQUIPMENT AND FREIGHT COST (1962 Prices)			\$ 1286

ASSUMPTIONS:

1. It is assumed that the life span rate on the glassware will be 6 pieces of each type of glassware/year unless otherwise specified.
2. Current filter paper stocks will last through 1965.

TABLE 5: Chemicals Costs for Nutrient Solution Work in the Greenhouse

<u>CHEMICALS</u>	<u>PRICE/UNIT</u>
Ammonium Nitrate	\$ 28.70/3kg
Ammonium Phosphate	\$ 90.95/3kg
Ammonium Sulfate	\$ 28.50/3kg
Calcium Nitrate	\$ 56.15/3kg
Calcium Phosphate	\$ 28.60/3kg
Calcium Sulfate	\$ 39.00/3kg
Boric Acid	\$ 12.40/500g
EDTA - Fe	\$ 29.10/1kg
Cupric Chloride	\$ 36.60/3kg
Magnesium Sulfate	\$ 72.35/3kg
Magnesium Nitrate	\$ 90.40/3kg
Manganeseous Chloride	\$ 25.00/500g
Potassium Sulfate	\$ 77.85/3kg
Potassium Nitrate	\$ 28.50/3kg
Cobalt Chloride	\$ 17.70/100g
Zinc Chloride	\$ 27.75/500g
Zinc Sulfate	\$ 15.50/500g
TOTAL Price 1981	\$705.10
Inflation Rate 15% (TOTAL 1982)	\$810.87
Freight (100%) plus Chemicals	\$1621.74

Depending on the amount of nutrient work which is done and the types of nutrient solutions which are made, the quantity of chemicals used will vary. This list is a bare minimum of chemicals which should be kept in stock for nutrient work.

TABLE 6: Recurrent Agronomic Supply Costs

<u>ITEM</u>	<u>COSTS</u>
1. Envelopes (3 1/8 x 5 1/2)	\$ 100
2. Envelopes (4 x 5 1/2)	\$ 100
3. Cotton bags	\$ 200
4. Markers	\$ 100
5. Tags	\$ 200
6. Stakes	\$ 200
7. Data books	\$1000
8. Crossing tools	\$ 500
9. Measuring tapes	\$ 100
Total	<u>\$2500</u>
Freight (60%)	\$1500
Total plus Freight	\$4000
Inputs (Fertilizer, Pesticides)	\$ 500
Freight (60%)	\$ 300
Total plus Freight	<u>\$ 800</u>
Grand Total	<u>\$4800</u>

Expendable materials and their costs for the agronomic portion of this project were supplied by Dr. Quyen Nguyen.

5

SOILS PROGRAM EQUIPMENT

- Water distiller	1417
- Muffle furnace	798
- Soil grinder: Manual	102
Electric	740
Total	<u>3057</u>
Total (with freight)	4885

LEGUME PROGRAM EQUIPMENT

1. Current Needs

	\$
- Sprayer	<u>400</u>
- Handsheller	100
- Calculators	<u>500</u>
TOTAL	1000
With freight	1600

2. Projected Needs

- Drying room	3000
- Dehumidifier	2000
- Sealing machine	1000
- Seed cleaner	1000
- Single plot thresher	750
- Plot planter	10000
- Tractor (60HP)	35000
- Truck	<u>15000</u>
TOTAL	67,750
Total (w/freight)	108,400

D. DISCUSSION

Currently the Mulungu Research Station receives a financial support of Z 1,466,000/year from INERA which represents 46% of the requested amount (Section C). Of this total salary costs account for Z 960,000 (65%) and research expenses Z 240,000 (17%). If all primes and benefits due personnel were paid, salary costs would be Z 1,000,000/year and if the station paid the personnel costs which they were originally responsible for but which are presently being paid by the project, the salary costs would be Z 1,060,000 or 72% of the yearly budget. All operating expenses, such as fuel, electricity, spare parts, maintenance, etc., must come from the remaining Z 266,000 (18%).

Because AID will finance the project through September 1983, INERA's cost of the project in 1983 will consist of only fourth quarter expenses. To cover these costs, INERA will have to increase Mulungu's budget by Z 85,836 and \$11,201. In 1984 recurrent costs will rise to Z 440,179 and \$ 51,522. By 1985 costs will require additional funds of Z 574,191 and \$ 59,251. These costs are minimum estimates. Furthermore these recurrent costs do not allow for expansion of the project nor replacement of items such as laboratory machinery, vehicles or farm equipment. There are also additional equipment needs which have not been budgeted into the AID budget. \$ 3,052 worth of soil equipment needs to be purchased to provide equipment redundancy in the lab (Table 6). The legumes program needs \$ 1,000 worth of equipment immediately and if the project expands they will need an estimated \$ 67,750 in equipment.

Current funding of Mulungu by INERA does not provide sufficient financial support for maintenance of the station, research activities or salary support. To fund the recurrent costs of the legumes research program and the soils laboratory, INERA will have to increase financial aid in Z's by 47.5% and

in dollars to 60,000 by 1985, INERA's 1982 budget was Z 21,000,000 reflecting a 9% budget increase from 1981 of Z 19,000,000. Budgetary increases of this type do not even accommodate salary adjustments for inflation. Thus maintaining this project, even at current levels will be beyond the financial capacity of INERA as it exists now.

Regardless of the organizational structure of the personnel competency, this project is not sustainable in the short or long run unless INERA is willing or able to allocate the funds necessary to support the legumes research and the soil laboratory.

A factor which may bear on the situation is that INERA has recently been changed from the auspices of DOA to the auspices of DRS (Department de Recherche Scientifique). DRS appears to have more funds available than does DOA. Whether this change will increase funding levels is unknown. However, all additional funding may be used in salary increases if the salaries of the INERA employees are increased to equal that of the DRS personnel. At Mulungu alone, this increase in salaries would raise costs to Z 2,000,000/year.

Because the organization of INERA is in a state of flux, financing is uncertain. If recurrent costs can not be financed there are two alternative sources of funds. The first alternative is to phase out over half of the research stations, thus freeing funds to be used to support this research activity. In the unlikely event of that happening, the second alternative is for AID to fund a follow-on project. Implicit in this new project is the assumption that within the next twenty years the GOZ will have resolved current economic problems which have left the GOZ virtually bankrupt. At the end of AID's financial support, the government should be able to finance recurrent costs. If this assumption proves not to be true, then we are again left with an unsustainable institution due to

insufficient budgetary support.

It has been suggested that agricultural research could be funded by raising produce on the stations. However from what we observed and from talking to different individuals, profits from the sale of commodities appeared to be marginal. For example, receipts from sale of produce received at Yangambi was approximately Z 2,000,000 for all the stations in 1982. Furthermore, if individual salaries depend on revenues from crop production, labor will be used to grow these crops at the expense of the research crops. This same argument can be used for the distribution of any scarce commodity, such as diesel or gasoline: Food crop reproduction will have priority over research activities.

In summary, without increased financial support of INERA by the GOZ or without major organizational and personnel changes in INFRA, INERA will be unable to cover the recurrent costs of the legumes research program and the soil laboratory. As a result, most project activities will cease. The only way that this project can cover recurrent costs is for USAID to fund the project for the foreseeable future to the time when the GOZ has resolved its economic crisis.

R₁ Continuation of project activities in a follow-on project.