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PROJECT REVIEW PAPER (PRP)

Project 660-064, INERA Support

ZAIRE, Nov. 14, 1975

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT REVIEW PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE ('X' APPROPRIATE BOX)
[X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PRP

DOCUMENT CODE 2

2. COUNTRY/REGIONAL ENTITY/GRANTEE: ZAIRE

3. DOCUMENT REVISION NUMBER:

4. PROJECT NUMBER: 660-064

5. BUREAU: A. SYMBOL: B. CODE:

6. PROPOSED PP SUBMISSION DATE: MO. 05 YR. 76

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS): INERA SUPPORT

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: A. INITIAL FY 77 B. FINAL FY 81

9. SPECIAL CONCERNS CODE (MAXIMUM SIX CODES OF FOUR POSITIONS EACH):

10. SECONDARY PURPOSE CODE:

11. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = _____)

PROGRAM FINANCING	FIRST YEAR 77			ALL YEARS		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						6164
(GRANT)	( )	( )	(1993)	( )	( )	( )
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						6164
TOTALS			1993			

12. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION (ALPHA CODE)	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 77 D. GRANT	FY 77 E. LOAN	FY 78 F. GRANT	FY 78 G. LOAN	FY 79 H. GRANT	FY 79 I. LOAN	ALL YEARS J. GRANT	ALL YEARS K. LOAN
			1993		1158		1059		6164	
		TOTALS	1993		1158		1059		6164	

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID

To develop in INERA the capacility to:

(1) Develop and service efficient "production packages"for food legumes.
(2) Provide soil fertility consultation services.
(3) Provide reliable estimates of soil production potentials.

14. WERE CHANGES MADE IN PID FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID FACESHEET.

[X] YES [ ] NO

15. PLANNING RESOURCE REQUIREMENTS (STAFF/FUNDS)

$75,000

16. ORIGINATING OFFICE CLEARANCE

SIGNATURE: /s/ Fermino J. Spencer

TITLE: Director, USAID/Kinshasa

DATE SIGNED: MO. 11 DAY 14 YR. 75

17. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MO. DAY YR.

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ACRONYMS

AGCD	Administration General de la Cooperation au Development, Belgium
CAKO	Commission of Agriculture, Kasoi-Oriental
CEMUBAC	Centre Scientifique et Medical de Univ. Libre de Bruxelles
CIMMYT	Centro International de Mejoramiento de Mais y de Trigo, London, Mexico
ETSA	Ecole Technique Secondaire Superieual d'Agricole, Tshibashi
FAC	Fonde European de Development
FED	Fonde European de Development
FX	Foreign exchange
GOZ	Government of Zaire
GOZDA	Government of Zaire, Department of Agriculture
IITA	International Institute of Tropical Agriculture, Ibaden, Nigeria
INEAC	Institut National d'Etude Agronomique au Congo, Brussels (and Yangambi Zaire until Independence)
INERA	Institut National pour L'Etude et la Recherche Agronomiques, Kisangani, Yangambi (successor to INEAC)
IRRI	International Rice Research Institute, Los Buenos, R.P.

IRSAC	Institute de Recherches Scientifiques en Afrique Central
K	Makuta - monitary unit = 2 U.S. cents
MT	Metric Ton(s)
ONAFITEX	Office National du Fibre Textile
PAR	Project Appraisal and Report (AID project evaluation procedure)
PASA	Participating Agency Agreement. U.S. Government instrument by which one agency procures services from another
PNM	Program National du Mais
TDY	Temporary duty
TVA	Tennessee Valley Authority, Muscle Shoals, Ala, U.S.A.
UNAZA	Universite Nationale Du Zaire
WARDA	West African Rice Development Association, Monrovia, Liberia
Z	Zaire monitary unit 100k = 1Z - $2

I. PRIORITY AND RELEVANCE

The purpose of the project is to develop within the GOZDA National Institute of Agricultural Research (INERA) the capability to provide the necessary soil fertility analyses and research to support GOZDA efforts in improving the quantity and quality of domestic food and to provide the applied and adaptive research necessary for the development and advancement of food legumes in agriculture. This is in support of the sector goal, which is to increase the per capita availability and nutritional quality of food, with special reference to the poor.

It is estimated that the Zairian population as a whole receives no more than 85 percent of the required calories for full efficiency or no more than half of the protein amino acids essential for normal growth and development. The traditional, subsistence farmers who make up 70 to 75 percent of the population suffer the most. Kwashiorkor and marasmus are serious problems. There is evidence that traditional farmers have reduced their role in the commercial market from the level of about $40 per farm unit in the late 1950s to $30 in the 1960s in absolute terms. (IBRD: Economy of Zaire 1972). It is assumed, although not verified, that the nutritional standard of these people was also lowered.

Looking to the future, Zaire has adequate phosphate deposits and hydro-electric energy potential to produce the fertilizer to support the production of its basic food requirements indefinitely. To make use of its fertilizer when it is manufactured requires research at the experiment stations and testing and demonstrations on the farm in advance of the development of the industry.

The project supports the sector goal by creating the capability on the part of the GOZDA research institute, INERA, to actively support food output projects, five of which are ongoing. Further, it undertakes to provide the prototype production "package" for high-quality protein crops and to introduce these packages to pilot, traditional groups. 1/

The project supports the DAP agricultural sector statement and health sector statement which both address human nutrition, food quality and domestic food supply. It must be pointed out however, that this in itself is not a commodity output project. It will support the ongoing food output projects. As the food legume"production packages" are developed as outputs of this project, they should be implemented as production activities.

1/ A "production package" is a receipe for a farm enterprise which prescribes the inputs and techniques required to yield the desired outputs. The inputs and techniques will include such elements as environmentally adapted varieties with favorable yield potential, fertilizer specifications, planting dates and cultural practices. See Annex H, page 35

II. PROJECT DESCRIPTION

A. BACKGROUND

1. The Problem: Food production per capita has declined over the past 15 years, due in part to increased population, urban migration and diminishing price incentives, but due markedly to a decline in services to farmers in the form of improved seed and technical support. It is estimated that maize yields have declined 50 percent, groundnut yields by 25 percent and manioc yields by 10 to 15 percent in this period. (IBRD Ag. Sector Survey.) Further, the development of certain food legume crops, including fieldbeans, soybeans, and cowpeas, was stopped before the work got much beyond the introduction stage. With the shutdown of L'Institute National de L'Etude Agronomique au Congo (INEAC), in 1960-66, everything stopped, including plant introductions, adaptive research, and soil fertility support.

Since 1971, field projects in manioc and maize production have been started up and have made definite progress, but they lack the soil science service they need for adequate development.

2. Early Development: Agricultural research in the region dates back to 1910. While INEAC developed and serviced the industrial crops, palm oil, rubber, coffee, cocoa and cotton, the institute included a division of food crops with equal rank and concern. The division worked on the genetic adaptation and improvement and protection of traditional food crops as well as exotic species and on methods of cultivation. Research was conducted with sweet potatoes, soybeans, sugarcane, peanuts, rice, manioc, fieldbeans, cowpeas, and maize.

The INEAC soils laboratory ran up to 15,000 analyses a year in support of the experiment stations and the major farming areas. The laboratory also did research on human nutrition, including the enrichment of manioc flour.

In 1953, the Belgian Commission for Technical Cooperation in Africa South of the Sahara established the Inter-African Pedologic Service at Yangambi. Over the next ten years they made soil and vegetation surveys of all except the center of the country. The target areas were mapped at the scale of

1:200,000 and the immediate areas of the stations were mapped at 1:25,000 or 1:50,000. These maps were published, and copies are reposited at the regional stations and at Yangambi. Each horizon of the complete profiles of the major soils was described and given complete analysis, and this report is in current publication.

3. INERA: At the height of its operations INEAC employed over 500 Belgium scientists, 400 at the Yangambi main station and the rest spread among six regional substations. By the late 1950s the INEAC research complex had reached a level of development and scientific output that was first among tropical agricultural research institutions and compared favorably and with respect with the better agricultural research establishments in the world. Each station was cleared, fenced and cross-fenced, had internal road and drainage systems, masonary office buildings, greenhouses, warehouses, shops and modern, comfortable residences. The library at Yangambi contained 49,000 volumes and those at the regional stations were adequate for day-to-day technical references.

There were a series of interruptions in INEAC's activities in the struggle for independence and unification in the 1960s, and in 1969, INEAC withdrew all its Belgian personnel, but leaving all properties, facilities and furnishings and documents in place.

INEAC had employed 4,000 Zairois as laboratory technicians, field technicians and laborers. They remained in place, and the GOZ assumed their payroll. There were seven Zairois engineer-agronomists, Class A 1 in the system.

In 1970, the GOZ established L'Institute National pour L'Etude et la Recherche Agronomiques (INERA) in the office of the President of the Republic. The seven Zairois scientists, who incidentally were able to keep one station, Gandajika, operating all through the political turbulance of the 1960s, were given the job of taking charge of the INEAC assets and developing a program.

In 1973, INERA submitted a proposal for reorganization to the President and that document serves as the policy paper. The

paper is derived from the premise that the dominant form of agriculture in Zaire would be the family-tended farm unit consisting of both cash and subsistence crops.

The paper defines research levels by a combination of complexity and scale as follows:

Level A, major restructuring of genetic makeup of plants and animals and of cultural systems --- international centers.

Level B, adaptation of Level A outputs to regional requirements --- INERA stations.

Level C, adaptation to farm requirements and introduction to adoption, pilot farming centers.

The paper proposed guidelines for cooperating with University National du Zaire (UNAZA). INERA would fund the research in terms of three to six year projects. Projects must address live issues of national concern. UNAZA would submit annual progress reports and final results to INERA. The paper proposes "horizontal" contact between INERA personnel and those of other agencies, including UNAZA, thus getting around the requirement of communicating through hierarchical channels.

In 1975, INERA was placed in the office of the Director General of Agriculture. The Director General, who was formerly Director of INERA, indicated that he concurs with the reorganization proposed, stating specifically that he wished to see more direct support of the production projects than had been the case in the past (Annex D).

The UNAZA agronomy faculty has relocated to the Yangambi main station and is gradually occupying its facilities. UNAZA will likely collaborate with INERA on soils research using the present INERA laboratory.

It is INERA's apparent intention to develop the regional stations, as resources permit, to provide answers to production problems associated with the priority crops.

4. AID Involvement:

a. Seed Improvement and Seed Production:

In 1969, a small project to assist four regional experiment stations conduct adaptive trials and multiply seed was financed with counterpart funds. The project ran for a number of years and was eventually assumed by the host government. The seed of suitable varieties of maize, groundnuts, rice, fieldbeans and soybeans were produced for local planting.

b. Soybean Flour Mill: INEAC began experiments with soybeans at Yangambi in the 1940s. In the early 1950s research was carried on at 5 substations including Gandajika. L'Ecole Technique Secondaire Superieure d'Agriculture (ETSA) Tshibashi, evidently got seed for the Gandajika station, promoted production and introduced whole soy flour. In 1966, the school produced 950 kg of whole soy flour. In 1970, there was 35 MT produced and in 1971, about 100 MT produced. In 1971, a USAID project agreement provided a counterpart loan of Z25,000 as part of the cost of a soy flour mill. A small counterpart grant financed the production of a motion picture to promote the demand for soybeans in the local diet. A seed distribution and buying system for the product was set up. The program is still functioning and the mill is still operating, although the group cannot get enough soybeans to supply the local demand.

c. Manioc Project: While manioc is practically void of the essential amino acids, it is extremely important to Zairois as an energy crop because it will yield on land too deficient in phosphorus to produce grain. Zairian manioc was hard-hit by bacterial wilt around 1970. The GOZ solicited AID assistance, and a contract was arranged with IITA, using PL 480 counterpart funds. This project has already identified a relatively high-yielding variety of manioc totally resistent to bacterial wilt, and it is now multiplying the stock as well as continuing selections for increased yields. However, the problem of getting this new variety or others accepted and into widespread use has not yet been resolved.

d. Maize Project: In response to a request for assistance in maize production in 1972, the Mission arranged a contract with CIMMYT to develop and demonstrate a maize production package. They have developed their first prototype package consisting of a new variety and tentative fertilizer recommendations. A companion PRP proposes to support 11,000 ha of project maize in FY 1977. Another project will be addressed to the maize marketing system in support of the GOZ policy to recoup self-sufficiency in maize production by 1980.

e. Fisherman's Cooperative: The Mission plans to assist a fisherman's cooperative on Lake Tanganyika, principally to increase the availability of high quality protein food in that area.

f. Fertilizer Requirements and Potentials Survey: In 1975, the Mission (TVA PASA) surveyed the fertilizer requirements for Zaire to produce its minimum food requirements, and concluded that by 1980 the country will need 82,000 MT.

Fortunately for the long-term, the survey revealed ample supplies of phosphate (12.5 to 25 million MT of P_2O_5 equivalent) awaiting development in the Bas Zaire coastal plain. The survey estimated that the maximum projected nitrogen requirement for food and fiber production in 1985 could be produced by using 80 megawatts, or only 5 percent of the combined capacity of the INGA I and INGA II hydroelectric projects. But to support even a minimum investment in the industry, domestic consumption would have to be greatly increased.

5. The Present Request: In June 1975, the GOZ requested AID assistance in advancing its research work in soil fertility studies, soil classification, agricultural meteorology, food legumes production and rice production. The Mission advised the GOZ to seek assistance in rice research through membership in WARDA. The Mission gave low priority to meteorology,

considering that although it is no doubt important, an investment of scarce resources in this activity would likely pay off only in the long term. This left standing the request for assistance in advancing food legume production, soil fertility research in support of food crop production, and land use potentials evaluation (Annex C). The food legume crops mentioned, soybeans, groundnuts, fieldbeans and cowpeas, fit well in the established cropping pattern as well as into national nutritional requirements. Particularly, they complement the maize production and marketing project which has already been designated as a priority project.

B. PROJECT DESCRIPTION

1. Sector Goal:

a. Goal Statement: To increase the per capita availability and nutritional quality of food for the poorer people of Zaire.

b. Measure of Goal Achievement: The increase or decrease of maize production may be measured by the annual availability of maize to PNM. Estimates of increased production of food legumes may be drawn from the systematic observation of the spread of the improved varieties and cultural practices introduced, since these are intended, first of all, as subsistence crops. Eventually, the direct beneficiaries of the project should produce surpluses, which should be reflected in the market. The needs of the target group of this project would have long since been met, insomuch as subsistence needs would have been satisfied first.

c. Means of Verification: A current Mission project provides a USDA PASA team to assist the GOZDA in setting up a food requirements and supply data system. Beyond this in the near term, the output projects, including the maize projects, and successors to this project, should provide for the measurement of their respective commodity outputs.

d. Assumptions:

(1) Price Policy: In the case of maize it is assumed that the GOZ will maintain buying prices that are sufficiently attractive to the farmers to provide the incentive to take the risk and go to the trouble of buying fertilizer and the other inputs necessary to obtain relatively high yields. This assumption is currently met with a recent increase in the government's buying price. While the crop research elements of the present project emphasize subsistence production, these farms must produce surpluses to provide for production inputs and off-farm subsistence requirements.

(2) Follow-on Projects: The traditional sector represents 3 million farm units, or 70 to 75 percent of the national population. Obviously, more inputs than have been committed by AID and other donors so far are required to achieve the sector goal. The present project should be followed by production output activities which address food legume crops.

2. Purpose:

a. Statement of Purpose: To develop the capability on the part of INERA to :

(1) through applied and adaptive research and assistance with on-farm, result demonstrations, develop and service efficient "production packages" for food legumes,

(2) provide soil fertility investigation, consulting and recommendation services to those involved in advancing Zairian food crop production, and while developing this capability, deliver these services to the on-going food production projects (this implies early-on cooperation and participation of the soil services of this project in the on-going food production projects),

(3) provide reliable estimates of the production potentials and limitations of soils in support of regional development planning.

b. End of Project Status:

(1) By the end of the fifth project year INERA should have a small, well-trained, multi-disciplinary, field research team addressing the production of food legumes, fully supported with minimally essential equipment in place:

(a) conducting reliable adaptive research leading to the identification and distribution of efficient, disease-resistant varieties within the food legum species,

(b) developing and adapting cultural practices suitable to traditional farmers and compatible with the maintenance of the ecological balance,

(c) assisting with first-round on-farm demonstrations of the production packages they develop.

(2) INERA should have functioning, adequate soil fertility services to support the planned advancement of the production of its major food crops. By the end of the project, INERA should be systematically:

(a) making soil analyses and supervising soil fertility response trials as part of the field research addressing the major food crops,

(b) providing planned consulting services to the regional Agricultural Commission Services on soil fertility and soil management for food crop production,

(c) providing assistance to the field teams in adapting and testing symbiotic nitrogen-fixing innoculants,

(d) providing assistance to all food crop projects in the design and evaluation of their adaptive trials, including crop: soil and crop: soil: fertilizer response evaluation,

(e) developing soil and crop management systems which maximize the use of organic and indigenous mineral materials and to the extent possible maintaining soil fertility.

3) INERA, or at least the country should have small, multi-disciplinary, agricultural resource planning team capable of:

(a) evaluating production potentials and limitations of given soil groupings,

(b) elaborating the potential payoffs from alternative regions and sites that might be proposed for intensive rural development.

Such a team would include soil scientists (classification), agronomists, agricultural economists (resource allocation) and rural sociologists.

c. Means of Verification: External evaluation (PAR).

d. Assumptions: The achievement of these purposes depend on:

(1) getting AID contract technicians in place early in the project and holding them for the five-year duration,

(2) getting the participants off to school no later than the second year and back beginning the fourth year, with most having returned by the fifth year,

(3) active, institutionalized cooperation between the production projects, INERA and the Agricultural Commission Extension Service.

3. Outputs:

a. Trained Personnel:

(1) 2 project directors at Mulungu and Gandajika by fifth project year,

(2) 22 scientists, Grade A1,20 with M.S. degrees by fifth project year,

(3) one soil survey director by third project year,

(4) 8 soils laboratory technicians by second project year,

(5) 24 soil surveyors by fourth project year.

b. Soil Fertility Service (see IV A 3):

(1) Operating laboratories at Yangambi and Gandajika by second project year:

- 5,000 soil samples a year by third project year,

- 10,000 soil samples a year by fourth project year.

(2) Consulting services to production projects:

(a) Mulungu area by second project year,

(b) Gandajika area by second project year,

(c) all food production projects by fifth project year,

(d) field-tested recommendations by third project year.

Soil Classification Service:

(1) Correlation of INEAC maps with the USDA soil taxonomic system by third project year,

(2) mapping of expanded project areas by fourth project year,

(3) evaluation of alternative project are by fifth project year.

Food Legume "Package" Development (see IV A 3):

(1) Improved varieties:

(a) preliminary screenings by first project year,

(b) comparative yield results by second project year,

(c) first year farm demonstrations and seed increase by third project year.

(2) Improved Cultural Practices:

(a) first year station trials by second project year,

(b) first year farm demonstration by third project year,

(c) early adoption by fourth project year.

(3) Improved rotation system by sixth project year.

Assumptions:

(1) prompt manning of the project by the contractor,

(2) timely arrival and release of commodities,

(3) adequate local currency support.

4. Inputs:

a. AID Inputs:

(See also VIII, FINANCIAL PLAN and ANNEX H, (II), TECHNICAL ANNEX.)

(1) Personnel:

7 full-tour technicians	421 man-months
various consultants	20 man-months

(2) Participantships:

20 candidates for the MS degree	480 man-months

(3) Commodities:

laboratory equipment supplies	$931,000
field equipment	$254,000
fertilizers and seeds	$122,000
vehicles	$285,000
petroleum fuel and lubricants	$615,000
Total	$2,207,000

b. Peace Corps Inputs:

2 English instructors Yangambi	120 months
Agronomists	144 months

c. GOZDA Inputs:

(1) Personnel:

professionals, A_1,	110 man-years
professionals, A_2,	160 [illegible] ars
others	360 man-years

(2) Plant and Equipment (in place):

offices and laboratories	$450,000
field research facilities	$200,000
communication equipment	$ 50,000
Total	$700,000

(3) Local Contract Construction:

laboratory & office construction	$178,000

(4) Vehicle & Equipment Maintenance (10% of cost).	$ 32,000
(5) Local Training Costs.	$ 50,000

(6) Housing and Utilities:

(a) INERA project personnel	$ 45,000
(b) Peace Corps volunteers	
(c) 3 resident units for AID technicians (Gandajika)	$ 90,000
Total	$1,095,000

Assumption: That PL 480 Title I loan agreements will be negotiated to be implemented concurrently with the project, with the self-help commitment specifically providing its local currency requirements.

5. Project Elaboration: The project will pair teams of Zairois and American agronomists at two locations and Zairois and American soil scientists at one location for five years. The team will be reinforced by PCVs the fourth and fifth years. The project should be negotiated in sufficient depth to assure unrestricted, two-way

cooperation between INERA and the other GOZDA agencies, specifically, the regional Agricultural Commissions and the maize projects.

a. Gandajika Team: Three A[illegible] advisors will be posted at Gandajika. One will concentrate on research leading to the development of the production packages, including improved varieties and improved cultural practices. The second will be concerned with soil fertility problems and will train and assist INERA staff in supporting the surrounding production projects with laboratory analysis, including laboratory installation and training laboratory: field plot correlations and fertilizer recommendations. The third advisor and his counterparts will work principally as consulting specialists with the production projects in the surrounding area, this being the means of delivering project outputs to farmers. One of three contract technicians will serve as chief of the contract party.

b. Two contract agronomists will implement the same kind of activity, working at and out of the Mulungu Station. The Mulungu Station and field teams will be supported by a soil fertility team which will operate a soil laboratory. This effort will be supported by a contract soils advisor. The project provides for a soil classification advisor to be located at Mulungu. His principle task will be to train teams of Zairois soil classifiers. The first phase of this activity will be to assist the Yangambi INERA soils office and UNAZA in setting up a course and training approximately 30 senior agronomy students in soil classification. The second phase will be to provide field training to UNAZA graduates and others in making soil surveys. This will be on-the-job training in which supervised student teams will make field-verified correlations between the INEAC soil maps, circa 1953-1959, with the USDA soil taxonomy system, which is more useful for development purposes. This exercise will begin at Mulungu, move to Gandajika then to other priority areas that are mapped by INEAC. The resulting maps will be further correlated with on-farm, crop: soil and crop: soil: fertilizer trials (also supported by the project) and with project

laboratory analysis, thus providing reliable extrapolations on land use potentials and crop: fertilizer responses on a wide area of the country.

Finally, as the survey teams gain confidence they will respond to requests from the central government to make survey evaluations of alternative development areas. The project will make rather extensive use of counterpart training, training-the-trainer, pre-service training and in-service training.

c. Peace Corps Volunteers; Two PCVs will teach English at UNAZA, Yangambi, for the duration of the project. For the fourth and fifth project years, three PCV agronomists will be located at each, Gandajika and Mulungu to assist early demonstrations of the project package.

III. AID EXPERIENCE:

While no two AID projects contain totally identical components, our experience in this area is quite general. The following cases are illustrative:

A. N. C. STATE WORLD-WIDE SOIL FERTILITY PROJECT AND USAID/BOLIVIA WHEAT AND SEED PROJECT:

In 1965, AID and the Govenment of Bolivia initiated a project to increase wheat production and seed production (including wheat and soybeans). The project was implemented through a contract with Utah State University with the assistance of the Peace Corps. U.S. U. advised research workers on their experimental work, both at the experiment station and on private farms, and advised extension workers who carried out the promotion work, which included buying, processing, storing and distributing seed. Peace Corps volunteers worked with the extension agents.

AID had a world-wide contract with North Carolina State University to, to the extent feasible, determine crop: soil and crop: soil: fertilizer response for the major crops and major agricultural soils of the tropics. In this case N.C. State initiated fertilizer

PROPOSED PROJECT LOCATION

trials parallel to those of the U.S. U. wheat project. Thus, N.C. State determined optimum fertilizer combinations which were compatible with the cultural method devised by U.S.U. The Bolivian Agricultural Extension Service, reinforced by the Peace Corps, implemented the production campaign, which amounted to: (1) getting group commitments to participate, (2) arranging for fertilizer credit; (3) method demonstrations of applying fertilizer; (4) seed distribution, and later, seed collection; (5) arranging for harvesting machinery and transportation to the market.

The N.C. State project assisted the Bolivian Ministry of Agriculture in tuning up a soils laboratory at Santa Cruz, which AID had built in an earlier project, and the laboratory did the chemical analysis of the N.C. State soil samples. The tuning amounted to: (1) adding chemical reagents; (2) adding a few minor pieces of equipment; (3) giving refresher training for laboratory technicians and (4) a visit to the laboratory by the N.C. State soil scientist about once a month. The Bolivian Airline transported the samples as a complementary service.

The N.C. State project also ran soil fertility trials on soybeans and potatoes. For these crops and wheat the project constructed general fertilizer guides keyed to a soil map of the country.

B. CAMBODIA SOIL LABORATORY:

AID assisted, successively, four different agencies of the Cambodian Ministry of Agriculture equip soils laboratories between 1957 and 1962. The fourth one was completed and staffed. An AID soils advisor trained the staff and remained with it until the U.S. evacuation in December 1963. Subsequently, all the equipment was set up in one, rather large, quite complete laboratory, and up to 1973 it effectively serviced the Mekong Delta Commission in its developme planning work.

IV. BENEFICIARIES:

A. TARGET GROUPS:

1. Immediate Targets: The project addresses the Bukavu area and the Luba group in the Gandaika area. See Annex H (I and IIB_5).

2. Why These Groups:

The scope of the present project is limited to: (a) developing and introducing "production packages" for food legumes and, (b) soil fertility services for all food crops. Since such work must emanate from experiment stations, the groups who are adjacent to the stations, were preselected. The Agricultural Commission, with the assistance of FED, is already involved with these groups, implementing INERA outputs. So is PNM with the CIMMYT-aided maize program. Just outside the perimeter of these projects is the FAO Freedom from Hunger Campaign. However, assistance from these sources is incomplete. In the first place maize is the only food crop they presently address, hence the success of these projects would not adequately improve the protein quality of the diet. In the second place, the success of these projects is jeopardized by the lack of soil fertility research and advisory services, particularly laboratory analysis and laboratory: field-plot correlations. The present project is seen as an essential supplement to these ongoing efforts.

The target group has adopted maize, introduced by the station, which has replaced manioc as the principal food staple. They have also adopted the practice of pure-stand, clean cultivation in short rotation, which was introduced by the Belgians through the station. The introduction of the food legumes in the present rotation would improve the system.

The effects of food legume work will likely be limited to the ethnic groups that they initially address because they coincide with large, isolated soil groups. It would be expected that cadre might be drawn from this project to implement similar work in other parts of the country.

The Bukavu area is the most densely populated rural area in the country. Malnutrition is critical. It is apparent that immediate attention should be made to improve the efficiency of the present farm output.

3. Means and Timing of Benefits:

a. Soil Fertility Analysis and Recommendations:

Assuming that the first one and one-half project years would be required to get the soil laboratory equipment in place, and that its work would in the beginning be limited to test and demonstration sites, the cooperating farms should receive their first benefits from the facility in the form of more precise advice on their soil fertility problems --- that is, the most profitable package of inputs --- the third project year.

b. Improved Cultural Practices: The introduction of improved cultural practices should progress through one year of trials on the station and in Commission plots, first year on-farm result demonstration, early adoption the third project year, with wider diffusion the fourth project year.

c. Improved Varieties: Assuming that first-round screening can be done the first project year, with two years of performance trials and two years of successive seed multiplication, it is likely that at least one improved variety for each species worked with can be made available to the target group in significant quantities the fifth and sixth years.

d. Improved Rotation System: The present rotation system covers seven years, consisting of two-season cropping for three consecutive years and native herbs and forbes the last four. The project will likely test the hypothesis that the "fallow" period may be reduced to two years by substituting the nitrogen-fixing legume Stylosantheses gracilis with considerably improved production potentials for the succeeding cycle. First cycle results would be available in September of the sixth year, but comparative results would not be available until the eighth year. From there on the practice should spread rapidly, because Stylosantheses surpresses weed plants and should be much easier to manage than native vegetation, and will likely add from 80 to 100 kg of nitrogen per hectare worth approximately

4. Ultimate Target Group: Since the scope of the present project is limited to developing and introducing the "package", successor projects will be required to get improvement beyond the initial target areas.

a. Land Use Planning: The payoff to the farmer is from the land use planning activity is of a longer range. Three years will be required for training personnel. After that they would fit into the national planning apparatus.

5. Project Response to the Expressed Needs of the Target Group:

a. Food Legume Research and Demonstration: Demonstration work on the value and use of soybeans has gone on long enough and effectively enough in the target areas that local demand exhausts the supply. For example, this year the Catholic Mission hospital-clinic at Gandajika bought all the soybeans that were available at 20k/kg. The clinic has the soybeans ground and blends the flour, one part to three parts of cornmeal, and feeds the mixture to Kwashiorkar patients who are brought in daily for the purpose. When the soybean supply is exhausted, the clinic resorts to fieldbeans and cowpeas which have approximately 70 percent of the nutritive value of soybeans. Neither were these available in the market. The Gandajika clinic, as well as the Kananga-Tshibashi movement and others, actively push the use of food legumes in the traditional diet. The fact that soybeans have been bid up to 20k/kg is evidence enough that they respond to an expressed need. The Bukavu group follows the same program, and they exhausted the soybean supply this year at 28k/kg.

b. Soil Fertility Service: The members of the target group appear to be trying to get as much return for their labor as they can and this service should increase their leverages.

B. CHANCES OF PROJECT SUCCESS:

1. Evidence of Change in the Past: As cited above, the target group has uniformly adopted a major food crop and quite an exact cultural system on the advice of expatriates.

2. Preliminary Groundwork: The groundwork for the food legume program has been in the laying for several years.

3. Humanist Concern: The INERA management and staff demonstrated a very strong feeling for the welfare of the traditional farm people and particularly in improving the protein quality of their diet.

4. Apparent Leverages: The apparent leverage to the participating farmer is around 100 percent over his present level of performance.

5. Compatibility: The adoption of the project outputs places no new or additional demands on the traditional social structure other than might be expected from increased income for the individual (see Annex H, p. 21-23).

V. PROPRIETY ISSUES:

A. Assistance in research versus more direct assistance to production: From the high priority placed on food production the question was asked: Is it appropriate to start up assistance in research at this time rather than concentrate all effort on food output? The maize campaign is already well underway. While there is no doubt that these projects have made progress in their more-or-less first-round efforts, it appears that they have gained about all the leverage they can until there is a better "package" developed, and this requires research. The FED maize project is using INERA varieties; thus they are limited in progress until INERA makes progress. None of the output projects now has reliable soil fertility laboratory support; thus they are extremely handicapped in extrapolating production recommendations from their field plot results. Therefore it appears that the time is appropriate to begin assistance in agricultural research in the support of priority crops.

B. Level of training. The question was raised, as scarce as trained personnel are, should they be kept away from work for

extended terms in the pursuit of advanced degrees. As it happens U.S. universities do not teach research methods and procedures at the undergraduate level, thus the masters degree level would seem to be essential for research. Howeve probably no more than one or two Ph.D. proposals seem appropriate.

VI. FEASIBILITY ISSUES:

A. ECONOMIC ISSUES:

While this is not a project to maximize economic gains, nor actually a commodity project, it has long-term economic implications which will affect its design:

1. Pursuit of a Chemical Fertilizer Program: Any cash inputs to the food crops must be earned through the sale of cash crops. While it would be expected that surpluses of the food legumes would be produced, where they are grown for subsistence only, their crop input support would have to be supplied by the cash crops, cotton and maize. Hence, the health of the crops in terms of profitability to the farmer will likely affect the progress of the successors to the present project. The maize market is likely to be particularly important.

2. Economic Objective in the Design of the "Package": Considering the present and likely the future cost of fertilizer, the question of whether to design the "package" for optimum yield or for least cost should be determined.

3. Farm Management Studies: While there are data on production costs on the CAKO seed farm which is partially mechanized, there are no existing data on the cost of production on traditional farms. It seems particularly important to obtain reliable estimates of the cost of bringing land from native fallow back into the cultural cycle and of unit cost of producing the crops in the present rotation and cultural system, as baseline data. Whether the services of an agricultural economist should be included in the project should be considered.

4. Farm Storage: There is evidence that the local prices for maize and groundnuts fluctuate widely (as much as 1000 percent for maize). Whether farm storage should be included in the "package" should be considered. This is under study in the maize production and marketing project design.

B. TECHNICAL ISSUES:

1. Appropriateness of the Technology:

The project does not propose any new technology which would be critical to its success. Rather, it proposes variations in practices which have already been introduced which will enable the research personnel and the farmers to realize more of the potential from the technology they have already adopted.

Probably the only new technology which should be adopted and tested economically is chemical weed control.

Presently, farmers require 30 man-days per hectare to weed groundnuts, and they injure the plants in the process. This labor requirement, which comes in a short, critical period, severely limits the size of the farmer's crop. This project should be deemphasize mechanization, as it does not appear to be available to the largest group in the foreseeable future.

2. Scope of the Project:

The GOZDA request included technical assistance in climatology. This request was not carried forward in the PID on the ground that it did not promise a pay-off on the short term or medium term. Examination of the establishment, the procedures and the accumulated data at the Gandajika station which is accepted as typical, suggests the contrary. This station has daily records of rainfall, wind direction, wind velocity, relative humidity, air temperature, soil temperature, sunshine and evaporation from 1940 to the present date. The technicians are diligent in maintaining the apparatus and in recording and preserving data. However, they do not appear to have the capability of summarizing their data and deriving from them probability projections of, particularly early-season, effective rainfall which limits the crop season. Since there are two crop seasons a year, it is extremely important to start each crop as soon as moisture is available. Sensitivity to this kind of information, backed by farming techniques to implement it - that is, adjusting the time and depth of planting to the expected date and amount of effective rainfall - should result in a 10 to 12 percent increase in maize yield

with no extra effort on the part of the farmers. This particular analysis and adaptation is not now practiced by Zairois farmers.

Therefore, it seems advisable to provide INERA the TDY services of an agricultural climatologist for three to four months to:

a. make a cursory survey of the principal agricultural weather stations,

b. set up a foremat for summarizing the pertinent data on hand,

c. assist in arranging for data processing,

d. conduct a workshop on summarizing data,

e. serve on the project design team.

The project design team should consider providing participant training in agricultural meteorology for two or more Zairois. The apparent reason that the data are still collected is that INEAC-trained Zairois to do it. Since there have been no Zairois agricultural meteorologists trained, the data the technicians gather are put to little use.

3. Environmental Impact:

The ecological balance among the damaging insect species and their preditors is very near perfect, holding crop losses to insects to two to five percent. Erosion of the roadbeds are prevalent and no doubt takes place in cultivated fields. In the short term the project should have no impact on the environment, one way or the other. In the long term (outputs of successor activities) the proposed rotation system should reduce the use of fire as an agricultural tool.

4. Accommodation for Technicians:

It is assumed that to the extent possible, the GOZ will provide housing for the AID contract technicians who may be

provided through the project. This is essential to the implementation of the project at Gandajika insomuch as there is no rental property in the vicinity of the station. The project could not be implemented in the 5-year time-frame, should it be delayed for the construction of new housing.

C. FINANCIAL ISSUES:

Local Currency Financing: While no inquiry was made of GOZDA intentions for the INERA budget during the projected life of the project, at the present available funds appear to be marginally less than required for budgeted operations. This should be explored. If appropriate, counterpart funds from past or current year PL 480 Title I agreements might be programmed to suggest the activity.

VII. COORDINATION WITH OTHER AGENCIES AND OTHER DONORS:

A. OTHER PROJECTS, AGENCIES AND DONORS:

1. Project Gandajika (Kasai-Oriental, CAKO):

a. Agency: Commission for Agriculture

b. Donor: FED

c. Objective: maize increase

2. Cotton Program:

a. Agency: ONAFITEX

b. Donor: FED

c. Objective: maintain self-sufficiency in cotton production

3. Plant Protection:

a. Agency: INERA

b. Donor: AGCD

c. Objective: general crop production support

4. Freedom-From-Hunger Campaign:

   a. Agencies: 1. Commission for Agriculture
                2. Social Service

   b. Donors: 1. FAO (technical support)
              2. AGCD (fertilizer)
              3. (Unidentified) Catholic Order Tshibashi

   c. Objective: improvement of nutrition in rural areas

5. Othe[illegible]:

   See ANNEX H (1D)

6. Domaine Kasese Project (Shaba):

   a. Agency: Commission for Agriculture, PNM

   b. Donor: AGCD

   c. Objective: maize increase

7. Mweka Project:

   a. Agency: Commission for Agriculture, PNM

   b. Donor: FAC

   c. Objective: maize increase

8. Regional Development, Gandanika Sub-region (Shaba):

   - under study and design

   a. Agency: Commission for Agriculture, PNM

   b. Donor: AID

   c. Objective: maize increase

9. Maize Project, Shaba:

   a. Agencies: (1) Society of Miner and Transport
                (2) GOZDA

   b. Objective: maize increase

B. PRIOR RECORD OF COOPERATION:

INERA has had various homes since independence, including the Office of the President, but it now resides with the Directorat General of Agriculture in the Agriculture Commission.

The official chain of command is through INERA headquarters at Yangambi to the regional stations.

Official means of lateral relations between INERA and other Commission agencies have not been established, except for the supply of breeder seed. Since in general the foreign aid programs work through the Commission's field services they follow the same protocol. This and perhaps the expected bureaucratic rigidities has in the past resulted in less than expeditious cooperation. Actually it represents an oversight in the negotiation of the projects in question.

Although not the case in the beginning, PNM and INERA-Gandajika cooperate with maize variety work. This gives the farmer access to both CIMMYT materials and INERA materials which promise to be complementary.

C. MEANS OF COOPERATION:

AID's role should be to help INERA develop the capability to provide the research and consulting services required by the production campaign. This infers joint participation in the work plans for the projects on both sides.

The field experiments of CAKO and FAO should be correlated with the INERA soils laboratory and compatible with the FAO/Rome data system. The FAO and INERA representatives agreed that this is much needed and desirable. It serves as an example for building an integrated program around established Zairian institutions.

VIII. PROJECT IMPLEMENTATION:

A. PROJECT ORGANIZATION AND MANAGEMENT:

1. Organization: The project should be implemented as an INERA program within its present frame of organization.

2. Technical Assistance: Technical assistance should be provided through an AID university contract. No institution other

than a land grant university would have the breadth of expertise required. The contract should be negotiated as a departmental activity; that is, AID would want the contractor's agronomy department as a whole to be concerned with the implementation and success of the project, rather than just to be asked to give up their personnel for five years.

The question of whether there should be a chief of party should be negotiated. In one view, the senior technician would represent the team. In another, this would be the principal duties of one person. In the latter case, it would be desirable that he have a background in extension agronomy.

3. Commodity Procurement: The first procurement of commodities should be made by the Mission as a matter of expediency. After the contractor is in place he should have this responsibility.

B. APPARENT CAPABILITY OF INERA TO IMPLEMENT THE PROJECT:

1. Capital Establishment: With the exception of a building for soils laboratory at Gandajika, there appears to be adequate buildings to house the project. Excellent facilities exist at Mulungu. Soils work at Y angambi may be limited due to the lack of continuous current (also the case at Gandajika).

2. Infrastructure: While the three stations where project work may be located are remote, they are each accessible by combined commercial airline and vehicle. The stations maintain daily contact through a single side-band radio network. Mail from Europe arrives in 10 days. Medical and dental services are available from European and American trained personnel.

3. Management: See Annex H, Section I for personnel profiles.

C. AID RESPONSIBILITY IN MANAGEMENT:

The Mission should provide a direct-hire project officer to assist in representing AID's interests in the project in Kinshasa,

provide Mission representation and backstopping to and for the contract team, monitor the project and provide documenta tion service. The project officer should have an academic background in agronomy, preferably, or general agriculture.

The successful implementation of the project will require the services of a direct-hire backstop officer in AID/Washington, having an agricultural background. Besides routine backstopping, he will expedite project documents and provide liaison with the contractor.

The project should be implemented through a Project Agreement (PRO AG) with an annual work plan annex and provisions for amendment by an exchange of letters between the GOZ and the Mission which express proposal and concurrence.

D. PROJECT PROGRESSION:

1. Pre-implementation Actions:

a. PRP review:	December, 1975
b. Project design:	Feb./March, 1976
c. PP review:	May, 1976
d. Project Agreement:	October, 1976
e. Contracting actions:	November, 1976
f. Commodity procurement:	November, 1976
g. Language training:	Nov/Dec., 1977
h. Teams at post:	January, 1977

2. Laboratory and Field Activities: To be prescribed by the PP team.

3. Review and Evaluation: Annual, joint Zairois-American evaluation aided by an outside consultant.

4. Project Phase-out and Succession: At the conclusion of the third evaluation (fourth project year) a decision should

be made as to the nature of follow-on activities, and if appropriate submitted in the form of a PID. Then the present project should be closed out on schedule.

E. PROJECT DESIGN:

1. PP Design Team:

Makeup of PP design team should include the following professionals:

- project design officer
- extension agronomist specialized in grain legumes
- soil scientist (soil fertility)
- soil scientist (classification)
- soil microbiologist
- agricultural engineer (farm machinery)
- local expediter
- interpreters

2. Special Considerations in Planning:

a. Equipment: A key factor in the progress of the project will be planning it around a functional, maintainable set of equipment. The project should be planned for the minimum mechanization and feasible maintenance. The design team should include an agricultural engineer with these terms of reference.

b. Lead Time: The maximum lead time should be provided for the arrival of commodities, household furnishings and household effects. The Mission should submit complete PIO/Cs as soon as its PRO AG is signed.

c. Language Requirements and Instruction Facilities:

(1) French: It is essential that both the contract technicians and their spouses achieve the FSI S-2 level in French language proficiency to survive at the posts. Only technicians with promising language aptitude should be recruited, and both they and their spouses should receive language training at the State Department Foreign Service Institute before their departure.

(2) English: All Zairois who are to study in the U.S. must learn to read, write, speak, and understand English, from the start. Therefore each post should be equipped with minimal training facilities, and the contract should provide for English language training at the posts.

d. Reconciliation of Commodity Lists and Costs: The commodity lists (Annex H) were prepared without the aid of catalogues and without the benefit of internal consultation. Therefore they should be considered at illustrative. The design team is requested to review the commodity requirements in terms of the minimum necessary to achieve the project purposes, for three reasons --- the cost of the commodities, the difficulties of maintenance and the cost of operation.

IX. FINANCIAL PLAN

A. AID Dollar Costs

ITEM	Total		FY 77		FY 78		FY 79		FY 80		FY 8
Personnel	$1000	MM	$1000	MM	$1000	MM	$1000	MM	$1000	MM	$1000
GANDAJIKA											
Lab Advisor COP	479	60	62	9	88	12	94	12	100	12	135
Grain Leg.Advisor	479	60	62	9	88	12	94	12	100	12	135
Extension Advisor	479	60	62	9	88	12	94	12	100	12	135
MULUNGU											
Soil Class.Advisor	413	48	72	9	95	12	102	12	109	12	35
Lab. Advisor	413	48	72	9	95	12	102	12	109	12	35
Grain Leg.Advisor	513	60	72	9	95	12	102	12	109	12	135
Extension Advisor	513	60	72	9	95	12	102	12	109	12	135
Consultants											
Soil Classification	43	6	21	3	22	3					
Soils Laboratory	21	3	21	3							
Grain Legumes	21	3	10	1.5			11				
Ext.Agronomy	28	4	14	2			14				
Climatology	28	4	14	2	14	2					
Contractor Supervisor	47	5	8	1	9	1	10		10	1	10

ITEM	Total		FY 77		FY 78		FY 79		FY 80		FY 81	
	$1000	MM	$1000	MM	$1000	MM	$1000	MM	$1000	MY	$1000	MM
Total Personnel	3477	421	562	75.5	689	90	725	88.5	746	85	755	82
PARTICIPANTS MS												
Soil Survey	48	48	24	24	24	24						
Soil Chem.	120	120	48	48	60	60	12	1[illegible]				
Grain Legumes	96	96	36	36	48	48	12	1[illegible]				
Ext.Agronomy	144	144	48	48	72	72	24	2[illegible]				
Climatology	72	72	24	24	36	36	12	12				
Total Participants	480	480	180	180	240	240	60	60				
COMMODITIES												
Soils Laboratories	575		575									
Supplies	250		60		25		85		55		25	
Climatology	60		40		20							
Farm Equipment and Maintenance	186		134		13		13		13		13	
Fert. and Seeds	122		12		20		30		30		30	
Fuel and Lubricants	615		123		123		123		123		123	
Vehicles & Maintenace	285		209		19		19		19		19	

ITEM	Total	FY 77	FY 78	FY 79	FY 80	FY 81
	$1000	$1000	$1000	$1000	$1000	$1000
Tractor & Maintenance	60	44	4	4	4	4
Ext.Teaching Supplies	8	8				
Office Equipment	46	46				
Total Commodities	2207	1251	224	274	244	214
Total	6164	1993	1158	1059	990	769

B. FINANCIAL PLAN GOZ COST IN DOLLARS

ITEM	Total		FY 77		FY 78		FY 79		FY 80		FY 81	
Personnel	$1000	MY	$1000	MY	$1000	MY	$1000	MY	$1000	MY	$1000	MY
A - 1	2640	110	440	22	484	22	528	22	572	22	616	22
A - 2												
A - 3	1219	160	208	32	224	32	243	32	262	32	282	32
Typists	117	30	70	6	22	6	23	6	25	6	27	6
Tractor Driver	34	10	6	2	6	2	7	2	7	2	8	2
Chauffeurs	168	55	29	11	31	11	33	11	36	11	39	11
Mechanics	59	15	10	3	11	3	11	3	13	3	14	3
Laborers	300	250	50	50	55	50	60	50	65	50	70	50
Personnel Total	4537	630	763	126	833	126	905	126	980	126	1056	126
Construction												
GANDAJIKA	118		118									
MULUNGU	50		50									
Construction Total	168		168									
TOTAL	4705		931	126	833	126	905	126	980	126	1056	126

1 Assumptions: 8% annual salary increase (rounded)
2. MY - Man Years

ANNEX A

AGENCY FOR INTC.

PROJECT IDENTIFICATION DOCUMENT FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

TION CODE (PROPRIATE BOX) [X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PID

DOCUMENT CODE: 1

2. COUNTRY/REGIONAL ENTITY/GRANTEE: Zaire

3. DOCUMENT REVISION NUMBER:

4. PROJECT NUMBER: 660-0064

5. BUREAU: A. SYMBOL AFR; B. CODE 1

6. PROPOSED NEXT DOCUMENT: A. [X] PRP [ ] PP B. DATE MO. 11 YR. 75

7A. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)

[INERA Support]

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: A. INITIAL FY 77 B. FINAL FY 81

7B. PROJECT TITLE - LONG (STAY WITHIN BRACKETS)

[Agriculture Research/Soil Science and Food Legumes in support of National Ag Research Inst.-INERA]

9. ESTIMATED COST (LIFE OF PROJECT) ($000 OR EQUIVALENT, $1 = .50)

PROGRAM FINANCING	AMOUNT
A. AID APPROPRIATED	1,990
B. OTHER U.S.	
C. HOST GOVERNMENT	1,048
D. OTHER DONOR(S)	
TOTAL	3,038

10. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION (ALPHA CODE)	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FIRST YEAR D. GRANT	FIRST YEAR E. LOAN	ALL YEARS F. GRANT	ALL YEARS G. LOAN
FN	119	084	645		1,990	
		TOTAL	645		1,990	

11. OTHER U.S. ($000)

A. PROGRAM TYPE	B. FIRST YEAR	C. ALL YEARS
TOTAL		

12. PROJECT GOAL (STAY WITHIN BRACKETS)

[Make Zaire self sufficient in production of major agricultural crops by 1985.]

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS)

[Assist the Government of Zaire in mounting an effective program of field-oriented research in soil science and food legumes.]

14. PLANNING RESOURCE REQUIREMENTS (STAFF/FUNDS)

One soils scientist-short term-University source ($8,000)
One agronomist-short term-INTSOY or IITA ($8,000)

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Fermin Ferrer

TITLE: USAID Director

DATE SIGNED: MO. 06 DAY 30 YR. 75

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MO. DAY YR.

AID 1330-2 (9-75)

INERA SUPPORT

I. Summary of Problem and Proposed Response

1. Purpose of the Project

The purpose of this project is to assist the Government of Zaire mount an effective program of field-oriented research in two areas (a) soil science and (b) food legumes.

Responsibility for agricultural research in Zaire is vested in the Institut National Pour l'Etude et la Recherche Agronomiques (INERA). Until March 1975 this agency, for all practical purposes, was a belgian research organization (for additional details, see paragraph 4). The Belgian Government phased out its aid program for two reasons: First, because the Government of Zaire "Zairianized" the Institut and was revising its relationships with Belgium on the basis of a more mature partnership, and secondly because the Government of Belgium revised its policies to limit the provision of operational personnel to Zairian institutions in preference to financing discrete projects with technical assistance advisors. As a result, INERA is now a fledgling organization which can be effective only to the extent that it is able to obtain, train and educate hundreds of qualified Zairians; establish priorities and policies for agricultural research; and draw on the assistance and experience of the international research centers and donor agencies. To this end, it has already requested assistance from Rockefeller and the USAID as well as from other sources. On the assumption that the Rockefeller Foundation will be able to respond at the overall policy/management/educational level, the USAID is limiting its response to very specific action programs which would have the most immediate impact on increased food production during the 70's.

Thus, this project is directly linked to, and a necessary precondition for achievement of, the first priority program goal set by the 1975 Development Assistance Program (DAP) for Zaire--"Increase through direct or indirect means food production destined for the market economy." Effective, field-oriented agricultural research in Zaire

is currently being conducted in one area only, the National Maize Program assisted by CIMMYT. The gross inadequacy of other agricultural research (also cited by the DAP) is a fundamental constraint to the development of Zaire's agriculture. While production research is necessary in all crop areas, of primary importance is soil science research, including soil testing and analysis, as a basis for any increased crop production. As fertilizer usage increases (the TVA Fertilizer Study anticipates a tripling in fertilizer consumption over the next five years), an information base in soil fertility and crop response becomes mandatory.

Increase in production of soybeans and other food legumes was also specifically indicated as a priority objective in the DAP, to help solve both fertilizer deficiencies and nutritional problems. In regard to the latter, only half of the recommended daily intake of 70 grams of protein per person is being consumed. The gap between proteins required annually by Zairois and those available currently is estimated to be 200,000 tons. Successful efforts to grow and introduce soybeans and other legumes into the diet have been made in a number of scattered localities in Zaire. However, there is little information available and no research being carried out on varietal adaptability and improvement, cultural and processing techniques, potential of other food legumes, etc. This type of adaptive research, in a program fashioned after the successful CIMMYT model is an essential precondition to expanding production of these important food crops. As regards plant nutrients, the nitrogen fixation effects of leguminous intercropping with cereals is well known. As research develops higher yielding varieties and cultural techniques for legumes, then introduction into crop rotations will substantially increase nitrogen availability for other crops in the rotation.

2. Project Description

a. Estimated Project Outputs

Soil Science Research

Functioning soil and plant tissue testing laboratories, equipped and staffed, and

capable of testing and making appropriate fertility recommendations on 7,500 soil and 2,500 tissue samples annually. Priority attention in the first three years of the project will be given to testing and recommendations in support of ongoing crop research at INERA stations and field trials. As testing capacity increases to indicated level, by the fourth year a minimum of 25 per cent and by the fifth year a minimum of 50 per cent of testing will be devoted directly to crop production projects.

Ongoing assistance to crop researchers at INERA field stations in the design and analysis of fertilizer and crop response experiments on priority crops (corn, manioc, oil palm, cocoa, rice, soybeans, tea, cotton, peanuts, pyrethum, tobacco and miscellaneous food legumes.

Ongoing studies of special problems of soil classification, fertility, texture, drainage, erosion, etc. as related to the production of the priority crops listed above.

A field trouble-shooting ~~capacity~~ capable of responding to requests for specialist advice and assistance from producers on soil/crop production problems.

Food Legume Research

An efficient, smoothly functioning national coordinated food legume improvement program which will contribute to rapid achievement of production goals established by the GOZ and which will be staffed by Zairois scientists as quickly as they can be trained.

Two functioning field research centers (Gandajika for soybeans and peanuts; Mulungu for miscellaneous food legumes) equipped and

staffed, and carrying out an effective program of varietal testing, breeding, protection, utilization and agronomic research in food legume production.

An ongoing program of on-farm testing including variety, protection, utilization, soil fertilization and improvement, cultural practice and rotation trials in major production regions.

An effective "out-reach" program through the development of extension type materials to carry research results to farmers, and recurring short training programs for extension agents, project managers, rural school teachers, church program leaders and farmers

Estimated Project Inputs

Soil Science Research

Commodities
- Lab equipment and supplies
- Lab rehabilitation
- Vehicles
- Field equipment and supplies
- Library and journals

Technical Assistance
- One full time experienced soil scientist (Program Director Ph.D.)
- Twelve months TDY assistance

Participant Training
- Two Ph.D. level
- Four M.S. level
- Short course training-in-country

Food Legume Research

Commodities
- Lab equipment and supplies (2 sites)
- Lab workshop and workshop rehabilitation (2 sites)

- Vehicles
- Field equipment and supplies (2 stations)
- Library materials (books, journals)
- Development and diffusion of extension materials.

Technical Assistance
- One full time experienced agronomist Ph.D. level.
- 18 months TDY assistance

Participant Training
- Two Ph.D. level
- Six M.S. level
- Short course training-in-country

Disbursement period

It is anticipated that the disbursement period of both phases of the project (soil science and food legume research) will be five years.

hat the reorganization and reform of INERA programs as pre-ented in the 1975 document "Reorientation de la Recherche t Restructuration" is effectively supported and implemented y the GOZ.

hat high calibre qualified Zairois personnel will be as-igned to the project and will be made available for indi-ated participant training.

hat international research organizations (such as IITA and NTSOY) and other donors will collaborate actively in the rogram.

hat GOZ will fulfill its budget obligations to the project on a timely basis.

[illegible] in Agricultural Research

In the pre-independence period Belgium had built up in the country one of the leading institutions of tropical agricultural research in the world, capable of undertaking a wide range of basic and applied research. The program was served by some 400 European technicians and a large African staff. The infrastructure included a large, well-equipped central station in Yangambe and approximately 60 sub-stations scattered throughout the country. The major areas of research were in the improvement of varieties of all important crops; the testing of rotations and methods of cultivation; the study of soils, fertilization, climatic conditions, of forests, insects and diseases, animal husbandry and fish culture; as well as the necessary basic studies in biology, genetics and botany.

This agricultural establishment was seriously affected by the disturbances following independence and by 1973 the staff had been rebuilt to 32 scientists, of whom 10 were Zairois. Only nine of the 17 major sub-stations had been reopened by 1974, and most staff effort was directed toward maintenance of plantations and infrastructure rather than research. A major blow to the reestablishment of INERA fell in March 1975 when the Belgian Government withdrew its support from INERA. As a consequence most foreign technicians have again withdrawn from the staff.

One of the few bright spots in the current ag research scene (but not included within the INERA complex) is the effort of the National Maize Program (PNM) supported by CIMMYT. Only three years old, this program has already succeeded in developing and diffusing adapted composite varieties, new cultural techniques and training a cadre of extremely competent, young Zairois research agronomists. Their current staff is made up of 20 Zairois and four expatriate researchers. The highly successful PNM program will be used by INERA as a model for its own activities.

5. Realistic Alternatives

Several alternatives to the recommended projects exist, although they appear neither realistic nor promising.

No programming in the ag research area - USAID could reject

the request to program in ag research, using the justification that we wish to concentrate our resources in the production field, as we are doing in maize. It should be pointed out, however, that the only reason we can move into maize production with some confidence is the existing research base provided by PNM/CIMMYT (originally an AID sponsored program). The soil science project will provide additional applied research in support of maize production, and other crop production projects as well. The food legume research is essential to our projected future soybean production effort. It is unrealistic to assume that the GOZ has resources at this time to support these programs. No other donors have shown interest, or to our knowledge have been approached, to support these two programs.

Select ag research programs in other fields - In making their request for assistance, the GOZ asked for support also in the fields of cotton, rice and climatology. We have declined participation in these areas: cotton, because it does not conform to current AID programming criteria; rice, because of the predominance of the Chinese Mission in this field; and climatology, because it appears to be of a lower order of priority.

5. The major beneficiaries of this program will be the small traditional farmer growing usually less than one hectare of subsistence and commercial crops and earning at the present time an annual income of somewhere between $20.00 and $50.00. As with any research program, the benefits are not direct, but come indirectly through the provision of improved inputs as a result of successful research efforts.

7. The benefits of the project will come about only if, in fact, there is a very widespread effect of research results out from the research station to the farmers who will use the results. It is for this reason that an attempt is being made to design the project very strongly in the direction of applied research with a strong extension component.

II. Financial Requirements

Project Cost (figures in $000)	U.S.	GOZ
Soil Science		
Commodities	324	96.5
Technical Assistance	447	139
Participant Training	200	225
Sub Total	971	460.5
Food Legumes		
Commodities	266.5	137.5
Technical Assistance	483	160
Participant Training	270	290
Sub Total	1,019.5	587.5
Project Total Cost	1,990.5	1,048

Type of Financing

It is recommended that the entire project be financed by grant funding because of the experimental nature of the programs and the heavy starting

III. Project Development

1. Design Completion

The major study that has been done to date is that done by INERA itself, published under the title "Reorientation de la Recherche et Restructuration". While this document does not go into great detail on the specific areas of research to be undertaken by this project; i.e., soil science and food legumes, it is, nevertheless, a very important study since it presents a recent pragmatic re-thinking of the problem of re-activating agricultural research in Zaire.

Additionally, each phase of the project will require a feasibility study to analyze in a more precise manner the requirements of the project. It is estimated that these

studies will require approximately six [illegible] of one specialist in each of the respective fields.

It is recommended that the food legume study be conducted by a member of the staff of INTSOY at the University of Illinois and that in addition to working out the specific details of project feasibility, he consider the most efficient manner in which INTSOY itself and IITA at Ibadan may be incorporated into the project.

It is recommended also that the soil science study be conducted by a competent staff member of one of the Universities involved in soil science research and that he, in like manner, consider the ongoing participation of one of these institutions in the full project.

These studies should be scheduled for September 1975.

Documentation Schedule

Submit PRP	November 1975
Submit PP	May 1976

3. AID Resources to Prepare Documentation

If Mission understaffing continues at present level, request six weeks TDY experienced programmer for completion of PRP and PP in addition to technical assistance requested in Part III.

IV. Policy Issues

None

A N N E X B

DEVELOPMENT ASSISTANCE PLAN (DAP) FOR ZAIRE

(January, 1975)

A. AGRICULTURE

1. The Role and Performance of Agriculture in Zaire's Economy

Agriculture provides a livelihood for about 70 percent of Zaire's total population but its contribution to GDP is relatively low. In 1972 the value of agricultural production accounted for 18 percent of the monetized Gross Domestic Product and 14 percent of total exports. Of agriculture's output more than one-half is in the subsistence sector. Although there are variations from year to year, agricultural exports, primarily coffee, palm oil and palm Kernal oil, account usually for little more than 17 percent of total export earnings and are mostly grown on plantations. Food for domestic consumption is grown on relatively small holdings either for cash or for subsistence.

The performance of the agricultural sector in 1968-72 has been rather modest. Value added at constant prices rose at an average annual rate of less than 2.5 percent. In view of the population growth during the same period, per capita agricultural output of food and non-food crops has declined substantially. Palm oil and palm Kernal oil production declined in 1973 because low domestic prices for palm oil did not provide sufficient incentive to harvest the palm fruit. Plantations have not been renewed, and old trees have been neglected.

Coffee production declined from 83,000 to 79,000 tons because of lack of moisture in the producing areas. Cotton was the only export crop to show a substantial production increase. Cassava, the main food crop, recovered from the blight that reduced production in 1971 and 1972. Rice production increased by about 30 percent, perhaps a result of six years of development by rice experts from Taiwan. (In 1973, the rice development program was taken over by a team from the People's Republic of China.) Corn production has not been sufficient to meet domestic requirements. Composite corn varieties are being introduced in Shaba, through the National Maize Program, and the Belgian Government is financing a project that will eventually have 18,000 hectares in intensive corn cultivation. Although Zaire has about 386,000 square miles of grainland and about one million cattle, meat production does not fill domestic demand.

[illegible] food imports are increasing. Wheat flour imports increased from 60,000 tons in 1969/70 (July/June) to 95,000 tons in 1972/73, and requirements will probably total 100,000 tons in 1973/74.

The more important factor in the problem of producing sufficient food in Zaire is not declining production, but of rapidly expanding population. Recent estimations place the estimated annual increase at 4.21% for the entire country. Migration from farm to city accentuates the deficit. Kinshasa's net rate of population growth is almost 12% per year. Equateur, Bandundu, and Haut Zaire have under 3% net increase. This population growth pattern generates an ever-increasing demand for food in commercial trade. For a food staple such as corn, where the current annual deficit is from 120,000 to 130,000 MT, the rhythm of increase of the deficit is estimated at some 15,000 to 20,000 MT per year.

The problem of food production facing Zaire can also be very effectively presented in terms of the nutrition gap. Estimates of per capita protein intake for Zaire range from 32.7 grams per day to 43.4 grams per day. This is approximately half of the required 70 grams of protein per day as recommended by the FAO for this area. Calorie intake is estimated at 85% of the required level. The difference between required proteins and available proteins, the "protein gap," has been projected into the future. This gap will increase from an estimated 200,000 MT in 1974 to approximately 380,000 MT by 1980.

Despite these present quantitative and qualitative deficiencies in food production below the level of current internal requirements, it must be emphasized that Zaire possesses the long-term food production potential to satisfy not only its own needs but to be, in fact, an important African exporter of food stuffs.

2. STRUCTURE OF THE AGRICULTURE SECTOR

a. Traditional Agriculture

Traditional farming is based on growing the staple food crops - cassava, maize, rice, plantain and groundnuts - in established rotation systems. There is a variety of cultivation methods and attitudes among groups and tribes, and the main crops also vary among regions of the country. The farm family's own labor constitutes the main input in peasant agriculture, and

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the division of labor is quite distinct. Men engage in hunting, land clearing and hut building. Women do the bulk of remaining chores. Indications are that a very large proportion of the labor requirements are for harvest and post-harvest operations, and the availability of women's labor at this period may be an important constraint.

The dominant form of land tenure is clan ownership under which the right to cultivate specific plots is granted by a tribal chief, but the crops grown on such plots are privately owned. Average plot size cultivated by a family varies from little over half a hectare - as in forest areas - to one/two hectares as in savannah. Given the small amount of land which is cultivated relative to the size of the population, most parts of the country do not face restrictions in production due to a scarcity of land. However, in several areas, population densities are quite high and pressure on land exists.

Efforts were made during the colonial period to organize peasant agriculture under a system of paysannats, which were designed to induce the peasants to cultivate the land within a planned pattern and to employ more advanced cultural practices. One of the main innovations was to require cotton in the rotation as a cash crop. The paysannat system collapsed almost entirely during the disorders of the 1960's, but has since been resumed in Kasai Oriental.

Livestock has a generally unimportant place in the traditional farming in Zaire, partly because much of the country is unsuitable for cattle raising (owing to tse-tse infestation and unsuitable climate), and partly because cattle are regarded by peasants as a sign of standing and wealth rather than as a source of income. The limited cattle raising is carried out as an independent activity, completely separated from crop cultivation. . . .

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3. GOVERNMENT AGRICULTURAL POLICY

a. The Ministry of Agriculture

In the past agriculture was accorded low priority in government policies where less than one percent of current expenditures in 1970 and 1971 was allocated to agriculture. In the last two years the picture has started to change. The budget for 1972 and 1973 shows absolute and some proportionate increases in both current and investment budgets. The change reflects recent government statements giving agriculture high priority in development efforts. Expenditures related to agriculture are incurred by agencies other than the Ministry of Agriculture, and to that extent the flow of public resources into agriculture is understated by the various agencies in Zaire. For example, the budget includes appropriations for provisional expenditures, part of which are devoted to agriculture. Agricultural schools are the supervision and budget of the Ministry of Education. Research is carried out by the Institut National pour l'Etude et la Recherche Agronomique (INERA) as an independent agency. The Office of the Presidency carries out certain rural projects which are budgeted through that office. The overall magnitudes are not known, but total public expenditures for agriculture are unlikely to exceed four to seven percent of total expenditure.

The Ministry of Agriculture was, until recently, a largely ineffective agency due probably to a shortage of personnel, lack of concern with agricultural development on the part of responsible decision makers and the difficulty in reorganizing and building up the central and supporting agencies, improving the extension service and providing agents with adequate facilities to carry out their work. The situation of the field staff is precarious. Provincial services depend administratively upon the provincial government, and the Ministry, therefore, does not have complete control over them. Field staff have no working means of transportation, and hence their effectiveness is totally limited. Little coordination has existed in the past between the Ministry of Agriculture and other agencies dealing with matters closely related to agricultural development. The Ministry of Agriculture places a great emphasis on agricultural projects. There are currently more than 30 projects for crops and livestock. At the end of 1973 there were 260 expatriates attached to the Ministry. China provided 120 of these in connection with the rice production program. Other large contributors of personnel through technical assistance programs were Belgian (50), the European Economic Community (33), France (12), and the UNDP (11). Because of the shortage of professionally-trained agriculturalists, the number of expatriate workers will have to increase if the agricultural projects are to move forward effectively.

GOZ interest in food crop production became especially manifest this past year with the market shortages of maize, steep increases in maize imports, and the inflationary spiral of prices. As a consequence, the GOZ requested USAID assistance in production inputs and marketing of maize as well as associated rural development activities necessary for ensuring a reasonable modicum of success. Specific activities developed with the GOZ have been evolving and two main production areas have been identified for the production of maize. In addition, a third area was identified where new crop and production technologies are yet to be identified. One major concern has been both the shortages and high cost of imported fertilizer. GOZ has also asked AID to help it identify the country's needs and to design a fertilizer mixing plant in partial fulfillment of those needs. The U.S.'s TVA has been contacted and plans are under-way to field a team in early 1975 to carry out the necessary feasibility study. Similarly, PID's have been prepared and analyses are continuing to develop the three integrated rural development projects mentioned above. Although a major objective in each case will be significant increases in food crop production, of equal importance will be net real income increases for small farmers and general improvement in the quality of

[illegible] to social and government services which might [illegible] maintain rural population stability. Additionally, these projects in their design are substantially different from the agricultural development scheme of regrouping peasants in paysannats, now current in the Department of Agriculture. If successful, these projects present an effective development model which can be replicated in future projects.

AID has also assisted the Department of Agriculture since 1972 in an effort to strengthen its project analysis, design and capability. This effort will be continued and expanded along the lines recommended by the Siffin Report with the objective of establishing an effective national agricultural planning and programming organization as a staff office of the Director General of the Department of Agriculture. USAID's contribution includes long-term technical assistance, a sizable participant training effort, and short-term expertise to study specific agricultural problems.

Progress in improving the quality of project development is already substantial. Progress toward effective long-range agricultural development planning has been slower but is starting to happen. This effort within the Department of Agriculture coupled with UNDP assistance to overall development planning at the level of the Presidency will give the GOZ, for the first time, the capacity to move effectively toward planned agricultural development.

AID's important inputs to the Department of Agriculture project development and planning capacity has been of great help in the design of AID's other efforts to define our participation in other viable agricultural projects and we will continue to take advantage of this opportunity.

USAID is presently considering a request of the GOZ for an in-depth study of cereal marketing and storage problems associated with the expansion of corn production.

b. Agricultural Research

Belgian authorities built up INERA in the colonial period to undertake a wide range of basic and applied research, and it was at the time the leading center for agricultural research in tropical Africa. Before independence, INERA employed 400

European scientists, a large African staff, had a central station, and some 60 experimental centers scattered throughout the country. The major areas of research were in the improvement and selection of seeds for all important crops, the testing of rotations and methods of cultivation, the study of soils and climatic conditions, of forests, parasites and insects, livestock raising and fish culture, as well as the necessary basic studies in biology, genetics and botony. The institute was successful in developing firm management programs and, in conjunction with a strong extension service involving seven thousand professionals and sub-professionals, secured the adoption of new crops and new cultivation methods over large areas of Zaire. Most notable was the rapid spread of cotton cultivation to some 700,000 farms in the traditional sector.

The agricultural research establishment was seriously affected by the disturbances of the 1960's. When normal conditions returned to Zaire, an effort was made to re-establish agricultural research. INERA was given virtually independent status in the Office of the Presidency. In 1972, the staff had been built up to 24 senior-level professional research workers, eight of whom were Zairians. In 1973, twelve Zairian research scientists and twelve research technicians had been added, and the number of expatriates had risen to 48. However, progress in staffing the various research centers which together constitute INERA had proceeded rather slowly. Only nine of the seventeen INERA sub-stations had been reactivated early in 1974.

As the result of AID initiatives, an agreement was signed in 1971 between the International Corn and Wheat Improvement (CIMMYT), Mexico City and the GOZ to establish a national corn research and marketing program. This program has made solid progress in the development of new high-yielding corn varieties, their extension in the national corn production program, and in the training of young Zairois agents in research and extension techniques.

The CIMMYT program, now called the National Maize Production Program, is almost the only substantial production-oriented agricultural research currently underway in Zaire, and it has set as a major objective the establishment of a dynamic model upon which other research efforts in the country may be patterned.

6. TOWARD A STRATEGY FOR AGRICULTURAL DEVELOPMENT

In considering means (programs) to realize the contributions of agriculture such as food, income, exports, improved nutrition, there are both short run and long considerations to strategy for development. The short-term strategy for AID would be concerned with the situation as it presently is, not what we would like the situation or realities to be, recognizing the existing and pervasive constraints which are most readily removed. Such a program would be rather concentrated in specific geographical regions and limited in scope, (not in terms of the level of assistance), and its achievements would be modest due to potential risks, but it would be based on realistic expectations for the next two/three years. For the longer term, efforts can be made to steadily reduce the constraints which are more difficult. But we should remember, although the pay off in some projects may lack a certain visibility for the next few years, the components making the longer term strategy could be started at the same time for the short-run strategy.

The problems and constraints inflicting plantation agriculture differ in nature from those applying to traditional agriculture. Consequently, two distinct features of strategy must be identified: one dealing with development of plantation agriculture; the other with the more complicated sector of traditional agriculture. There are, however, two common elements to both strategies - the need to improve the transport network and building of the institutional structure. AID is already involved in traditional agriculture, and to be specific, is concentrating on food production and is planning integrated rural development programs. This is the correct strategy, and direct involvement in the development of plantation agriculture should fall in a second priority category.

Raising present crop yields will be the most practical approach to adopt in most agricultural development projects. The key factors in raising yields will consist of improving the quality of inputs, and this will call for an integrated program, including strengthening existing research, extension and marketing institutions, transport improvement, health, provision of new production inputs, etc.

It is, of course, anticipated that some research in food production can be achieved in those areas where the maximum land ratio is low.

[illegible] increase in food production, is to concentrate resources in a few key area projects. Project sites should have certain characteristics. They should be production areas which are potentially important as a source of supply to consumers; existing transport should be adequate, or readily improvable. Project areas should be logically identifiable as distinct geographic regions.

The changes to be introduced under the projects should, as a general rule, not be over-complicated or over-extended since we are starting from scratch in a traditional agriculture. This would rule out complicated schemes which require large inputs of technical knowledge on the part of those running the project, or which require heavy investment, e.g., in farm machinery. The project would rely heavily on simple changes rather than the "big rush."

To facilitate and support the food or central programs, it will be necessary to make more efforts to improve marketing. At the farm level of the marketing channel this might require efforts to open or ease the access of selling to traders - possibly by building rural roads or by getting collection centers better local storage to reduce losses, or giving information to peasants on prices. The traders who buy from farmers would probably provide better marketing services if they could get credit to expand the scale of their operations. At the national level, it implies support and development of the marketing structure and institutions, both public and private.

In summary, USAID agricultural programming in Zaire will concentrate on those sets of integrated actions which will lead to an improvement in food crop production, both quantitatively and qualitively.

Specific projects will

- emphasize food crop production,

- include those ancillary actions which are necessary conditions to attainment of the basic objective of improved food production, i.e., improvement of transport and marketing infrastructure, improvement of health conditions as needed,

- maximize opportunities to improve training of Zairois at all levels involved in the project,

- pay particular attention to improvement of institutions involved at the project level (research, extension, marketing,

- be concentrated in those geographic areas where climatic, resource access to market, and other conditions are such as to minimize risk and increase chances of success,

- be so designed as to be replaceable, if successful, and be continued under Zairois resources following termination of USAID support.

Additionally, specific projects will be sought out which give promise of substantial improvement of nutrition levels, e.g., fisheries development, soybean and other pulse production.

Finally, the effort to improve the agricultural development planning, programming capability of the Department of Agriculture and associated institutions, such as ONACER, will be continued and expanded.

Substantial additional sector analysis yet remains to be done to complete this Agricultural Sector Assessment. At least a part of the sector analysis yet to be completed can be accomplished in the course of specific studies already planned, for example the proposed TVA fertilizer study, and the Kansas State Grain Marketing and Storage Study. Completion of the agricultural sector analysis will probably require TDY assistance of at least one agricultural economist, possible an agronomist and a livestock specialist. Given the heavy traffic of TDY specialists anticipated in early CY 75 (in support of projects in East Kasai, South Kivu, North Shaba, Uvira fisheries, plus the TVA fertilizer and Kansas State Grain Storage and Marketing studies), special attention must be given to the scheduling of the GAP sector analysis team to assure that they are in Zaire in a period when they may be adequately supported by the AID mission.

c. Malnutrition

Malnutrition is generally considered to be a primary or associated cause of approximately 60 percent of Zaire's high morbidity and mortality. While no comprehensive national nutrition survey has been undertaken to date, several local surveys point to the fact that malnutrition is pervasive and may be actually increasing.

The main nutritional problem is protein deficiency. While average caloric intake is estimated to be 85 percent of caloric requirements as determined by FAO, only half or 35 grams of the recommended daily intake of 70 grams of protein per person is being consumed. Declines in agricultural outputs in recent years due to GOZ pricing policies and subsequent disincentives to increase production, breakdown in the farm to market transportation system and rampant inflation in food prices coupled with low income levels have severely limited food available to the populace. In fact, the gap between proteins required annually by the populace and those available currently is estimated to be 200,000 tons.

The substantial level of malnutrition is especially serious, because of its synergistic effects, both exacerbating existing illnesses, and increasing susceptibility to new infection. At the same time, malnutrition is compounded by the high incidence of disease leading to malabsorption of nutrients which in turn significantly raises the nutritional requirements of an already malnourished populace.

Two sub-groups of the population are especially vulnerable to malnutrition: infants and children under five, and pregnant women. In the Kinshasa nutrition/health survey previously mentioned, the data shows that after weaning approximately one out of every three children examined fell below normal weights for their age. In the rural areas malnutrition is significantly higher, as much as 60% in various areas studied, with Kwashiorkor and marasmus still a serious problem in two regions of Zaire. Malnutrition is especially prevalent in pregnant women and coupled with high parasitism has resulted in an estimated 50 percent of all pregnant women having serious anemia. The large number of perinatal and infant deaths can also be traced to significant maternal malnutrition.....

MOUVEMENT POPULAIRE DE LA REVOLUTION

-Wet/Va-

Bureau du Président

ANNEXE

INSTITUT NATIONAL
POUR L'ETUDE ET LA RECHERCHE
AGRONOMIQUES

DIRECTION GENERALE
B.P. 1.510
KISANGANI.

Yangambi, le 23 juin 1975.-

CAB/DG/894/75.-

U. S. A. I. D.

à

KINSHASA/GOMBE.-

A l'attention de Monsieur SPENCER
Directeur.-

Monsieur,

OBJET : DOMAINES D'ASSISTANCE SOLLICITEE PAR L'INERA.-

Veuillez trouver en annexe, les divers domaines de recherche de l'INERA pour lesquels une assistance vous a été sollicitée lors de l'entretien que vous avez eu avec le Directeur Général du Département de l'Agriculture et le Délégué Général à l'INERA le jeudi 22 mai 1975.

Vous en souhaitant bonne réception, je vous prie d'agréer, Monsieur, l'assurance de ma considération très distinguée.-

LE DELEGUE GENERAL,

NGANDO-MOJUNGO.-

BUREAU DU PRESIDENT DE LA REPUBLIQUE
INERA
CABINET
DIRECTEUR GENERAL

Annexe.-

1. **But** :

Etude du sol et che... des meilleures terres pour la promo tion agricole du pays.

2. **Organisation et Activités** :

- 1 Chef de Section

2 Bureaux de :

2.1. **Prospection et Cartographie**

- prospection
- cartographie et photo-interprétation
- sondages socio-économiques

2.2. **Chimie et Fertilité du sol** :

- fertilité physique
- fertilité chimique
- fertilité biotique
- minéralogie du sol
- analyses des plantes
- radio-isotope

3. **Patrimoine** :

3.1. **Personnel** :

3.1.1. **en place** :

- 2 Ingénieurs Pédologues (chimie)
- 1 Ingénieur Pédologue
- 1 Ingénieur Technicien } prospecti

3.1.2. **prévu fin 1975** :

- MAWIYA, Ing. Ag — 4 Ingéieurs Pédologu
- AYUBANEIKA — 1 Botaniste
- 1 Sociologue

3.1.2. à long terme :

- 1 Ingénieur Agronome labo fertilité chimique
- 1 -"- -"- -"- physique
- 1 -"- -"- labo microbiologie du sol
- 1 Minéralogiste labo minéralogie
- 1 Ingénieur chimiste pour analyses plantes
- 1 Ingénieur chimiste physiologiste pour labo radioisotope
- 4 Pédologues prospecteurs
- 1 Géomorphologue
- 1 Cartographe

3.2. Equipement :

3.2.1. en place

- produits chimiques : besoins couverts au quar
- verrerie : besoins couverts à moiti
- appareils : - 1 conductrimètre Beckman
  - 1 photo colorimètre Beckman
  - 1 centrifugeuse Cat nº V.28
  - 2 fours à moufle
  - 8 étuves
  - 9 balances analytiques Mettler
  - 1 agitateur électrique pour analyses en série

4. Besoins d'Assistance :

4.1. Equipement divers (voir listes en annexe)

4.2. Experts expérimentés pour :

4.2.1. - relance : - fertilisation
- biologie du sol
- radioagronomie
- photo-interprétation

4.2.2. - formation des Zaïrois dans diverses spécialisations à domicile

4.2.3. - formation des Zaïrois à l'étranger dans le cadre de l'utilisation des appareils modernes sophistiquéset autres spécialisations

4.2.4. - passage d'un électromécanicien pour contrôle des appareils de labo.

B.- SECTION DE CLIMATOLOGIE.-

1. But :

Etude des interférences entre le climat et les êtres vivants dans les différentes régions géographiques du Zaïre en vue de définir pour les réaliser, les conditions optimales à la production agricole.

2. Organisation et activités :

1 Chef de Section

2 Bureaux de :

2.1. - Statistiques :

climatographie

vérification des données

hydrologie

rayonnement

évapotranspiration

archives

2.2. - Fine Mécanique :

horlogerie

contrôle technique du réseau

3. Patrimoine :

3.1. Personnel :

3.1.1. en place:

- 1 Ingénieur Agronome

3.1.2. prévu fin 1975 :

- 1 Ingénieur Agronome
- 1 Géographe
- 1 Ingénieur électro-mécanicien (A1)

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3.2. Equipement :

3.2.1. liste des Stations du réseau :

	LAT.	LONG.	ALT.	Nº DE CODE
1. Forêt ombrophile de la cuvette centrale :				
YANGAMBI (Station centrale) :	0º49'N	24º29'E	470 m	001
YAKUMA (2e Ordre) :	0º46'N	24º14'E	375 m	004
BALA (2e Ordre) :	0º03'N	18º18'E	350 m	205
Rebord nord de la cuvette centrale :				
BINGA (3e Ordre) S.C.C. :	2º18'N	20º30'E	400 m	203
YALIGIMBA (2e Ordre) P.L.C. :	2º17'N	22º51'E	435 m	202
LOKA (2e Ordre) :	2º12'N	22º42'E	380 m	209
Rebord sud de la cuvette centrale :				
LUKUNDI (2e Ordre) :	2º50'S	23º11'E	535 m	206
2. LONGI :				
BONGABO (2e Ordre) :	3º06'N	20º32'E	450 m	204
BONETA (1er Ordre) :	3º11'N	19º46'E	475 m	302
KUTUBONGO (2e Ordre) :	4º37'N	19º53'E	550 m	304
3. UELE :				
BAMBESA (Station principale) :	3º27'N	25º43'E	621 m	301
MAGBO (3e Ordre) P.N. GARAMBA :	3º46'N	29º32'E	740 m	906
4. ITURI :				
NIOKA-BRUSI (Station Princ.) :	2º09'N	30º39'E	1678m	701
LEMA (3e Ordre) :	2º07'N	30º38'E	1677m	702
MONO-HAMA (1er Ordre) :	2º49'N	30º45'E	1350m	703
5. KIVU :				
KUTSOMA (3e Ordre) P.N. ALBERT :	0º19'N	29º44'E	1330m	905
MUDIHIRA (3e Ordre) :	0º16'S	29º10'E	2190m	607
KATINDI (3e Ordre) P.N. ALBERT :	0º47'S	29º17'E	1040m	904
MULUNGU-MOLEHE (Station principale complétée par 3 Stations pour la mesure des gradients altitudinaux) :	2º18'S	28º47'E	1731m	601
RUMANGABO (3e Ordre) P.N. ALBERT :	1º21'S	29º22'E	1620m	903

KULUNGU NYAMUNGUNYE (3e Ordre)	2°18'S	28°48'E	1703 m	602
TSHIBINDA (2 Ordre)	: 2°19'S	28°45'E	2055m	603
MONT-BUKULUMISA (2e Ordre)	: 2°20'S	28°43'E	2378m	605

6. KASAVANES SUD :

GANDAJIKA (St. princ.)	: 6°45'S	23°57'E	780 m	405
KANIAMA (2 Ordre)	: 7°25'S	24°09'E	949 m	503
KIYAKA (Ier Ordre)	: 5°16'S	18°57'E	735 m	402

7. SHABA :

LUSINGA (3e Ordre) P.N. UPEMBA	: 8°36'S	27°13'E	1785m	901
KISANGA (Ier Ordre)	:11°44'S	27°25'E	1187m	501
KIPOPO (3e Ordre)	:11°34'S	27°24'E	1300m	504
KINGOMBO (Ier Ordre)	:11° S	27° E		506
KABELENGE (2e Ordre)	: 9°40'S	22°55'E	920m	507

8. BAS-ZAIRE :

TSHUAZI (Ier Ordre)	: 5°27'S	14°54'E	505m	106
GIMBI (Ier Ordre)	: 5°31'S	13°22'E	480m	101
LUKI (Ier Ordre)	: 5°37'S	13°06'E	350m	104
KONDO (2e Ordre)	: 5°34'S	12°58'E	230m	103

N.B. :

La classification en ordre est propre à l'Institut :

3e Ordre : doté d'instruments à lecture directe

2e Ordre : instruments à lecture directe + équipement enregistreu

1er Ordre: Idem que 2e Ordre avec en plus un géothermographe + un anémographe.

Yangambi : Station centrale dispose en plus d'un laboratoire de contrôle et d'étalonnage.

4. Besoins en assistance :

4.1. Personnel :

- 1 expert expérimenté en rayonnement pour relancer les activités
- 1 expert en hydrologie
- 1 agro-climatologiste

4.2. Equipement :

- modernisation du réseau, notamment des instruments [illegible]

- appareillage et fonctionnement du rayonnement.

1. - PROJET LEGUMINEUSES.

1. But :

Promouvoir la production des legumineuses (soja et arachide) qui fournissent l'huile et l'aliment au bétail et qui (soja, haricot) complémentent en protéine la ration alimentaire.

2. Objectif :

Arachide - Soja : obtenir des variétés plus productives, plus riches en protéine, à teneur en huile élevé, plus résistantes aux maladies

Haricot : obtenir des variétés plus nutritives, plus appréciées du point de vue organoléptique plus résistantes aux maladies

3. Organisation et activités :

- Boketa : Station de basse altitude (Soja)
- Gandajika : point d'appui ;
- Mulungu : station de haute altitude (Haricot
- M'Vuazi : point d'appui ;
  - 1 chef de projet
  - 4 divisions de :

3.1. Physiologie :

- résistance à la sécheresse
- activité photosynthetique et symbiotique

3.2. Génétique :

- accroisement germplasm par introduction étrangère et prospection locale
- hybridation et sélection

3.3. Fertilisation et méthodes culturales :

- fumure minérale
- techniques culturales

3.4. Défense des cultures :

- détermination des maladies et insectes parasites
- lutte

4. Patrimoine :

4.1. Collection :

4.1.1. arachide : 400 variétés à Gandajika
4.1.2. Soja : 200 -"-
4.1.3. haricot : 219 -"- à M'Vuazi
4.1.4. Vigna : 57 -"- à Gandajika.

4.2. Equipement :

4.2.1. en place : négligeable
4.2.2. à prévoir :

4.2.2.1. Labo :
- spectrophatomètre à absorption atomiqu
- auto-analyseur Technicom

4.2.2.2. Engins :
- chenillard Caterpillar D4
- tracteur M.F. 168 + accessoires
- moissonneuse soja

4.3. Personnel :

4.3.1 en place : haricot : 1 A_2 à Mulungu
soja : 1 A_1 à Gandajika
arachide: plusieurs A_2 dispersés.

4.3.2. à prevoir :
Haricot - 2 Ingénieurs Agr. à Mulungu
- 9 Experts expérimentés
Soja - 3 Experts expérimentés (Boketa)
arachide- statu quo.

5. <u>Besoins en assistance</u> :

5.1. Equipement: de labo ad hoc
documentation

5/2. Personnel : 1 chef de projet haricot (Mulungu)
1 équipe d'experts expérimentés en soja pou Boketa.-

ANNEXES A LA SECTION DE PEDOLOGIE.-

I.- BESOINS PRIORITAIRES EN EQUIPEMENT.

1. - 1 spectrophotomètre à absorption atomique
avec accessoires pour analyse en série
modèle UNICAM
Adresse : UNICAM INSTRUMENTS LIMITED
YORK STREET CAMBRIDGE ENGLAND.

2. - 1 diffractomètre aux rayons X

3. - 1 spectromètre aux rayons X

4. - 1 colorimètre photo électrique Gallenkamp
réf. G... avec accessoires pour analyses en série OSI

5. - 7 agitateurs magnétiques non chauffants petit modèle
réf. 76.050.54 OSI

6. - 2 agitateurs magnétiques chauffants petit modèle
réf. 76.051.54 OSI
Adresse : O S I
141, rue de Javel
75739 - Paris Cedex 15
FRANCE.

7/ - 5 titrateurs automatiques avec accessoires pour analyses en série
adresse : TECHNICON U.S.A.

8. - 1 micro Kyeldahl avec rechanges pour dosage d'azote
Adresse : D E S C O

9. - 4 ballons de distillation 500 ml : DESCO

10. - 2 distillateurs 50 l/jour : DESCO

11. - 2 chauffe-ballons de 4 l réf. 76.150.72
de 6 l réf. 76.150.75 OSI

12. - 5 creusets en ~~plastique~~ platine : DESCO

13. - 2 petits agitateurs avec 3 séries trnis : DESCO

14. - 3 machines à calculer électrique (4 opérations avec mémoire)

15. - 1 appareil d'analyses thérmique différentiel (TDA)

16. - 1 thermobalance Adamel (France)

17. - 1 appareil de Rechar's (mesure du p.F.)

18. - 3 conductimètres

19. - 1 planimat D2 à table à dessin extérieur EZ 3 marque Zeiss
Adresse : CARL ZEISS
7080 Oberskochen
ALLEMAGNE FEDERALE

20. - 1 PH mètres :

a) 1 à lecture digitale type GTE marque OGI

b) 1 standard type GTC OGI

c) 1 portatif type GKA OGI

d) 1 à immersion type GKT avec gamme de mesure de 5 à 9

adresse : O G I
141, rue de Javel

21. - Reconditionneurs d'air

22. - Polarimètre pour dossage du sucre

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II.- AUTRE MATERIEL NECESSAIRE.

1. PRODUITS CHIMIQUES :

Acide acétique p.a.
-"- borique p.a.
-"- chlorhydrique p.a. (d= 1,19)
-"- fluorhydrique pur (d= 1,13)
-"- E.D.T.A.
-"- EG.T.A.
-"- nitrique fumant (d= 1,51)
-"- oxalique pur
-"- Ophosphorique pur (d=1,71)
-"- perchlorique pur (d= 1,60)
-"- sulfurique concentré (d= 1,84)
Alcool méthylique
-"- éthylique
-"- B naphtol
Ammoniaque p.a. (d= 0,92)
-"- acétate p.a.
-"- chlorure p.a.
-"- oxalate p.a.
-"- molybdate p.a.
-"- nitrate p.a.
-"- Fe (II) sulfate pur
-"- sulfate pur
-"- monovanadate p.a.
-"- sulfocyanate
Argent nitrate p.a.
Aluminium chlorure
Baryum sulfonate
Brome
Calcium acétate
-"- chlorure
Etain chlorure
Cuivre sulfate
Glycérine
Fer II chlorure

Hexane
Hydroxylamine chlorhydrate
Magnesium chlorure
Manganèse chlorure
Mercure chlorure
Potassium chlorure
-"- cyanure
-"- Iodure
-"- Nitrate
-"- Palmitate
-"- Permanganate
-"- sulfate
Hydroxyde titrisol
Sélénium pur en poudre
Sodium acétate
-"- bicarbonate
-"- carbonate
-"- chlorure
-"- fluorure
-"- hydroxyde
-"- naphtionate
-"- pyrophosphate
-"- thyosulfate

2. INDICATEURS :

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Bleu de bromathymol
Bleu de méthylène
Comprimés tampon indicatée
Jaune de titane
Méthyl rouge
Murexide
Noir eriochrone T
Papier tournesol
Sel de seignette
Devarda
Scies diamentées + accessoires afin de découper les roches pour

Poudre de polissage des lames

Poudre "Carborundum" : type 150

200

600

800

1000

3. MATERIEL DE TOPOGRAPHIE :

Théodolites T.O. - T1 - T2

Niveau en lunette

Clisimètre

Jalons

Altimètre

Mires parlentes

Mires de nivellement

Blocs notes

Mètre ruban de 100 m ou 2 de 50 m

-"- en acier (100 m) division en cm

4. MATERIEL DE CARTOGRAPHIE :

Stéréoscopes

Papiers ozalide

Rapporteurs

Boîte complète de traces à lettre

Plumes uno ou rapidographes

Encre de chine toute couleurs

Gommes

Boîte de compas

-"- de punaises

Lattes en plastiques de 50 cm

-"- de 100 cm

5. EQUIPEMENT DE CAMP :

Mille lit

Mille cantine

Couvertures

Tentes

Chaises pliantes

Tables pliantes

Trousseaux médical

Réchaud à pétrole

Lampe colleman

Seau douche

Appareil de photo

Jeep ou Toyota

Pioches

Pelles

Pompe à eau

Machettes

Bêche

PH portatif

Machine portative

Enregistreur

Bottines nos 6,7,8,9 et 10

Imperméables

Moustiquaires

Fusils Calibre 12

MISSION Dr ELWIN DUNCAN ET Dr LLOYD ET DR VAN WAMBEKE
CLYBERN DE L'A.I.D. A L'INERA/GANDAJIKA DU 01/11
AU 8/11 1975.-

BESOINS POUR L'ASSISTANCE AID A LA STATION DE GANDAJIKA ET MILIEU RURAL.-

I. Besoins techniques et humains.

1. Experts étrangers travaillant avec des homologues Zaïrois pour la culture des légumineuses.
2. Formation de cadre Zaïrois : Stages, séminaires ou conférences, formation universitaires ou post-universitaires (bourses d'étude)
3. Encadrement et éducation du paysan en milieu rural (Vulgarisation)
   - Techniques culturales
   - Education nutritionnelle
4. Etude pédologique de la région et établir une carte pédologique plus détaillée. Fertilisation du sol (engrais chimiques)

II. Equipement.

- Tracteurs agricoles plus équipement complet (charrue, Reme plow, herses, etc...)
- Semoirs
- Epandeuses d'engrais
- Récolteuses (moissonneuses-batteuses)
- Séchoir
- Magasin de stockage semences
- Une usine de transformation récoltes soja et arachides (huilerie, biscuiterie etc...)
- Véhicules de transport récoltes et autres (de préférence diesel)
- Véhicules pour agents (de préférence tout terrain)
- Un combi VW pour agents subalternes.
- Petit outillage : houes, machettes, coupe-coupes etc...
- Herbicides et insecticides pour entretien et défense des cultures et récoltes, plus matériels nécessaires (pulvérisateur porté avec pompe microniseur 6 à 8 m par exemple)

2. Laboratoire pédologique avec équipement complet et produits nécessaires. Voir en titre d'exemple la liste ci-jointe établie par Mr Barideau ex. Chef de projet Expérimentation. Un spécialiste pour ce laboratoire et formation cadre Zaïrois.
3. Logement du personnel de Cadre et subalternes : maisons.
4. Climatologie : Voir notre Direction générale pour l'estimation des besoins.

LE DIRECTEUR DE SECTEUR, a.i.

/NDM-
I.N.E.R.A.
STATION PRINCIPALE DE
GANDAJIKA.

MATERIEL INDISPENSABLE POUR L'INSTALLATION D'UN LABORATOIRE D'ANALYSES CHIMIQUES A LA STATION DE GANDAJIKA.

Dosage du carbone

Produits :- sel de Mohr Fe (NH4)2 (SO4)2 - $6H_2O$ 20 Kg
- bichromate de potassium $K_2 Cr_2O7$ 15 Kg
- fluorure de sodium NaF 10 Kg
- diphénylamine 500 gr
- H_2SO_4 concentré 10 l.

Matériel :- ballons d'attaque 50 ml. fond rond (24 pièces)
- réfrigérants 40 cm (12 pièces)
- rampe de chauffage 6 ou 12 postes électricité ou gaz
- ballons jaugés 250 ml. (24 pièces)
- entonnoirs Ø 10 cm (24 pièces)
- burettes 50 ml. graduées à 0,1 Ou 0,05 ml. (5 pièces)

Dosage de l'Azote total

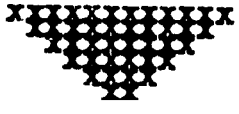
Produits :- sulfate de sodium Na_2SO_4 30 Kg
- mélange ou Sélénium selon Wieninger 30 Kg
- H_2SO_4 cone - 15 l.
- phénolphtaléine 500 gr.
- soude caustique Na OH 20 Kg
- acide borique H_3BO_3 5 Kg
- acide chlorhydrique Hcl 35 % 10 l.
- rouge de méthyle 500 gr.
- bleu de méthylène 500 gr.

Matériel :- matras kjeldhal 300 ml. (24)
- ballons jaugés 250 ml. (24)
- rampe de distillation pour kjeldhal
- Erlenmeyers ou Berlin de 250 ou 300 ml. (24)
- burettes 50 ml. graduées à 0,1 ou 0,05 ml.
- pipettes jaugées de 100 ml.

Eléments échangeables

Produits :- acétate d'ammonium 10 Kg
- acide acétique cristallisable 10 l.
- monométhyl-aminophénol sulfate 5 Kg
- sulfite de sodium $Na_2 SO_3$, sulfite acide de sodium $Na2HSO_3$ 10 Kg de chaque ou pyrosulfite de sodium $Na_2 S2 O5$ 10 Kg
- molybdate d'ammonium 5 Kg
- acétate de sodium anh 10 Kg
- dihydrogénophosphate de potassium $K H_2 PO4$ anh 10 Kg
- chlorure de potassium Kcl 10 Kg

Matériel :- ballons jaugés de 100 ml. 50 pièces
- pipettes jaugées de 5, 10, 20, 25,30 ml. 10 pièces de chaque
- colorimètre
- photomètre à flamme ou butane.-



ANNEX D

Supplementary Statement by Mukendi Mouji Tshingoma
Director General, Department of Agriculture
October 29, 1975

It is generally felt that the programs of INERA should be oriented to solving priority problems. There is a serious food problem developing, and corn production and food legume production are most critical. Almost all studies indicate that any type of agriculture above the barest subsistence level requires chemical fertilizer.

Adaptive research in soil fertility in the tropics must take into account the following:

- There are many different types of soils, each which reacts differently to chemical fertilizers, frequently by fixing or releasing soil nutrients in unfavorable ways.

2. Experimental work carried out either at the INERA stations or on the farms should be associated with acceptable identification or names of the soils they are conducted on, which have been tested and described in accordance with a reliable classification system.

This would permit more efficient extrapolation of results to new farms and areas and greatly improve the impact of the demonstration efforts. At the present this is not being done in any project.

Therefore it is proposed that we include for negotiation in the present project provisions for a team of soil scientists for soil identification and chemical fertility diagnosis. The present high cost of fertilizer makes this recommendation all the more forceful. For the same reason, it justifies the inclusion in the rotations or in the fertilizer formulas the use of nutrients which can be generated locally - more specifically, legumes (including soybeans, crotelaria and stylensanthes) for nitrogen and local sources of soil amendments, including lime and rock phosphate.

At the present there is no institution in Zaire able to carry out any type of pre-investment study or appraisal of the land use potentials of given areas or regions considered for agricultural development. Until now this important phase in the development process had to be contracted to private firms at very high

ANNEX E

REPUBLIC OF ZAIRE

AGRICULTURAL SECTOR SURVEY

Protein Deficiency and the Role of Agriculture

Introduction

1. The Zairan Government is anxious to improve the diets of the population as part of its overall program for economic and social development. Particular attention has been focused on the reduction of protein deficiency in areas where extreme conditions, as evidenced for example by the existence of Kwashiorkor, are known to exist. In the course of its agricultural investigations, the sector survey mission gathered some information on the scope of protein deficiency in Zaire and on some of the activities currently underway to remedy existing deficiencies. The purpose of this Annex is to describe the situation and to comment briefly on the role which agriculture can play in improving dietary standards.

Protein Deficiency: Its Types, Location and Attempted Cures

2. There are four general circumstances in Zaire which give rise to protein deficiency. First of all, temporary deficiency often exists due to an interruption of food production. The cause might be a breakdown in security in the countryside or crop failure because of bad weather. In these circumstances, protein deficiency is likely to be accompanied by other forms of undernourishment. Secondly, there is chronic deficiency due normally to a combination of limited production potential and unbalanced dietary habits. In Zaire, these circumstances are usually confined to savannah regions in which manioc is the staple food crop, though population pressure in parts of Kivu province is creating a chronic problem there as well. Thirdly, there is urban deficiency due to lack of purchasing power. This is basically a problem of poverty which affects large cities in Zaire and most other countries in the world. Fourthly, the refugee problem represents a special circumstance that results in protein deficiency, because production has not been organized in a refugee area, or because the refugees have not fully adapted to a new range of available foods in their new environment.

3. The locations of the urban and refugee-related defic[illegible] re[illegible] rather specific, of course. Some degree of protein deficiency may be assumed to exist in virtually all large cities, though statistical evidence is not available. An education program has been undertaken by the Ministry of Health, with the assistance of the World Health Organization, to train personnel in better dietary practices and make knowledge of these practices available to urban mothers. To date, Kinshasa has received the most attention,

but the officials concerned are well aware that similar problems exist in the other urban centers. The refugee problem exists primarily in two areas: in Haut Zaire province along the border with the Sudan, and in Bandundu province along the border with Angola. In the recent past, there has also been a serious problem in Bas Zaire, again concerning refugees from Angola, but many of these refugees have now been successfully settled into villages and are producing food for their own subsistence. The High Commission for Refuge has been active in each of the areas. Assistance has also been forthcoming from several voluntary agencies and, especially in the Kwango district of Bandundu, from religious missions.

4. As for security-related disruption of production efforts, perhaps the most important location where this has taken place is the Maniema region in Kivu province. Security in the region has been a problem over a long period, and the roads and Government services have deteriorated markedly.

5. Another area with "temporary" malnutrition problems is the Kasai. Migration to the cities (Luluabourg, Mbuji-Mayi) has caused spectacular increases in urban population (200 to nearly 700% over the past 15 years) and has helped tip the supply-demand balance from surplus to deficit in basic foo stuffs. Whether this flood of people away from the countryside is "temporary" or not is problematical; hence, the problem of such areas is distinct only in degree and not in kind from the chronic problem areas.

6. Three chronic deficiency areas are generally recognized to exist in Zaire. One is in the southern part of Bandundu (especially Kwango district); another is in the savannah areas of southern Kasai Occidental; and the third is in central Kivu, in very densely populated territories such as Ngweshe and Kabare. In central Kivu, it was estimated that, in the mid-1960's 1/, between an eighth and one-fifth of all children suffered from Kwashiorkor, though insecurity during these years was part of the cause. Even before the troubles, however, Dr. Maeyer reported that there were parts of the savannah regions in Kwango-Kwilu (Bandundu), south Kivu, and Kasai "ou les indices chez les enfants de 1 a 6 ans attaignaient suivant les regions entre 5 et 26 pour cent" 2/. More recent estimates in Kasai Occidental suggest that more than 50% of children between the ages of one and four suffer from malnutrition 3/.

1/ Dr. Vuvleste, Le Probleme de Nutrition dans le République Démocratique du Congo in the collection of seminar papers: Séminaire sur L'Alimentation et L'Economie Rurale, IRES.

2/ Cited by Dr. Nguete, Principales Carences et Leur Localisation in Séminaire sur L'Alimentation et L'Economie Rurale, IRES - Lovanium.

7. In central Kivu, a special campaign -- supported by Government and a number of voluntary agencies -- is underway to combat the widespread malnutrition 1/. Firstly, emergency food supplies are being brought in for direct distribution to the affected population. Secondly, and more long-term in nature, the introduction of soya bean cultivation is being encouraged. A similar effort with regard to soya beans has been carried out in Kasai Occidental during the past several years.

8. The soya campaign in Kasai has had some success, as shown by the production figures in Table 1. It should be emphasized, however, that the success of the program is due in large measure to long years of effort by volunteers -- Père Vanneste, Mlle. D'Heer and their collaborators -- at the mission school at Tshibashi just outside Luluabourg. Soya has been successfully introduced into the local diet by providing it in the form of flour, which can easily be mixed with maize flour and manioc to produce an only slightly modified version of the basic food dish, the bidia. No special cooking procedures nor utensils are required. No dietary taboo is violated. The taste is not modified substantially. As a result, consumer acceptance has been accomplished with relative ease. Before this successful approach was found, other less well adapted methods were tried and had all failed. The point is: the introduction of a new food such as soya into the diet is not an easy matter. Careful research into local dietary habits and experimentation are required.

9. The method discovered to work in the Kasai has great advantages. Since the soya is integrated into the basic food dish, its benefits can be realized on a regular basis for the whole population. In contrast, consider the situation whereby, by some means, it had been possible to greatly expand the number of chickens and eggs available to the population. Chickens are traditionally consumed at irregular intervals to celebrate some local event or to honor an important guest; neither meat nor eggs are eaten by pregnant women. Thus, increased supplies of these foodstuffs would not necessarily lead to greater or more regular protein intake. Also, the diet of weaned infants is a form of porridge which is nothing more than a partly prepared bidia. Thus, without any extra effort being required of the mother, the protein advantages of soya are passed directly to the age group most in need of protein supplements.

1/ Cf. Oeuvre pour La Lutte Contre le Bwaki et la Protection de L'Enfance, Rapport Annuel, January 1969-December 1969. Bwaki is the local term of Kwashiorkor.

Table 1: SOYA CULTIVATION IN KASAI OCCIDENTAL, 1965-69

	1965	1966	1967	1968	1969
Crops (tons)	.2	2.6	13.7	n.a.	763
Equivalent Improved Diets /1	18	200	1,050	n.a.	58,000

/1 Number of adult yearly rations of recommended quantities of soya flour, i.e., 30 grams per day, assuming a milling percentage of 83%.

Source: Figures 1965-1967 are purchases of Tshibashi; 1969 is Ministry of Agriculture estimate.

10. The cultivation of soya beans in Kasai has not presented special problems. In fact, given that it brings a higher price than groundnuts, soya has distinct attraction to farmers. It makes less of a demand on the soil than its three main competitors in the region, haricot beans, groundnuts and voandzou (Bambara nuts). It also has higher yields and shorter maturation (depending on the variety -- about 90 days), so that two crops a year are possible. The strictly agricultural problems of introducing soya are therefore much less complex than the key problem of social acceptance.

Basic Determinants of the Protein Problem

11. Protein Supply. In 1957, the colonial government initiated a vast survey, covering the whole of Zaire, of animal protein sources available to the population. A principal aim was to determine areas where introduction of fish culture could be justified by animal protein shortages. The survey report, published in 1961, still constitutes the best source of information on general protein availability in Zaire. A global summary is produced in Table 2. No account was taken of imports or internal trade, so that imbalance in actual diets would have been less than indicated by regional production figures alone. This is especially the case for Leopoldville province, which received sizeable imports.

Table 2: ANNUAL LOCAL PRODUCTION OF ANIMAL PROTEIN
(percentage distribution within Provinces)

Province	Insects	Hunting	Fish	Fish Culture	Livestock	Poultry	Total
Leopoldville	15	16	56	2	10	1	100
Equateur	9	28	56	-	4	2	100
Haut Zaire	10	55	22	-	11	2	100
Kivu	4	26	49	-	18	3	100
Katanga	7	24	61	-	7	1	100
Kasai	22	30	33	1	10	4	100
Total Zaire	10	30	47	1	10	2	100

Source: Gomez, P.A.; Halut, R.; Collin, A. Production des protéines animales au Congo. Bulletin Agricole du Congo, 1961 -- [illegible]

12. Note the very high proportion of animal protein deriving from natural production (fishing, hunting, insects), as opposed to production initiated by man (fish culture, livestock, poultry). Since the survey, it is quite possible that the relative importance of natural sources has increased. Substantial variations within provinces are not revealed by the table. The northern part of Kasai province, which is thinly populated and includes areas of rain forest, is more similar to the pattern shown for Haut Zaire province, where heavier reliance is placed on hunting. In contrast, the southern part of Kasai province is forced to place heavier reliance on insects as a source of animal protein. Studies carried out by students at the mission school in Tshibashi confirm that insects are the principal source of animal protein in the villages of the old Lulua district, accounting for 60-80% of the total.

13. In the provinces most affected by protein deficiency, the survey gave some indication of the absolute amount of animal protein available per person per day (Table 3). Considering the increases in population which have occurred since the study, it is likely that these figures overstate the current availability.

Table 3: ANIMAL PROTEIN AVAILABILITY, SELECTED AREAS (1957-58)
(gram equivalent per adult equivalent per day) /1

Area	Insects	Hunting	Fishing	Fish Culture	Livestock	Poultry	Total
Leópoldville	2.2	1.4	5.0	0.1	0.9	0.1	9.7
Kivu	0.7	4.8	9.2	0.1	3.4	0.6	18.9
Kasai	2.1	2.8	3.2	0.1	0.9	0.4	9.5

/1 Conversion factors: insects, 20%; from hunting, livestock, fish, poultry: fresh 20%, smoked or dried 50%. One child = 0.5 adult equivalent.

Source: As for Table 2.

14. Comparable figures on vegetable sources have not been compiled for the whole country; some very rough estimates for selected areas are shown in Table 4. In Bandundu and Kasai Occidental, groundnuts and maize are much more important as sources of protein than they are in Kivu. On the contrary, haricot beans are the dominant source of protein in Kabare territory of Kivu province, whereas they are much less important in the other two provinces.

cassava, the most important food crop in Bandundu and Kasai, has been excluded for lack of reliable estimates, but it is in any case extremely low in protein content 1/.

Table 4: VEGETABLE PROTEIN AVAILABILITY, SELECTED AREAS
(gram equivalent per person per day)

Area	Maize	Millet	Groundnuts	Haricot	Rice	Sweet Potatoes	Total
Bandundu/1	2.7	1.2	8.3	-	0.4	n.a.	n.a.
Kasai Occidental	4.2	0.1	7.4	1.3	1.2	n.a.	n.a.
Kabore (Kivu)/2	-	1.9	-	14.3	-	6.8	30.6/2

/1 Calculated using mission estimates for maize production and Ministry of Agriculture estimates (1969) for other products. Protein equivalents taken from Vanneste, P., Comparaison de la Valeur Protéique d'un Bidia Ordinaire avec un Bidia Enrichi par la Farine de Soya. Tshibashi, mimeo.

/2 Source as for Table 1. Note that total includes meat (3.3 g) and fish (0.7 g), which corresponds to the Kivu average for meat (Table 3) but is much below for fish.

15. Protein Requirements. Protein requirements differ somewhat between men and women, but roughly speaking the gross requirement for an adult is about 0.5 g per kg of body weight 2/. A growing child requires about three times as much, about 1.5 g per kg of body weight. The age, sex and body weight distribution of the population is not the same in all parts of Zaire. Roughly speaking, however, somewhere between 30 and 35 g per day would seem to be a minimum requirement in most areas. When this range is compared with rough estimates of protein availabilities (Tables 2 and 3), it is easy to understand how the symptoms of protein deficiency described earlier came about.

1/ The adequacy of protein supply is complicated by the chemical properties of the amino acids involved, and also by the relation of protein supply to calorie supply. Of the amino acids which make up proteins, 10 are unique in the sense that they cannot be replaced by any others. The human body needs these 10 acids in certain quantities and in the proportions found in an egg or in mothers' milk. Absorption of protein intake is in proportion to the amino acid which is available in the lowest concentration. Thus, for example, the protein supply from a diet consisting almost entirely of grain is limited by the amino acid lysine. In contrast, legumes such as peas or beans are relatively rich in lysine. Thus a combined diet of grain and legumes is more beneficial than the same total amount of protein from grain alone. Also, the calorie component of a diet can "overpower" the protein component to some extent, if the proportion of protein by weight is below a certain minimum. An example is found in parts of Kivu, where the dominant source of calories and the dominant source of protein is the same, namely haricot beans.

2/ Most estimates of protein requirements are based on the recommendations of a joint FAO and WHO committee of experts (1965).

16. Also, the complicating factors should not be forgotten -- there are sharp geographical differences in supply; the better-off members of the community will receive a higher share; adults, more than children; supplies are unevenly distributed through the year, etc. While these points may seem obvious, they can all too easily be forgotten when it comes time to recommend programs for alleviating protein deficiency.

The Role of Agriculture

17. Limits. The first and most obvious limitation on the role of agriculture is lack of consumer acceptance of specific food products or programs. Any number of soya schemes in Africa have failed for this reason. The practical implications of this limitation are twofold. The first is the importance of trying to increase the availability of protein-rich foods already consumed by the population. This course of action depends on the potential of particular local foods as well as the strength of dietary habits -- preferences or taboos can preclude increased consumption of foods that do have potential by the groups in the population that most need extra protein (e.g. eggs for pregnant women in Kasai). The second implication is that careful study of existing dietary habits, and the acceptability of possible modifications, should precede any major agricultural campaign to introduce a new food crop as a means of alleviating protein deficiency.

18. Another limitation on the role of agriculture is suggested by the high relative importance of "natural" sources of protein, such as insects, hunting and fishing. More effective results might be obtained by devoting limited resources to improving the "yield" from these sources rather than by using these resources for a more conventional agricultural program. For example, research carried out before independence in the Kwango district (present Bandundu province) came up with several possible means for increasing the harvest of insects. Some of the means (forbidding the felling of certain trees or harvesting pupae; adhering to a certain timetable for burning the savannah) would involve propaganda campaigns and possibly also certain enforcement staff. Sufficient information is not available to permit a judgment as to whether this sort of program would be a more cost-effective means of reducing protein deficiency than more conventional agricultural alternatives (e.g. soya or beef cattle development). The basic point is that, before agricultural programs are initiated, alternatives based on "natural" resources ought to be considered.

19. A third limit on the role of agriculture is based on the complicated chemistry of proteins (see footnote, para 15). Measures to increase protein supplies are more effective if they "fit in" with the existing production pattern in a technical sense -- that the amino acids supplied supplement rather than duplicate the amino acid composition of existing consumption patterns.

20. Opportunities. In view of the need to tailor agricultural programs to specific local characteristics of the protein supply, it is not possible to say very much in general terms about opportunities for agriculture. An

exception relates to the urban centers, where protein deficiency is primarily a problem of poverty. The general opportunity here is the downward pressure on prices that increased agricultural production, and especially yields, would create. This potential to influence protein-rich foods in this fashion is less important for Kinshasa than for cities in the interior. In Kinshasa, apart from tariffs and small transport costs, it is world prices that largely determine wholesale (but not retail) prices. Elsewhere prices should be more responsive to output increases. Suppose that an agricultural intensification scheme in Kasai Occidental significantly increased groundnut surplus in the province; some decrease in the price of groundnuts could be expected, and hence, the dietary standards in Luluabourg would be improved as an indirect benefit for the scheme. It should be noted, however, that prevailing retail margins (See Annex 2) would tend to dilute this effect.

21. A few specific comments can be made in regard to agriculture's potential role in the Kasai Occidental and Bandundu areas where protein deficiency is chronic. These comments are quite tentative and are intended more to raise questions than to provide answers 1/.

22. Kasai Occidental. The most striking agricultural opportunity in this region is no doubt further development of soya cultivation, possibly in connection with area development schemes. Since soya beans must be given a simple heat treatment (to eliminate certain toxins), and then milled before consumption as flour, it will probably be necessary to expand the number of processing centers, which require simple hammer mills. To ensure satisfactory results it might be advisable, at least initially, to entrust soya processing to religious missions in the province. Since there are at least two or three missions in every territory, this should present no problem. Seed distribution could take place through the same channels. Seed multiplication may perhaps be taken up at a later stage by the two stations at Bena-Lango and Panya, which are to be reactivated with Belgian assistance.

23. There is almost certainly potential for developing livestock in the region, especially small stock like goats and poultry. Government estimates show a total goat population of over half a million in the two Kasai (roughly three-quarters in Kasai Oriental). The figure for beef is not much more than 10% of this and, what is more, the ownership pattern is entirely different. Goats are owned by villages, whereas the greater part of the cattle are in the hands of one large ranching society and the religious missions. What little beef is consumed in the province is almost entirely in Luluabourg and Mbuji-Mayi, where per capita consumption is about 1 kg per capita per year. Even this small amount is not evenly spread through the population because of the relatively high price of beef.

1/ For additional comments on the zone of Kivu, see Annex 5.

24. The potential for fish is not especially promising. Estimates of the total potential for the Kasai river and its tributaries are only about 8,000 t a year, most of which would not help the areas in southern Kasai where protein is short. Potential for fish culture is also rather poor in general for southern Kasai, western Katanga, and the southern half of Bandundu 1/. Despite the poor conditions, it might be possible to promote fish culture in the area around Kikwit in Bandundu, where some spontaneous activity has taken place in recent years; but without such an indication of local interest in Kasai, it would not appear a promising opportunity there.

25. Consideration might also be given to voluntary resettlement within Kasai Occidental as a means of relieving areas chronically deficient in protein. Two development schemes having the support of the provincial authorities are discussed in Annex 4. Mweka territory, north of the railroad, would appear to be an especially promising area for resettlement, since soil potential is favorable and the population density is low due to lack of secondary roads. As one limitation to this approach, the people most affected by chronic protein deficiency are at the same time the ones least likely to undertake voluntary resettlement.

26. Kwango-Kwilu (Bandundu). Among existing crops, there appears to be some potential for expanding production of groundnuts, rice, and voandzou. A Chinese team based at Kikwit has already started investigating the scope for rice. The team will also experiment with soya interplanted in customary cassava fields. It is to be hoped that this experimentation will be complemented by dietary studies of the sort done in Kasai. Voandzou is reported to be a common crop well accepted by the local people. If this is true and consumption can be expanded, it could be an alternative to soya as a source of protein.

27. The position in regard to livestock is roughly the same as in Kasai Occidental, though the concentration of goats in relation to the human population is higher (about 1:7). While the fishing potential, both natural and artificial, of the Kasai and its tributaries is not great (para 24), there is a significant unexploited potential in Lac Leopold II in the northern part of the province. Estimated potential is 10,000 t per year compared to a current yield of 225 t annually. The natural outlet for this production would appear to be Kinshasa, but appropriate efforts at improving marketing links between the lake and the southern part of the province could make possible some diversion of supplies in the direction of Kikwit.

28. Possibilities for improving insect "yields" should not be overlooked. Moreover, since the Kwango area is a traditional source of honey, and since the population of this district includes numerous people who

1/ Cf. paper by A. de Bent in Séminaire sur L'Alimentation et L'Economie Rurale, I.R.E.S.

subsist on hunting, it might be worthwhile to explore in detail the prospects for encouraging honey gathering, both as a direct source of protein and as a source of cash income.

Concluding Remark

29. If these comments on agriculture and the problem of alleviating protein deficiency seem fragmented and rather ad hoc, that is probably an accurate impression of agriculture's role in this complicated matter. Sweeping solutions that apply over wide areas are very likely to be inefficient or even, in part, unacceptable to the people they are supposed to help. The range of situations in which protein deficiency arises; the variety of available sources; the diversity of dietary habits and taboos -- all these factors prescribe programs that are multifaceted and carefully tailored to the needs of the particular situation.

ANNEX F Projected Total Consumption of Selected Agricultural Products, 1980 and 1985

Crop	Production 1973-74	Consumption 1973-74	1980 Low/a	1980 Med./b	1980 High/c	1985 Low/a	1985 Med./b	1985 High/c
	1000 MT							
Maize	365	528	627	684	742	786	851	917
Rice	233	240	314	328	342	376	393	409
Wheat	3	142	182	191	200	219	229	239
Millet & Sorghum	26	26	31	34	36	36	39	43
Groundnuts	165	165	228	231	234	262	265	267
Potatoes	26	26	28	31	34	36	39	42
Sweet Potatoes	355	355	428	431	433	490	498	500
Cassava	9750	9750	11520	11550	11580	13230	13260	13260
Sugar Cane	60	78	88	94	100	108	115	121
Banana	1250	1250	1480	1510	1540	1740	1770	1800
Meat	41	55	71	80	88	92	108	118
Cotton, lint	22	16	20	22	29	26	30	36
Tobacco	1050	1050	1312	1426	1512	1637	1768	1833

/a Assumes no increase in income and continuation of recent consumpt rends

/b Assumes a 1-1/2% per year increase in income and continuation of t consumption trends

/c Assumes a 3% per year increase in income and continuation of rece nsumption trends

Source: TVA, Supplying Fertilizers for Zaire's Agricu al Development (Kinshasa:USAID, 1975

PROJECT ANNEX G

Name of Project: Construction of a pilot soybean flour factory.

Location of Project: École Technique Secondaire Superieur d'Agriculture, Tshibas

Pere Vanneste of ETSA, Tshibashi has conducted numerous trials to determine the best varieties of soybeans for production in the Luluabourg area. These varieties have now been distributed to farmers and production is increasing with each planting season. Field production is encouraged because of the protein value of soybeans when used in local diets.

Starting in 1966, 950 kilograms of soybean flour were produced at ETSA for use as a dietary supplement. It is estimated production for 1970 will be 35,000 kilograms. Farmers are paid eight to nine makuta per kilogram for the soybeans and the flour is sold to hospitals and stores for 15 makuta per kilogram. Current demand is in excess of ETSA's capacity. Demand is estimated to be in excess of 80 tons this year.

Interest in the use of soybean flour for nutritional purposes is increasing in all parts of the Democratic Republic of the Congo. This plant will, for the short term, meet some of the growing demand for soybean flour. More importantly it is a pilot plant, and with proper supervision and publicity will encourage the development of similar plants by the private sector in other regions of the Congo.

ETSA agrees to maintain complete documentation as to costs and profits of the pilot plant in order that this information may be available to other parties for the development of similar or larger plants as the future demands. Such documentation will also provide a basis for establishing an amortization, or repayment schedule, for the interest-free loan provided by counterpart funds. The amount of funds to be provided is zaires 24,750. The plant will also be used to provide training programs for students at ETSA, thus expanding its importance in the future development of such plants throughout the Congo.

The supervision and operation of the plant will be under the direct control of Father Vanneste and other Fathers working at ETSA. The counterpart fund contribution, as mentioned above, will be in the form of an interest-free loan with repayments scheduled to begin after the plant commences to earn a profit. Joint discussions by ETSA, the Ministry of Agriculture and USAID will determine the repayment schedule.

T [illegible] will be utilized for the construction of a 10 x 20 meter building, construction of two silos inside the plant for the storage of soybeans and corn, the purchase of soybeans, and for the initial operating costs. The Catholic Relief Service has contributed $16,200 for the purchase of equipment. This equipment includes a roaster of 75 kilograms per hour capacity, a 22 KVA generator, a grading and drying machine, seed cleaner, bag filling machine, equipment to print bags, and a mixer yet to be purchased.

The Ministry of Agriculture has contributed one large grinder for milling the grain. The Ministry of Education has contributed a 44 KVA generator.

The counterpart fund loan will finance the following activities:

Counterpart Fund Loan

Construction Costs	
1. Construction of plant building	10,000 Zaire
2. Construction of storage silos in plant	7,500
Operating costs for starting the plant	1,250
Cash for ETSA Tshibashi	18,750
Purchase and importation of 100 tons of soybeans	6,000
total amount for reimbursement to Counterpart Fund	24,750

Proposed Loan Repayment Schedule

Repayments are scheduled to begin at the end of the second complete year of factory operations. There will be three (3) annual payments of Zaires 8,250 each to amortize the loan.

The proposed repayment schedule will be subject to renegotiation if such an action is deemed necessary or desirable. Any changes would have to be approved by the Director of ETSA Tshibashi, the Ministry of Agriculture and USAID.

Repayments will be deposited to the Special Account to be reutilized for projects as agreed by the Counterpart Commission.

Seen and Approved by:

Ecole Technique Secondaire
Superieure d'Agriculture,
Tshibashi

Construction of a Pilot Soybean Flour Factory

Project AA-6-243

The project agreement was signed August, 1970, providing 24,750 zaires as a loan for the construction of a flour factory. This money is to be repaid in three annual payments commencing at the end of the second complete year of factory operations. In addition, the project requires an amendment providing a grant of 10,000 zaires covering the cost of importing 100 tons of soybeans to put the plant in operation. All processing equipment has been donated by the Catholic Relief Service, the Ministry of Education, and the Ministry of Agriculture.

The writer visited Luluabourg during December to check on the progress of contruction. Construction is now planned to commence about the end of January; after all materials have been purchased and delivered to the site.

Construction will be supervised by one priest released from other duties in order that he may devote full time to this activity. Purchase of supplies has been hindered by the Manager of the Banque du Congo refusing to release project funds on deposit at the bank until he had received a copy of the Ministerial order establishing the project. We have requested the Director of the Banque du Congo's assistance in ordering his manager to release the funds.

In the interim, small amounts of flour are being produced daily -- 280 - 300 kilograms. Production is expected to expand once the factory is completed and equipment is installed.

Everett L. Headrick
January 1971

ANNEX H

TECHNICAL ANNEX

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Citoyen Nzundu, Scientific Director, INERA

Citoyen Jean Talla, Chief of Soil Section, INERA

Citoyen Kurayum M'BUS, Chief of the Bureau of Soild Surveys, Yangambi

Citoyen Diandja Atomonda Nsandu, Director of Administration, INERA

Citoyen Moju Nyenye, Chief Secretarial Section, INERA

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Citoyen Lizwa, Administrator

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Mr. Ahmed Eid, Agronomist, FAO

Mr. Charles Coursier, Agronomist, FAO

I. SURVEY

A. Kinshasa

1. Background. With the assistance of Bill Garvey and Marie Stephan, the complete files of the Foo and Agriculture Division were reviewed for background.

2. Interview with the Director General of Agriculture: The purpose of the project were reviewed with Citoyen Mukendi Mbuyi Tshingoma, Director General of GOZDA, at the outset of the mission (Annex D). Citoyen Mukendi is a professional agriculturist and formerly director general of INERA.

3. Discussion with Dr. Thomas G. Hart, CIMMYT representative in the PNM project: The purposes of the project and ways and means of integrating its outputs were discussed with Dr. Hart, and he said that he would do what he could to support it

B. Yangambi

1. Interviews and observations:

a. M.Nzundu, Directeur Scientifique General of INERA. Ingenieur Agronome of the University of Lovanium with three years experience in Gandajika, and one year at Bambesa station. Was appointed to the present position one year ago.

He stressed the need of assistance in the legume problem, and the severe protein shortage especially in the Eastern part of the country, or the Kivu area, where there is the highest population density. This area is served by the INERA station of Mulungu, located approximately 20 miles north of the capital of this region (Bukavu) at a short distance of the airport.

). M. Jean Talla: The soils section of INERA which s the central soils laboratory where almost all amples coming from all parts of Zaire, should be analysed, was inspected.

This section is at present headed by Citoyen Jean Talla, of Cameroun nationality, who received his training at the Lumumba University, Moscow, USSR. He gave the impression of having the broadest view on soil science. The lab space which is available is about one hundred square meters. At present the power plant for the whole Yangambi station lacks oil to produce electricity during weekends and after 21 hours. All air conditioning equipment has been transferred to the University buildings and no electric lab equipment is working. The climatic conditions at Yangambi make it imperative to have air conditioning.

M. Talla stated that the lab at present is capable of making the following analysis:

- Soil texture, particle size distribution
- Cation exchange capacity, at pH 7
- Exchangeable bases, Ca, Mg, K, Na
- Exchange acidity and exchangeable aluminum
- Carbon, total Nitrogen, nitric and ammonium N
- Total Silicium, Aluminum, Iron oxides.

It was not possible to obtain any information the number of samples which has been sent from the outside to the lab during the last few years. A very few came from Yangambi for determination of clay content. Probably none are anymore sent to this soils laboratory, which apparently is in a dorment stage.

The methods which are still considered for analysis are those that were instituted several years ago, before independance, and a few number of the previous analysts are still sitting at their lab tables.

M. Talla thinks that a thousand samples could be treated at present for the determinations which were mentioned above, if enough chemical reactants were available.

The Section de Pedologie is divided into two parts. The first, which is mainly carrying out

analytical work was described above. The second is the soil survey and classification group.

Two soil scientists are attached to the group: Dr. Kurayum-Mbus, Ingenieur Agronome, Pedologue of Zaire, who was trained at the University of Ukraine at Kiev, USSR; and Mr. Mondjalis Poto, who had his agricultural high school education at A & R, Belgium, and followed the soils courses at the University of Ghent, Belgium.

They have practically no equipment and claim not to have any opportunity to travel. Except for Mr. Mondjalis, who worked with a Belgian mission for six months at Kaniama, Shaba, they have apparently not produced any maps.

2. Prospects: The Yangambi INERA station suffers from severe isolation from almost everything except the forest environment. In the actual conditions it can only with great difficulties, which will not be easy to overcome, play a small role as a central agronomic research station which has to serve the whole country. The lack of communication with other parts of Zaire will for a long time in the future constitute a tremendous handicap.

The role of the INERA group at Yangambi will in the future most likely be restricted to applied

and adaptive research for the Central Equatorial Forest region.

This is essentially an area with plenty of land, a negligable population pressure, where it will for long years to come continue to be cheaper to open new fields instead of maintaining their fertility by costly fertilizer or any type of intensive farming. Soil conservation and optional land use is best achieved by tree crops and some subsistance annual crops. It may be pointed out that oilpalm and cassava are in the local diet important food crops. Bananas and rice are widespread.

a. Laboratory work: In this perspective it is not felt that a first priority should be given for establishing at Yangambi INERA station a costly, highly specialized soil fertility laboratory, as the list of equipment submitted by INERA suggests, capable of handling a very large number of samples in a very short time.

The effort should rather be restricted to restoring the capability of the lab to determine chemically the levels of N, P, K, Ca, Mg, K, Na, Al, Mn in order to support the experimental work on the utilization of fertilizers on bananas, oilpalm and cassava at the station. Cocoa and

coffee trials could also be considered. There is no such work going on at the moment, except for small fertilizer tests in old palm tree groves which are replanted. A program, to support this work should obviously also consider the purchase of various forms of fertilizers.

b. Bureau de prospection: Three years ago the Agriculture Faculty of the National University of Zaire (UNAZA) was transferred to Yangambi, and is progressively taking over and occupying a great part of the laboratory space, buildings and houses which previously belonged to INERA.

Since soil survey is highly dependent on trained soils people willing to work in the field under strenuous conditions, the presence of education facilities at Yangambi justifies in part the policy of keeping a soil survey group on the station and supporting a routine soil survey laboratory.

The next mission should also evaluate training facilities at the Lubumbashi UNAZA campus, where the faculties of geology and geography are located. Soil survey is one of the earth sciences which perhaps may be more adequately served at these faculties. This point needs further study, however.

It was estimated that at present approximately 2 to 4 ingenieurs agronomics interested in soils are graduated each year. According to Dr. Mukendi, Professor of Soil Science, there is practically no interest shown by University trained ingenieurs agronomics to engage in soil survey field work. Strong incentives to attract them and interest them in mapping should be created (perdiem, etc.)

During the time of the visit at Yangambi, a field trip in the area was organized, and a typical soil profile of the area was discussed with practically the whole Zaire team of soil scientists, and some last-year students. These students left a very favorable impression by the quality of their questions. A great effort should be made to keep the enthusiasm of these few young men alive by giving them work opportunities which correspond to their training. Otherwise they will be lost very quickly.

The following solution which seemed to have the highest possibilities of success was discussed with the full INERA soils group, and the directeur scientifique of INERA, Citoyen Zundu.

1. Fellowships to about thirty Ingenieurs technicians of secondary agricultural high schools

for intensive training at Yangambi, about 3 months in soil survey techniques. The recruitment would best include nationals of all parts of the country. The curriculum would be both theoretical and practical with an emphasis on field operations. Notions of topography, landforms, rock types, profile description, sampling, and use of aerial photographs would be given at this courses.

A modus-vivendi between UNAZA and INERA should be worked out with outside help to organize the course. Labor and vehicles, transportation and field equipment supervised autonomously by the project should be at hand. The teaching staff should establish grades and rank the candidates for recruitment into the INERA teams. Depending on the success of this operation, it could be repeated regularly, according to national needs.

2. Formation of survey teams, assigned to specific development areas, to be selected by the project and related to the legume - food - crop program. They would either assist in identifying and selecting the experimental plots where soil maps are available, or/and map regions which have not been surveyed.

This on-the-job training should be supported by an experienced soil survey specialist in each team. Tentatively a team would include the following personnel:

(Assuming as an example a survey of 100.000 ha/year at 1:100.000 scale with sampling areas at 1:50.000), in man/years

1 University trained
Soil Survey Officer
2 or 3 other specialists
5 Assistant Soil Surveyors
7 team leaders for supervision of labor, drivers, camp leaders
1 USAID Soil survey officer
2 or 3 USAID Consultants

Field operation equipment, vehicles, camping facilities if necessary should be purchased and strongly supervised by the mission leader. The equipment will differ from one place to another and can be more specifically itemized when the areas are selected. It depends on local ecological conditions and pressure of time

They would operate from regional headquarters at established experimental stations or cities, and partly return to a central INERA Soils bureau at the end of the mission for report writing, final drafting, interpretation and analytical work. The part of the personnel remaining at the surveyed area, would form a nucleus for possible regional offices, or any other follow-up actions.

The on-the-job training of the Zaire University personnel should be completed by fellowhips at U.S. Universities for advanced studies on soils and problems related to the areas which have been mapped.

The number of teams will depend on the overall purposes of the project itself. It should be kept in mind however that previous experience has shown that the most only one - fifth of the field soil survey specialists stay on their job beyond 5 years, and that many must be trained in order to keep a few.

At present several regions have been mentioned by the project request for legume production: Boketa (in the Ubangi region, N.W. Zaire), Mulungu (in the East Kivu region, close to Bukava), Gandajika (Kasai), and Mvuazi (lower-Zaire). Only Yangambi (INERA Headquarters), Mulungu, and Gandajika were visited by the PRP team.

3. Review of INERA Request; The following comments are related to the request submitted by INERA by their covering letter CAB/DG/894/75, June 23, 1975 and the annexe dealing with item A (section de Petologie).

In the list of the equipment which is requested, only a very low priority can be given to the following apparatus: X-ray diffraction and spectrometre (No.2 and 3), technicom automatic titration equipment (No.7), differential thermal analysis and thermogrametric equipment (Page 15, 16), Zeiss planimat (ig). They are not needed for the applied or adaptive research purposes connected with the food crop production project. Neither is the thin section equipment for petrographic analysis of rocks which is listed under "indicateurs" Polarimeters for sugar determination are not essential

The list of chemical reagents to be purchased does not include quantities. It was not possible to know during the short time available what had already been ordered, was available or would arrive from elsewhere. The same comments apply for glassware.

The laboratory handled routine analysis for soil survey purposes on approximately 10,000 samples in 1960.

A rough estimate for the future, which will need checking by the next mission, would be a yearly lab budget of $25,000, plus the requested atomic absorption apparatus which for the project duration will probably amount to an expenditure of $25,000

It is at present not possible, with the documents at hand in Zaire to give more accurate figures. Members of the Cornell Staff at Ithaca could perhaps make better estimate by assuming routine analysis of three thousand soil survey samples per year, for determinations including texture, carbon, nitrogen, pH, cation exchange capacity by NH_4OAT, pH7, and Na OAT, pH8.2, exchangeable, cations Ca, Mg K, Na, AC, H, free Fe_2O_3, conductivity, water content at 15 bar tension, manganese, zinc, molybdenum and boron.

C. Mulungu Station

1. Staff: The s

consists of:

Director:	Citoyen MUZINGA, Ing.Agro of UNAZA, 1172
Administrator:	Citoyen LIZWA
Accountant:	Citoyen ALIYA

Projects

Coffee, tea, quin quina:	Citoyen MWANZA, Ingenieur Technician
	Citoyen MOSSOLO,
Pyrethrum Project:	Mr. DOLPIRE, Belgium
	Ing. Agronomie Gembloux
	Citoyen MBIKAYI, Ing.Techn.
Legume Project:	Mr. SCOHIER, Belgium
	Ing. technician
	Citoyen MIASUEKAMA, Ing.Agr UNAZA, 1975
	Citoyen (expected this year) UNAZA, 1975)
Cattle: (Brown Siusse):	Supervied by Cit. MUZUNGA
Foresting :	(latent)

2. Survey: The Mulungu - Tshibinda station covers an area of approximately 1000 ha. between the altitudes of 1700 to 2100 meters. It is located 25 Km from the city of Bukavu, connected by asphalt road, and receives electric power from the city's hydro-electric plant (220 V). From Bukavu there are paved road connections to Bujumbura (capital of Burundi), to the port of Uvira where imports and export to the Indian Ocean takes place through Tanzania. Other roads

also allow access to most ecological areas of the Kivu region, which is extremely variable. The official Bukavu airport is located at 5 Km. from the station and receives fully loaded Fokker twin-engines planes and partly loaded Boeing 737.

At ten minutes driving distance at the IRSAC station maintains a medical staff of CEMUBAC, who conduct nutrition studies on children and mothers. They run a laboratory to determine protein groups in blood, and carry out special studies on Marastic Kwashiorkor (protein deficiency) and gloitre (Iodine). They found correlation with manganese in soils.

Soils are derived from basalts and some similar families with those occurring in Hawaii may be found, making transfer of technology more efficient. They are only representative of the basaltic region of Kivu, however, and a series of local experiments in other parts of the area will have to be concluded. A generalized soil map of the Kivu highlands has been published by Pécrot, and some parts of the lowlands towards the Zaire basin have been mapped by Jamagne. Both maps follow the INEAC legend of 1960. The mapping units

will need to be redescribed in terms of the USDA Soil Taxonomy in order to broaden the scope of comparison. Probably the climatic regimes of Kivu cover the Ustic, Udic and Perudic ranges, and the temperatures vary from isomesic to isohyperthermic.

The INERA station has a chemistry (pyrethrine, quinine determination) and a soil science laboratory. The soils part has been inactive since 1960. At present there are about 100 m^2 in lab space (soils) but this could be doubled if the basement were remodeled. There are three (+) 75 m^2 newly built greenhouses with thermostatic (Honeywell) temperature control (fuel oil).

Except for the end-over-end shaking machine (48 flasks), Attenberg cylinders (20), and Kjeldall digestion set (6), the rest of the equipment will need to be replaced. Nobody is in charge of the labs. Chemical reagents and fertilizers will have to be renewed.

If the foodcrop (legume) project is to have a direct impact on the nutrition of the population, the Kivu highlands certainly are a priority area. The population density in the highlands is estimated at 250/Km^2, the highest in Zaire.

During an interview with Father Farcy at Bukavu who carried out social studies in the area of Ikoma,

on the road Kabare-Walungu the population increase is 35/1000/year. The area of arable land was about 0.21 ha/inhabitant in 1948; 0.17 in 1969, 0.16 in 1970. At present child mortality is reducing the population growth. It is estimated that in this type of soil 0.60 ha is the minimum requirement for mere subsistance. Figures of 214 and 320 inhabitants per arable km^2 have been reported

At the IRSAC station, close to Mulungu (Institute de Recherches Scientifiques in Afrique Centrale) a medical team has published statistics on occurrence of Marastic Kwashiorkor in the Kivu area.

Malnutrition is increasing at an alarming rate; it affects mostly children between 6 months and 1 year of age. The 1974 CEMUBAC report mentions infant mortality figures of 230 per thousand. Statistics show that the situation is getting worse every day, and is more dramatic in rural areas than in the cities.

It is not restricted to proteins. Fats are also becoming extremely expensive and road deterioration hinders imports from Kisangani. One liter of palmoil is sold for 1 Zaire at present, which is prohibitive for most people, even if it were available in rural areas.

The station has a collection of several varieties food crops which are listed below

Potatoes	7
Cassava	27
Bananas	30
Lupin	2
Sarasin	2
Sorghum	14
Elensine	11
Sweet Potatoes	79
Corn	17
Soya	168
Phaseolus	218

Most of the land is hilly and occupied by either bananas (for beer and food), beans (phaseolus) and corn. Fallows are invaded by Digitaria which is very hard to eradicate. Erosion is a very serious problem. The valley bottoms with organic soils are used mostly for sweet potatoes, and are often artifically drained by primitive methods.

There is local experience with the introduction of soybeans in the rotations and the admixture of whole soybean flour in the diet. They are carried out by missionaries at Murhesa, where it is presently sold at 28K per kilo. A toasting plant and a mill driven by local hydro electric energy supply is running at this mission, but the supply

of soybeans is too small to meet the demand. The same group of missionaries is presently trying to repeat the experiment in the northern part of Kivu. In several locations old coffee plantations are transformed to cropland.

The Mulungu station is running experiments on Phaseolus- Corn rotations which include comparison of varieties, date of planting, densities and herbicites.

They consider the Quarantino 817 variety the best adapted to the station conditions.

In soybeans the IR 09 (from ISAZ Experimental station at Rubona, Rwanda) and the Santa Maria, and Imperial (= SJ 127) are among the best.

No fertilizers are used at present, and, no inoculation tests have been carried out. The Rubona station in Rwanda which operates in comparable climatic conditions has published results on the effects of Inoculation of legumes (see A. Camerman. L'inoculation des légumineuses au Rwanda. Bulletin des Recherches Agronomique de Gembloux, volume hors serie, pp. 235-242, (1972)).

According to Citoyen Muzinga there are good prospects of obtaining the cooperation of local farmer communities in Kivu to run experiments.

These, of course, would have to be protected against theft.

It is felt that there are two possible ways out to the growing demographic pressure which agricultural development can help to realize. The two solutions are not mutually exclusive and will probably have to be combined. The first is increasing the yields per unit area of the actual cropland, by proper use of fertilizers, varieties and rotations. The second is the transfer migration of population down to the West in the forested area of the Zaire river basin.

Both alternatives justify adaptive research with an important soil science component, either in soil ferility and chemistry. and/or survey. The wide range of ecologic conditions and the specificity of some of the legumes which are grown with relation to the Rhizobium symbiosis, would require the contribution of a soil microbiologist. The ratio of inputs between soil chemistry /soil survey to be established at Mulungu will depend on the strategy of agricultural development defined by the project. At any rate, there is no doubt that the properly planned use of fertilizers, will have to increase in the future.

The Kivu area is an optimal region for training field soil scientists, and could ideally serve the purposes set out for the survey teams which were mentioned in the comments on the visit to INERA Headquarters at Yangambi. The soils spectrum in Kivu is by far much broader, and more diversified than the Yangambi area.

Some suggestions were made by Citoyen Muzinga. He insisted on assistance in soil conservation, specifically the control of erosion. He was also aware of the language problem which will arise in a U.S.-Zaire technical assistance program, and suggested that the Zaire cooperating staff would be authorized to take intensive courses in English at Kinshasa before the arrival of the U.S. personnel, of course, the U.S. team would need to be proficient in French, especially if non-university people are to be trained. He also stressed the need of training abroad, not only for the personnel involved in technical work, but, also for the executive directorate staff. He also proposed visits to English speaking African countries such as Uganda, Tanzania.

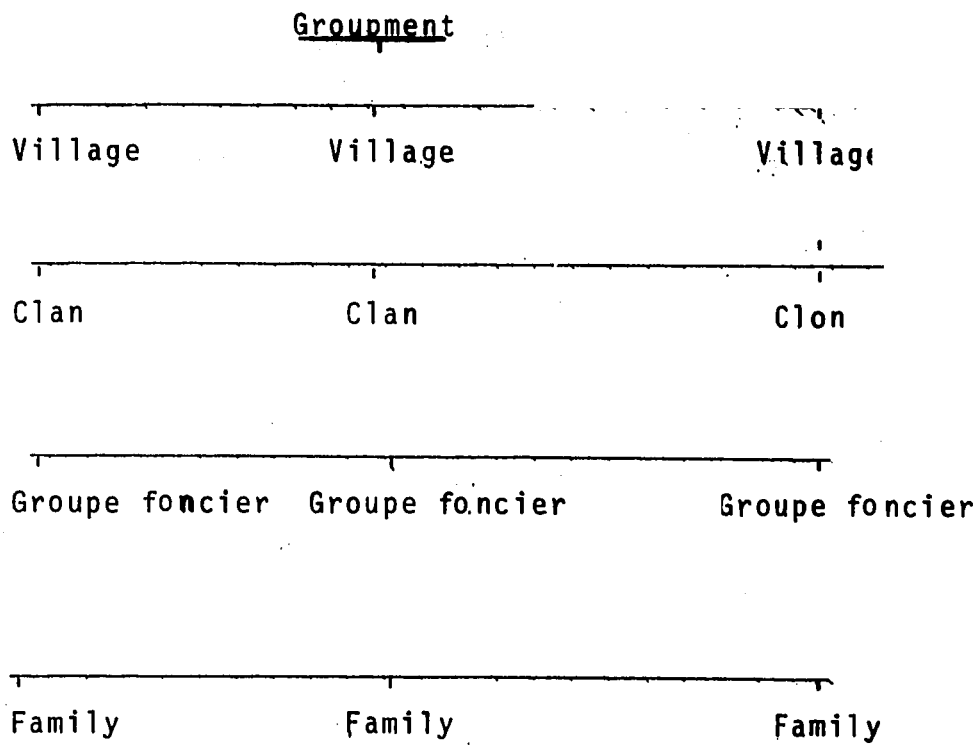
As in many other stations, the library is in a very poor state, and interrupted subscriptions to most periodicals would have to be renewed and missing volumes purchased.

D. Gandajika

1. Target area: The initial target area, between 6" and 7" lat. and 22° and 24° longitude was mapped at 1:200,000 scale with the INEAC legend in 1958. One-fourth of a one square degree block surrounding the station was mapped at 1:50,000. (INEAC Soil Series No.15, Brussels).

2. Social structure and attitudes: The initial target group, in the Gandajika area include the Luba, Lulua and Kanyoka. The Luba dominate in numbers, dialect and social structure, but not always in political force.

The social structure is patrilineal and geometric, on this approximate order :



(from H. Beguin, "La mise en valeur agricole du Sud-est du Kasai", Série Scientifique No.88 I.N.E.A.C., Yangambi, 1960.)

The social structure among the Lulua and the Kanzoka is not as clear, nor as complex as among the Luba. Neither are the social bonds as strong. Hence the Lulua and the Kanzoka exercise more freedom to break away from their clans and groups than do the Luba.

Historically, it has been accepted that the necessities of life may be considered personal property but any surplus that may be accrued must be available for the benefit of the group. The group could progress, but individual advancement above the group level appeared difficult.

This was believed to dampen the enthusiasm for work leverages. On the other hand efforts and progress toward the elevation of group well-being is evidenced; hence the people are accustomed to working together.

Beguin observed,

"For the most part the Congolese is very sensitive to the productivity of his labor. The ratio of the quantity produced by an individual and the quantity of labor required to obtain it is a matter of great importance. Further, he will reject a new technique which requires more work on his part if he judges the incremental return not to be equivalent.....

"These attitudes are characteristic of the whole population of the region, but in varying degrees. In general the Luba possess more aptitude for the change in attitudes than the other ethnic groups." (Translation, Ibid, p.35).

In 1959, population density varied from zero to 45 inhabitants per Km 2 with 20 considered the average.

3. Contacts

a. Director of food crop research Gandajika: Citoyen Kakule Kakusi Rasiki, Director of food crop and animal research at Gandajika, is acting head of the station in the absence of the Director, who is in Mexico on a four year, CIMMYT scholarship. Mr. Kakule would be the director of the project activities centered at Gandajika. He is an A^1 Engineer Agronomist and the son of peasant parents. He appears to be serious, well-organized and all work. He has a very keen interest in increasing food legume production as a means of improving the diet of the region, especially among the poor. He personnally arranged meetings of the team with the other donor representatives and with CAKO, and directed the inspection of the clinic. It is obvious that he makes a special effort to maintain good relations with CAKO.

b. Counterpart professional food legumes. The letter of request dated June 23, indicated that one A_1 Agronomist was located at Gandajika and "several" A_2's in the area to work on food legumes. The A_1 who is apparently available is Citoyen Kakule, who would probably not be able to

devote more than 25 percent of his time to the project. Besides himself, at the station there are now two A2's who could divide their time, or possibly be divided between maize work and legume work. In addition there is one A3 who would be available to the project. The request indicated that one A2 is available at Mulungu and that two more would be provided.

c. Discussions with GOZ agencies: The Agricultural Commissioner for the Gandajika region held a meeting of the heads of the GOZ agricultural programs in the region to discuss the project. They expressed the consensus that the services offered through the project would complement their present efforts and that they would welcome it. They pointed out, however, that the policies under which they operate would have to be adjusted to provide for the inclusion of project outputs in their programs.

d. Discussions with other donor representatives: The project was discussed with the concerned field technicians of AGCD, FAO and the Catholic Mission (clinic) at Gandajika. The FAO team, which is sponsoring 2000 fertilizer demonstrations in food crops (maize and groundnuts) stated that the outputs

promised by the project are needed as services to theirs. They emphasized the need for an arrangement in the project agreement for interproject cooperation. The Mission clinic is simply interested in seeing more soybeans produced in the region.

4. Order of progressive diffusion: The order of progression of a variety or a practice developed by the station follows:

a. First there are adaptive trials and competitive yield tests on the station.

b. The promising development is farmed out to 26 traditional-type farmers settled on the station for the purpose.

c. If the new input works out and is accepted by the 26 test farmers it (in the case of a crop variety) is put into multiplication at the station, producing the equivalent of breeder seed.

d. These seeds are sold to the Agricultural Commission (CAKO) which multiplies them on a 110 hectare seed form. This activity is supported financially and technically by FED.

e. CAKO sells the increase to farmers at a subsidized price.

f. CAKO village extension agents follow through with farm demonstrations

INERA maintains contact directly or indirectly through the Agricultural Commission and thus provides direct support (presently limited to breeder seed of improved varieties) to the following organizations:

a. CAKO (FED-assisted)

b. FAO Freedom-From-Hunger Campaign, which, working through Commission agents, conducts 2000 on-farm, result demonstrations a year in an active fertilizer promotion campaign.

c. Père Vanneste at the technical agricultural school which received the counterpart loan in 1971, and his group. This group is assisted by the FAO Freedom-from-Hunger campaign through the GOZ Social Service. The whole-soy mill is operating. There is also an oil extractor mill at Isiro.

d. UNIONCOOP, a missionary-aided agricultural cooperation group at Mbuji-Mazi.

e. Cabin Sisters (District of Cabin).

5. Soils:

a. The region around Gandajika and at the station are somewhat privileged as to agricultural potentials, and some soils are either influenced by calcium carbonate - containing rocks, or are only covered by a light-textured layer, which on the high

plateaus of Kasai may reach several meters depth. Although the comparison is far from perfect, one may think of a kind of a limestone valley in the Red-Yellow Podzobic areas of the U.S.

The soils of Gandajika, therefore have a generally higher base saturation than the majority of the Zaire soils. There has been some clay illuviation, and, as far as it could be seen by augering, most profiles would fit into Alfisols with an ostic moisture regime and an isohyperthermic temperature. Most would be oxic subgroups however.

The soil problems which need to be solved and fitted into the research package are thought to be the following, without giving any priority to the sequence:

1. At the request of the Zaire staff at the station, increase the area which had been mapped at 1:200,000 scale as pilot areas for the generalized soil map, by another 100,000 hectares located surrounding the paysannats of the region.

b. Establish a soil fertility laboratory capable of responding to the demand from on-the-farm ferilizer trials carried out by the FAO fertilizer program. (2000). These would include exchangeable available P, K, Co, Mg, Al, H and pH. Organic carbon and total N could be included. This lab would also analyize samples from the INERA stations in southern Zaire, and from other institutions or farmer.

Research on the nitrogen-supplying power of soils during rotations should be carried out parallel to field trials.

c. Carry out an interpretation of existing soil maps for practical agricultural purposes and transfer of management techniques. It would include correlation of mapping units with the USDA soil taxonomy and capability and crop suitability groupings. It would also define the domains of critical nutrient levels applicable to certain groups of soil.

d. Part of the soil research program should include measurements of soil moisture stress during the various seasons at different soil depths. Correlation between 15 bar water content,

field capacity and saturation with other physical properties (texture, clay net content, etc.) will improve the quality of the soil survey interpretation work.

8. Practical Problems

We were informed that no lab space is available at present, although the phytopathology lab ($\pm$ 75 m^2) is unused at the moment. No houses ould be changed into labs or offices.

This situation could change, however, before the program would start.

The electricity is 220 Volt and 50 cycles. Voltage is variable and a stabilizer would be necessary.

II. PROPOSED PROGRAM

A. Food Legume Research and Development, A Case for a Food Production Package Program in ZAIRE

ELWIN R. DUNCAN

1. Setting: The Kasai Region: Kasai Region of South Central Zaire (± 6°5 and ± 25°E elevation of ± 1400 m) appears representive of the undulating savanna, light-texture, red soil region of south central Zaire. There is an operating INERA experiment station at Gandajika with an excellent weather station and approximately 40 years of weather data. This area is receiving attention and assistance from several international organizations and appears relatively well organized for providing certain agricultural services. One apparent problem with the international assistance groups is that they are ignoring, or at least not building the national institutions. This seems to be a short-sighted and probably selfish approach to assistance.

The soils of this area are dominantly red-and-yellow oxic paleustalts, well to excessively drained, low in organic matter, phosphorus and sulphur and relatively satisfactory in potassium. While infiltration rate is high the short duration, high intensity rainfall creates a potentially serious erosion hazard.

The climate and weather of this area is favorable for crop production and human habitation. Rains normally commence in late September and continue into early May. There is very little rain from mid-May until mid-September. This gives (±) 240 days favorable for crop production and (±) 120 days of dry weather. The annual maximum temperature is 30°C (86°F) with a range of (±) 2°C among months. The annual minimum temperature is 18°C (64°F) with a range of approximately (±) 2°C among months. Absolute maximum temperature has reached 37°C (96°F) and absolute minimum temperature have been as low as 9°C (48°F). Percent of possible sunshine for the year is (±) 52 percent and ranges from as low as 45% to as high as 92%.

Principal crops grown include cotton (a government requirement) maize, groundnuts, cassava and several varieties of beans. Additional food crops include beans, soybeans, bananas, pineapple, mangos and leafy vegetables.

The cropping systems and production practices have been influenced by the Belgians and at present are influenced by GOZ policy. The dominant cropping system is cotton, planted in December and maturing for harvest in June, the dry season.

Cotton is followed by 1/2 maize and 1/2 groundnuts, planted in late September and harvested in January. The second planting (called the second season) has maize following both maize and groundnuts, planted in late January and harvested in late May and June. The third year of the system has maize interplanted with cassava which is harvested in the fourth year. Native vegetation (largely Imperata cylindrica, Pennisetum clandestinum and other grasses and woody shrubs) is allowed to grow in the cassava and for the next 3 "natural fallow" years.

Accurate production levels are difficult to determine, but yields must be considered low by potential yield standards.

Cotton yields with no fertilizer	(±) 600 kg/ha
Maize yields following cotton	(±) 1000 kg/ha
Peanut yields following cotton	(±) 1000 kg/ha
Cassava yields (fresh roots)	(±) 25 T/ha

Beans yields are highly variable, and there is no useful information on soybeans.

Prices farmers receive for their products are highly variable, depending almost entirely on supply. All cotton is sold to the government. While the GOZ requires the production of cotton, as much as 3 years supply can be found on farms because it has not been taken by the government. The 1975 price was 7K*/kg, and the seed was discarded.

Maize prices for government purchase for the 1974-75 crop was 4 K/kg., and this price has been raised to 7.5K/kg. for the 1975/76 crop. The price in the market in early November 1975 was 10K for 3 to 4 ears (± 0.5kg.). This would be 20K/kg. (16¢/lb or about $9.00 per bu.at official exchange rates). The price INERA receive for hybrid or synthetic seed maize is 18K/kg.

Groundnut seed sold by INERA is 15K/kg. Retail price for hand-roasted groundnuts was 1K for 8 unshelled groundnuts. A Catholic clinic in Gandajika paid 20K/kg. for the last raw soybeans they purchased for kwashiorkor curative purposes, but none was available on November 6. This price at official exchange rates is about $10.00 per bushel. Prices of all crops at harvest is, of course, quite much less, but still higher than government purchase levels.

Labor supply does not appear to be a problem for traditional farmers who with family labor do their own work.

* 1 Z = $2.00 and 1 Makuta (K) = 2 cents at official government exchange rates.

Labor for working government seed production units (maize and groundnuts) is in very short supply. Wages paid is (1) 2/k per day or about 7.6.50k pe month. (At official conversion rates this is $13.00/month).

On casual observation the people, including children, appear healthy. However, the nurse at the Catholic clinic reported widespread malnutrition and there were many classic cases of kwashiorkor at the clinic. This could be a case of "cotton and cassava" poverty. Primary education is common, but not universal.

French is the language of the educated and tribal dialects the language of adults without education.

2. <u>The Importance of a Package Program</u>:

Any enterprise regardless of how large or small, consists of more than one separate input which can be identified and altered to best fit into the enterprise. In developed nations complex farming operations may use a computer to determine the specific inputs that will achieve the desired goal. Many large manufacturers use

a computer to continuously monitor, and alter as necessary, the inputs used to produce a product. The traditional farmer also uses a package of practices to yield an anticipated end product. The package for maize production will consist of time, knowledge, labor, seed, knowledge of soil, weather, attitudes of the gods, etc. The results are less precise and less dependable because of his limited knowledge of alternative practices and inputs, and the effect of changing one on the rest of the package. Commonly his attitude is one of minimizing risk rather than optimizing production, because he will not eat as well or possibly not at all in case of failure. There have been many cases of poor results among traditional farmers from using potentially high yielding rice varieties from IRRI or equally excellent wheat varieties from CIMMYT. The problem was not with the varieties, but the inability to apply the entire package of required practices. Fertilizer may not have been available, or too costly, for the farmer to purchase, inadequate rainfall at critical periods and poor weed control are factors or inputs temporarily beyond control of the farmer. A package of inputs

must be put together for the traditional farmer that is fully understood by him and within his reach. The failure of one input must not be allowed to jeopardize his results to a greater degree than would have happened with his traditional package. As knowledge increases, skills are acquired and risk levels are lowered, the inputs in the package can be altered to allow further improvement in results. The point of this discussion is that the promotion of a single practice has little chance for success when the influence of other inputs are ignored, the package approach is essential to improving the chances of success of any part of the package.

3. Apparent Opportunities for Improvement of Yields:

Traditional farmers use only hand tools (hoe, machette and a coupe-coupe) in their farming operations. There is little chance that this equipment will change in the next decade except for minor improvements. Small size of units (land is government controlled), lack of capital, total lack of mechanical skills and experience and absence of cattle militate against change to power equipment. In this area the "average"

farm consists of 1 1/2 ha. in crops and 1 ha. in fallow at this time. This can be handled by family labor.

There are, however, a number of production practice changes that can be made which will reduce labor, increase yields and make land more productive.

Altering cropping systems appear to be a simple and effective needed change. The present commonly used cropping system is shown as follows:

YEAR 1 YEAR 2

Cotton — Maize / Groundnuts — Maize —

YEAR 3 YEAR 4

Maize — Maize with Cassava — Cassava — Natural Fallow 3 years

<u>A Proposed Cropping System</u>

YEAR 1 YEAR 2 YEAR 3

Cotton — Groundnuts / Soybeans — Maize — Soybeans / Groundnuts — Maize —

YEAR 4

Maize — Stylosanthes — Stylosanthes Repeat

If it were necessary to include cassava in the cropping system the proposed cropping system could be lengthened to include one additional second crop of maize, one year of an improved 12 month maturity cassava and 1 1/2 or two years of Stylosanthes fallow.

Anticipated production over a four-year period would be as shown in the table below:

Productions in Four Years of Two Cropping Systems

(2 ha. farm)

Present System

	Without Fertilizer		With Fertilizer
Cotton,	2 ha.	1000 kg	2200 kg.
Groundnuts	1 ha.	1000 kg.	2200 kg.
Maize,	7 ha.	5600	13900
Soybeans	0	-	-
Cassava	2 ha	50T fresh wt.	-

Proposed System

	Without Fertilizer		With Fertilizer
Cotton,	2 ha.	1200 kg.	2600 kg.
Groundnuts	2 ha.	2000 kg.	4400 kg.
Maize,	6 ha.	7200	15000
Soybeans	2 ha.	1200	2200
Cassava	0	-	--

In the present cropping system cassava is not weeded in the harvest year, probably resulting in a significant yield reduction, but this practice actually constitutes the first year of fallow, followed by 3 additional years of natural fallow Land preparation for cotton is very costly, as is the weeding of cotton. The principal problem is the eradication of Imparata. This is much less of a problem with mechanical farming.

In the proposed cropping system Stylosanthes is established in the second half of the fourth year and is allowed to grow one additional year. Stylo has proved to be an effective controller of Imparata and other weed-type plants and is an effective legume. Seedbed preparation for cotton from Stylo would require much less labor than for the natural fallow. It is reasonable to expect an equivalent contribution of nitrogen of 70 to 90 kg. per ha. This could allow a reduction in the nitrogen application to cotton to be used later on maize for further yield improvement. In the proposed cropping system maize has been scheduled after groundnuts and soybeans to take advantage of the anticipated 20 to 30 kg/ha nitrogen equivalent contribution of these two legume crops.

Other cropping systems could prove even more suited, but the principles involved in the proposed system should stand.

Soil protection from water erosion should be practiced regardless of the cropping system used. None is apparent at this time. While the sandy soils have a high infiltration rate, moderate slopes and short slope length, the intensity of the rainfall will result in considerable sheet erosion. Minimum tillage with surface mulch has proven useful on similar surface soils in West Africa and may be useful here. Production practices can be significantly altered and improved without added labor or money costs, in fact may reduce labor, reduce evaporation and improve erosion and weed control. A casual review of the rainfall in this area shows that about 25 percent of rainfall occurances are more than 25 mm and a high percentage less than 15 mm. From October to May, those months without high rainfall occurances, tend to have much below normal rainfall. Practices must be developed to protect the soil from high intensity rainfall erosion and minimize the drought effects of the one to three week periods with low or no rainfall.

Planting of grain and grain legume crops should usually be completed by September 20 and it will usually be done in dry soil. Some years, such as 1974 and 1975, planting will be done in early September. Planting depth for maize should be 6 to 7 cm deep so that rainfall amounts of less than 15 mm will not result in germination. Depth of planting for most soybean varieties should be 4 to 6 cm deep; however, simple research is needed to determine depth of planting tolerance for all crops. There is no apparant justification for planting on ridges or mounds, especially on upland soil and when fertilizer is used.

Fertilizer should be banded when prices are as high as at present. Strip-tillage for seed bed preparation with the crop resedues between the rows for erosion and weed control should be considered. The common practice of deep, hand or machine cultivation for weed control with resulting ridging has serious limitations. The principal problems is that of root pruning.

Modern maize producers have long since recognized that more than 2 plants per hill or stand stand is not desirable. Decreasing the

distance between hills or stands and reducing the number of plants per hill will result in reduced competition for moisture and nutrients and larger ears, and higher yields will result. Plant spacing, planting depth, population per unit of land area, methods of fertilizer application and other productions practices should all be studied for possible significant immprovement opportunities.

Fertilizer is not much used in the Gandajika area, even though yields of most crops can be more than doubled through its use. Prices are, of course, high.

Current fertilizer recommendations for different crops are not well established through research.

For Cotton 50 + 65 + 10 + 25 (SO_3)

For Maize 45 + 0 + 0 and residual from cotton

For Groundnuts, 0 + 45 + 0 and residual from cotton

Recommendations for cotton are being revised to 60 + 40 + 10 + 25 (SO_3). This will reduce the P_2O_5 residual effect for maize and groundnuts.

Prices of fertilizer vary widely, but it appears that P_2O_5 from triple super-phosphate will cost ($\pm$) 40 K/kg. and N from urea will cost ($\pm$) 32 K/kg. Prices of potassium were not readily available, but amounts needed are small and not a big factor.

There is no apparent recognition that phosphorus and potassium do not move significanly in the soil. With the cost of fertilizer materials and the relatively low yield levels, serious consideration should be given to maximum returns from fertilizer application rather than maximizing yields. Band application and incorporating phosphorous and potassium into the soil to a depth of at least 10 cm must receive early consideration. The problem of phosphorous fixation in these soils has not been well studied. Band application of N is as efficient as broadcast applications and may significantly reduce grassy weed problems. Band application of small amounts of K, P and S incorporated in the soil is more efficient than broadcast applications of comparable amounts.

Until an effective soil testing laboratory has been established and properly staffed and correlation experiments conducted, reliable fertilizer recommendations cannot be made. This is a high priority need.

4. <u>INERA Contribution to Increased Food Production:</u>

Excellent weather data are available at Gandajika and other INERA stations. It has been collected and is available for as much as 40 or more years. When these data are summarized by

"climatological weeks" (five day climitological weeks are desirable for agricultural purposes) and probability of occurrence statements made, a most effective tool for making production practice recommendations will be available. The weather data at Gandajika are most unusual in accuracy, number of observations and length of series of years. An entomologist at Gandajika (INERA) is presently attempting to relate insect attacks on cotton with weather patterns. A proper summary of available data will make such efforts commonplace and accurate. INERA is the logical unit to complete this summary and the necessary interpretations. This should be a high priority item.

Screening and testing of grain legume and maize varieties should be the responsibility of INERA. With the present low level of funding, short-cut methods of screening and testing must be found. There is presently little opportunity for plant breeding as a method of varietal improvement at INERA because of low level funding and shortage of qualified personnel. These are, however, several international organizations such as CIMMYT and IITA which can do preliminary screening of the world collections of grain legumes, food grains and other food crops. Further screening and testing of fewer varieties by qualified INERA workers can play a significant role in providing

improved varieties for local conditions in the next decade. Closer cooperation by the international organizations with national institutions such as INERA can materially improve the effectiveness and efficiency of all of the organizations Some system of coordination is essential,as is indigenous institution building.

Alternative cropping systems to those presently used, to take advantage of legume nitrogen contributions, should have high priority by INERA. It must be recognized that definitive information may not be forthcoming in less than 10 years. but pieces of generated information can be put to use by farmers within 3 years. It is doubtful if there is any justification for fallow,as such, in this area. There is no evidence in other countries that the results of natural fallow persists or that soil structure is significantly altered under hand cultivation conditions as a result of natural fallow It is illogical to assume that significant progress with more effective cropping systems and efficient fertilizer use will not occur until the same land area is farmed by the same family over a period of at least 10 years The advantages of the more effective cropping systems and fertilizer applications will be

reflected in easier land preparation and weed control and in increased yields. The most effective systems can be researched and demonstrated by INERA.

Improved and more accurate fertilizer recommendations can be made by INERA through a well-equipped and staffed soil testing laboratory coupled with appropriate fertilizer correlation experiments. No other institution in Zaire has the potential capabilities that INERA has. As more and useful research is generated INERA must be provided funding so that extension or outreach personnel will be educated about and made capable of transmitting research information in a useful and applied manner. Soil testing and or recommendations without sound research backing is neither accurate or useful though both are commonly used in developed nations as a sales tool for selling fertilizers to farmers.

5. <u>Staffing Facilities and Equipment for a Package Program</u>: (Gandajika, Zaire, Example)

Solving the problem of increasing food crop production, improving the quality of diet and increasing income to farmers in a developing nation

is a slow and costly process. A successful effort can, in a decade or two influence an entire nation. With rapidly increasing populations and resultant pressures on food supplies, efforts must be made.

The goals of increasing total output of food grains, and improving the quality of diet by introducing grain legumes into the production scheme and into the diet is both desirable and possible in selected regions of Zaire. Soybeans, not now commonly grown, offer the greatest opportunity for improving diets and eleminating malnutrition of any of the grain legumes. The time required to accomplish these goals will be determined largely by:

(1) The food production policies of the GOZ.

(2) The level of research related to food production.

(3) The degree of cooperation between the international agencies and institutions within Zaire.

(4) The ability and willingness of government of developed nations to field teams with skills and facilities to demonstrate that useful changes can be made.

(5) The degree of cooperation and support given by the GOZ and its institutions to the "demonstration" teams

The make-up of a production package team of specialists, facilities, equipment requirements and educational training for counterpart Zairians to work in the Kasi area and based at the INERA station at Gandajika is proposed as follows:

Development and staffing of a soil testing support facility at the INERA station, Gandajika:

(1) A control agronomist or soil scientist with the ability to establish a functional laboratory, organize it for efficient operation and train technicians to operate the laboratory. He must also be able to design and direct the supervision of correlation experiments and assist in developing fertilizer recommendations for the several crops to be grown.

(2) At least two and preferably four Zairois must be trained in the U.S. to the MS level. They will take over the soil testing laboratory and its responsibilities. They must have work experience in a soil testing laboratory, of the approximate level of sophistication to be operated in Zaire, while receiving academic training.

(3) Four technicians (A3) will be trained by the expatriate to perform routine laboratory assignments. These technicians must be completely reliable.

b. Development of suitable grain legumes adapted to specific locations and production practices best suited to soils and abilities of farmers who use them:

(1) A contract agronomist with grain legume (especially soybeans) and maize knowledge to assist INERA in the development of an intensive screening and testing program of potentially useful grain legume and maize varieties. He will have primary responsibility for development of production practices suited to local conditions.

(2). At least 2 and preferably 4 Zairois must be trained in the U.S to the MS level in field experimental design and testing. Their training should be primarily with soybeans. They must have summer work experience in the field. They will return to INERA to work on grain legume variety and production practice research.

(3) Four technicians will be trained by the expatriate to establish, care for, tak- notes and harvest crops they will work with. These technicians must be completely reliable and able to eventually work without supervision.

c. Development of a production package program and establishing the package on farmers' farms as demonstra tions:

(1) A contract agronomist with an extension orientation to help develope the package inputs, plan and establish result demonstrations at the INERA station, supervise production package technicians in their work with farmers, and provide educational leadership for farmers, technicians and other interested parties. This is primarily an organization and educational job, however the technicians must be technically competent in grain legume and maize production.

(2). At least 2 and preferably 4 Zairois must be trained in Crop Production as an agronomist in the U.S. to the MS level. Minor work should be done in Extension Education. While in training each participant would be expected to spend one summer with a grain legume-oriented extension worker.

(3) Three production package supervisors, one to be located in each of three selected demonstration areas, will be trained by the expatriate to help establish the production package demonstrations on farmers to supervise the demonstrations and hold local information meetings with farmers at least monthly. These demonstration areas should eventually contain as many as 50 demonstrations in each area.

d. Summary of weather data and development of the data into useful agricultural production publications: Equipment at the weather station will be reviewed and upgraded as needed.

(1) An Agricultural Climatologist consultant to review the available data, suggest most effective procedures and methods for summarizing data with appropriate probability statements. This person might well accompany the next study team so that summary work could begin as soon as possible. Six weeks should complete the first contract.

(2) At least 2 and preferably 4 Zairois must be trained in the U.S. as Agricultural Climatologists to the MS level. They might well use the accumulated data from selected weather stations as their thesis problems. Their studies must include strong statistical training.

They should have at least one summer on instrument maintenance and repair training.

(3) Two recording technicians from each of at least 3 INERA stations will be trained by the expatriate consultant on his second visit to Zaire.

B. Soil Services - Armand Van Wambeke

1. Purpose: There are two major objectives for the soil studies package:

(a) to increase the capacity of INERA to provide to agronomists working on food crops, or on rotations including them, the following service:

(1) estimates of the potential of the land to produce food crops.

(2) estimates of the fertilizer requirements of soils under different management systems, and recommendations of formulas to farmers, taking into account economic cost: benefit ratios.

(b) train teams of Zairian soil scientists capable to accomplish the tasks which have been outlined above.

2. Components: The soil science package should include the following components, which are all equally important:

(a) Knowledge of the important soil characteristics needed for interpretation, which means classification down to the family level, and interpretative groupings adequate to be used by extension officers working in comparable ecological regions.

(b) Knowledge of the nutrient content of the rootzone during the different phases of the crop rotation, by soil fertility analysis.

(c) Knowledge of the fertility-critical levels, or the response curves to fertilization at measured soil nutrient contents, for given crops on given kinds of soils.

3. Implementation : The following operations are required to implement the package preposed in 2, above:

(a) In the period 1953-1960, soil maps were made of the target areas as well as other areas of the country. These maps should be reinterpreted in terms of the present USDA soil taxonomy system. This operation will serve to train Zairian soil surveyors and as a guide to the selection of adequate sites for on-the-farm demonstration of management systems and fertilizer trials. Essentially, this operation requires field work with some laboratory analysis.

(b) Map new areas where requested by the GOZDA on the basis of demographic pressure, opening of land for new settlements and introduction of fertilizer use in regions where no soil information is available.

(c) Establish soil fertility laboratories at strategic locations where samples and analytical data can quickly reach their destination.

(d) Work with the agronomists in the design of field experiments and fertilizer trials, sampling of experimental plots and defining critical levels or response curves.

(e) Make chemical soil analyses for fertilizer recommendations to farmers, extension officers, plantations, experiment stations and others needing the service.

4. Organization: The operations mentioned under 3, above would need the recruitment of several soil scientist, Zairois and American, trained or to be trained, supervised if inexperienced, which belong to the disciplines listed below. These personnel should both produce results which are immediately applicable, and select and train local staff.

The full-time personnel would include:

a) Soil survey team leaders (USAID & Zaire)

b) Soil surveyors (Zaire)

c) Soil chemists, fertility (USAID & Zaire)'

d) Soil analysts (Zaire)

e) Soil microbiologist (Zaire)

They would be supported by TDY personnel or short-term consultants, as for example soil microbiologists, nematologists, soil physicists, soil micromorphologists, aerial photo specialists and geomorphologists.

5. Location: A combined legume-soils project, from a geographical viewpoint, does not, in a country as large as Zaire, necessarily cover the same regions or require the same institutional structure. Since the emphasis in this project is on food legumes a certain priority ranking of soil regions in this country should be defined.

The government of Zaire mentioned several regions: Bas-Zaire, (Mvuazi), Yangambi (Equational Forest region), Gandajika (Southern Savannas), Boketa (Northern Savannas), and the Eastern highlands. The team only visited three locations--Yangambi, the Eastern highlands and Gandajika were inspected. Boketa and Mvuaze were not inspected, but should be inspected by the project desion team.

Considering population pressure on land, the intensity of land use, the importance of the legume crops in the food producing rotations, there is no

doubt that the Eastern Highlands are by far the first priority area. If hunger and protein deficiencies of children and mothers are the basic criterion, again the Eastern Highlands come first. The lower savannah (Boketa and Gandajika) would come next, Yangambi the last. The priority of lower Zaire could not be evaluated during this mission.

The present communication conditions in Zaire exclude operating from one central location. Therefore a geographical priority should be established. Two regions could be included in a normal-size project. They could be treated simultaneously or in a sequence. From a technical assistance viewpoint a concentration of a multidisciplinary team at one location presents many advantages. Dispersion over large distances reduces the impact, and therefore it is felt that a sequential operation would better correspond with a complete package program. It would undoubtedly, by interaction of diciplines, present great advantages and favor multidisciplinary training of local staff.

6. Scope: It is not possible at this stage to propose a sequence of operations, as too many conditions may change before the project actually starts. In order to help the project design team, which will have to go into more detailed planning and negotiation the

following actions are suggested:

(a) The GOZ should select about 20 ingerieur agronome techniciens from different parts of the country, 2/3 of them with interest in agronomy or soils, 1/3 with an interest in chemistry and lab work. Arrangements should be made between UNAZA and INERA to train the candidates in a 3-month, intensive course at Yangambi. Ideally these courses could be produced at the beginning, with the assistance of the USAID soils advisors (soil interpretation-classification and soil chemistry). They would then know the immediate needs of the labs and make specific purchase orders for equipment. Fellowships should be provided to the students.

(b) Additional mapping: The GOZ should as soon as possible provide the aereal photographs covering the areas which were mapped in previous years. It will also be necessary to have a map showing the areas where they would, for reasons explained above, request additional mapping.

7. Technical Assistance and procedure:

The USAID soil chemist-fertility specialist and the soil interpretation-classification specialist should be assisted by Zairois counterparts in the following ratios:

(a) Soil Chemist-Fertility (SCF)

- Two Ingenieurs Agronomes (Chime)

-Four Ingenieur technicians who followed the intensive course.

-Labor

(b) Soil interpretation-classification expert (SIC)

-Two Ingenieurs Agronomes (prospection)

-Six Ingenieur techniciens (prospection)

-Labor, drivers

It proposed that the SCF start his services, advice and short term assistance to the INERA soils laboratory at INERA Yangambi. This, if reagents and small equipment are available, should not take more than one month each year.

(c) Both SCF and SIC in the beginning at least would be stationed at Mulungu. The labspace at this location is available, and no major problems in energy supply are to be expected.

As soon as laboratory and offices are ready at Gandajika, part of the Zaire SCF staff move to Gandajika, and the SCF/USAID expert should continue to advise them, his term with the project would be of two years.

Consultants (2 times/2 months) in soil fertility aspects should be foreseen. The SIC specialist would start his on-the-job training and correlation work in Kivu. Two years' activity in various parts of the Kivu region would be necessary. As soon

as the Zaire counterparts are considered capable of working individually they may be gradually detached to the Gandajika area for mapping and interpretation work as requested. The total USAID/SIC man-years would be four. His activities in Kasai would gradually increase at a rate commensurate with the transfer of Zaire survey teams to the Gandajika area. The SIC group will need the short term assistance of a consultant in photo interpretation, soil survey investigations and soil-water-plant relationships. The agronomy element of the project will need short-term consultants in soil microbiology, nematology and rhizobium symbiosis. The personnel requirements for the soils package are summarized below:

	Man-Years
SCF expert	2
consultants	1/2
SIC expert	4
consultants	1

8. Equipment and Supplies

Soil Chemistry Labs

Yangambi - support	$150,000
Equipment supplies	125,000
Soils Microbiology Mulungu	150,000
Soils laboratory - Gandajika	120,000
	125,000
vehicles	20,000
SUBTOTAL	$1070,000

Soil Interegation - Classification

Yangambi

1 jeep (4 wheel drive) 10,000

Mulungu - Gandajika

2 trucks (3T)

7 Pick-Up (4 wheel drive)

7 Vehicle (4 wheel drive)

Camping Equipment

Photo enterpretation

Drawing equipment

Cartographic equipment

Office equipment

SUBTOTAL

Fertilizers trials

Fertilizers	$ 25,000
TOTAL:	$1,390,00

9. Participants

Five fellowships in soil science are recommended, two in soil fertility - chemistry, two in soil interpretation - classification, and one in microbiology.

Combined Personnel, Equipment and Supplies Listing

1. Soil Survey and Interpretation:

a. Personnel

2 AID consultants (each)	6 months	12 mo.
1 AID technician (Correlation)	4 years	48 mo.
2 Students in training (2 years each)	4 years	
2 Zairois crew chiefs (3 years each)	6 years	
6 Zairois survey technicians (3 years each)	18 years	
7 Drivers (3 years each)	3 years	

b Equipment and Supplies and Support

Yangambi laboratory support	-	$ 100,000
1 Jeep	-	$ 10,000
Microbiological Lab. support	-	$ 120,000

Mulungu - Gandajika

2 2 1/2 trucks (1 each location)	- $ 40,000
7 4-wheel drive pickups	- $ 70,000
Camping equipment	- $ 15,000
Photo interpretation	- $ 40,000
Drawing equipment	- $ 5,000
Cartographic quipment	- $ 10,000
Office equipment	- $ 10,000

2. Soils Laboratories;

a. Personnel

2 AID technicians Lab supervision	each - 5 years	120 mo.
1 AID consultant	- 3 months	3 mo.
7 Students in training (2 years each)	-10 years	
8 Laboratory technicians (each 5 years)	- 40 years	

b. Equipment, supplies and support

Structure - Gandajika	$ 118,000
Structure - Alteration Mulungu	$ 50,000
Laboratory equipment (2 sets	$ 200,000
Chem.reagents and supplies	$ 150,000
Greenhouse supplies	$ 5,000
1 3/4 truck pickup	$ 10,000
Office equipment	$ 10,000

3. Grain Legume Testing :

a. Personnel

2 AID technicians	each 5 years	120 mo.
1 AID Consultant 2 trips, 1.5 mo.	each trip 3 mo.	
4 students in training (2 years each)	8 years	
8 Zairois technicians (5 years each)	40 years	

b. Equipment, Supplies and Support

2 3/4 Ton Truck 4 Wheel Drive pickups	$ 20,000
2 65 HP Tractors	$ 40,300
3 Plows (1 disc type)	$ 9,000
1 Tenderers disc harrow	$ 5,000
1 Special planter	$ 6,000
2 Heavy duty mowers	$ 4,300
2 4-wheel trailers	$ 3,400
1 Wood working machine	$ 1,200
1 Tool set	$ 1,100
Shop equipment, Hoist, Arc Weld,etc.	$ 10,100
Fertilizers, Seeds etc.	$ 22,000
	$ 10,000

4. Extension (Outreach) Operations:

a. Personnel

2 AID technicians (each 5 years	120 mo.
1 AID consultant (2 trips, 2 mo. each)	4 mo.
6 Students in training (2 years each	12 years
6 Zairois technicians (5 years each)	30 years
2 Drivers (5 years each)	10 years

b. Equipment, Supplies and Support

Teaching supplies	$ 8,000
Fertilizers (5 years)	$ 80,000
Seeds	$ 20,000
2 4-wheel driver 3/4 T pickup	$ 20,000
1 2 1/2 Ton Truck	$ 20,000
Office Equipment	$ 10,000

5. Weather station and Data:

a. Personnel

1 consultant 2 trips, 2 mo. each	4 mo.
3 students in training (2 years each)	6 years
4 Zaoirois technicians (5 years each)	20 years

b. Equipment, Supplies and Support

New and replacement equipment	$ 32,000
Protective fence	$ 6,800
Filing cabinets (locking)	$ 1,000
Summary and printing of data	$ 20,200
Office Equipment	$ 6,000

FUEL AND LUBRICATION SUMMARY

1. Fuel, Oil and Grease - Road Vehicles

Units	Mi/Yr ea.	Mi/Gal	Miles	Total/Year Gasoline	Total/Year Oils	Total/Year Lubricants
13-3/4T. Pickups	10,000	8	130,000	16,250gal.	100 gal.	50 lb
Total 5 Years:				81,250	500	250
3-2 1/2T. Trucks	5,000	5	15,000	3,000	10	10
Total 5 Years:				15,000	50	50
Total for Road Vehicles				96,250gal.	550gal.	300 lb

2. Fuel, Oil and Grease - Field and Stationary Equipment

Unit	Hr/Yr Each	Gal/Hr	Total/Year Total Hours	Total/Year Diesel Fuel	Total/Year Oils	Total/Year Lubricants
2 Tractors	1,360	4	2,720	10,880 gal.	54 gal.	50 lbs.
Total 5 Years:				54,400	270	250
Generator	5,110	8	5,110	40,880	128	50
Total 5 Years:				204,400	640	250
Total for Field & Stationary Equipment:				258,800gal.	910gal.	500 lbs.

3. Total Costs of Fuel and Lubricants

Gasoline, av. $2.00/gal:	96,250 gal. x $2.00 =	$192,500
Diesel Fuel, av. $1.60/gal:	258,800 gal. x $1.60 =	$414,080
Lub. Oil, av. $5.00/gal:	1,460 gal. x $5.00 =	7,300
Lub.Grease, av. $1.00/lb.:	750 lbs. x $1.00 =	750
		$614,630

Profil n° 13

Coordonnées géographiques : 6° 15′ S, 23° 30′ E.

Climat : (Aw)s; température annuelle moyenne : 24 °C.
total annuel des pluies : 1550 mm.
3 mois de saison sèche.

Région : Kasai, Bakwanga.

Végétation : jachère en zone des savanes guinéennes.

Matériau originel : recouvrements du type Salonga.

Topographie : pente faible d'une vaste dépression, altitude ± 700 m.

Drainage : bon, nappe phréatique moyennement profonde.

Classification : série SE-Z13; Hygro-xéroarénoferral, jaune, sur sables Salonga.

Description : P. GILSON [1958].

Description morphologique.

A_1	0-14 cm	sableux (sandy loam); nombreux agrégats humifères mais ensemble boulant; nombreuses racines et radicelles; (10 YR 4/1).
$A_{1,2}$	14-28 cm	sableux (sand); sec; un peu de sable délavé; nombreuses radicelles; (10 YR 4/1).
A_3	28-58 cm	sableux (sand); un peu sec; larges infiltrations humifères; un peu de sable délavé; nombreuses radicelles; (10 YR 4/2).
AC	58-84 cm	sableux (sand); un peu sec; quelques taches humifères; radicelles; (10 YR 5/3-4/3).
C_1	84-114 cm	sableux (loamy sand); moins sec; rares taches humifères; quelques radicelles; (10 YR-7,5 YR 5/4).
C_2	114-157 cm	sableux (loamy sand); un peu frais; meuble; quelques agrégats; (7,5 YR-10 YR 5/6).

Caractérisation analytique.

Horizon	Profondeur (cm)	Refus à 2 mm	Granulométrie en pourcent, fractions en microns						
			0-2	2-20	20-50	50-100	100-250	250-500	500-1000	1000-2000
A_1	0-14	—	15,7	2,8	12,3	48,0	19,0	2,2	0
$A_{1,2}$	14-28	—	8,5	1,4	14,0	57,2	17,3	1,6	0
A_3	28-58	—	8,3	1,5	13,2	58,7	17,0	1,3	0
AC	58-84	—	8,6	1,6	16,0	54,5	17,3	2,0	0
C_1	84-114	—	10,2	2,1	17,0	53,0	15,7	2,0	0
C_2	114-157	—	11,1	2,1	16,0	49,5	18,6	2,7	0

Horizon	Matières organiques		pH	Complexe absorbant (m.-éq./100 g)			Fe_2O_3 (%)
				Test HCl N/20		Val. TCa	
	C (%)	N (%)		Ca	K		
A_1	0,97	0,097	5,8	1,4	0,20	3,9	0,7
$A_{1,2}$	0,42	0,033	5,7	0,8	0,06	2,2	0,5
A_3	0,26	0,021	5,5	0,5	0,04	1,9	0,4
AC	0,16	0,017	5,6	0,6	0,04	1,3	0,5
C_1	0,13	0,014	5,4	0,5	0,04	1,4	0,5
C_2	—	—	5,3	0,6	0,04	1,2	0,6

Profil n° 43

Coordonnées géographiques : 6° 5′ S, 23° 10′ E.

Climat : (Aw)s; température annuelle moyenne : 24 °C.
total annuel des pluies : 1575 mm.
3 mois de saison sèche.

Région : Kasai, Bakwanga.

Végétation : savane.

Matériau originel : sable argileux, produit d'altération récente de grès Karroo.

Topographie : paysage accidenté, pente 15 %, altitude ± 650 m.

Drainage : bon.

Classification : série KÉ-U12; Sol tropical récent, sur grès mésozoïque.

Description : P. GILSON [1958].

Description morphologique.

A_1	0-23 cm	sablo-argileux (sandy clay loam); brun foncé (7,5 YR 4/3); structure polyédrique subanguleuse moyenne bien développée avec éléments grumeleux autour des racines; friable; racines nombreuses; transition graduelle.
A_3	23-38 cm	sablo-argileux (sandy clay loam); ocre-rouge (5 YR 4/8); structure polyédrique moyenne bien développée; racines nombreuses; friable; transition graduelle.
C_1	38-56 cm	*id.* avec débris altérés de roche gréseuse.
C_2	56-101 cm	horizon composé principalement de grès tendre plus ou moins altéré.
C_3	101-173 cm	grès altéré contenant des passes d'argilite micacé.
C_4	173-256 cm	roche pourrie.

Caractérisation analytique.

Horizon	Profondeur (cm)	Refus à 2 mm	Granulométrie en pourcent, fractions en microns							
			0-2	2-20	20-50	50-100	100-250	250-500	500-1000	1000-2000
A_1	0-23	0	22,4	2,5	6,8	46,3	20,2	0,8	0,7	0,3
A_3	23-38	0	26,1	3,2	5,5	46,7	16,5	0,7	1,0	0,3
C_1	38-56	18,3	21,3	3,6	7,5	41,7	18,2	2,0	3,3	2,0
C_2	56-101	86,4	17,2	4,8	6,7	34,6	27,0	3,0	4,0	2,7
C_3	101-173	72,8	21,1	7,2	9,6	44,2	16,0	0,7	1,0	0,2
C_4	173-256	91,3	20,9	5,0	6,7	42,5	23,5	0,6	0,6	0,2

Horizon	Matières organiques		pH	Complexe absorbant (m.-éq./100 g)			Fe_2O_3 (%) sur argile
				Test HCl N/20		Val. TCa	
	C (%)	N (%)		Ca	K		
A_1	0,83	0,086	5,1	1,0	0,22	9,2	4,9
A_3	0,56	0,081	5,1	0,9	0,20	10,4	5,4
C_1	0,33	0,044	5,1	2,0	0,18	12,1	6,5
C_2	0,18	0,023	5,4	3,4	0,17	10,6	9,3
C_3	—	—	5,2	3,9	0,16	14,8	9,5
C_4	—	—	5,2	2,8	0,15	12,4	8,0

Profil n° 44

Coordonnées géographiques : 6° 10′ S, 23° 10′ E.

Climat : (Aw)s; température annuelle moyenne : 24 °C.
total annuel des pluies : 1575 mm.
3 mois de saison sèche.

Région : Kasai, Bakwanga.

Végétation : savane.

Matériau originel : sable argileux, produit d'altération intermédiaire de grès Karroo.

Topographie : replat morphologique dans un paysage accidenté, altitude ± 660 m.

Drainage : bon.

Classification : série KÉ-S12; Hygro-xéroferrisol, rouge, sur roches mésozoïques.

Description : P. GILSON [1958].

Description morphologique.

A_1	0-5 cm	sableux (loamy sand); brun foncé (7,5 YR 4/2); sans structure; meuble; racines nombreuses; transition nette.
A_3	5-32 cm	sablo-argileux (sandy clay loam); brun-rouge (5 YR 4/4); structure polyédrique subanguleuse moyennement développée; meuble; racines moyennement nombreuses; transition graduelle.
B_1	32-53 cm	sablo-argileux (sandy clay loam); ocre-rouge (2,5 YR 4/6); structure polyédrique moyenne mal développée; meuble; activités radiculaires faibles; transition graduelle.
$B_{2,t,1}$	53-112 cm	sablo-argileux (sandy clay loam); ocre-rouge (2,5 YR 4/6); structure polyédrique subangulaire grossière bien développée avec patines argileuses sur les agrégats, ces revêtements sont discontinus et minces; tassé; peu de racines; transition graduelle.

$B_{2,t,2}$ 112-170 cm sablo-argileux (sandy clay loam); ocre-rouge (2,5 YR 4/6); structure subangulaire moyenne bien développée avec revêtements discontinus sur ± 50-60 % de la surface des agrégats; meuble.

Caractérisation analytique.

Horizon	Profondeur (cm)	Refus à 2 mm	Granulométrie en pourcent, fractions en microns							
			0-2	2-20	20-50	50-100	100-250	250-500	500-1000	1000-2000
A_1	0-5	—	11,3	1,7	6,8	50,2	27,0	2,2	0,6	0,2
A_3	5-32	—	20,0	2,6	7,2	45,3	21,6	2,0	1,0	0,3
B_1	32-53	—	25,7	1,8	7,2	42,5	19,8	2,0	0,8	0,2
$B_{2,t,1}$	53-112	—	25,2	2,2	6,5	39,3	23,6	2,0	1,0	0,2
$B_{2,t,2}$	112-170	—	25,7	2,0	7,0	42,2	20,0	1,6	1,0	0,5

Horizon	Matières organiques		pH	Complexe absorbant (m.-éq./100 g)			Fe_2O_3 (%)
				Test HCl N/20		Val. TCa	
	C (%)	N (%)		Ca	K		
A_1	0,58	0,067	5,8	1,1	0,25	4,2	0,6
A_3	0,55	0,083	5,1	0,9	0,20	7,2	1,6
B_1	0,23	0,053	5,2	0,8	0,16	6,1	1,4
$B_{2,t,1}$	0,19	0,042	5,2	1,2	0,14	6,6	1,2
$B_{2,t,2}$	—	—	—	4,1	0,13	6,8	1,4

PD-AAB-909 660064 (1)

AID 1330-1 (9-70)

PIO/T

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

PROJECT IMPLEMENTATION ORDER/TECHNICAL SERVICES

1. Cooperating Country: Zaire

2. PIO/T No. 660-064-3-70027

3. [X] Original or Amendment No. _____

4. Project/Activity No. and Title: INERA Support 660-0064

DISTRIBUTION

AFR/DR - 6
SER/CM - 2
SE/FM - 2
GC/AFR - 1
AFR/EMS - 1
SER/MO - 1
REDSO/WA - 2

USAID
F&A - 15
PROG - 5
CONT - 5
CAMO/PER-1
GOZ
DOA - 2
Plan - 2
INERA 1

5. Appropriation Symbol: 72-1171006

6.A. Allotment Symbol and Charge: 756-50-660-00-69-71

6.B. Funds Allotted to: [ ] A.I.D./W [X] Mission

7. Obligation Status: [ ] Administrative Reservation [ ] Suboblligation

8. Funding Period (Mo., Day, Yr.) From 11/15/77 to 9/30/78

9.A. Service to Start (Mo., Day, Yr.) Between 1/15/78 and 5/31/78

9.B. Completion date of Services (Mo., Day, Yr.) 5/31/82

10.A. Type of Action: [X] A.I.D. Contract [ ] Cooperating Country Contract [ ] Participating Agency Service Agreement [ ] Other

10.B. Authorized Agent: AID/W with host country and USAID assistance

Estimated Financing $1.00 = U.S.D. Zaires		(1) Previous Total	(2) Increase	(3) Decrease	(4) Total to Date
11. Maximum A.I.D. Financing	A. Dollars	-0-	$203,000	-0-	$203,000
	B. U.S.-Owned Local Currency				-0-
12. Cooperating Country Contributions	A. Counterpart	-0-	33,000	-0-	33,000
	B. Other				-0-

13. Mission References: ProAg 77-5

14. Instructions to Authorized Agent

Request proposals from potential contractors, one of whom will implement a negotiated contract for technical services described herein. The contractor should be experienced in international settings, preferably in Africa, in creating "production packages" for food legumes through applied and adaptive research; implementing soils analysis laboratories and land classification units to provide services to producers of food and other crops; and assessing the agricultural research subsector of host country and specific agricultural research institutions. Potential sources for these services are Florida State University; University of Hawaii; a Consortium of Universities; USDA; International Institute of Tropical Agriculture, Ibadan, Nigeria, etc. This PIO/T provides funds for the (con't)

15. Clearances - Show Office Symbol, Signature and Date for all Necessary Clearances.

A. The specifications in the scope of work are technically adequate: Leland Voth, F&A

B. Funds for the services requested are available: Donald Barrigan, CONT

C. The scope of work lies within the purview of the initiating office and approved Agency Programs: David Fredrick, PROG 10/31/77

D. Jacob L. Crane, PROG

E. C. John Fliginger, F&A

F.

16. For the cooperating country: The terms and conditions set forth herein are hereby agreed to: MUKENDI MBUYI TSHINGOMA

Signature and date:

Title: Director General, Dept of Agr.

17. For the Agency for International Development: FERMINO J. SPENCER

Signature:

Title: Director/USAID

18. Date of Issuance: 11/2/77

PIO/T

Project/Activity No. and Title: INERA Support 660-0064

SCOPE OF WORK

19. Scope of Technical Services

A. Objective for which the Technical Services are to be Used

The overall goal towards which this project will contribute is to increase the level, availability, and nutritional quality of food production for the(con't)

B. Description

A. General

The headquarters for the INERA is currently located at Yangambi on the Zaire River near Kisangani, the provincial capital. The Mulungu research station is 30 km from Bukavu with the area airport midway between. The INERA has a coordination office in Kinshasa. Each of these points has radio contact with the other.

Yangambi, although isolated in many respects, is located adjacent to the National Agricultural University where there are a number of international staff members. Water, electricity and gasoline are often in short supply. Housing is that which was occupied by former expatriate staff and is in fair condition. These can be made attractive. Kisangani, 80 km by dirt road, has nearly daily aircraft service from other parts of Zaire. (con't)

C. Technicians

(1) (a) Number	(b) Specialized Field	(c) Grade and/or Salary	(d) Duration of Assignment (Man-Months)
See Block 19B			

(2) Duty Post and Duration of Technicians' Services

See Block 19B

(3) Language requirements

FSI S-2, R-2 in French. Team Leader: S-3, R-3 in French with understanding of Swahili very useful

(4) Access to Classified Information

The Contract Team Leader should be cleared to Confidential

(5) Dependents ☒ Will ☐ Will Not Be Permitted to Accompany Technicians with tour of duty greater than eighteen months.

D. Financing of Technical Services

(1) By AID - $ 203,000 (2) By Cooperating Country - $33,000

Project/Activity No. & Title: INERA Support 660-0064

20. Equipment and Supplies (Related to the services described in Block 19 and to be procured outside the Cooperating Country by the supplier of these services)

A. (1) Quantity	(2) Description	(3) Estimated Cost	(4) Special Instructions
See Block 19B			

B. Financing of Equipment and Supplies

(1) By AID — $

(2) By Cooperating Country —

21. Special Provisions

[X] A. The PIO/T is subject to AID (contracting) [illegible] regulations.

[ ] B. Except as specifically authorized by AID, no other local lines to be authorized under the terms of a contract with a U.S. Supplier. Services not stated under this PIO/T must be obtained from U.S. sources.

[ ] C. Except as specifically authorized by AID/W, the purchase of commodities authorized under this PIO/T will be limited to the U.S. under Geographic Code 000.

[ ] D. Other (specify)

22. Reports by Contractor or Participating Agency (Indicate type, content and format of reports required, including language to be used if other than English, frequency or timing of reports, and any special requirements)

The Team Leader will prepare a quarterly report summarizing the highlights of each of the attached team member's reports. Each report will include, among other items, progress, problems, in-service training, participant training, observations and goals for the ensuing period. Reports will be addressed to Food and Agriculture Officer/USAID with copies to the Delegate General of INERA; the Director General of Agriculture, and the Contractor.

23. Background Information (Additional information useful to Authorized Agent and Prospective Contractors or Participating Agency; if necessary cross reference Block 19.C(4) above.)

1. Project Paper: INERA Support 660-0064

2. Contract Team Leader should be cleared to have access to classified information to the level of confidential

24. Relationship of Contractor or Participating Agency to Cooperating Country and to AID

A. Relationships and Responsibilities - INERA is composed of numerous research stations, each with a station chief, and all directed by the Delegate General. The Contract Team will provide technical services to the INERA Headquarters and to Mulunga Station. (con'

B. Cooperating Country Liaison Official - The Team Leader will provide liaison on Contract matters with the Director General of Agriculture, and provide coordination of information to the Zairian Institute for Scientific Research (IRS).

C. AID Liaison Officials - USAID/Kinshasa Director (Contract reports and mediation)
USAID Project Officer (Contract supervision and liaison)

LOGISTIC SUPPORT

25. Provisions for Logistic Support

A. Specific Items (Insert "X" in applicable column at right. If entry needs qualification, insert asterisk and explain below in C. "Comments")

		In Kind Supplied By		From Local Currency Supplied By	
		AID	Cooperating Country	AID	Cooperating Country
(1)	Office Space		X		
(2)	Office Equipment	X	X		
(3)	Housing and Utilities		X		
(4)	Furniture	X	X		
(5)	Household Equipment (Stoves, Refrig., etc.)	X	X		
(6)	Transportation in Cooperating Country	X	X		
(7)	Interpreter Services				
Others (Specify) (8)					
(9)					
(10)					
(11)					
(12)					
(13)					
(14)					
(15)					

B. Additional Facilities Available From Other Sources

1. See Block 19B

2. Personal vehicles will <u>not</u> be transported to post at project expense.

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Block 14 (con't) first year of a contract with an overall estimated life of four years with an estimated cost of $2.28 million, depending upon availability of funds.

Block 19A (con't) low income majority in Zaire. The Project will develop the institutional capability of the National Agriculture Research Institute (INERA) to: (a) create "production packages" for food legumes through applied and adaptive research, using a participatory research approach; (b) provide soils analysis, fertility investigations, consulting and recommendation services to those interested in advancing agricultural production; (c) provide reliable estimates of the production potentials and limitations of soils in Zaire; (d) allocate INERA's resources in an optimal manner, within budgetary restraints, to research priorities.

Block 19B (con't) In Bukavu there is a U.S. Consulate office with two American officers. The Peace Corps conducts some of its in-country training for its volunteers in Bukavu. Bukavu is located along Lake Kivu, one of Africa's great lakes. The lake's elevation is 1,400 meters. Most of the surrounding area is at an elevation of 1,500 to 2,500 meters. Mulungu and Bukavu are within a few hours driving time of several parks including the Gorilla Sanctuary. Climatically the area is pleasant with some of Zaire's more productive soils in the region. Thus, many fresh fruits and vegetables are obtainable. Bukavu may not have many western imported goods. However, Bujumbura, capital of Burundi, is accessible by car in half a day and has more supplies available.

Contractor personnel will have duty-free privileges. They will also be eligible for membership in the American Employees Recreation and Welfare Association (AERWA). Thus they will be able to order groceries and commissary supplies from AERWA in Kinshasa (probably through a Mulungu or Kisangani group order, etc.). The Contractor will need to develop a method to transport commissary goods and other supplies from Kinshasa to the project sites.

There are no educational facilities in the project area for American dependents. There is an American school in Kinshasa. Dormitory facilities for junior high and high school students can generally be arranged with one of the missionary groups.

Each person, employee and dependents under this contract will have one trip to Kinshasa per year plus one Rest and Recuperation trip per 24-month tour. (Latter being to Athens, Greece or equivalent.)

Individuals and dependents who accept these assignments should be self-starters, strong minded and able to cope with a vastly different culture and environment. They should be accustomed to being self-sufficient with respect to physical needs, inventive with respect to social and recreational activities and generally satisfied with themselves since

Block 19 B (con't.) that will be their main resource.

B. Contract Employee Benefits

These generally are governed by contractor's policies and USGSTR's as occasionally amended for U.S. direct hire employees at similar posts in Zaire, including post differential, cost of living allowance, education allowance and transportation of household effects to post as accorded to U.S. direct hire personnel at post. Personal vehicles will not be transported to post under this project. Personal use of Project vehicles can be arranged. U.S. contract personnel may use the Embassy pouch for first class mail and parcels under two pounds.

C. Supplies, etc.

Office space, office equipment, housing, utilities, furniture, household equipment (stoves, refrigerators, etc.), official transportation within Zaire shall be furnished contractor employees.

D. Technical Services

In order to develop the capabilities of the INERA, as outlined above, the contractor will provide a blend of technical assistance, on-the-job training, formal graduate level academic training and commodity procurement.

The technical assistance will consist of long term and short term personnel (see attached Table I). Among the seven long term positions, the Rural Sociologist will be the contract team leader, unless otherwise agreed upon with USAID. The short term personnel will be scheduled by the team leader with the concurrence of the AID Project Officer and as suggested in Table I.

A logistical support person for contract personnel is included in the contract team. He will arrive in advance of the team, make in-country arrangements in support of the team, coordinate specifications for required project commodities and place orders for same. He will overlap by two months with the arrival of the full team.

The five positions of Soil Scientist, Land Classifier, Lab Technician, Research Agronomist, and Rural Sociologist will be posted at Mulungu. The other two positions dealing with the assessment of INERA and the Agricultural Research Subsector will be posted at Yangambi.

In addition to the short course and on-the-job training conducted by the contractor's technical staff, the contractor will select trainees in cooperation with the Participant Training Selection Committee (ref. P.P. page 51) and will handle the administration, counselling, etc. of the

Block 19 B (con't) PIO/T 660-064-3-70027

participant training program in the U.S. (however the trainees research work and related theses will be done in Zaire on subjects which will have practical uses to Zaire). (See attached Table II.)

The first major project evaluation will be completed by July 1979 (approximately one year after arrival at post of the technical personnel), and annually thereafter. There will be two separate and distinct foci of evaluation. One will be the technical assistance and training in the agricultural research activities in legumes and soils carried out at the Mulungu INERA Station. The other evaluation focus will be the process of analyzing the entire subsector of agricultural research.

Technical assistance costs are estimated on the basis of person years/months of technical assistance, long and short term. Costs include the following:

	Long Term $/Person Year	Short Term $/Person Month
Salary	$ 30,000	$ 2,500
Per Diem		1,800
Differential	6,000	
Overhead (120% of Salary)	36,000	3,000
Education, Int. Travel to and from post, R&R, home leave, etc.	8,000	700
TOTAL/PERSON YEAR/MONTH	$ 80,000	$ 8,000
PERSON YEARS/MONTHS	24	46
TOTAL COST	$1,920,000	$ 368,000

Participant training costs are based on a per month cost in the U.S. of $950, plus a set aside of 20% of total participant program cost of $50,000 for a University Contractor to handle the administration, counselling, etc., of participants, and an additional fund of $22,000 for English language training. ($950 x 24 mo. x 11 participants + $50,000 + $22,000 = $322,800.) No training administrative costs are programmed in this initial PIO/T.

The Project Paper envisioned that a sole contractor or institution in the U.S. would be awarded the contract for technical assistance. Therefore, it is proposed that the contractor carry out the purchase of equipment, allowing a 5% surcharge for administration. Table III presents a summary of project commodity requirements which the contractor would administer with the exception of categories 2, 5, and 9. The USAID Mission will order the latter in advance of letting a contract for this PIO/T. No funds are included in this initial PIO/T for commodities, or the administration of their procurement.

Local currency support equivalent to $33,000 by the GOZ is provided to rehabilitate the laboratory facilities at Mulungu and houses for the

Block 19 3 (con't) contract team at Yangambi and Mulungu.

E. Contractor Selection Criteria

1. Experience and qualifications of proposed personnel and backstop office (60%).
   a. Long term field personnel (40%).
   b. Short term field personnel (15%).
   c. Contractor's home office support staff (5%).

2. Understanding by the proposer of the problems to be addressed, approach to be used and organization to accomplish scope of work (20%).

3. Overall responsiveness and price of proposal (20%).

Block 14 1 (con't) The Contract Team will be headed by a Team Leader who will coordinate project activities at the Mulungu Station with the station chief. The assessment of the agriculture research subsector and INERA will be coordinated with the Delegate General of INERA.

TABLE I

PERSON MONTHS OF TECHNICAL ASSISTANCE

	FISCAL YEAR 78	79	80	81	82	TOTAL
Long Term						
Soils Scientist	4	12	12	12	8	
Land Classifier	4	12	12	12	8	
Lab Technician	4	12	12	12	8	
Research Agron.	4	12	12	12	8	
Rural Socio.	4	12	12	12	8	
Agricultural Res. Mgt. Planner	4	12	8			
Business Mgt. Consultant	4	12	8			
Sub-Total	28	84	76	60	40	288 = 24yrs.
Short Term						
Logistical Support	6					6
Pedology		2	1			3
Plant Pathology		2	1	3		6
Plant Physiology and Weeds		1	2	2	1	6
Soil Fertility			2	1		3
Entomology			2	1		3
Crops Extension				3		3
Soil Microbiology			1	2		3
Food Technology	2	1				3
Farm Management					3	3
Soils Extension					3	3
Contract Supervision		1	1	1	1	4
Sub-Total	8	7	10	13	8	46 = 3+ yrs.
TOTAL	36	91	86	73	48	334 = 27+ yrs.

TECHNICAL ASSISTANCE INITIAL SCHEDULE

Date	
2/10/78	Logistical Support person arrives in Zaire
5/15/78	T.A. Team Leader arrives
5/31/78	T.A. Team arrives
7/31/78	Logistical Support person leaves

Block 19 B
(con't)

TABLE II

PERSON MONTHS OF PARTICIPANT TRAINEES

FIELD OF STUDY	No of participants	FISCAL YEAR 79	80	81	82	83	TOTAL
Soils Sciences	(3)	6	27	30	9		72
Land Classification	(4)	6	27	33	21	9	96
Research Agronomist	(2)	3	15	21	9		48
Plant Pathology	(1)		3	12	9		24
Entymology	(1)			3	12	9	24
TOTAL	(11)	15	72	99	60	18	264 = 22 yrs.

Block 19 B
(con't)

TABLE III

PROJECT COMMODITY REQUIREMENTS SUMMARY

CATEGORY	FISCAL YEAR 78	79	80	81	TOTAL
1. Agricultural Equipment	$ 30,000	$20,000	$1,000	$1,200	$ 53,000
2. Transportation Equipment	59,100	10,000	37,000		106,100
3. Maintenance and Repair Equip.	9,200		600		9,800
4. Seed & Fertilizer	2,000	3,000	5,000	5,000	15,000
5. Office Equipment	9,900				9,900
6. Pedology Lab Equipment	24,000	16,000	5,500	5,500	51,000
7. Soil Survey Equipment	26,000	24,000	14,000	14,000	78,000
8. Legume Lab and Field Equip.	4,000	2,000	1,000	1,000	8,000
9. Household Furniture	70,000				70,000
Sub-Total	$234,200	$75,800	$64,100	$26,700	$400,800
5% +	12,100	3,900	3,200	1,300	20,500
TOTAL	$246,300	$79,700	$67,300	$28,000	$421,300