

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT DATA SHEET

1. TRANSACTION CODE: **C** (A = Add, C = Change, D = Delete)
 Amendment Number: 1
 DOCUMENT CODE: 3

COUNTRY/ENTITY: ZAIRE
 3. PROJECT NUMBER: 660-0124

4. BUREAU/OFFICE: AFRICA 06
 5. PROJECT TITLE (maximum 40 characters): APPLIED AGRICULTURAL RESEARCH & OUTREACH

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): 09/30/98
 7. ESTIMATED DATE OF OBLIGATION (Under 8" below, enter 1, 2, 3, or 4)
 A. Initial FY: 90 B. Quarter: 3 C. Final FY: 95

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY <u>90</u>			LIFE OF PROJECT		
	B. FY	C. C/C	D. Total	E. FY	F. C/C	G. Total
AD Appropriated Total	8,000		8,000	24,853		24,853
Grants	8,000		8,000	24,853		24,853
Loans						
Other						
U.S.						
Host Country		3,584	3,584		17,347	17,347
Other Donors:						
TOTALS	8,000	3,584	11,584	24,853	17,347	42,200

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROXIMATE PRIMARY RELATION/PURPOSE CODE	B. PRIMARY TECH CODE (1. Grants 2. Loans)	D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) DFA 141	070	13,000		4,853		24,853	
(2)							
(3)							
(4)							
TOTALS		13,000		4,853		24,853	

10. SECONDARY TECHNICAL CODES (maximum 6 codes or 3 positions each):
 012 | 020 | 079 | 090

11. SECONDARY PURPOSE CODE: 181

12. SPECIAL CONCERNS CODES (maximum 7 codes or 4 positions each):

A. Code	R/AG	XII	BSW	PVON	ENV
B. Amount	24,853	22,200	8,000	7,000	8,000

13. PROJECT PURPOSE (maximum 480 characters):
 To strengthen and improve the capacity of the Ministry of Agriculture and Rural Development and collaborating institutions to develop and transfer agricultural technologies for selected food crops, on a sustainable basis, to farmers.

14. SCHEDULED EVALUATIONS: Interim 01/93 Final 08/98

15. SOURCE/ORIGIN OF GOODS AND SERVICES: 000 941 Local Other (Specify) 935

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of 2 page PP Amendment):
 This amendment increases authorized LOP funding for the project by \$4,853,000 to add a natural resource management element to the project and more sharply focuses and defines the project's present activities. The purpose and basic rationale for the project remain unchanged.

17. APPROVED BY: Paul L. Stanley
 Title: Acting Director USAID Zaire
 Date Signed: 05/27/91

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

ACTION MEMORANDUM FOR THE ACTING DIRECTOR

Date: May 29, 1991
From: Allen P. Fleming, ARD
Subject: Project Amendment, Applied Agricultural Research and Outreach II Project (660-0124)
Through: Ronald D. Harvey, ARD

I. PROBLEM:

Your approval is requested to authorize an amendment to the Applied Agricultural Research and Outreach II (RAV II) Project in order to add a natural resource management element to the project and to more sharply focus and define the project's other activities. The amendment will increase project funding by a total of \$4,853,000 from the Development Fund for Africa account, for a new life of project (LOP) funding level of \$24,853,000. No additional obligation of funds is being made at this time.

II. DISCUSSION:

A. Description of the Project: The purpose of the project is to strengthen and improve the capacity of the Ministry of Agriculture and Rural Development and collaborating institutions to develop and transfer agricultural technologies for selected food crops, on a sustainable basis, to farmers. The project provides funding for activities in outreach and technology transfer, applied research in agricultural technology and related natural resource management, research management, human resources development, and improvement in the financial sustainability of food crop research. The project is being implemented by the Service National de Recherche Agronomique Appliquee et Vulgarisation (SENARAV) of the Ministry of Agriculture and Rural Development.

The project's main beneficiaries will be farmers, with special attention being given to female cultivators, who provide much of the agricultural labor in the country. The project will develop technologies and outreach methods which meet the labor-productivity, income, and nutritional needs of rural households. NGOs will be strengthened in their ability to provide targeted extension information, crop varieties, and agricultural technologies to their clients. Project outputs will include sustainable, productive, and socio-economically adapted technologies and crop varieties; improved methods for the transfer of technologies to public and private development entities; improved financial sustainability of food crop research activities; trained research, outreach, and research management staff; and improved management practices in food crop research programs and outreach.

The Project Paper for RAV II recognized the important role natural resource management could play in supporting sustainable, environmentally sound agriculture in Zaire, but it made no provision for developing and integrating natural resource management activities into the project. RAV II is, therefore, being amended to integrate natural resource management into the ongoing research and outreach activities of the project. Specifically, emphasis is being put on developing and integrating into the project natural resource management technologies in soil management, innovative agroforestry, and agro-ecology.

The RAV II natural resource element will expand the research focus of the project's existing research and development sections to include natural resource management concerns, add long-term positions in soil management and agroforestry/agro-ecology to the technical assistance team, develop a soil and plant analysis laboratory and a plant propagation laboratory, and provide advanced degree training in natural resource management for six Zairian scientists (from the reallocation of training positions already included in the project). By adding a research interest in natural resource management to the existing research and development sections of SENARAV's national programs, the study of natural resource issues will be firmly integrated into the project's research and outreach system.

A sharp drop in the availability of counterpart funds for the project has caused funding for some items in the budget--especially in-country travel for the technical assistance team and contractor support--to be moved from local currency to dollars. This greater need for dollars has put pressure on the foreign exchange budget, prompting a need to focus more sharply and better define the project's activities. The main changes made have been to concentrate more intensely research and research facilities rehabilitation at certain key project sites.

B. Financial Summary: The attached Project Paper Supplement (PPS) proposes adding \$4,853,000 to the project, bringing total LOP authorized funding to \$24,853,000. The overall dollar breakdown of A.I.D.-provided project funding (\$000) is as follows:

Item	Authorized with Original Project Paper*	Authorized with this Amendment	Total LOP Funding
1. Tech. Assist.	10,172	402	10,574
2. Training	4,333	315	4,648
3. Bldg. Rehab.	900	(19)	881
4. Commodities	2,136	,335	3,471
5. Networking/ Research Grants	1,000	140)	560
6. Contractor Suprt.	-	3,0 1	3,031
7. Audits & Eval.	685	(180)	505**
8. Other costs/ Contingency	774	409	1,183
TOTALS	20,000	4,853	24,853

Over the life of the project, the Government of Zaire (GOZ) will contribute to RAV II the equivalent of \$17,347,000 from its own regular budgetary resources and from jointly programed GOZ-owned counterpart funds.

* Per the line items for Project Grant Agreement 660-0124, Amendment No. 1, which is the latest budget.

** It is estimated that \$225,000 will be spent for audits and \$280,000 for evaluations.

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C. Committee Action and Findings: The Project Committee has reviewed the Project Paper Supplement and related documents and has confirmed the socio-economic acceptability and technical soundness of the project.

The implementation plan contained in the PPS has been reviewed by the Project Committee, which concluded that the plan was realistic and established a reasonable time frame for carrying out the project.

D. Special Concerns: An amendment to the Cooperative Agreement with the South-East Consortium for International Development (SECID) will have to be negotiated in order to implement this amendment.

Local cost financing, in accordance with the procedures outlined in Handbook 1B, Chapter 18, is being authorized in order to ensure the expeditious implementation of the project.

The USAID officer responsible for the project is Allen Fleming. The officer responsible for the project in AFR/PD is Leroy Jackson.

III. WAIVERS:

No waivers are required with this amendment.

IV. JUSTIFICATION TO THE CONGRESS:

REDSO/ESA Regional Legal Advisor Cliff Brown informed the Mission that Africa Bureau and Agency policy require a Congressional Notification (CN) for a change in the previously notified authorized level of project funding if the change is \$5.0 million or more. As the authorized funding is being increased by less than \$5.0 million, no CN is required.

V. AUTHORITY:

Section 4.A.(2)a. of Africa Bureau Delegation of Authority 551, revised, gives you the authority to amend project authorizations up to a total LOP funding of \$30.0 million. The terms of this amendment are, therefore, within your scope of authority.

VI. RECOMMENDATION:

That you sign the attached Project Authorization Amendment, Project Data Sheet for the Project Paper Supplement, and Project Agreement Amendment and thereby approve an increase in the authorized amount of grant funding for RAV II from \$20.0 million to \$24.853 million in order to add a natural resource management element to the project and to more sharply focus and define the project's other activities.

Approved: Brent C. Mundy Date: 21 May 11

Disapproved: _____ Date: _____

J

VII. ATTACHMENTS:

1. Project Authorization Amendment
2. Project Paper Supplement
3. Project Agreement Amendment

Clearances on the Action Memorandum for the Acting Director to authorize an amendment to the Applied Agricultural Research and Outreach II Project (660-0124):

RHarvey, ARD	<u>JH</u>	<u>5/29/91</u>
JBierke, PEP	<u>J/B</u>	<u>5/29/91</u>
JKryschtal, EXO	<u>JK</u>	<u>5/29/91</u>
JWall, PDO	<u>JW</u>	<u>5/29/91</u>
AHullung, CONT	<u>AH</u>	<u>5/29/91</u>
MSullivan, GDO	<u>MS</u>	<u>29 May 91</u>
AVance, RLA	<u>AV</u>	<u>5/29/91</u>

FIRST AMENDMENT TO PROJECT AUTHORIZATION

Name of Country: Republic of Zaire
Name of Project: Applied Agricultural Research and Outreach II
Number of Project: 660-0124

1. Background

Pursuant to the Foreign Assistance Act of 1961, as amended, and the Foreign Operations, Export Financing and Related Programs Appropriations Act, 1990, the Applied Agricultural Research and Outreach II Project was originally authorized on July 6, 1990, with life-of-project (LOP) planned obligations of not to exceed \$20.0 million in grant funds over an eight (8) year period. The Project Assistance Completion Date is September 30, 1998. The project supports the food crop research and outreach activities of the Service National de Recherche Agronomique Appliquee et Vulgarisation (SENARAV) of the Ministry of Agriculture and Rural Development.

2. Authorization of Additional Funds

Pursuant to Section 496 of the Foreign Assistance Act of 1961, as amended, I hereby authorize an additional Four Million Eight Hundred and Fifty-three Thousand (\$4,853,000) United States dollars in grant funds for the said project, for a new authorized LOP total for planned obligations of not to exceed Twenty-four Million Eight Hundred and Fifty-three Thousand (\$24,853,000) United States dollars. This sum, which is subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, will be used to finance foreign exchange and local currency costs for the project. There is no change in the planned life of the project.

3. Local Cost Financing

With respect to the local cost financing which is authorized above, I hereby determine, in accordance with A.I.D. Handbook 1B, Chapter 18, that the prices of the goods and services to be acquired locally are reasonable, taking into account comparable delivery terms and prices from eligible sources and the implementation schedule of the project.

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4. Covenant

The Project Agreement Amendment, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following covenant, together with such others as A.I.D. may deem appropriate.

Assignment of Professional GOZ Research Personnel to SENARAV:

The Grantee hereby covenants to employ, contract, second or otherwise make available to SENARAV, to the extent possible, qualified professionally trained (M.S. or Ph.D.) Zairian researchers to serve as counterparts to long-term technical assistance advisors.

5. Status of Original Authorization

The original Project Authorization, as amended herein, remains in full force and effect.



Baudouin F. de Marcken
Acting Director
USAID Zaire

Date: 29 May 19

**Applied Agricultural Research and Outreach II Project (660-0124)
Project Paper Supplement**

Natural Resource Management Element

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- B. Institutional / Administrative**
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- D. Procurement Plan and Detailed Budgets**
- E. Initial Environmental Examination**
- F. Memorandum on Amending the Applied Agricultural Research and Outreach II Project (660-0124)**

Acronyms

AFNETA	Agroforestry Networks for Africa
AFRENA	Agroforestry Research Networks for Africa
CIAT	International Center for Tropical Agriculture
COP	Chief of Party
COSCA	Collaborative Study on Cassava in Africa
CPF	Counterpart Funds
FSI	Foreign Service Institute
GIS	Geographic Information System
GOZ	Government of Zaire
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Development Agency)
II	Impact Indicator
INERA	Institut National de Recherche Agricole
IZCN	Institut Zairois pour la Conservation de la Nature
LOP	Life of Project
NGOs	Non-Governmental Organizations
NRM	Natural Resource Management
PACD	Project Assistance Completion Date
PI	Performance Indicator
PNL	Programme National de Légumineuses
PNM	Programme National de Maïs
PRONAM	Programme National de Manioc
PRAPAC	Programme Régional d'Amélioration de la Culture de la Pomme de Terre en Afrique Centrale
PP	Project Paper
RBR	Regular Budgetary Resources of GOZ
R&D	Research and Development
RAV II	Recherche Agronomique Appliquée et Vulgarisation II
SECID	Southeast Consortium for International Development
SENARAV	Service National de Recherche Agronomique Appliquée et Vulgarisation
SNV	Service National de Vulgarisation
TA	Technical Assistance
USAID	United States Agency for International Development
WWF	World Wildlife Fund
ZALI	Zaire-American Language Institute

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I. RATIONALE FOR PROJECT PAPER SUPPLEMENT

A. Summary of Project Paper Changes

The life-of-project (LOP) funding of the Applied Agricultural Research and Outreach II Project (RAV II), which supports the food crops research and outreach activities of the Service National de Recherche Agronomique Appliquee et Vulgarisation (SENARAV), is being increased by \$4,853,000 to a new LOP total of \$24,853,000. Of this \$4,853,000, \$4,156,500 will be used to add a natural resource management element to the project, and \$696,500 will be used to cover the cost of switching certain budget line items from counterpart funds to dollars. The project's PACD remains unchanged.

The large shortfall in USAID-generated counterpart funds since the RAV II design have resulted in the need for greater focusing of support for facilities rehabilitation, research and outreach than originally envisioned in the PP. There is also increased uncertainty whether the Government of Zaire will be able to support planned levels of recurrent costs for research infrastructure from its regular budgetary resources. In addition, USAID's suspension, since January 1991, of support to SENARAV's national maize program (PNM) has required modifications in project interventions and phasing of activities. The most important changes are presented below.

1. Project support will be refocused on: (1) research facilities rehabilitation at Mulungu and M'Vauzi; (2) research at Mulungu, M'Vauzi and Gandajika; and (3) outreach at Mulungu, Kiyaka, M'Vauzi, and Gandajika.
2. Additional dollar funds have been provided for: (1) Fuel, Vehicle Repair, Air Travel and Per Diem for TA; and (2) Other Contractor Logistical Support.
3. Funds originally planned for facilities rehabilitation and equipment for the Kaniameshi research station (headquarters of PNM) have been reprogrammed. Should USAID resume support to PNM, funding will be drawn from the contingency line item.

4. A research element in natural resource management will be added to the existing Research and Development Sections¹ of SENARAV's national programs which presently conduct research in agronomy, soil science, and agricultural economics.
5. The Research and Development Sections will provide: (1) the lead role in incorporating sound natural resource management into the agricultural technology development process; (2) on-station research in soil management, agroforestry, and agro-ecology; (3) analysis of socio-economic, biophysical, and agronomic data from on-farm trials; (4) liaison between station-based research and on-farm research, with primary responsibility for the design of research-oriented on-farm trials; and (5) technical backstopping to the Research and Development (R&D) Teams.
6. SENARAV's research infrastructure in natural resource management will be strengthened through the development of a Soil and Plant Analysis Laboratory and a Plant Propagation Laboratory at the Mulungu sub-station in South Kivu.
7. Two technical assistance positions, one in Soil Management, the other in Agroforestry/Agro-ecology, will be added to the SECID team to develop research, training and outreach programs in their areas of expertise. They will provide technical backstopping to SENARAV's Research and Development Sections in the development of environmentally sound agricultural technologies.
8. Research and Development Teams, with responsibilities for the extension of SENARAV technologies to outreach organizations, will be based in the Kivu region, in addition to those already planned in the PP for other regions. They will promote the adoption of agricultural production technologies that incorporate sound natural resource management.

¹ Not to be confused with the Research and Development (R & D) Teams. The Research and Development Sections are the multidisciplinary research units within each national program which backstop and provide research support to the R & D Teams.

9. Six training slots under the original project for M.S. and Ph.D. level training will be reallocated to provide graduate-level training in natural resource management for Zairian scientists: three in Agroforestry/Forest Ecology, two in Soil Management, and one in Soil Chemistry or Analytical Chemistry.
10. The evaluation schedule has been amended to enable an in-depth assessment in January 1993 of the status of project activities, the adequacy and level of GOZ financial support to SENARAV's programs, and future support requirements.

B. Rationale for Project Changes

This supplement addresses both unforeseen complications which have arisen since the Project Paper was completed, as well as incorporates a natural resource management element into SENARAV's research and outreach activities.

Changing Conditions Since RAV II Design

Lack of GOZ adherence to an economic structural adjustment program has resulted in a significant cutback in USAID-funded PL-480 and commodity import programs. These programs generate local currency required for operational support to USAID-financed projects. Thus the amount of counterpart funds (CPF) originally budgeted for RAV II has been drastically reduced. The ability of the GOZ to provide funding for maintenance of research infrastructure and other recurrent costs at the levels planned in the PP is also uncertain. These combined factors require a sharper focusing of project activities and switching some budgetary items (i.e. contractor logistical support, TA in-country travel and per diem, vehicle repairs) from counterpart funds to dollar funds.

In addition, USAID has suspended all support to the Programme National de Mais (PNM) since January 1991 due to the occupation of the Kaniameshi research station by the Zairian military. This suspension includes cessation of technical assistance, training, commodities, facilities rehabilitation, and operational expenses. This amendment has taken this suspension into consideration by reallocating funds budgeted in the original PP for Kaniameshi to other budget line items. Should the suspension be lifted and support to PNM be reinstated, program costs would have to be drawn from the contingency line item. TA work plans would also have to be adjusted.

Given the greatly reduced local currency funding availability, certain project interventions have been concentrated on fewer sites than originally planned.

Integrating Natural Resources Management into RAV II Activities

The Project Paper for the RAV II Project clearly recognized the important role natural resource management could play in developing sustainable, environmentally sound agriculture in Zaire. The PP stated that environmental responsibility would be a major thrust of RAV II and that the project would focus its efforts on the development of technologies that preserved the natural resource base. These could, in turn, help ensure that agricultural production in Zaire was maintained at an acceptable level over the long term. Among the specific actions stated in the PP that the Project might take were:

- o a greater focus on fragile agro-ecological zones as on-farm testing and outreach sites;
- o a greater emphasis on the development of environmentally sound technologies such as improved fallow and other systems aimed at improving soil fertility;
- o training in the principles of ecologically sound agricultural development for SENARAV scientists and technicians; and
- o the development of ecologically responsible technologies that are adoptable by Zairian farmers.

However, despite all this interest in environmental sustainability, the PP lacked a specific plan on how natural resource management was to be integrated into the project. This omission, and the resulting need to develop and fully integrate a natural resource management element into the project, were widely recognized at the time RAV II was authorized. At a meeting held in the USAID Director's office on June 27, 1990, it was agreed that RAV II should be amended in order to add a Global Climate Change (environmental sustainability) component to the project (see Annex F of this Project Paper Supplement, PPS).

This Project Paper Supplement outlines how environmentally sound, sustainable agriculture will be promoted by integrating natural resource management into the ongoing research and outreach activities of RAV II. Specifically, a new emphasis is being added to the project for the development of technologies in soil management, innovative agroforestry, and agro-ecology that will become an integral part of RAV II's research and outreach activities. This is discussed in more depth in the technical analysis.

Integration

In adding a natural resource management element to the ongoing agricultural technology development process, it is important, for institutional sustainability, to choose a method of integration that ensures that the new component becomes an integral part of the whole system. Therefore, instead of creating a National Program for Natural Resource Management and then facing the resulting administrative and coordination problems; the natural resource element is being integrated into the already existing Research and Development Section of each of SENARAV's national programs.

The Research and Development Sections have numerous responsibilities which include: 1) conducting research in agronomy, soil science and economics; 2) the design of on-farm trials; and 3) providing technical backstopping to the outreach-oriented Research and Development Teams. Thus, they are responsible for integrating varieties and crop management technologies from the commodity research programs into farmer-adoptable technology packages. Integration of the natural resource management element at this institutional level will take advantage of the Sections' scientific capacity (advanced degrees) and their important role in the development and testing of agricultural technologies. Having each Research and Development Section take the lead role for research and technology development in soil and natural resource management will foster the inclusion of this emphasis in the over-all technology development process and consequent recommended technologies.

Research Support

Over the long term, the emphasis on natural resource management will be a strong element of SENARAV's activities nationwide. To achieve the desired results will require: 1) training additional personnel in SENARAV and in the Institut National de Recherche Agricole (INERA), 2) the development of specific research programs for each region and research station, 3) the development of analytical laboratories to support the research program, and 4) an overall sensitizing of SENARAV, INERA and expatriate personnel to the need to include a focus on natural resource management in agricultural research.

C. Original Project Concept

The goal of the Applied Agricultural Research and Outreach II Project (660-0124), RAV II, is to increase agricultural production, and rural household income in the zone of USAID program emphasis. The project purpose is to strengthen and improve the capacity of the Department of Agriculture, Rural Animation and Community Development and collaborating institutions to develop and transfer agricultural technologies for selected food crops, on a sustainable basis, to farmers.

RAV II was designed as an eight-year, \$41.5 million project (\$20.0 million from USAID and \$21.5 million from the GOZ), which builds on the progress made in RAV I, but places much greater emphasis on outreach and technology transfer, research management, and financial and environmental sustainability. Applied research is to continue on the three major food crop groups under the mandate of SENARAV -- cassava, maize and grain legumes. This research will be guided through intensive feedback from Research-Development teams to be established in several different regions. Human resource development remains a priority.

The project is being implemented with the assistance of U.S. Title XII institutions. The implementing GOZ agency is SENARAV, established in early 1990 by the elevation of the project to a division of the Ministry of Agriculture and Rural Development. SENARAV is composed of a National Coordination Office, the National Cassava Program (PRONAM), the National Maize Program (PNM), and the National Grain Legume Program (PNL).

Outreach: The project will train and make operational six Research and Development teams during the first three years of the project. These teams will be primarily responsible for working with outreach agencies to improve the rate of development and adoption of sustainable, productivity-enhancing technologies. They also have some responsibilities for on-farm research.

Applied Research: Applied on-station research and on-farm testing will be reoriented to place greater emphasis on natural resource management (especially soil fertility management) and production technologies. Varietal selection and breeding received a relatively heavy emphasis in phase one of the project.

Research Management: Research management will be improved to ensure that: priorities are set and followed, the programs are budgeted to the level of individual research activities, program results are submitted for peer review, results are published regularly, and that the operation and maintenance of stations is adequate.

Human Resources Development: The project will support the training of 31 SENARAV staff to the M.S. and Ph.D. levels, concentrating on disciplines which were lacking in the first

phase of the project, notably agricultural economics, sociology, soil science, and integrated pest management. This number includes at least three women scientists, one to the Ph.D. level. Long- and short-term training will be provided in technical areas, including substantial efforts to improve skills in research administration and management, station operation and maintenance, laboratory management, accounting and finance, statistics, etc.

Sustainability: The project will help SENARAV make progress towards financial sustainability. Improvements in research and outreach outputs and productivity will strengthen SENARAV's credibility and make a case for more consistent public funding. The critical mass of scientists and technicians needed will be determined and staff size will be set accordingly. Base salaries and benefits will be equalized, in concert with INERA and other donor-supported projects, at a level which will keep researchers in the system and improve the likelihood of the GOZ being able to pay its personnel from regular budgetary sources. Additionally, the GOZ will pay an increasing portion of personnel costs of national staff employed by SENARAV, picking up all personnel costs by early January 1992. The GOZ will also provide increasing budgetary support for other operating expenses.

RAV II will foster environmental sustainability by: 1) increasing emphasis on fragile agro-ecological zones as on-farm testing and outreach sites; 2) increasing emphasis on the development of environmentally sound technologies; 3) providing short-term training in agro-ecology; and 4) investigating possible linkages with international organizations concerned with conservation issues.

The project will also facilitate the integration of SENARAV programs into the National Institute for Agricultural Research and Studies (INERA), as agreed by an interdepartmental memorandum in late 1989 signed by the Ministry of Agriculture and the Ministry of Higher and University Education and Scientific Research. USAID supports SENARAV and INERA integration as part of a policy of coordination with the World Bank, UNDP, and other donors to restructure the national agricultural research system with the objective of improving its effectiveness and programmatic sustainability.

D. Project Activities to Date

The RAV II project was authorized on July 6, 1990. The Project Grant Agreement was signed with the Government of Zaire's Ministry of Agriculture and Rural Development on July 7, 1990, obligating the first tranche of \$8.0 million to the project. A subsequent First Amendment to the Project Grant Agreement, obligating an additional \$5.0 million, was signed on March 30,

1991. RAV II overlapped with the first phase of the project through September 30, 1990, the RAV I Project Assistance Completion Date (PACD). All Conditions Precedent to initial disbursement included in the Project Grant Agreement have been satisfied.

A number of activities have been initiated since the RAV II Project Grant Agreement was signed, some of which represent a continuation of RAV I programs and some which are particularly tied to the start-up of the new project. Internal reviews were held in July, 1990 for each of the three national programs under SENARAV (PRONAM, PNL and PNM). The output of these meetings formed the basis of the Fourth Annual Scientific Review of SENARAV, which was held in August, 1990. Seven new varieties (three maize, three manioc, and one soybean), plus two alley-cropping systems were recommended at the Annual Scientific Review for official release.

SECID fielded a short-term pre-implementation team which was able to participate in the Annual Scientific Review and produce draft two-year workplans. The long-term implementation contract was subsequently signed with SECID on September 29, 1990 and the first of the implementation team arrived in November. As of April 2, 1991, all ten SECID technical assistance team members had arrived at post. USAID and SENARAV have reached agreement on the redeployment of five SECID staff due to USAID's suspension of support to the National Maize Program. All five of these positions had national responsibilities for crops other than maize. An initial SENARAV-SECID team conference was held April 2-3, 1991, to discuss a variety of issues related to project management and implementation.

Twenty-nine participant trainees who initiated their graduate degree programs under the RAV I project were transferred to RAV II funding, under the direct management supervision of Southern University, SECID's lead institution for this project. Five participants have completed their programs and returned to Zaire since July, 1990. The SECID implementation team, together with SENARAV, has initiated procedures for monitoring students' progress more closely than has been the case to date. The first seven candidates for advanced degree training under RAV II were selected and enrolled in English Language classes at the Zaire-American Language Institute in October, 1990. They will begin their studies in the U.S. later this year. Meanwhile, a second group is being selected to begin English language classes at ZALI in July, 1991.

Two important activities related to financial management have been carried out since project start-up. SENARAV was certified as having met USAID Zaire pre-specified standards for sound financial management of Counterpart Funds (CPF). USAID also funded the second complete audit of INERA accounts, which

was a pre-condition for the World Bank's proposed agricultural research project and which is another step towards the planned integration of INERA and SENARAV by 1993.

II. PROJECT DESCRIPTION

A. Adjustments in RAV II

Serious shortages of counterpart funds and difficulty of the GOZ to support high levels of recurrent costs including maintenance of research infrastructure has led to greater focusing of project activities and adjustments in project budgets. In addition, the suspension of USAID support to the national maize program (PNM) has resulted in modifications in both budgets and phasing of project activities. The major modifications are summarized below.

Given the greatly reduced local currency funding availability, certain project interventions have been concentrated on fewer sites than originally planned. Sites were chosen based on their potential for having the highest impact for funds spent, and positive contribution to program sustainability. Table 1 presented below (which modifies Table 1, page 18 of the original PP), shows planned locations for research facilities rehabilitation, research, testing and outreach. Criteria for site selection are also discussed.

For research facilities rehabilitation, emphasis will be put on those sites which are representative of key agro-ecological zones, and which already having basic physical and human resources: reliable water and electricity, ease of communication and transportation, existing research facilities, trained technicians, access to health care, schools and other amenities. Based on these criteria, the facilities rehabilitation effort will focus on Mulungu and M'Vauzi. Research laboratory rehabilitation will be concentrated at these two sites (Mulungu, being the base for the national resource management element. Rehabilitation at Gandajika will be more limited with less emphasis placed on rehabilitating laboratories. This strategy assures reasonable, access by researchers to laboratories (soils and plant tissue analysis, seed technology, tissue culture, entomology), documentation centers, computers for data analysis, and reproduction equipment for technical research reports and extension materials.

For principal research activities, selection criteria for sites were: representation of key agro-ecological zones, access to research facilities, high farm population density, and capacity to provide adequate technical support to research and development teams. Based on these criteria, primary research sites will be located at Mulungu and M'Vauzi. Gandajika will become a secondary research site. Research may be supported at Kaniameshi in the future, subject to funding availability and the resumption of USAID support to the national maize program.

Table 1. Research Facilities, Research, Testing, and Outreach Sites

<u>Location</u>	<u>Facilities</u>	<u>Research</u>	<u>Testing*</u>	<u>Outreach</u>
M'Vuazi	X	X		X
Kiyaka			X	X
Gandajika	X*	X		X
Niembo			X	X**
Kaniameshi	X***	X***		X***
Mulungu	X	X		X

* SENARAV will collaborate with other elements of the national agricultural research system in Zaire for adaptive testing of technologies at such INERA stations as Yangambi, Bambesa, Nioka, and other stations where these technologies can be usefully tested at no or minimal additional cost to the project.

** Subject to funding availability, SENARAV Research and Development (R & D) teams will be established in year three of the project at Niembo. SENARAV personnel from Gandajika will provide technical backstopping to USAID's Central Shaba Agricultural Development project until the R & D team is established at Niembo.

*** Subject to funding availability and USAID resumption of support to the National Maize Program, research facilities, research and outreach programs will be established at Kaniameshi.

For outreach activities, the criteria used for sites were: high farm population densities, importance of areas for supplying urban markets with staple food crops, nutritional status of the region (both rural and urban), high concentration of outreach agencies, and probable positive short-term impact on both food crop production and natural resource management. Based on these criteria, outreach teams will initially be located at the Mulungu, Kikwit, M'Vauzi, and Gandajika sites. Teams may be added to Kaniameshi and Niembo in the future, subject to increased funding availability, and in the case of Kaniameshi, to the resumption of USAID support to the national maize program. Gandajika-based SENARAV personnel will provide a modest level of support to USAID's Central Shaba Agricultural Development project at Niembo, until it is possible to establish a SENARAV research and development team at Niembo.

Rehabilitation and construction will take place at the following locations:

- Kaniameshi -- Rehabilitation of seed conditioning and storage facility; housing; multi-purpose laboratories; offices, miscellaneous research facilities; work shop; electrical and water system; roads; drainable; erection of greenhouse and screenhouses (subject to USAID resumption of support to PNM).
- M'Vuazi -- Rehabilitation of a germplasm conservation unit; seed conditioning and storage; tissue culture, pathology, entomology and Multi-purpose laboratories; training facilities; offices, miscellaneous research facilities; housing for TA; electrical and water system; roads; and drainage.
- Kinshasa -- As part of this Project Agreement, the GOZ was asked to provide and has provided a government-owned building which will be used by SENARAV for office space. An annex will be added to this building to provide a conference room, document reproduction facilities, and additional office space.
- Gandajika -- Rehabilitation of a seed conditioning and storage facilities; greenhouse and screehouse; offices; miscellaneous research facilities; entomology laboratory; garage; water system; roads; and drainage.
- Mulungu -- Rehabilitation of Offices; Soil and Plant analysis laboratory; plant propagation laboratory; agroforestry herbarium; and miscellaneous research facilities.

Commodity requirements have been modified to reflect transfer of some commodities from other projects (TA furniture and appliances, vehicles), purchase of vehicles at the end of RAV I, revised requirements for research based on input of SECID TA, and a strategy adopted by SENARAV to rely more heavily on motorcycles to meet transportation requirements particularly for on-station research. No commodities will be purchased for the Kaniameshi research station, pending resumption of USAID support to PNM. Funding for Kaniameshi is not budgeted but may possibly be drawn from the contingency line item.

The duration of some TA positions has been reduced, including the agronomist, entomologist, economist, grain legume breeder, and financial management specialist. The plant breeder (maize)/pathologist position's responsibilities have been revised. This is discussed in more detail under the institutional/administrative analysis.

Funding levels provided in the original PP for long-term participant training remains unchanged. However, the number of participants has been reduced from 31 to 25. This reflects higher estimated costs per participant than originally planned based on the projects experience to date and the current status of RAV I participants.

Dollar funds have now been provided for fuel, vehicle repair, air travel and per diem for TA, and for other contractor logistical support (i.e. support personnel, guards, utilities, house repairs, communications). These costs were originally budgeted in counterpart funds. Funding levels for networking/research grants have been reduced and funded entirely in dollars.

B. New Element Description

The natural resource management element will concentrate on instituting research and support facilities to better integrate natural resource management into farmer adopted technologies. The NRM element will be national in focus (within SENARAV Programs) and will complement a similarly defined need also at the conceptual stages within the INERA institutional framework. In light of the eventual merger of the two institutions, this element will provide an initial point of integration which draws on shared scientific personnel and provides logistical support to natural resource activities in food crop production research.

The natural resource management element will be based on the establishment of three new research thrusts in soil management, agroforestry, and agro-ecology. These thrusts will provide technological research support in soil fertility management, soil conservation, and a diversified approach to the use and management of trees to meet farmers needs (soil fertility restoration, food, fuelwood and building material). An important element of the agro-ecology research effort will concentrate on the evaluation and outreach of technologies based on land utilization and the effects technologies will have on off-farm natural resources. This element will provide a conceptual analysis for the targeting of specific technologies in relation to the state of the surrounding natural resource base. This will ensure that environmentally sensitive areas (i.e. national parks) are not negatively impacted by technologies (i.e. introduction of an exotic species). It will also identify where such introductions could be economically beneficial to the farmer and beneficial or at least neutral to the natural resource base.

Institutionalization of this focus in SENARAV will be provided through: (1) the consolidation of a Research and Development Section within each national program, (2) upgrading the research facilities at Mulungu to conduct applied research, (3) providing technical assistance to design and guide research, training and outreach in natural resource management, (4) supporting participation in international networks which focus on natural resource management technology development, (5) advanced degree, as well as specialized short-term training of Zairians, in pertinent areas of natural resource management, and (6) establishment of R&D Teams in the Kivu region, in addition to those planned for other regions in the PP. These R&D Teams will work with the Service National de Vulgarization (SNV) and the NGO community to provide improved outreach to farmers.

The addition of the natural resource management element changes neither the original goal nor purpose of the project paper, but strengthens implementation to increase the project's capacity to meet both its goal and purpose.

There are six possible sites for locating the research field sites and laboratories for the natural resource management element: the three research centers for the three national SENARAV programs (M'Vauzi, Gandajika and Kaniameshi) and the three national program substations (Kiyaka, Niembo and Mulungu). The following criteria, which take all major factors into consideration, were developed for assessing the relative merits of the six sites:

- (1) the new activities should add to, and reinforce, existing SENARAV and INERA research programs;
- (2) a significant number of outreach agencies (NGOs or governmental) who are already functioning and capable of utilizing SENARAV-generated technologies should be present;
- (3) the population density should be high enough that technology dissemination activities are cost-effective;
- (4) the site should be a major food producing area of SENARAV-mandated crops;
- (5) there should be some basis for expecting a positive environmental impact from short-term interventions.
- (6) there should be relatively stable power and water supplies for research and laboratory facilities; and
- (7) laboratory infrastructure (equipment and trained staff) should to the greatest extent possible, already exist.

The rankings of the possible sites (Table 2) show that Mulungu, located in South Kivu, is by far the most suitable location for the main natural resource research facilities. Therefore, a research site, laboratories, and technical assistance personnel will be located at the SENARAV Mulungu station in South Kivu, with additional research sites at M'Vuazi and Gandajika. The research and outreach programs at the above three sites will be initiated within the first two years of component start-up. Outreach activities will also be initiated at Kiyaka. Research and/or outreach programs at the remaining two SENARAV sites, Kaniameshi and Niembo, will be started in year three, subject to funding availability and USAID resumption of support to PNM.

Table 2. Site selection rankings for NRM Element.

<u>Criteria</u>	<u>MVZ</u>	<u>KIY</u>	<u>GAN</u>	<u>KAN</u>	<u>NIE</u>	<u>MUL</u>
1. Reinforce SENARAV and INERA activities	2	2	2	2	1	3*
2. NGOs for outreach	1	2	1	1	2	3
3. High agricultural population density	1	2	2	2	1	3
4. SENERAV-mandated food growing area	3	3	3	2	3	3
5. Probable positive short-term environmental impact	2	2	2	1	2	3
6. Relatively stable power and water supply	1	0	0	0**	0	2
7. Existing laboratory infrastructure	2	0	0	0***	0	2
Total	12	11	10	8	9	19

<u>Rankings</u>	<u>Locations</u>			
3 - High	MVZ	M'Vauzi	KAN	Kaniameshi
2 - Medium	KIY	Kiyaka	NIE	Niembo
1 - Low	GAN	Gandajika	MUL	Mulungu
0 - none				

* Mulungu serves as the soil research center of the INERA Natural Resource Management Program.

** Kaniameshi is near Lubumbashi. Power could be obtained at relatively low cost and other urban services are available.

*** Sound buildings exist at Kaniameshi, but laboratories have not been established.

SENARAV has been active at Mulungu, and has had research personnel there, since 1983, at the start of RAV I. SENARAV's main focus at Mulungu has been on developing improved varieties of beans for high altitudes, but smaller research programs also exist for working with SENARAV's other two nationally mandated crops, cassava and maize. In addition, Mulungu also serves as the soil research center of the INERA Natural Resource Management Program.

The Mulungu station is connected to the South Kivu central electricity grid, which provides a steady flow of power, and has an adequate supply of water. The existing laboratories are structurally sound, but outmoded and badly in need of renovation.

North and South Kivu are Zaire's most densely populated agricultural areas. Pressure on the land is intense, and the agricultural activities on the hilly and mountainous terrain have led to severe erosion. A well-established network of NGOs exists in the two regions, but the present NGO-run outreach programs in soil management and agroforestry lack a research base. As a result, the trees and agricultural technologies extended are sometimes not well suited to the farmers' needs.

Kiyaka, Gandajika and M'Vauzi were chosen as sites for natural resource management activities on the same criteria. They are given lower priority than Mulungu simply because Mulungu ranks higher on most of the criteria for selection. However, all of the regions are under-going degradation of the natural resource base due to agricultural activities, and all sites will benefit from integrating natural resource management into the locally extended technologies. Activities will be initiated at these four sites simultaneously. By year four of project life, the natural resource management component should be fully incorporated at all SENARAV research, testing and outreach sites.

Providing adequate research support for the natural resource management activities being added to the project will require two additional positions on the SECID technical assistance team. Natural resource management is new to SENARAV, aside from modest efforts in alley cropping and soil fertility research. Outside technical assistance is needed to design and initiate a comprehensive research, outreach and training program and to successfully integrate it into the SENARAV structure. Two persons, one with expertise in tropical soil management, the other experienced in agroforestry/agro-ecology, will be required for three years.

The particular expertise of a Soil Management Specialist and an Agroforester/Agro-ecologist is required to provide the technical focus needed on the two major causes of natural resource degradation. These are abusive soil management

encouraged by the utilization of traditional farming practices in a market economy, and the increasing demand for fuelwood in the more densely populated rural areas. The specific interventions and technical solutions developed to improve natural resource management will be tailored to the agro-ecological, and social environments found in the different parts of the project area. Climate, crops, soils, landform, land tenure, and market demands will all be factored into the research and outreach processes.

III. NRM ELEMENT IMPLEMENTATION PLAN

A. Implementation Perspective

The implementation plan will describe how the concept of environmentally responsible agriculture will be made operational from an implementation perspective within the frameworks of a national agricultural research and extension organization and of a food crops research and outreach development project. This implementation plan will be subdivided into a description of how the above components will be integrated with the present structure to form a modified institutional and training strategy.

From an implementation perspective, the new element will strengthen the original project design in several ways:

First, this element will alter to some degree the criteria for selecting Primary and Secondary Collaborators. SENARAV has responsibility for food crops research, but it does not currently have primary national responsibility for research in such areas as forestry or agroforestry. Nor does SENARAV directly have a responsibility for the stewardship of natural resources in Zaire. Many NGOs and certain governmental organizations in Zaire, however, do have such responsibilities. In order to maximize the positive environmental impact from agricultural research and development, SENARAV can play two positive roles. It can play a backstopping role for NGOs and governmental agencies whose primary area of expertise does lie in these other areas. It can also select as Collaborators those organizations which indicate a willingness to include environmental considerations within their own outreach activities.

Second, SENARAV can help ensure that the technologies that it develops are environmentally appropriate. Let us take a concrete example. SENARAV could develop bean varieties which will produce at high altitudes in the Kivu region. The development of one or more such varieties would, in effect, make it possible and desirable for farmers to utilize for agricultural production lands which are today in natural forest. These lands are generally on very steep slopes, and should in theory be maintained as part of national parks or buffer zones around these parks. Or, alternatively, SENARAV could concentrate on improving bean yields at lower altitudes on lands which have already been converted to agricultural land use. This latter alternative would encourage farmers to utilize these lands more intensively

and reduce the incentive to move into new lands.² Thus, the research priorities and programs established by SENARAV can have a very direct impact on the natural environment of a region. SENARAV's research and outreach programs in each area will be evaluated from this perspective. Environmental criteria will be developed and included in SENARAV's research management process in which research priorities and content are determined.

Third, SENARAV can play an active role in developing land use management strategies for Zaire. There is both a micro (on-farm) and regional aspect to land use management. SENARAV's most direct impact can occur at the micro level to help plan micro level land use management in order to maximize appropriate resource utilization on farms. For example, several NGOs have excellent nurseries and tree dissemination programs, but lack the expertise to incorporate a land use management recommendation in their outreach programs. SENARAV can increase the effectiveness of these programs by providing the needed expertise. At the same time, a regional perspective is also needed. Some lands are simply not appropriate for agriculture at all. Others can be utilized on a sustained basis only through the incorporation of tree species, contour ridges and other conservation practices. Yet others are highly appropriate for agriculture and should be used much more intensively than they currently are. SENARAV, through its research programs and the use of Geographic Information Systems, can help define appropriate land use strategies and feed this information both downstream (to NGOs, for example) and upstream (into appropriate national level government agencies).

Fourth, SENARAV can monitor its activities from an environmental perspective. Too often, negative environmental impacts (degradation of estuarine systems from pesticides, for example) are discovered only after technologies have been developed and widely disseminated. This is often a result of focusing impact evaluation solely at the farm level and of utilizing purely agronomic and economic criteria for evaluation. Selected environmental criteria will be utilized in SENARAV's impact evaluation (these are discussed below) in order to discern any environmental effect early in the dissemination process, before widespread regional impact can occur. At a minimum, this will prevent SENARAV from contributing to environmental degradation. On the positive side, adoption of SENARAV technologies could in fact improve environmental quality. Certainly, maintenance of the status quo should be regarded as success.

² Clearing land for agriculture, using slash and burn techniques, is one of the primary sources of deforestation and environmental destruction.

Fifth, SENARAV and INERA can begin to build a national cadre of scientists who are trained in land use and natural resource management and, perhaps more importantly, can initiate on-going dialogue and cooperation between agricultural scientists and institutions concerned primarily with the conservation of Zaire's natural resource base. Too often in the past, natural scientists and conservationists and agricultural scientists and farmers have been pitted against each other, pursuing mutually exclusive goals and objectives. This luxury for debate and conflicting goals is not affordable for developing countries in general, and for Zaire in particular. Instead, every effort must be made to establish mutual goals and programs which aim both at preserving the natural environment and at improving the livelihood of farmers and the food security of the nation. SENARAV and INERA, with their environmental consciousness, cadre of trained scientists, and willingness to play a leadership role, can play a crucial role in Zaire in establishing the common goals and objectives, and designing research and outreach activities to meet those goals.

B. Participant Training

Incorporation of INERA personnel will reduce the total level of training in natural resource management required within SENARAV. Nonetheless, some long-term training will be required. Six individuals from SENARAV or INERA will be trained in the following areas:

Agroforestry/Forest Ecology (3)
Soil Management (2)
Soil Chemistry or Analytical Chemistry (1)

Support for these individuals will be provided by funds already available to RAV II. This implies by necessity that long-term training needs already identified in RAV II be altered (Table 3). These will come from long-term training allotments in Extension, Farming Systems Research, and Agricultural Economics. Training in Extension in the United States is often not at all appropriate to the needs of Extension workers in developing nations. Most Farming Systems programs in the United States do not offer a major and, at any rate, conducting good on-farm research requires a thorough base in some agricultural science. Further, the natural resource management activities, by definition, will be largely concerned with outreach.

In addition, USAID-funded projects have trained over 75 individuals in agricultural economics and others are still in long-term training in the United States. The GOZ will be asked to second qualified graduate-level trained agricultural economists to SENARAV. Therefore, only one agricultural economist will be trained in RAV II.

The project will also support specialized U.S. and third country short-term training and field study tours for SENARAV professionals. This may include courses organized by the Organization for Tropical Studies in Costa Rica and/or ICRAF in Kenya, study tours in Central America or Haiti where Zairians could observe similar land use problems to those encountered in parts of Zaire as well as active NRM research and outreach programs, and visits to programs of the U.S. Soil Conservation Service. Most short-term training of this nature will be integrated into training programs of SENARAV graduate students studying in the U.S.

Table 3 (I-1 Modified). SENARAV Personnel On-Board, Current Training and Proposed for Training in Various Disciplines*.

(1) DISCIPLINE	END OF PROJECT GOALS**		(2) NOW ON BOARD		(3) NOW IN TRAINING		(4) PROPOSED TO BE TRAINED	
	MSC	PHD	MSC	PHD	MSC	PHD	MSC	PHD
Agronomy (crops)	5	2	1		4	2		
Agronomy (soils)	3	3			3		3	3
Ag. Economics	1				1			
Ag. Engineering	1				1			
Entomology	2	3			2	3		
Extension	1				1			
Food Technology	2				1		1	
Agrofor./Ecology	3						3	
Farm Syst. Resrch.								
Plant Breeding	3	3	1		5			3
Plant Pathology	2	3			1	3	1	
Soil Management	2						2	
Chem./Soil Chem.	1						1	
Rural Sociology	1	1		1			1	
Biometrics	1						1	
Bus./Public Adm	4						4	
Accounting	2						2	
Women (all fields)***	2	1					3	1
Totals	34	15	2	1	19	8	19	6

* Personnel on board and in training is as of June 1990 when RAV II project design was completed.

** Important: Total MSc candidates have been reduced by the number who will also receive Ph.D.

*** Women participants are included in discipline listings.

(1) Farming Systems Research and Biometric studies will also be provided as minor courses in other fields. Plant physiologists included in crop sciences.

(2) Personnel on board and end of project goals does not include two Ph.D. entomologists, two M.S. agronomists and one M.S. plant breeder who are currently program administrators; and four M.S. degree holders at Mulungu (INERA employees) trained under RAV I. Also not included are the eight candidates now completing studies for the Ph.D.

(3) Three of these candidates started their programs late during RAV I and are included as RAV II participant trainees.

- (4) Some trade-offs may be necessary between FSR, crop and soil sciences as the exact nature of current training requires additional analyses.

C. Two-Year Work Plan

The work plan discussed in the SECID Project Proposal will be amended to include the additional activities associated with the natural resources management element of the project. These activities include soil management, agroforestry, and agro-ecology. The technical assistance team (including the new positions for Soil Management Specialist, and Agroforester/Agro-ecologist), in consultation with appropriate Zairian counterparts, will construct a detailed two-year work plan. The work plan will build upon the existing project work plan and will address the following issues:

- o design and implementation of an on-station soils laboratory at the Mulungu station near Bukavu;
- o design and implementation of a tissue culture and seed preparation laboratory at Mulungu;
- o design and development of the soil management research and training program;
- o design and development of the agroforestry research program and training;
- o design and development of the agro-ecology research and training program, including design and implementation of an agro-ecology/bio-geophysical survey of the RAV II target localities;
- o establishment of R&D teams in the Kivu region;
- o program coordination between RAV II natural resource activities and Zairian and international counterparts;
- o station rehabilitation at Mulungu;
- o commodity acquisition; and
- o program monitoring and evaluation schedules.

IV. Cost Estimate and Financial Plan

A. Introduction

The budgets presented here were created to correspond to those budgets presented in tables 3, 4 and 5 of the original RAV II PP. Table 3 provided a summary of the contributions of both the U.S. Government and the GOZ. Table 4 summarized the USAID contribution by line item and project year. Table 5 presented the GOZ contribution by line item and calendar year and provides the breakdown between counterpart funds and regular Zaire government budget resources. These budgets are considered indicative rather than exact.

The budgets in the following pages consist of three sets of budgets with three budgets in each set. The budgets are in sets because of the need to work with US dollar budgets (Tables 5, 8 and 11), local currency budgets for counterpart funds and the GOZ contribution (Tables 6, 9 and 12), and then combine US dollar and local currency budgets (Tables 4, 7 and 10).

The budgets include a set of revised budgets for the original RAV II project (Tables 7, 8 and 9), a set of budgets for the NRM Element (Tables 10, 11 and 12), and a set of budgets which combines the revised RAV II and the NRM Element budgets to provide an overall budget for the project (Tables 4, 5 and 6).

USAID funding is budgeted by project year, which in this case corresponds to the USG fiscal year. Fiscal year 1991 is used as the first project year for all of the USG contribution budgets (RAV I PACD was September 30, 1990). Amendment funding will commence near the end of project year 1 and continue through project year 8. GOZ funding and counterpart funding is budgeted by calendar year.

Cost estimates and commodity lists are provided in detailed budgets in Annex D.

B. Sources of Financing

Following the plan developed in the RAV II PP, USAID will provide a high proportion of the funding in the early years of the project, with an increasing proportion contributed from the GOZ regular budget resources as the project continues. The GOZ will pay all SENARAV personnel costs beginning in 1992 and will maintain facilities from its regular budget.

C. Combined Project Budgets

The budgets for the whole of the newly expanded project activity are found in budgets 4A, 5A and 6A. The total budget including both RAV II and the NRM Element is 42.200 million dollars. The USG contribution is 24.853 million dollars and the GOZ will contribute 17.347 million dollars. Of this 17.347 million dollars, counterpart funds will provide 7.47 million dollars and 9.877 million dollars will be paid from the GOZ regular budget. The USG will contribute 59 percent of the total budget and the GOZ 41 percent.

Line items 1 through 8 are part of the Technical Assistance/Program Support Contract for the project. Items 9 through 11: vehicles and parts, audits and evaluations, and the contingency fund will remain under the direct control of USAID.

Although a 6.09 million dollar component has been added to the original RAV II project, the total budget increase is only \$700,000. In this process, the original RAV II project has been significantly revised and restructured.

TABLE 4. COMBINED RAV II (Revised + NRM Element) Life of Project Costs Contributed by the USG and the GOZ, Thousands U.S. Dollars.*

Item	CONTRIBUTIONS BY:				Total Dollars	Percent of Total	
	USG	GOZ					
		Counterpart Funds	Regular Budget Res.	Sub-total			
	Contr-actor	SENARAV	Budget Res.	Sub-total			
TECHNICAL ASSISTANCE/ PROGRAM SUPPORT							
1. Technical Assistance/ Personnel	10,573.9	279.0	7,157.3	7,436.3	18,010.2	42.68%	
2. Training	4,647.7	35.1	8.3	43.5	4,691.2	11.12%	
3. Facilities Rehabilitation	880.5		216.3	216.3	1,096.8	2.60%	
4. Research Equipment and Supplies	1,647.4	271.9	269.2	541.1	2,188.5	5.19%	
5. Office/Household Equipment and Supplies	859.1	786.1	331.2	1,117.3	1,976.4	4.68%	
6. Networking/Research grants	560.0				560.0	1.33%	
7. Contractor Logistic Support	515.9				515.9	1.22%	
8. Fuel, Repair, Air fare and Per Diem	2,515.4	5,330.7	1,678.8	7,009.4	9,524.8	22.57%	
9. VEHICLES AND PARTS	964.6	122.9	19.4	142.3	1,106.9	2.62%	
10. AUDITS/EVALUATIONS	505.0				505.0	1.20%	
11. OTHER COSTS/CONTINGENCY	1,183.5	643.9	196.8	840.8	2,024.3	4.80%	
Totals	24,853.0	0.0	7,469.6	9,877.4	17,347.0	42,200.0	100.00%
Percent of Contributions	58.89%			41.11%			

Items 1 - 8 are part of the TA/Project Support contract.

* Because the values given in this table have been rounded, while their individual integrity has been maintained, not all rows and columns appear to sum correctly. The totals given, however, are in fact correct.

TABLE 5. COMBINED RAV II (REVISED AND NRM Element) Life of Project Costs Contributed by the U.S. Government, Thousands U.S. Dollars*.

Item	PROJECT YEAR									Total	Percent of Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98			
TECHNICAL ASSISTANCE/PROGRAM SUPPORT											
1. Technical Assistance/ Personnel	2,630.0	2,919.0	2,403.5	729.3	469.2	492.7	474.4	455.9	10,573.9	42.55%	
long-term	2,380.0	2,709.0	2,183.0	532.5	286.9	301.2	300.2	315.2	9,007.9		
short-term	250.0	210.0	220.5	196.8	182.3	191.4	174.2	140.7	1,566.0		
2. Training	560.0	917.2	814.7	678.9	783.5	519.5	297.2	76.7	4,647.7	18.70%	
long-term, short-term foreign and domestic											
3. Construction/Rehabilitation	300.0	580.5							880.5	3.54%	
4. Research Equipment and Supplies	582.3	619.9	114.7	114.7	69.8	48.4	50.2	47.4	1,647.4	6.63%	
5. Office Equipment and Supplies	548.0	153.8	69.5	24.3	18.8	15.6	16.3	12.9	859.1	3.46%	
6. Networking/Research Grants	75.0	125.0	125.0	100.0	75.0	35.0	25.0		560.0	2.25%	
7. Contractor Logistical Support	80.8	129.5	117.4	54.0	33.3	35.0	36.7	29.3	515.9	2.08%	
8. Fuel, Repair, Air Fare and Per Diem	595.4	697.9	575.1	165.9	119.7	125.7	131.9	103.9	2,515.4	10.12%	
9. VEHICLES AND PARTS	251.0	122.9			546.1	44.7			964.6	3.88%	
10. AUDITS/EVALUATIONS	60.0			218.0		50.0		177.0	505.0	2.03%	
11. OTHER COSTS/CONTINGENCY	284.1	313.3	211.0	104.3	105.8	68.3	51.6	42.5	1,183.5	4.76%	
TOTAL	5,966.6	6,578.8	4,430.8	2,189.4	2,221.1	1,437.7	1,083.5	948.2	24,853.0	100.00%	
Percent of Total	24.01%	26.47%	17.83%	8.81%	8.94%	5.77%	4.36%	3.82%	100.00%		

* Most estimates are adjusted for a 5.0 percent annual rate of inflation.

TABLE 6. COMBINED RAV II (Revised + NRM Element) Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR										Total	Percent of Line Item	Percent of Total	Percent of CPF & RBR			
	1990	1991	1992	1993	1994	1995	1996	1997	1998								
1. Personnel																	
CPF**	237.0	672.2	822.1	879.8	924.7	969.8	1,019.0	1,069.3	842.4	7,436.3							
RBR	8.0	622.2	822.1	879.8	924.7	969.8	1,019.0	1,069.3	842.4	279.0	3.75%	1.61%	2.82%				
2. Training																	
CPF		2.5	5.3	5.5	5.8	6.1	6.4	6.7	5.3	43.5							
RBR		2.5	5.0	5.0	4.9	4.9	4.8	4.7	3.4	35.1	80.80%	0.20%	0.47%				
3. Facilities Rehabilitation																	
CPF			10.9	25.2	34.5	36.2	38.0	39.9	31.4	216.3							
RBR			10.9	25.2	34.5	36.2	38.0	39.9	31.4	0.0							
4. Research Equipment and Supplies																	
CPF	52.0	129.3	41.7	43.8	46.0	48.3	57.4	60.3	62.3	541.1							
RBR	27.0	122.3	34.4	27.3	21.3	13.4	11.3	3.9	11.0	271.9	50.25%	1.57%	3.64%				
5. Office Equipment and Supplies																	
CPF	15.0	230.6	117.9	138.8	117.8	123.7	129.9	136.4	107.4	1,117.3							
RBR	13.0	147.6	61.7	81.5	102.3	102.1	101.1	101.4	75.5	786.1	70.36%	4.53%	10.52%				
6. Networking/Research Grants																	
CPF																	
RBR																	
7. Contractor Logistic Support																	
CPF																	
RBR																	
8. Fuel, Repair, Air Fare and Per Diem																	
CPF	202.0	662.6	770.1	808.5	849.0	891.5	936.0	982.8	907.0	7,009.4							
RBR	97.0	624.6	716.8	703.7	688.8	668.2	644.8	615.8	570.8	5,330.7	76.05%	30.73%	71.36%				
	105.0	38.0	53.2	104.8	160.1	223.2	291.2	367.0	336.1	1,678.8	23.95%	9.68%	17.00%				

TABLE 6. COMBINED RAV II (Revised + NRM Amendment) Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR									Total	Percent of Line Item	Percent of Total	Percent of CPF & RBR
	1990	1991	1992	1993	1994	1995	1996	1997	1998				
9. VEHICLES (In-country shipping)		56.0				86.3				142.3			
CPF		56.0				66.9				122.9	86.33%	0.71%	1.64%
RBR						19.4				19.4	13.67%	0.11%	0.20%
10. AUDITS/EVALUATIONS										0.0			
CPF										0.0			
RBR										0.0			
11. OTHER COSTS/CONTINGENCY	24.7	104.6	89.5	95.9	99.3	108.6	109.9	115.4	92.8	840.8			
CPF	21.7	96.6	82.5	82.3	80.1	81.1	75.1	71.8	52.7	643.9	76.59%	3.71%	8.62%
RBR	3.0	8.0	7.0	13.6	19.3	27.5	34.7	43.6	40.1	196.8	23.41%	1.13%	1.99%
Subtotals													
CPF	387.7	1,099.5	900.4	899.8	897.5	936.5	837.1	797.6	713.5	7,469.6		43.06%	100.00%
RBR	143.0	758.2	957.0	1,097.9	1,179.7	1,333.9	1,459.4	1,613.2	1,335.0	9,877.4		56.94%	100.00%
TOTAL	530.7	1,857.8	1,857.4	1,997.7	2,077.2	2,270.4	2,296.6	2,410.8	2,048.5	17,347.0		100.00%	
Percent of Total	3.06%	10.71%	10.71%	11.52%	11.97%	13.09%	13.24%	13.90%	11.81%	100.00%			
Percent of CPF	5.19%	14.72%	12.05%	12.05%	12.02%	12.54%	11.21%	10.68%	9.55%	100.00%			
Percent of RBR	1.45%	7.68%	9.69%	11.11%	11.94%	13.50%	14.78%	16.33%	13.52%	100.00%			

* All estimates are adjusted for a 5.0 percent annual rate of inflation

** The amount budgeted for 1991 does not include severance pay.

NOTE: This is an illustrative budget only, from which there may be variance. GOZ commitment is to the total amounts to be provided and not necessarily to follow this exact line-item budget.

D. Revised RAV II Budgets

The total revised budget for RAV II, prior to adding the NRM element, is 36.110 million dollars (previously \$41.50 million). This consists of a 20.697 million dollar USG contribution (previously \$20.0 million), with the additional \$697,000 provided from the Amendment. The GOZ contribution is 15.414 million dollars (previously \$21.5 million). Of this 15.414 million dollars, counterpart funds will provide 6.347 million dollars and 9.067 will be paid from the GOZ regular budget. The USG will contribute 57 percent of the total budget and the GOZ 43 percent.

In the original RAV II project budgets, all of the in-country operating funds for technical assistance, contractor logistical support and one-half of the facilities rehabilitation costs were budgeted in local currency. The significant reduction in the amount of counterpart funds available has made this impossible. This change and the prediction that counterpart funds will be limited to \$900,000 per year including funding for the NRM element (with the exception of 1.1 million in 1991) has required a significant restructuring of the RAV II project.

Long-term technical assistance has been reduced by 6 person years (net). The Legume Breeder, Agronomist, Entomologist, and Agricultural Economist positions have all been reduced by one year. The Financial management position has been reduced by 3 years. The Research Station Management position has been increased by 1 year.

The facilities rehabilitation budget has been reduced from \$1.8 million (dollar and local currency) to \$660,000 which will be entirely funded in dollars. The entire funding of contractor logistical support (line item 9) and in-country travel for TA (line item 8) has been moved from local currency to dollars. A minimum of essential research and office supplies to support TA (a part of line items 4 and 5) has also been changed to dollar funding. In the process, laboratory facilities planned for Gandajika, and a soils lab planned for Kinshasa or N'Vuaze have been eliminated from the project. Construction for PNM has been dropped due to USAID's suspension of support to PNM. The initial planned purchase of 20 four-wheel vehicles has been reduced to two. This reduction is partially offset by 10 vehicles purchased with money from RAV I and the transfer of 4 vehicles from other projects as part of USAID's program restructuring. A number of motorcycles have been added to provide mobility at reduced cost. The networking/ research grant line item has been reduced from \$2.6 million (dollars and local currency) to 560,000 dollars, and will be funded entirely in dollars.

TABLE 7. RAV II (REVISED) Life of Project Costs Contributed by the USG and the GOZ, Thousands U.S. Dollars.*

Item	CONTRIBUTIONS BY:				Total Dollars	Percent of Total
	USG	GOZ				
		Counterpart Funds Contr-actor	SENARAV	Regular Budget Res.		
TECHNICAL ASSISTANCE/ PROGRAM SUPPORT						
1. Technical Assistance/ Personnel	8,833.2	279.0	6,701.0	6,980.0	15,813.2	43.79%
2. Training	4,338.8				4,338.8	12.02%
3. Facilities Rehabilitation	660.0		174.4	174.4	834.4	2.31%
4. Research Equipment and Supplies	957.9	213.6	263.0	476.6	1,434.5	3.97%
5. Office/Household Equipment and Supplies	723.5	743.9	327.0	1,070.9	1,794.4	4.97%
6. Networking/Research grants	560.0				560.0	1.55%
7. Contractor Logistic Support	433.0				433.0	1.20%
8. Fuel, Repair, Air Fare and Per Diem	1,948.1	4,484.2	1,417.0	5,901.2	7,849.3	21.74%
9. VEHICLES AND PARTS	751.5	54.0	8.5	62.5	814.0	2.25%
10. AUDITS/EVALUATIONS	505.0				505.0	1.40%
11. OTHER COSTS/CONTINGENCY	985.5	572.3	176.0	748.3	1,733.9	4.80%
Totals	20,696.5	0.0	6,347.0	9,066.9	15,413.9	100.00%
Percent of Contributions	57.31%			42.69%		

* Because the values given in this table have been rounded, while their individual integrity has been maintained, not all rows and columns appear to sum correctly. The totals given, however, are in fact correct.

TABLE 8. RAV II REVISED Life of Project Costs Contributed by the U.S. Government,
Thousands U.S. Dollars*.

Item	PROJECT YEAR								Total	Percent of Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98		
TECHNICAL ASSISTANCE/PROGRAM SUPPORT										
1. Technical Assistance/ Personnel	2,390.0	2,436.0	1,896.3	428.3	420.6	441.6	420.8	399.6	8,833.2	42.68%
long-term	2,180.0	2,289.0	1,742.0	301.0	286.9	301.2	300.2	315.2	7,715.4	
short-term	210.0	147.0	154.4	127.3	133.7	140.4	120.6	84.4	1,117.8	
2. Training	558.0	868.9	753.0	639.6	720.2	478.6	267.8	52.8	4,338.8	20.96%
long-term, short-term foreign and domestic										
3. Facilities Rehabilitation	300.0	360.0							660.0	3.19%
4. Research Equipment and Supplies	582.3	68.3	71.7	75.2	47.3	36.9	38.7	37.5	957.9	4.63%
5. Office Equipment and Supplies	548.0	57.8	57.3	11.6	12.2	12.8	13.4	10.6	723.5	3.50%
6. Networking/Research Grants	75.0	125.0	125.0	100.0	75.0	35.0	25.0		560.0	2.71%
7. Contractor Logistical Support	65.2	104.1	99.6	35.2	32.1	33.7	35.4	27.9	433.0	2.09%
8. Fuel, Repair, Air Fare and Per Diem	526.1	552.4	422.3	85.7	89.9	94.4	99.2	78.1	1,948.1	9.41%
9. VEHICLES AND PARTS	251.0	36.8			419.0	44.7			751.5	3.63%
10. AUDITS/EVALUATIONS	60.0			218.0		50.0		177.0	505.0	2.44%
11. OTHER COSTS/CONTINGENCY	267.8	230.5	171.3	79.7	90.8	61.4	45.0	39.2	985.5	4.76%
TOTAL	5,623.3	4,839.5	3,596.4	1,673.2	1,907.1	1,289.1	945.2	822.6	20,696.5	100.00%
Percent of Total	27.17%	23.38%	17.38%	8.08%	9.21%	6.23%	4.57%	3.97%	100.00%	

* Most estimates are adjusted for a 5.0 percent annual rate of inflation.

TABLE 9. RAV II (REVISED) Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR										Percent of Line Item	Percent of Total	Percent of CPF & RBR
	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total			
1. Personnel													
CPF**	237.0	646.0	767.0	822.0	864.0	906.0	952.0	999.0	787.0	6,980.0			
RBR	8.0	596.0	767.0	822.0	864.0	906.0	952.0	999.0	787.0	279.0	4.00%	1.82%	4.43%
										6,701.0	96.00%	43.65%	73.98%
2. Training										0.0			
CPF										0.0			
RBR										0.0			
3. Facilities Rehabilitation			10.9	25.2	26.5	27.8	29.2	30.6	24.1	174.4			
CPF										0.0			
RBR			10.9	25.2	26.5	27.8	29.2	30.6	24.1	174.4	100.00%	1.14%	1.92%
4. Research Equipment and Supplies	52.0	89.3	38.6	40.5	42.5	44.7	53.6	56.3	59.1	476.6			
CPF	27.0	82.3	31.6	24.5	18.5	10.7	8.6	1.3	9.1	213.6	44.81%	1.39%	3.39%
RBR	25.0	7.0	7.0	16.0	24.0	34.0	45.0	55.0	50.0	263.0	55.19%	1.71%	2.90%
5. Office Equipment and Supplies	15.0	200.6	115.8	136.6	115.5	121.2	127.3	133.7	105.3	1,070.9			
CPF	13.0	117.6	59.8	79.6	100.5	100.2	99.3	99.7	74.3	743.9	69.46%	4.85%	11.82%
RBR	2.0	83.0	56.0	57.0	15.0	21.0	28.0	34.0	31.0	327.0	30.54%	2.13%	3.61%
6. Networking/Research Grants												0.0	
CPF										0.0			
RBR										0.0			
7. Contractor Logistical Support													
CPF										0.0			
RBR										0.0			
										0.0			
8. Fuel, Repair, Air Fare and Per Diem	202.0	586.1	637.9	669.8	703.3	738.5	775.4	814.1	774.1	5,901.2			
CPF	97.0	548.1	597.9	585.8	572.3	553.5	532.4	506.1	491.1	4,484.2	75.99%	29.21%	71.26%
RBR	105.0	38.0	40.0	84.0	131.0	185.0	243.0	308.0	283.0	1,417.0	24.01%	9.23%	15.64%

TABLE 9. RAV II (REVISED) Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR										Total	Percent of Line Item	Percent of Total	Percent of CPF & RBR
	1990	1991	1992	1993	1994	1995	1996	1997	1998					
9. VEHICLES (In-country shipping)		20.0				42.5					62.5			
CPF		20.0				34.0					54.0	86.40%	0.35%	0.86%
RBR						8.5					8.5	13.60%	0.06%	0.09%
10. AUDITS/EVALUATIONS											0.0			
CPF											0.0			
RBR											0.0			
11. OTHER COSTS/CONTINGENCY	24.7	94.1	79.6	85.2	88.0	94.6	97.4	102.3	82.5	748.3				
CPF	21.7	86.1	73.6	73.2	71.0	70.6	66.4	63.3	46.5	572.3	76.48%	3.73%	9.09%	
RBR	3.0	8.0	6.0	12.0	17.0	24.0	31.0	39.0	36.0	176.0	23.52%	1.15%	1.94%	
Subtotals														
CPF	387.7	884.0	762.8	763.1	762.3	735.0	706.7	670.4	621.0	6,293.0		40.99%	100.00%	
RBR	143.0	732.0	886.9	1,016.2	1,077.5	1,197.8	1,328.2	1,465.6	1,211.1	9,058.4		59.01%	100.00%	
TOTAL	530.7	1,616.0	1,649.8	1,779.3	1,839.8	1,932.8	2,034.9	2,136.0	1,832.1	15,351.4		100.00%		
Percent of Total	3.46%	10.53%	10.75%	11.59%	11.98%	12.59%	13.26%	13.91%	11.93%	100.00%				
Percent of CPF	6.16%	14.05%	12.12%	12.13%	12.11%	11.68%	11.23%	10.65%	9.87%	100.00%				
Percent of RBR	1.58%	8.08%	9.79%	11.22%	11.89%	13.22%	14.66%	16.18%	13.37%	100.00%				

* All estimates are adjusted for a 5.0 percent annual rate of inflation

** The amount budgeted for 1991 does not include severance pay.

NOTE: This is an illustrative budget only, from which there may be variance. GOZ commitment is to the total amounts to be provided and not necessarily to follow this exact line-item budget.

E. NRM Element Budget

The total budget for the NRM Element is 6.09 million dollars. The USG contribution is 4.157 million dollars. The GOZ will contribute 1.933 million dollars. Of this 1.933 million dollars, counterpart funds will provide 1.123 million dollars and 0.811 million dollars will be paid from the regular GOZ budget. These costs are adjusted for a 5 percent annual rate of inflation and include a 5 percent contingency fund.

This NRM Element provides an additional amount of money to the RAV II project to integrate natural resource management concerns and research into the ongoing agricultural research program. Activities in soil management, innovative agroforestry and agro-ecology will promote sustainable agriculture and environmental responsibility. The amendment provides financing to more fully integrate The Eastern Highlands of North and South Kivu into the geographical area originally covered by RAV II. The amendment also adds two long-term TA positions (6 person years) to the SECID team; a 3 year position in Soil Management and a 3 year position in Natural Resource Management. These additional TA will be stationed at the Mulungu research station in the Kivu region. Financing is provided to rehabilitate and equip a soils laboratory at Mulungu, as well as a combined seed technology and tissue culture laboratory. As in other RAV II target zones, Research and Development teams will be established in the Kivu region and are financed under this amendment. Financing is also provided to extend the R & D training program to the Kivu region. Several of the RAV II long-term training scholarships will be reoriented to provide training in soil management and agroforestry. Funding is provided so that most RAV II long-term training participants will attend at least one NRM related short course during their training.

TABLE 10. RAV II NRM Element Life of Project Costs Contributed by the USG and the GOZ, Thousands U.S. Dollars.*

Item	CONTRIBUTIONS BY:					Total Dollars	Percent of Total
	USG	GOZ			Sub-total		
		Counterpart Funds	Regular Budget Res.	Contr-actor			
TECHNICAL ASSISTANCE/ PROGRAM SUPPORT							
1. Technical Assistance/ Personnel	1,740.7			456.3	456.3	2,197.0	36.08%
2. Training	308.9		35.1	8.3	43.5	352.4	5.79%
3. Facilities Rehabilitation	220.5			41.9	41.9	262.4	4.31%
4. Research Equipment and Supplies	689.5		58.4	6.2	64.6	754.1	12.38%
5. Office/Household Equipment and Supplies	135.6		42.2	4.2	46.4	182.0	2.99%
6. Networking/Research grants						0.0	0.00%
7. Contractor Logistic Support	82.9					82.9	1.36%
8. Fuel, Repair, Air Fare and Per Diem	567.3		846.5	261.8	1,108.2	1,675.5	27.51%
9. VEHICLES AND PARTS	213.1		68.8	10.9	79.8	292.9	4.81%
10. AUDITS/EVALUATIONS						0.0	0.00%
11. OTHER COSTS/CONTINGENCY	197.9		71.6	20.8	92.4	290.3	4.77%
Totals	4,156.5	0.0	1,122.6	810.5	1,933.1	6,089.6	100.00%
Percent of Contributions	68.26%				31.74%		

* Because the values given in this table have been rounded, while their individual integrity has been maintained, not all rows and columns appear to sum correctly. The totals given, however, are in fact correct.

TABLE 11. RAV II NRM Element Life of Project Costs Contributed by the U.S. Government, Thousands U.S. Dollars*

Item	PROJECT YEAR								Total	Percent of Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98		
TECHNICAL ASSISTANCE/PROGRAM SUPPORT										
1. Technical Assistance/ Personnel	240.0	483.0	507.2	301.0	48.6	51.1	53.6	56.3	1740.7	41.88%
long-term	200.0	420.0	441.0	231.5	0.0	0.0	0.0	0.0	1292.5	
short-term	40.0	63.0	66.2	69.5	48.6	51.1	53.6	56.3	448.2	
2. Training	2.0	48.3	61.7	39.4	63.2	40.8	29.5	23.9	308.9	7.43%
long-term, short-term foreign and domestic										
3. Facilities Rehabilitation		220.5							220.5	5.30%
4. Research Equipment and Supplies		551.6	43.0	39.5	22.5	11.5	11.5	9.9	689.5	16.59%
5. Office Equipment and Supplies		96.0	12.1	12.7	6.7	2.8	2.9	2.3	135.6	3.26%
6. Networking/Research Grants									0.0	0.00%
7. Contractor Logistical Support	15.6	25.4	17.9	18.8	1.2	1.3	1.3	1.4	82.9	2.00%
8. Fuel, Repair, Air Fare and Per Diem	69.3	145.5	152.8	80.2	29.7	31.2	32.8	25.8	567.3	13.65%
9. VEHICLES AND PARTS		86.1			127.0				213.1	5.13%
10. AUDITS/EVALUATIONS									0.0	0.00%
11. OTHER COSTS/CONTINGENCY	16.3	82.8	39.7	24.6	14.9	6.9	6.6	6.0	197.9	4.76%
TOTAL	343.2	1,739.3	834.4	516.1	313.9	145.6	138.2	125.6	4,156.5	100.00%
Percent of Total	8.26%	41.84%	20.07%	12.42%	7.55%	3.50%	3.33%	3.02%	100.00%	

* Most estimates are adjusted for a 5.0 percent annual rate of inflation.

TABLE 12. RAV II NRM Element Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR									Total	Percent of Line Item	Percent of Total	Percent of CPF & RBR
	1991	1992	1993	1994	1995	1996	1997	1998					
1. Personnel	26.2	55.1	57.8	60.7	63.8	67.0	70.3	55.4	456.3				
CPF									0.0				
RBR	26.2	55.1	57.8	60.7	63.8	67.0	70.3	55.4	456.3	100.00%	24.01%	56.30%	
2. Training	2.5	5.3	5.5	5.8	6.1	6.4	6.7	5.3	43.5				
CPF	2.5	5.0	5.0	4.9	4.9	4.8	4.7	3.4	35.1	80.80%	1.85%	3.22%	
RBR		0.3	0.6	0.9	1.2	1.6	2.0	1.8	8.3	19.20%	0.44%	1.03%	
3. Facilities Rehabilitation				8.0	8.4	8.8	9.3	7.3	41.9				
CPF									0.0				
RBR				8.0	8.4	8.8	9.3	7.3	41.9	100.00%	2.20%	5.17%	
4. Research Equipment and Supplies	40.0	3.2	3.3	3.5	3.6	3.8	4.0	3.2	64.6				
CPF	40.0	2.8	2.8	2.8	2.7	2.7	2.6	1.9	58.4	90.34%	3.07%	5.35%	
RBR		0.3	0.5	0.7	0.9	1.1	1.4	1.3	6.2	9.66%	0.33%	0.77%	
5. Office Equipment and Supplies	30.0	2.1	2.2	2.3	2.4	2.6	2.7	2.1	46.4				
CPF	30.0	1.9	1.9	1.9	1.8	1.8	1.7	1.3	42.2	91.03%	2.22%	3.88%	
RBR		0.2	0.3	0.5	0.6	0.8	0.9	0.8	4.2	8.97%	0.22%	0.51%	
6. Networking									0.0				
CPF									0.0				
RBR									0.0				
7. Contractor Logistical Support									0.0				
CPF									0.0				
RBR									0.0				
8. Fuel, Repair, Air Fare and Per Diem	76.5	132.2	138.8	145.7	153.0	160.6	168.7	132.8	1108.2				
CPF	76.5	118.9	117.9	116.6	114.7	112.4	109.6	79.7	846.5	76.38%	44.54%	77.67%	
RBR	0.0	13.2	20.8	29.1	38.2	48.2	59.0	53.1	261.8	23.62%	13.78%	32.30%	

TABLE 12. RAV II NRM AMENDMENT Life of Project Costs Contributed by GOZ Counterpart Funds (CPF) and Regular Budget Resources (RBR), Thousands U.S. Dollars*.

Item	CALENDAR YEAR									Total	Percent of Line Item	Percent of Total	Percent of CPF & RBR
	1991	1992	1993	1994	1995	1996	1997	1998	1999				
9. VEHICLES (In-country shipping)	36.0				43.8					79.8			
CPF	36.0				32.8					68.8	86.28%	3.62%	6.31%
RBR					10.9					10.9	13.72%	0.58%	1.35%
10. AUDITS/EVALUATIONS										0.0			
CPF										0.0			
RBR										0.0			
11. OTHER COSTS/CONTINGENCY	10.6	9.9	10.8	11.3	14.1	12.5	13.1	10.3		92.4			
CPF	10.6	8.9	9.1	9.0	10.5	8.7	8.5	6.2		71.6	77.48%	3.77%	6.57%
RBR	0.0	1.0	1.6	2.3	3.5	3.7	4.6	4.1		20.8	22.52%	1.10%	2.57%
Subtotals													
CPF	195.6	137.5	136.7	135.1	134.7	130.4	127.2	92.5		1,089.8		57.35%	100.00%
RBR	26.2	70.1	81.7	102.2	127.6	131.2	147.6	123.9		810.5		42.65%	100.00%
TOTAL	221.8	207.6	218.4	237.3	262.3	261.7	274.7	216.4		1,900.3		100.00%	
Percent of Total	11.67%	10.93%	11.49%	12.49%	13.80%	13.77%	14.46%	11.39%		100.00%			
Percent of CPF	17.95%	12.62%	12.55%	12.40%	12.36%	11.97%	11.67%	8.49%		100.00%			
Percent of RBR	3.24%	8.65%	10.07%	12.61%	15.75%	16.19%	18.21%	15.29%		100.00%			

* All estimates are adjusted for a 5.0 percent annual rate of inflation

NOTE: This is an illustrative budget only, from which there may be variance. GOZ commitment is to the total amounts to be provided and not necessarily to follow this exact line-item budget.

F. Disbursement Plan

The table below presents information required by AID Handbook # 3 on methods of Implementation and financing. This table is a revised version of Table 8 in the original RAV II project paper and includes all of the combined financing of the RAV II project and the NRM Element. Therefore, this table replaces the disbursement plan in the original project paper.

All dollars will be obligated over an eight-year period. The Major portion of the USAID \$24.85 million contribution will be transferred to a Title XII contractor through a letter of credit (TFCS/LOC) mechanism, and to other contractors as appropriate. The Title XII contractor will issue monthly reports of its dollar expenditures to USAID Zaire. Other contractors, such as the evaluation contractor, will submit vouchers to USAID.

It is planned that USAID Zaire will make available to the project 7.470 million dollars in local counterpart funds (previously \$12.2 million). There is still some question, given the anticipated levels of future commodity import and PL 480 sales, whether CPFs will be available in sufficient quantities to fully fund the project. If not enough CPFs are available to meet the project's needs, it may be necessary to finance some local costs by converting dollars to zaires or to further restructure the project.

Table 13. RAV II Life of Project Methods of Implementation and Financing (PP Table 8).

Method of Implementation	Method of Financing	Amount Millions US\$
U.S. Government Contributions:		
All USG contributions, except audit/evaluation, AID direct procurement and contingency	Letter of Credit to Title XII Institution	22.2
Audit/Evaluation, AID direct procurement	Direct Payment to Contractor(s)	1.47
Contingency	Direct Payment	1.18
Sub-Total USG		24.85
Government of Zaire Contribution:		17.35
GRAND TOTAL		42.2

V. Monitoring and Evaluation Plan

The overall Monitoring and Evaluation Plan for RAV II remains largely unchanged, with the exception of the additional bio-physical and economic indicators described below, along with adjustments in scheduling of both internal and external evaluations. Specific modifications include:

A. Monitoring Plan for Logframe Outputs

The goals of the Monitoring and Evaluation Plan for bio-physical sustainability were not covered in the Project Paper. RAV II is designed to be environmentally sensitive. Bio-physical sustainability is one measure of this. Sustainable agriculture should not have a continual negative impact on the bio-physical characteristics of a particular region. The minimum performance indicator (PI) and impact indicator (II) for bio-physical sustainability are as follows:

PI: Increased awareness by the R&D Teams, and RAV II scientists and technicians in general, of the importance of considering bio-physical sustainability as one of the goals of agricultural development. This can be measured by evaluating how clearly these concerns are reflected in the annual work plans for each national program. The Agroforester/ Agro-ecologist and COP can make these evaluations each year, and develop a plan of action to improve activities related to bio-physical sustainability if problems are observed.

II: The short-term bio-physical inventory team will identify a portfolio of plant and animal "indicator species" that could be used to test biodiversity and bio-physical stability in a particular region. Based on recommendations from the short term inventory team, the Agroforester/Agro-ecologist will select several of these "indicator species", and evaluate their status in several regions where RAV II projects have been most active. Not all project sites need to be evaluated. The frequency of these evaluations should be in the third and sixth year of the amended project (1994 and 1997). The project will be considered bio-physically sustainable if these "indicator species" have not decreased in numbers as a result of project related activities during the course of the project. Economic data will be assessed with regard to long-term inputs and sustainability as well as short-term profitability.

The monitoring and evaluation plan in the original Project Paper employs analysis at the farm level to measure impact of research and outreach activities. The impact of the on-farm natural resource management will be measured using similar analysis (for example impacts on soil fertility and erosion, and reforestation/deforestation rates). The Soil Management

specialist and Agroforester/Agro-ecologist will be responsible for developing criteria for such analysis.

B. Reviews, Audits, and Evaluations

The date for the first internal review will be changed from July, 1992 to **May, 1992**. The second internal review will be changed from July, 1996 to **May, 1996**. The date of the first external evaluation will be changed from November, 1984 to **January, 1993**. The date of the final evaluation remains the same. The first external evaluation is being advanced considerably given the nature and extent of adjustments in funding source and orientation of the project included in this amendment. This evaluation, in addition to addressing objectives stated in the Project Paper, will review the effect of the adjustments, particularly regarding phasing of activities and adequacy of funding levels, on SENARAV's programs. This evaluation will also identify further adjustments required in RAV II as a result of the merger of INERA and SENARAV, if this has occurred by this date.

VI. Project Analysis

A. Technical

The Technical Analysis in the original RAV II Project Paper indicates the important emphasis that will be placed on environmental responsibility (pages 65-68): (Quote)

"Environmental responsibility will be a major thrust of RAV II. Environmentally responsible agricultural development involves, in the first instance, protecting Zaire's soil, forest, and water resources. It involves, in the second instance, improving agricultural practices to limit further degradation and rehabilitate environments already degraded. In RAV II, environmental responsibility will be a major focus of research, training, and outreach, addressed through:

- o training in the principles of ecologically sound agricultural development for SENARAV scientists and technicians;
- o development of linkages between Zaire's agricultural research system and international organizations that are willing to contribute financial resources and expertise to preserving and rehabilitating Zaire's natural resources;
- o a focus on agro-ecological zones subject to near-term degradation;³
- o development of ecologically responsible technologies that are adoptable by Zairian farmers." (End Quote)

The strategy of the amended project is to increase the ability of RAV II to meet the goals for environmental stability stated in many places in the original Project Paper. The amended project will use newly developed technologies and strategies in three main areas to increase the chances of success in meeting the goal of promoting sustainable agriculture in environmentally responsible ways. One is to promote programs and technologies in

³ This is basically the concept of triage, in which sites which will probably not be adversely affected by agriculture over the short term and sites which have already suffered extensive environmental damage are both given lower priority for intervention than sites where short term intervention could probably prevent irreversible environmental deterioration.

the newly developing area of agro-ecology. The second is to improve the applicability of agroforestry techniques by developing more appropriate varieties of trees, and more creative ways of using trees in farm settings. The third major strategy is to improve soil management using affordable and appropriate techniques, and to offer advice on wise land use based on soil capability and ecological considerations.

Definitions

Soil management, as defined here, refers to the maintenance of the soil resource. This includes both soil conservation and soil fertility management. Soil conservation is essentially defending the soil from erosion. Soil fertility management is a process of manipulating the chemistry and physics of the soil to provide optimal and yet sustainable availability of soil-borne nutrients, water and gases for plant growth. Soil management technologies frequently employ: utilization of contour ridging, maintaining vegetative cover of the soil throughout the year, planting green manures that are not harvested, but tilled into the soil for nutrient and organic matter enrichment, active management of fallow periods (resting the soil from agronomic activities), and other technologies designed to improve the quality of the soil resource over the short and long term.

Innovative agroforestry refers to the incorporation of trees into the farming system. It can be employed as a technique in soil management for both soil conservation (preventing erosion) and soil fertility (deep tree root penetration allows the recycling of plant nutrients found deep in the ground). It can also provide fuelwood and timber for farm household use. Agroforestry involves the use of technologies such as: alley cropping (growing trees interspaced with food crops and employing frequent tree pruning and mulching to increase nutrient availability to the food crops), living fences (to delineate fields, restrict movement of livestock, and provide poles), fruit trees for food crop diversification, development of woodlots for fuelwood and poles, managed fallows, and management of existing forest and tree resources.

Finally, agro-ecology refers to the study and management of the farm as one component in the larger agro-ecosystem. Species diversity off-farm can have a critical impact, for example, on the success of such on-farm practices as integrated pest management. At the same time, land use management on-farm can have a significant impact on regional biodiversity or erosion. Hence, agro-ecology includes land use management and places the farm within the context of the larger regional system of which it is a component.

Conservation-Oriented Research

Applied research will focus on the development of technologies which are environmentally sound. For example, research will focus on soil fertility, improved fallow systems, and the use of such technologies as alley cropping, green manure and farm woodlots, which can significantly reduce environmental degradation. In RAV II, an interdisciplinary team of breeders, entomologists, pathologists, soil scientists and agronomists will work with social scientists and agroforesters/agro-ecologists to clarify constraints to increasing productivity in each crop and to develop knowledge and plant material designed to overcome these constraints, using environmentally sound technologies.

Applied agricultural research under RAV II as amended will:

- o improve and maintain germplasm and the varietal purity of cassava, grain legume (beans, groundnuts, cowpeas, and soybeans), and maize;
- o provide sustainable, low-input and improved management practices designed to increase soil fertility and conserve Zaire's natural resource base by using improved land use practices and environmentally sound agricultural technologies;
- o provide data on more appropriate tree species to be used in agroforestry programs, and information on innovative agro forestry programs that will use the "farm woodlot" strategy to increase wood supplies and increase habitat;
- o improve the overall productivity of farming systems, from the point of view of both farm earnings and the farm family's nutritional status;
- o enhance the linkages between on-station research, on-farm research, and outreach and ensure that the farmer is included as a full participant in the development and testing of technology; and
- o increase and strengthen the linkages between SENARAV and IARCs, other national and regional research networks and programs in Africa, and public and private sector agricultural research programs in Zaire.

Outreach/Technology Transfer

SENARAV must include environmental sensitivity as part of its extension programs in order to advocate the acceptance of ecologically responsible technologies by Zairian farmers.

Specifically, SENARAV will:

- o improve the flow of information to researchers by identifying, characterizing, and prioritizing clientele groups;
- o ensure that research is farmer-driven by involving farmers as full participants in the testing and verification of technologies, and by measuring success in terms of farmer adoption of new technologies;
- o provide increased institutional support to selected public and private outreach entities through in-service training, technical assistance, provision of extension materials and monitoring and evaluation;
- o reorganize the Farming Systems and Outreach Teams of RAV I into combined Research and Development (R&D) Teams, with the participation of station-based researchers; and
- o insure that all of the technical staff on the R&D Teams, as well as all SENARAV scientists and administrators have the opportunity to become familiar with the principles of land use planning and agro-ecology.

In addition, SENARAV will collaborate with numerous extension and conservation groups and NGOs in the different regions. This will include WWF, the Canadian Project Parc, and the GTZ Kivu projects in agricultural extension and natural resource management.

Training

Agro-ecology is one major area of short-term training that will be provided by the project contractor. In addition, the contractor will investigate the potential of providing training in agro-ecological principles, methods, and field studies to long-term participant trainees. U.S. universities, collaborating with the contractor, have indicated a willingness to explore the possibilities of providing SENARAV trainees with field experience in the Pic Macaya Biosphere Reserve Project in Haiti, a USAID-funded project that focuses on the relationship between agricultural development and environmental preservation. The University

of Maryland's Global Change Climate Center can also be drawn on for this purpose.

Linkage

Many international organizations are deeply concerned about the fate of the enormous biological wealth of Zaire. While most attention has focused on Zaire's tropical rain forests, greater attention should be paid to other unique ecosystems in Zaire. Its tropical deciduous forests, for example, are under greater threat than the rain forests at the current time. These forests have virtually disappeared on a worldwide basis. Gallery forests are also threatened everywhere. By stabilizing and intensifying agricultural production on lands appropriate for agriculture, these unique biological systems can be preserved. The design team was contacted about the potential for initiating cooperation between such organizations as the New York Zoological Society (NYZS) and SENARAV. Links between such organizations as the NYZS, Fairchild Botanical Gardens, the Missouri Botanical Garden, and the Organization for Tropical Studies will be explored. Contacts with the AFNETA and AFRENA agroforestry networks will be expanded in RAV II. Additional linkages between agricultural research in Zaire and conservation will be explored in relation to the possible establishment of a Zairian agricultural research fund through a debt-for-nature swap at the appropriate time.

B. Institutional / Administrative

1. Roles of New Technical Assistance

Providing adequate research support for the natural resource management activities being added to the project will require two additional positions on the SECID technical assistance team. One position will require expertise in tropical soil management, the other in agroforestry and agro-ecology. Both positions will be for a duration of 3 years. Detailed job descriptions are provided in Annex B.

2. Modification of Roles of Present Technical Assistance

The integration of this natural resource management component into the RAV II Project will require modification of the responsibilities of many of the technical assistance personnel already in the country. As these responsibilities have been modified, the expected level of effort for certain positions has also been changed as reflected in Table 14.

In summary, changes have been made to the following positions:

Financial Management:	Reduced from 6 years to 3 years
Agricultural Economist:	Reduced from 4 years to 3 years
Agronomist:	Reduced from 3 years to 2 years
Legume Breeder:	Reduced from 3 years to 2 years
Entomologist:	Reduced from 3 years to 2 years
Research Station Management:	Increased from 2 years to 3 years

Revised position responsibilities are detailed in Annex B. New work assignments clearly represent at least eighteen months of full-time commitment. Therefore, should USAID re-initiate its support to PNM, individuals would be asked to modify their workplans to provide technical support over an extended time frame, but within the total time programmed for each TA position.

3. Modified Short-Term Technical Assistance Schedule

The short-term technical assistance schedule has been modified to reflect the addition of the NRM element, changes in the roles of the existing long-term technical assistance, and modifications in the project work plan (Table 15).

Table 14. RAV II Long-term Personnel (PP Table J-7 Modified)

Position	1	2	3	4	5	6	7	8	SUBTOT
----- person years -----									
1. Field Personnel									
<u>Coordination</u>									
COP	1	1	1	1	1	1	1	1	8
R&D/Training	1	1	1						3
Financial Mgnt.	1	1	1						3
<u>National Programs</u>									
Plant Br. /Legume	1	1							2
Plant Br. /Path.	1	1	1						3
Agronomist	1	1							2
Ag. Econ.	1	1	1						3
FSR Spec.	1	1	1						3
Entomologist	1	1							2
Res. Sta. Mgnt.	1	1	1						3
Soil Mgnt.		1	1	1					3
Agroforestry		1	1	1					3
2. Home Office	1.5	1.5	1.5	0.5	0.3	0.3	0.2	0.2	6

Table 15. Short-Term Technical Assistance By Subject Matter Area and Year (PP Table J-8 Modified)*

Subject Matter Area	FY91**	FY92**	FY93	FY94	FY95	FY96	FY97	FY98
Biometrics		1	1		1		1	
Agricultural Economics	1	1	1					
Soil Fertility/Agronomy		1	1		1			
Documentation/Information Systems		1	1					
Pest Management/Plant Pathology		3		1		1		
Seed/Post Harvest Technology		2			1	1	1	
Laboratory Development and Maintenance			1	1				
Gender Analysis/Outreach	2	2		1		1	1	1
Research Station Management	1		1		1	1		
Debt Conversion/Endowment Fund			1					
Financial Management		1		1				
Plant Breeding		1		1				1
Natural Resource Management, Agro-ecology and Agroforestry	2	3	3	3	2	2	2	2
Total On-Site	6	16	10	8	7	7	6	5
On Campus	1	4	2	2	2	2	1	5
GRAND TOTAL	7	20	12	10	9	9	7	5

* In some cases the person-months of short-term technical assistance exceeds the total that would be possible if the true cost were \$20,000 per month. However, in these cases the SECID team has procured short-term technical assistance at a lower cost, primarily through the use of personnel from international agricultural research centers, who do not charge salary costs. Hence, the short-term technical assistance listed here does fall within the budgetary limits of the project.

** Short-term technical assistance for FY91 and FY92 will not exceed the total budgeted amount, but due to the fact that the long-term technical assistance team was not fully fielded until March, 1991, more of the short-term technical assistance will occur in FY92 than was originally planned in the Project Paper.

C. Economic Analysis

Agricultural research and outreach programs must become more sensitive to the long-term consequences of the technologies they generate and transfer to farmers. Yield-increasing technologies must undergo a second level of screening that ensures that the resource base that will support the new technology can be maintained in the long run. Many agricultural development projects engender negative consequences (externalities) with regard to the environment and sustainability of the natural resource base which may not become apparent until well into the project, or even after the project ends. One of the major objectives of this Amendment is to ensure that such is not the case with the RAV II project.

The yield increases and cost reductions anticipated from the new varieties generated by SENARAV during the RAV II project will not be possible if strategies are not put in place to mitigate damage caused by the "overuse" of agricultural land and the use of inappropriate soil degrading production practices on highly-erodible agricultural land. In addition, the resource base has also been degraded by traditional farming practices. Thus, the development and transfer of soil-enhancing and erosion-reducing practices appropriate for both traditional and new varieties will be a primary goal of the research and outreach program pursued under this amendment.

Such practices as agro-forestry and soil-fertility enhancement will be investigated for their adaptability to Zairian farming systems. Many examples of these practices exist throughout Africa and other parts of the world. The challenge of the Natural Resource Element is to fine-tune these existing techniques to the diverse conditions in Zaire and to convince farmers that it is in their best interest to use such methods.

Given the critical importance of Zaire's tropical forests and biological diversity to Africa and the world, this amendment not only addresses the micro-level farm management decisions in the light of sustaining farm income, employment, and nutrition but also addresses the macro-level impacts of all these micro-level decisions on regional, national, and global quality of life.

The potential quantitative effect of increased agricultural production in terms of higher farm income and lower consumer costs is well documented in the original project paper. It is difficult to make a quantitative estimate of the benefit stream which will be generated by this Natural Resources Element. Most of these benefits will only become apparent after a number of years of successful project activity. They require that a sufficient number of farmers adopt improved natural resource

management techniques so that their combined farm level impacts begin to have an effect at the macro level. There is little information to indicate the number of farmers necessary or the number of years which might be required for such impacts to become evident. Yet we know, that logically, it will happen if the project is successful in developing sustainable agricultural production systems which include agroforestry, erosion control, and intensified agricultural production.

This section will outline the economic impacts of this amendment and will provide quantitative estimates of these impacts where possible. Quantitative estimates include: (1) rates of return (IRR) and net present value (NPV) to SENARAV research programs with and without loss of soil fertility, (2) IRR and NPV to the Natural Resource Element, and (3) sensitivity analyses. Although many important impacts can not be quantified, they will be presented to ensure their proper consideration in the overall assessment of the appropriateness of the activities proposed under the amendment. The quantitative measures are presented to provide an indication of expected economic impact: however, they must be viewed in the light of the myriad difficulties in ex ante estimates of returns to research and outreach programs.

Integrated Soil Management

One of the major thrusts of this amendment is to develop and facilitate extension of techniques which will help control erosion. Such techniques will help maintain soil fertility and prevent the loss of agricultural production which accompanies erosion and decreasing soil fertility. Farmers will obtain higher yields and higher returns to labor than would be possible without erosion control. They will be able to crop such parcels for longer periods of time and/or return to such parcels after a shorter fallow period than would have been possible without erosion control. In some areas these effects will reduce the frequency with which farmers using a slash and burn system clear new land for cultivation.

Erosion control when implemented on a substantial scale will also have important effects on the watersheds in question. Run-off will be reduced and flooding will be less severe than would otherwise be the case. Siltation of surface water will be reduced and water quality will be improved. This in turn may allow increased fish production in the river systems and lakes, and promote a reduction in health problems related to water quality. In some areas increased infiltration and improved water quality may reduce the time and effort which women must devote to carrying water for family consumption. The time saved will provide an increase in leisure for these women or lead to further production and productivity increases.

Use of grasses and legumes for green barriers and ground cover have several positive impacts in addition to erosion control. They may be used to expand and intensify livestock production which in turn may increase family income and provide manure as a soil fertility amendment. If not processed through livestock they can be used directly as mulch to increase soil organic matter and water retention, which will increase crop productivity. Legumes will fix nitrogen and increase crop productivity and/or reduce expenditures on purchased fertilizer, where that is an alternative.

Quantitative estimates of internal rates of return (IRR) and net present values (NPV) for RAV II research programs under alternative soil degradation levels on new varieties are presented in Table 16. A detailed explanation of cash flow development to calculate IRR's and NPV's is given in Annex C. The difference between the stream of benefits associated with "no impact" and the stream of benefits associated with alternative soil degradation levels will be used as an estimate of benefits to the soil-conserving activities of the Natural Resource Element. These estimates are the soil-degrading damage avoided if soil conserving and enhancing technologies are developed and transferred.

Economic surplus methodology was used as in the Project Paper; however, the original calculation of economic surpluses and the resulting IRR's did not adequately take into consideration the cost and effort needed to address resource-conserving issues. Norton et al.⁴ summarizes the usefulness of economic surplus methodology in evaluating agricultural research and extension in developing countries. The alternative approach often employed of quantifying benefits as the additional profits or receipts per acre (calculated through enterprise budgets) multiplied by the expected number of acres using improved varieties does not take into account probably the most important benefit to agricultural research and extension - lower food prices. In addition, the likely possibility that farmers may in fact use the yield increasing varieties on sufficient acreage to meet subsistence needs and substitute the remaining land to more profitable cash crops. For basic food crops like cassava in Zaire, this substitution of land and labor to other activities, made possible by the lower resources needed to produce the basic food crop with new varieties, can be an important benefit. Thus, the economic surplus approach is preferred because it takes into consideration two very important benefits - lower food prices for consumers and resource substitution to higher valued uses - that are largely ignored by alternative methods of benefit estimation.

⁴ American Journal of Agricultural Economics, May 1987.

Baseline assumptions used for key parameters in the estimates presented in Table 16 are given in Table 17. Return estimates were developed for the most important crops (cassava, maize, and peanuts) receiving research and outreach attention by the three national programs (PNL, PRONAM, and PNM) under SENARAV mandate. Returns to the Natural Resource Element are underestimated to the extent that peanuts, though probably the most important, are only one of several crops targeted by PNL. Results indicate that when loss of soil fertility is considered: returns to cassava research fall from 42.5% (as originally presented in the economic analysis of the Project Paper) to 40.3%, returns to peanut research are diminished from 20.9% to 19.8%, and returns to maize research decrease from 31.3% (as originally presented in the Project Paper) to 29.2%. Each of these decreases in returns is a result of the inability to avoid soil degrading losses on new varieties.

Table 16. Internal Rates of Return and Net Present Values for RAV II Research Programs for Selected Soil Loss Factors (without Natural Resource Element)

Soil Degradation Factor	IRR	Cassava		Groundnut		Maize	
		NPV	IRR	NPV	IRR	NPV	IRR
0%	42.5	44.7	20.9	7.6	31.3	16.7	
1%	40.3	38.5	19.0	5.8	29.2	13.9	
3%	35.8	28.1	15.0	2.8	25.1	9.4	

IRR = internal rate of return; NPV = net present value in millions of US\$ discounted at 10%

Table 17. Baseline Assumptions on Key Parameters for Internal Rate of Return Estimates for RAV II Research Programs (with and without Natural Resource Element

Assumption on Key Parameters	RAV II Research Programs		
	Cassava	Groundnut	Maize
Demand Elasticity	0.2	1.0	0.4
Supply Elasticity	1.0	1.0	1.0
Initial Quantity (1000 tons)	3,728	430	781
Initial Price	\$90	\$250	\$139.5
Cost Reduction	35%	25%	40%
Probability of Research Success	60%	75%	70%
Max. Area under New Varieties	40%	40%	40%
Conservation Adoption Rate	1%	1%	1%
Soil Degradation Factor	1%	1%	1%

Sensitivity of internal rate of return to RAV II research programs for changes in probability of research success, supply and demand elasticities, cost reduction, and new variety adoption are shown in Table 18. Demand elasticity is much less important than supply elasticity due to the impact of increasingly inelastic supply on prices. New varieties that effect a substantial decrease in production cost for a crop which is highly supply inelastic result in significant benefits to consumers through greatly reduced prices. Cost reductions and new variety adoption rates have largely the same impact on the vertical supply shift that occurs as a result of the new technology. The probability of research success and cost reduction are related to the extent that expectations of larger cost reductions will generally be associated with a lower probability of success. Internal rates of return to RAV II research programs are very sensitive to new variety adoption, probability of research success, and cost reduction.

Estimates of returns to the Natural Resource Element investment are presented in Table 19. The baseline return to the NR Element is 25.0%, if the Element results in avoiding 1% compounded annual soil fertility losses on 1% compounded annual increases in acreage using improved soil management practices. Results are very sensitive to both the conservation and new variety adoption rates. The lower ranges presented in Table 19 appear quite conservative. A 0.5% rate for both adoption rates would imply that: 1) loss of soil fertility would only decrease supply by a little over 10%, in a 20-year period, and that 2) only about 10% of production of these crops would be accomplished with improved varieties after a 20-year research and extension program.

Adoption rate for improved soil management practices on new and traditional varieties was estimated as increasing at a 1% compounded annual rate. The probability of research success that was used in the IRR's for new crop varieties (cassava, peanuts, and maize) was not included in the returns to the Natural Resource Element activities due to the rather negligible probability of complete failure to develop such new technologies. The soil conservation adoption rate will be the ultimate indicator of success.

Benefits to the amendment also include soil losses avoided on traditional varieties. The breakdown of benefits on new versus traditional varieties is presented in Annex C. Due to the much larger percent of acres in traditional varieties, extension emphasis might be focused on old varieties: however, farmers that adopt new varieties might also be more likely to adopt conservation practices.

Table 18. Sensitivity of Internal Rate of Return for RAV II Research Program (without Natural Resource Amendment)

Groundnut		Cassava		Maize	
Value	IRR	Value	IRR	Value	IRR
Probability of Research Success (%)					
65	16.1	55	37.6	60	25.5
75	19.0	60	40.3	70	29.2
85	21.7	65	42.8	80	32.7
Supply Elasticity					
0.8	14.7	0.8	33.8	0.8	24.0
1.0	19.0	1.0	40.3	1.0	29.2
1.2	22.8	1.2	46.2	1.2	33.9
Demand Elasticity					
0.8	19.0	0.1	40.2	0.2	29.0
1.0	19.0	0.2	40.3	0.4	29.2
1.2	19.0	0.3	40.3	0.6	29.4
Cost Reduction (%)					
20	14.5	25	30.7	30	22.4
25	19.0	35	40.3	40	29.2
30	22.9	45	48.7	50	35.2
New Variety Adoption (max. %)					
30	13.4	30	32.0	30	22.4
40	19.0	40	40.3	40	29.2
50	23.7	50	47.7	50	35.1

Table 19. Internal Rates of Return to Natural Resource Element for Selected Soil Conservation Adoption Rates and Soil Degradation Factors

Soil Degradation Factor	Soil Conservation Adoption Rate		
	0.5%	1.0%	1.5%
0.5%	4.5	14.8	21.7
1.0%	13.1	25.0	33.9
1.5%	18.7	32.6	43.8

Two important limitations of this analysis are (1) the geographical distribution of soil degradation and adoption and (2) the long term nature of soil-conserving benefits and farmers' perception of its importance. When an aggregate national view is taken, the benefits to soil conservation may appear less significant than when viewed locally. In many parts of the world, soil conservation efforts are being targeted to areas where overuse of fragile soils is having ruinous effects. In such locations farmers need assistance in addressing an apparent, perceptible loss in economic well-being. Identifying priority areas in Zaire may be a strategy that will achieve the greatest return.

Increased Wood Production

A second major thrust of this amendment activity will be to develop and help facilitate extension of improved agroforestry techniques which will lead to improved farming systems. These will contribute to erosion control as well as to increase the production of wood products, particularly fuelwood and poles for construction. A wide range of agroforestry techniques may be developed including contour tree barriers, living fences, wind breaks, delimiting fields, fruit trees, alley cropping and small farm and community woodlots. In addition to erosion control, these techniques may contribute to:

- o improved soil fertility (mulch, compost, and nitrogen fixation in the case of legumes);
- o increased family revenues (livestock production, fruit sales, sales of fuelwood and poles, potentially lumber sales in the distant future);
- o reduced labor requirements (labor needed to collect fuelwood);
- o lower fuelwood prices, particularly for urban communities; and
- o improved family consumption (fruit, livestock, more available income).

In some cases (where land scarcity is not yet a severe problem) the potential of income from poles might provide an incentive for some farmers to leave land in fallow for periods longer than are now common. This in turn would increase soil fertility and the productivity of these parcels. Farm and community woodlots also provide a habitat for wildlife and could lead to some increase of biodiversity in many deforested areas.

Intensified Agricultural Production

The intensification of agriculture in areas where agricultural activities are appropriate will have a secondary effect of decreasing farmers' land needs. With intensified production practices farmers can increase family income and/or reduce the land area necessary to meet family income and consumption needs. With increased income, families may be able to afford some inputs to improve soil fertility. An alternative may be to increase the amount of land in fallow or increase the length of time land is left in fallow. Each of these possibilities should lead to increased productivity and potentially to increased family income. When intensification of agricultural production is widespread, it will reduce the rate at which new land is cut and cleared for production, and thus decrease agricultural pressure on the forests and parks.

Indirect Benefits

Many of the most important benefits cited above are clearly indirect and long term. These include increased production and productivity through erosion control and agroforestry. As the production of fuelwood and poles increases, there is less need to cut trees in the forests to supply these needs. As intensification and increased productivity reduce land pressure, it will generate increased soil fertility which leads to additional productivity increases. When production and productivity increases have progressed substantially on a regional and national level, there will be less need to clear land in the traditional slash and burn mode. All of these effects of improved natural resource management will contribute to the long term sustainability of agricultural production, the

natural resource base and the existing diversity of agro-ecological systems. This in turn will translate into indirect, but very important contributions to reducing pressure on the tropical and gallery forests and parks of Zaire, and support the bio-diversity for which they provide a habitat. Technical support to and backstopping for other projects directly involved in park and reforestation activities will contribute to the establishment of better buffer zones around the parks, particularly in Kivu.

Leveraging Funds

RAV II project and the Natural Resources Amendment funding achieve significant leveraging by working with a large number of NGOs and organizations involved in agricultural extension, reforestation and park protection. This amendment will expand that group to include WWF, GTZ and Project PARC. As an example, Project PARC works with 46 NGOs in Bas-Zaire, Bandundu and Kivu. RAV II could never reach the large clientele with which these many organizations work within the limits of its own funding and human resources. In addition, those organizations will be more effective with the research and developed technologies which RAV II will provide.

Economic Sustainability

The economic sustainability of this project and this amendment are, in part, dependent on the macroeconomic situation in the country. Zaire is in the midst of a crisis with regard to the structural adjustment program, the government budget, inflation and economic growth. However, it is a country of abundant natural and economic resources and has the long term potential to develop a very successful national economy. Given this potential, it seems reasonable to assume that this short term crisis will be resolved.

The original PP proposes establishing an Endowment Fund for agricultural research based on a debt conversion. Although still a valid and important strategy, progress on this debt conversion will likely be delayed until after the short term economic crisis is resolved. Given the present macroeconomic situation, it appears that natural resource management activities will have to be financed by donors and the regular budget resources of the GOZ in the short term.

Nonetheless, the GOZ is committed to supporting an increasing share of the project and amendment costs over time. In addition to salaries, starting in 1992, the GOZ will support the maintenance of facilities an increasing percentage of total project and amendment operating costs.

D. Environmental

Environmental responsibility was a major concern of the original Project Paper, which stressed the importance of protecting Zaire's soil, forest, and water resources. The original PP also stressed the importance of improving agricultural practices to limit further degradation, and to rehabilitate environments already degraded. Environmental responsibility in the RAV II Project Paper was addressed and has already been presented (see p. 20, this document).

These statements of environmental objectives clearly document the environmental concerns of the RAV II project, and of the original project paper. The basic environmental analyses presented on page 73 of the original PP is sound, and does not need to be revised.

Additional environmental activities have been added in this amendment to the PP in order to strengthen the ability of the RAV II project to meet the environmental objectives stated above. A full-time Agroforester/Agro-ecologist has been added to coordinate, implement, and monitor ecological programs in RAV II. A full-time Soil Management Specialist has been added to provide technical coordination and input in the soil management research, training and outreach programs and help develop soil testing laboratories.

A base line environmental profile has been added to the RAV II project to provide the scientists and technicians of RAV II with the basic data on environmental conditions in the project areas, and to serve as a standard by which the performance of the project in preserving or improving biological diversity within the framework of sustainable agriculture can be measured. Proper permits will be required from the GOZ and U.S. authorities before biological materials can be collected in Zaire, or temporarily removed from the country for study. All specimens collected will be deposited at appropriate Zairian institutions as voucher specimens, with the exception of a small collection of voucher specimens to be deposited at a U.S. based museum with an international reputation and open access to all scientists. Whenever possible, inventory activities will stress the collection of data and not specimens (i.e. such as transect counts of live plants and animals). All of the additional activities in the areas of natural resources and soil science are designed to improve ecological awareness, and promote sustainable agriculture within the framework of preserving the diversity of renewable natural resources. Project activities will be designed to study ways to reduce environmental degradation, and to educate individuals at all levels in the results of these investigations. The Natural Resources Specialist will use the data collected by the short term TA bio-physical inventory team to develop simple and cost effective ways to monitor the environmental responsibility of RAV II projects and activities. No negative environmental impacts from these activities are anticipated.

E. Social Soundness

The RAV II Project Paper contained a detailed Social Soundness Analysis whose findings remain valid for the natural resource management element being added to the project. Of the four major constraints to agricultural production identified in the analysis--poor market and transport infrastructure, lack of land titles and insecurity of tenure, shortages of labor, and traditional authority systems--the land issue will be of particular importance for the implementation of the natural resource management element.

The typical farm household has 6.7 persons who farm an area of about one hectare in the Southern Band and a somewhat smaller area in heavily populated North and South Kivu. Both modern and customary land tenure systems operate in Zaire. Under the modern system, all land belongs to the State and is acquired by individuals through prescribed titling and registration procedures. Few small farmers, however, gain legal title to land. In relation to income, land prices are high, especially in North and South Kivu, making land purchase beyond the reach of most farmers. And even if farmers could manage to buy land, they would in many cases have difficulty paying the yearly taxes. Generally, those who do manage to purchase land are male.

Most farmers, therefore, gain access to land through customary land tenure, which makes them dependent on traditional authority figures for obtaining land use rights. Land tenure under customary law varies from region to region, but generally is determined by the lineage, clan, or village group. Individuals may farm the land, but the land itself is a sacred trust from the ancestors for the use of the collective unit. This sacred trust is overseen or supervised by someone--usually the chief--recognized by the group as serving as the connection with the ancestors in regard to matters pertaining to land use. Individuals have a right to use the land, but do not possess it.

Farmers' access to land affects the type of agricultural and land management innovations they are willing to adopt. Farmers without secure tenure, for example, are not very willing to adopt technologies that provide only long-term payoffs. This is particularly important in the case of agroforestry, where farmers have to be assured of access to the land long enough for trees to mature to a size where they can be used for fuelwood and poles for construction. The type and security of land tenure will be two important factors in selecting clientele for the project to work with.

In North and South Kivu, farmers often cultivate six or more small parcels of land spread over a considerable distance. Farmers like having a number of separate fields because it spreads their risk. Which crops are grown in the parcels--maize, beans, sorghum, potatoes, bananas, or cassava--depends in part on how far each of the fields is from the farmer's home. Theft is a major problem, so low value crops requiring little cultivation, such as cassava, tend to be planted in the most distant fields. This spatial

approach to crop selection on the part of farmers may affect their willingness to utilize natural resource management techniques. For example, it may make using distant fields as wood lots more interesting to farmers.

A special social consideration of importance for North and South Kivu is the relationship between local farmers and the two national parks found in the area, Virunga, north of Goma, and Kahuzi-Biega, west of Bukavu. In general, neighboring farmers resent the existence of the parks, in some cases disputing the ownership of the land on which the parks have been established. They see the parks as a wasted resource and want the land, wood and bush meat the parks offer. Pressure on the parks is intense, with a steady loss of park land taking place to tree cutting, charcoal making and cultivation.

Recognizing the need to better understand the social context in order to successfully carry out the project, the institutional contractor will bring in a social scientist under a short-term technical assistant contract to examine the relationship between land tenure patterns and land use practices and advise on ways of improving the adoption rate by farmers of environmentally sound agricultural technologies and long-term land use practices.

VII. Conditions and Covenants

There are not new conditions precedent associated with the Natural Resource Management Element. An additional covenant is being added to the original project paper as presented below.

Assignment of Professional GOZ Research Personnel to SENARAV: The Grantee hereby covenants to employ, contract, second or otherwise make available to SENARAV, to the extent possible, qualified professional trained (M.S. or Ph.D.) Zairian researchers to serve as counterparts to long-term technical assistance advisors.

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Life of Project:
From FY 90 to FY 98
Total U.S. Funding: \$24,853,000

Project: Zaire Applied Agricultural Research and Outreach II Project, 660-0124

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Goal: To increase agricultural production, productivity, and rural household income in the zone of USAID emphasis.</p>	<ol style="list-style-type: none">1. Increased production and sale of food crops2. Increased farmer incomes in project areas and zones of diffusion3. A 10 to 20 percent increase in real income of households adopting new technologies4. Increased real returns to crop labor hours5. Improvement in the economic well being and nutritional status of households adopting new technologies6. Improved natural resource management, measured by long field life and reduced shifting cultivation	<ol style="list-style-type: none">1. GOZ statistics on agricultural production and income2. Project reports3. External post project evaluation4. USAID program research data bases	<ol style="list-style-type: none">1. Technology transfer processes maintained through continued existence and strengthening of NGO's, PVO's, projects and private sector extension2. GOZ liberalization of food policy and agricultural marketing3. Base line data regarding nutritional status of households will be determined and commonly agreed upon means for evaluating changes in nutritional status will be developed

**NARRATIVE
SUMMARY**

Project Purpose: To strengthen and improve the capacity of the Department of Agriculture and collaborating institutions to develop and transfer agricultural technologies for selected food crops, on a sustainable basis, to farmers

**OBJECTIVELY VERIFIABLE
INDICATORS**

1. Increased number of sustainable technologies, responsive to client needs, produced by applied research
2. Increased adoption of economically viable technologies by farmers
3. Zairians fully managing the national research programs for selected food crops
4. Significantly higher levels and greater continuity of financing for agricultural research

**MEANS OF
VERIFICATION**

1. SENARAV, SEP, and other DOA reports
2. SENARAV work plans
3. Reports from outreach entities and periodic evaluation of SENARAV institutional support for outreach entities
4. Project evaluations and audits
5. Special studies to measure such factors as the degree to which (1) research priorities reflect farmers' problems; (b) SENARAV technologies have been adopted by farmers; (c) research management has improved over time

**IMPORTANT
ASSUMPTIONS**

1. The technologies now available to SENARAV are adoptable by farmers
2. Outreach entities effectively carry out agreed upon functions
3. GOZ will steadily raise the level of annual funding for agricultural research and will supply monies on a timely basis
4. GOZ and donors will support the development of a foundation to help finance agricultural research and related activities
5. GOZ and other cooperating entities will recognize and act upon women's needs
6. Supporting transportation and communication infrastructure will be maintained
7. Research programs will mobilize, train, and retain qualified personnel
8. Improved agricultural policies will be implemented to encourage private sector participation in agricultural development
9. DSR, DOA, and Ministry of Higher Education and Scientific Research roles in agricultural research will be resolved

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs:			
1. Productive, economically, biophysically, and socially adapted technologies developed and germplasm introduced, created, and maintained.	1.1 20 improved technologies for cassava and grain legume production developed by SENARAV 1.2 Tissue culture facilities established at research stations 1.3 Germplasm conservation facilities and seed preparation laboratories established at research stations 1.4 Germplasm rejuvenation programs maintained at research stations 1.5 Two cassava and three grain legume varieties developed and released 1.6 Five improved technologies for natural resource management 1.7 One soil analysis laboratory established	1. SENARAV, SEP, and other DOA reports 2. Outreach entity reports and outreach publications 3. Project evaluations and audits 4. Journal articles, conference papers, and conference reports 5. Farm household level surveys 6. Natural resource assessment	1. SENARAV programs successfully targeted and prioritized and the technologies now available to SENARAV are adopted by farmers 2. SENASEM and outreach entities effectively execute agreed upon functions 3. GOZ will supply monies on a timely basis each year 4. Management autonomy and control of agricultural research fund 5. IARC's retain capacity and funding to work with Zairian research structures 6. Efficient and timely procurement of TA personnel, equipment, and required site rehabilitation 7. GOZ and cooperating outreach entities will recognize and act upon women's needs and SENARAV and outreach entities will be able to identify women for short term and long term training 8. National programs will be able to identify, mobilize, train, and retain qualified personnel 9. Private sector entities to take responsibility for seed and planting material replication and distribution exist, are willing to cooperate with SENARAV, and are capable of producing and distributing certified seed and high quality, disease free planting material 10. DSR, DOA, and Ministry of Higher Education and Scientific Research will be willing to adopt linkages

Outputs: Cont'd.

2. Improved methods and processes for the transfer of technology to public and private sector development entities:
 - a. Signed agreements with public and private sector outreach entities in each region covered by the project;
 - b. Ongoing in-service training program developed by SENARAV for NGO's and government outreach agents in the use of improved technologies, outreach methods, and program monitoring and evaluation techniques;
 - c. Computerized data base established which is used to monitor and evaluate technology adoption by farmers;
 - d. Improvement in the economic well being, nutritional status, and resource management skills of households adopting new technology
 - e. Increased numbers of women adopting technologies developed by SENARAV, resulting in increased income for women
 3. Improved sustainability of SENARAV activities and programs:
 - a. Establishment of a competitive grants program for research carried out by Zairian scientists in collaboration with researchers in US universities and international research institutions
 - b. Signed agreements with private sector entities for producing and distributing seeds and planting material;
 - c. Establishment of a fund for agricultural research in Zaire
- 2.1 50 research and extension publications
 - 2.2 Written objectives, methods, and evaluation criteria for research and development teams for each national program
 - 2.3 30 on-farm trials per national program, with trials distributed over priority agroecologic zones and representative farmers clientele groups
 - 2.4 Objectives, methods, and evaluation criteria incorporated into agreements with cooperating outreach entities stating how women will be incorporated as beneficiaries and stating the number of women who will be reached through outreach activities
 - 2.5 Two training programs per year for supervisory level personnel in cooperating outreach entities and are evaluated by participants
- 3.1 25 internationally and nationally recognized organizations contacted regarding contributions to Zaire agricultural research fund
 - 3.2 Six research grants awarded to Zairian researchers working collaboratively with US or international research institutions, at least one of which deals with Natural Resource Management
 - 3.3 10 agreements with private entities for foundation seed and disease-free planting material
 - 3.4 One fund established

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Outputs: Cont'd.

4. Research and outreach staff trained in technical and management fields with an increased number of women trained and employed as research and outreach personnel
 - 4.1 Training for SENARAV personnel, including training in farming systems methodologies, training for teaching adult learners, gender issues analysis, program planning and evaluation, and agro-ecology
 - 4.2 6 Ph.D., 19 MS and 75 specialized short-term trainees in agricultural science, social science, natural resource management, and management disciplines, including 5 women trained at the BS or Ing. Agronome level, 2 women trained at the MS level, and 1 woman trained at the Ph.D. level
5. Research management improved through:
 - a. Collaborative research programs with private and public sector research entities;
 - b. Development of two year work plans for each national program, rolled over annually;
 - c. Development of a strategic plan for research for SENARAV
 - d. Research linkages between SENARAV and INERA;
 - e. Improvement of operation and management procedures for each research station;
 - f. Internal and external peer review of national research programs;
 - g. Improved collaboration with international research centers;
 - h. Program budgeting to the level of individual research activities
- 5.1 Annual budgets for each national program
- 5.2 Research and outreach plans of work and annual accomplishment reports written for each SENARAV national program
- 5.3 Collaborative research agreements signed with public and private sector research programs
- 5.4 At least two project research or extension publications presented or published focusing on women in development at national or international seminars, workshops, or conferences
- 5.5 Rehabilitation of research facilities at two sites, offices, and housing
- 5.6 Annual peer review sessions for each national program
- 5.7 Publication of annual SENARAV report highlighting significant achievements
- 5.8 Economic and bio-physical analysis of recommended technologies
- 5.9 Generation of data for inclusion into GIS data base

Annex B. Institutional/Administrative

A. Institutional Setting

Institutionally, the natural resource management focus will be integrated into SENARAV through the Research and Development Sections of each national program. These Sections include researchers from the disciplines of agronomy, soil science, natural resource management, and economics. The Sections are an amalgam of three groups of researchers:

- (1) researchers formerly assigned to the Extension (Vulgarisation) Section;
- (2) researchers formerly assigned to the Farming Systems (Système de Production Agricole) Section, and;
- (3) newly hired (or seconded) researchers working in the area of natural resource management and agricultural economics.

These personnel are primarily at the M.S. and Ph.D. level, but include some AO (Ingénieur Agronome) level personnel as well. The Research and Development Sections will have four major functions, providing:

- (1) the lead role in natural resource management research in the areas of soil management, agroforestry, and agro-ecology;
- (2) liaison between station-based research and on-farm research, with primary responsibility for implementing research-oriented on-farm trials and for the design of production-oriented trials implemented by R&D Teams and primary collaborators;
- (3) analysis and interpretation of socio-economic and agronomic data from on-farm trials, and;
- (4) backstopping for the R&D Teams.

The personnel in the Research and Development Sections will have responsibility for subject matter research in natural resource management (the three focus areas) as well as major input to the technologies tested in on-farm trials. The division of labor and responsibilities expected in on-farm trials are described below:

Research Oriented Trials

Planning and design: Primarily the responsibility of the Research and Development Section; some trials may be planned and designed by other researchers (entomologists, agronomists, etc.).

Execution: Field activities largely implemented by Research and Development Section staff. R&D Teams will conduct routine data collection. Primary researchers will visit trials frequently to assist in planting, harvesting, and monitoring.

Analysis: Responsibility of the primary researchers.

Production Oriented Trials

Planning and design: Primarily the responsibility of the Research and Development Section, with very few trials planned and designed by other researchers.

Execution: Field activities implemented by farmers under the supervision of R&D Teams and Primary Collaborator staff. R&D Teams primarily responsible for data collection. Primary researchers will provide assistance as needed in planting and harvesting.

Analysis: Responsibility of the Research and Development Section.

Pre-Dissemination Trials

Planning and design: Primarily the responsibility of the Research and Development Teams.

Execution: Field activities implemented by farmers under the supervision of R&D Teams and Primary Collaborator staff.

Analysis: Research and Development Teams will conduct with the assistance of the Research and Development Section.

Staffing

INERA currently has a natural resource management program. The merger of SENARAV and INERA is planned for 1993. Every effort will be made to avoid duplication of effort. One mechanism for doing so is to utilize existent INERA scientists and personnel within SENARAV's national programs to move forward in the area of natural resource management for both organizations. The precedent for this has already been set at Mulungu station where personnel from INERA are seconded to SENARAV's National Legume Program. A similar approach can be taken for other positions, particularly individuals working in the area of soil management and agroforestry. The GOZ will also be requested to second qualified graduate-level (M.S. or Ph.D.) trained agricultural economists to SENARAV to enhance SENARAV's capacity in this key area.

Similarly, it is important that INERA and SENARAV avoid the development of highly divergent approaches to natural resource management. The incorporation of INERA personnel into SENARAV's programs in the area of agroforestry and natural resource management will help ensure that complementary approaches are developed within the two institutions. At the time of merger in 1993, the institutions will have an established working program for at least three major food crops. These will provide a model for expanding natural resource management as a component in other national programs.

Technical Assistance Support

Of the long-term technical assistance present for RAV II, the Research and Development/Training and Farming Systems Specialists will have primary responsibility for working with the R & D Teams. The Agronomist, Soil Management Specialist, and Agroforester/Agro-ecologist on the other hand, have a much larger responsibility directly to the Research and Development Section. Finally, the other non-administrative technical assistants, the Grain Legume Breeder, Plant Breeder/Pathologist, and Entomologist will spend the majority of their time in subject-matter related research. Table 3 summarizes the recommended distribution of work between research and outreach activities.

Table B-1. Distribution of Work Time Among Research and Outreach Activities

Position	Subject Matter Research	Production Systems	Research & Development teams
----- Percent of Time -----			
R&D Training*		20	60
FSR Spec.		40	60
Soil Mgnt.	40	40	20
Nat Resource	40	40	20
Agronomist	40	40	20
Ag. Econ.	50	40	10
Plant Br/Legume	65	25	10
Plant Br/Pathology	65	25	10
Entomologist	65	25	10

* 20% on participant training

Outreach and Training

Personnel in the Production Science Section and the Research and Development Teams will be provided training in natural resource management. An overall training program containing natural resource management subject matter was an original component of the RAV II design. This program will now receive additional input from the Soil Management and Agroforestry/Agro-ecologist technical assistance positions.

In addition to the R&D Teams planned in the original RAV II PP, three R&D Teams will be based out of the Mulungu station. This will provide a full complement of R&D Teams for each of the three SENARAV stations and sub-stations (Table H-2 Modified).

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Table B-2. Staffing Levels for Research and Development Teams (PP Table H-2 Modified)

<u>Stations</u> <u>Sub-stations</u>	<u>Team Leader</u>	<u>Field Units</u>	<u>Social Science</u>
M'Vauzi	1 AO	3 A1 3 A2	1
Kiayka	1 AO	3 A1 3 A2	1
Gandajika	1 AO	2 A1 2 A2	1
Mulungu	1 AO	3 A1 3 A2	1
Kaniameshi*	1 AO	3 A1 3 A2	1
Niembo	none**	1 A1 2 A2	1
Total	5 AO	15 A1 16 A2	6

* Activities suspended pending a decision to resume support to PNM.

** Team Leader located at Gandajika.

The R&D Teams will consist of individuals, primarily at the A1 and A2 level, but with some A0 level personnel (primarily Team Leaders). They will either be individuals who have worked in the Farming Systems or Extension Sections or individuals who will be hired. Initially, it is unlikely that these individuals can plan on-farm trials or analyze the data from such trials on their own. They will require extensive backstopping, primarily from the Research and Development Section, but including the Entomology, Phytopathology, and Selection Sections. They will also require assistance in both the planning and execution of on-farm trial experiments and the subsequent data analysis.

The R&D Teams also require extensive training, particularly during the first eighteen months after Team start-up. This training is primarily the responsibility of the Research and Development and Farming Systems Specialists. Due to the travel needed to conduct such training it will be impossible to initiate R&D Teams at all Outreach Sites at one time. The following schedule for initiating and training R&D teams is planned (see modified Table H-2 for staffing levels of these R&D teams):

Years 1 and 2:

M'Vuazi
Kiyaka
Gandajika
Mulungu

Year 3:

Kaniameshi
Niembo

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Initial training for the Mulungu, Kiyaka, M'Vuazi and Gandajika teams will require approximately eighteen months, whereas the training for the teams at Niembo and Kaniameshi will be completed in approximately nine months. This reflects extensive travel and development of training materials. This order of prioritization reflects the priorities set for initiating natural resource management activities (potential for impact, number of potential NGO collaborators, population density, etc., as described in the original Project Paper and further defined in table 2 of this amendment).

B. Roles of New Long-Term Technical Assistance

Providing adequate research support for the natural resource management activities being added to the project will require two additional positions on the SECID technical assistance team. Natural resource management is new to SENARAV, aside from modest efforts in alley cropping and soil fertility research. Outside technical assistance is needed to design and initiate a comprehensive research, outreach and training program and to successfully integrate it into the SENARAV structure. Two persons, one with expertise in tropical soil management, the other experienced in agroforestry/agro-ecology, will be required for three years.

1. Soil Management Specialist

a. Responsibilities and Functions

Reporting directly to the Chief of Party (COP), the Soil Management Specialist serves as technical advisor on soil management and conservation research and will also be responsible for the development of the soil testing laboratory. The Soil Management Specialist will:

- o design and implement a soil management research program with the objective of maintaining and improving soil fertility, conservation and agronomic sustainability;
- o supervise the development of soil testing laboratory at the Mulungu Station to include selection and installation of equipment, training technicians, and development of overall laboratory and equipment management procedures;

- o design an educational outreach program in conjunction with the R&D and Agroforester/Agro-ecologist with the objective of improving the knowledge of NGOs in the area of soil management.
- o collaborate with short-term technical assistance in the social sciences to better understand the relationships between land tenure and land use practices with the goal of improving the adoption of environmentally sound long-term land use strategies;
- o design a set of criteria in conjunction with the Agroforester/Agro-ecologist on land use guidelines that could be used in recommending appropriate land use activities;

b. Appointment Term/Level of Effort

This position will be on a full-time basis for 36 person months and based at the Mulungu research station near Bukavu, South Kivu.

c. Qualifications

The incumbent must possess:

- o a Ph.D. in Soil Management with a Bachelors or Masters degree in chemistry and/or soil chemistry;
- o teaching and research experience in quantitative and instrumental chemistry.
- o at least three years of experience in the study of tropical soils and soil management and conservation in the humid tropics;
- o a demonstratively productive record of involvement with U.S. universities in overseas technical assistance projects.
- o a proven ability to work effectively with host country senior and junior peers;
- o independently certified French language capability at the FSI 3/3/ level before full-time residence in Zaire begins.

2. **Agroforester / Agro-ecologist**

a. Responsibilities and Functions

Reporting directly to the Chief of Party and stationed at the Mulungu Research Station near Bukavu, South Kivu, the incumbent will provide technical support in forestry and agroforestry to the teams operating in conjunction with SENARAV's national programs. The incumbent will also serve as the ecological consultant and natural resources coordinator for SENARAV. The Agroforester/Agro-ecologist will:

- o design and implement an agroforestry research program on farm woodlot production and management with the objective of developing a way to increase the availability of wood for local use (fuelwood, charcoal production, building materials) while at the same time maintaining or improving biological diversity in the project implementation areas;
- o conduct and coordinate agroforestry research projects designed to identify the most appropriate species and planting strategies;
- o design an educational outreach program in conjunction with the R&D Specialist with the objective of improving the knowledge of local farmers about specific conservation strategies;
- o work with the visiting short-term inventory team and the R&D Specialist to conduct training sessions on the concepts of agro-ecology, applied agroforestry, zoning and micro-zoning, bio-physical sustainability, and the natural ecological characteristics of Zaire;
- o design a set of criteria in conjunction with the Soil Management Specialist on land use guidelines that could be used in recommending appropriate best management/alternative strategies to farmers (i.e zoning and micro-zoning);
- o coordinate the introduction of an agro-ecological and natural resources data base related to the project implementation areas into the GIS system;
- o coordinate a baseline environmental and agro-ecological profile (by a team of three short-term TAs) with the objective of establishing a data base for natural resources in the project implementation areas;
- o use the data base generated by the short-term inventory team and the GIS data base to develop an agro-ecological/environmental monitoring

system for RAV II activities in agricultural development;

- o work with a short-term Social Scientist TA to better understand the relationships between patterns of land tenure and local land use practices with the goal of improving the adoption of agricultural production technologies and long-term land use practices (such as the increased use of trees and shrubs).

b. Appointment Term/Level of Effort

This position will be for a 36-month term. The total effort will be divided between the functions described above. The position will be based at the Mulungu Station, but will require travel to areas in North Kivu, and other areas in Zaire. This person is expected to work closely with National Programs, the R&D Teams, and with Zairian and international organizations working toward the adoption of sustainable agriculture practices, enhanced use of the natural resource base, and the preservation of biological diversity.

c. Qualifications

The incumbent will possess:

- o a Ph.D. degree in forestry or a related biological science;
- o professional training and/or work experience in agroforestry, with extensive experience in applied forest ecology;
- o at least three years of experience working as a natural resource management specialist within the framework of agricultural development in the developing world;
- o a proven ability to work effectively with host country senior and junior peers;
- o a demonstratively productive record of involvement with U.S. universities and with consortia of overseas technical assistance projects;
- o independently certified French language capability at the FSI 3/3/ level before full-time residence in Zaire begins.

- o. development of overall laboratory and equipment management procedures for tissue culture, rapid multiplication and seed preparation technologies.
- b. design and implement a research program in cassava improvement with the objective of providing farmer acceptable varieties that are resistant/tolerant to the major cassava pests.
- c. oversee maize breeding program if and when USAID resumes support to PNM.

2. Agronomist

The original RAV II PP placed the major responsibilities for natural resource management on this position. This amendment adds a strengthened natural resource management component to SENARAV at all sites and expands outreach activities in the Kivu region. It is clearly impossible for one individual to undertake all of these additional responsibilities as foreseen in the original Project Paper and therefore, this amendment adds a soil management specialist. The Agronomist position, now located at M'Vauzi, has subsequently been reduced to a 24 month position with duties revised to include:

- o major responsibility for designing and implementing agronomic cropping systems research;
- o integration of natural resource management practices into the recommended practices and outreach programs of SENARAV;
- o participate in the design and implementation of cropping systems sub-projects to be carried out on- and off-farm.
- o participate in developing outreach recommendations and the preparation of extension publications.

3. Research Station Management Specialist

The refurbishment of facilities at the Mulungu station in South Kivu will require input from the Research Station Management Specialist. Should support to PNM be reinstated and the refurbishment at the Kaniameshi Station proceed, this individual will be unable to complete all activities in the time frame originally specified. The position duration for the Research Station Management Specialist will be increased from 24 to 36 months as necessary. This individual will be stationed in Kinshasa.

4. Legume Breeder

C. Modification of Roles of Present Long-Term Technical Assistance

The integration of this natural resource management component into the RAV II Project will require modification of the responsibilities of many of the technical assistance personnel already in the country. As these responsibilities have been modified, the expected level of effort for certain positions has also been changed as reflected in the modified Table J-7.

Refurbishment of facilities; development of tissue culture, soil and plant analysis, and seed preparation laboratories at Mulungu; and new attention on the development of research programs in the Kivu region will undoubtedly effect the TA personnel, all of whom have national mandates. The TA advisor originally designated as the Plant Breeder/Pathologist (Maize), for example, has already undergone a change in job description. Responsibility for advising both the maize and cassava breeding programs, as well as for establishing a tissue culture laboratory, developing a management system for the laboratory, and training personnel to run the laboratory at M'Vuazi all are now part of the new description.

These work assignments clearly represent at least eighteen months of full-time commitment. Therefore, should USAID re-initiate its support to PNM, individuals would be asked to modify their workplans to provide technical support over an extended time frame, but within the total time programmed for each TA position.

The situation is similar for several other positions with national mandates. These technical assistants will develop modified workplans (Project Paper, p. 37) that include expanded activities for the Kivu region. Position descriptions should be modified to include the following:

1. Plant Breeder/Plant Pathologist

The present technical assistance Plant Breeder/Pathologist was originally scheduled to be stationed with PNM at Kaniameshi, but having other national responsibilities. This person will now be stationed at M'Vuazi with a possible transfer to Kaniameshi in the future. Given his experience and program requirements the position responsibilities will be modified to include:

- a. development of the Plant Propagation Laboratories in M'Vuazi and Mulungu including:
 - o selection and installation of equipment;
 - o training laboratory technicians; and

This position will be relocated to the Mulungu station and reduced to 24 months in duration. The upgrading of the research, training and outreach programs, and the better scientific infrastructure at Mulungu will enable this position to be more effective than at the Gandajika station. Technical backstopping of the grain legume program by CIAT researchers through periodic visits to Zaire will also be supported. This position will still have national responsibilities which include continued support to the breeding programs at the Gandajika station.

5. Entomologist

Presently one Ph.D. and three M.S. entomologist trained under RAV I have returned, and all advanced degree training participants are scheduled to return to Zaire by the summer of 1992. By this time host country scientific staff levels in this discipline will be filled, thereby allowing long-term expatriate technical assistance in this field to be phased out. Therefore, the technical assistance position in Entomology, now based at M'Vauzi, will be reduced from a 36 to 24 month appointment.

6. Agricultural Economist

Given the planned secondment of qualified agricultural economists, the long-term Agricultural Economist technical assistance position will be reduced from 48 to 36 months in keeping with most of the other long-term technical positions. The Agricultural Economist is based in Kinshasa.

7. FSR Specialist

This position, originally scheduled for Kaniameshi, is now based in Kikwit, and may be transferred to Mulungu in the future based on evolving project needs.

8. Financial Management Advisor

The present Financial Management technical assistance position will be changed from a 72 to a 36 month appointment. Any developments in creating a research endowment foundation after the 36 month duration will be handled by short-term personnel.

ANNEX C. ECONOMIC ANALYSIS

This annex is included to assist in explaining the methods used in the economic section and to provide more detail on the cash flow calculations used to obtain economic returns. Internal rates of return (IRR) and net present values (NPV) were calculated from 20-year cash flows for SENARAV research programs at selected levels of potential soil loss impacts on production costs with and without the Natural Resource Amendment. Sensitivity analyses were conducted for those variables judged to be either most critical or most uncertain. Methods used for calculation of returns to research programs (cassava, peanuts and maize) to the Natural Resource Element will be presented in this Annex.

The economic surplus methodology of Norton et al.¹ was adapted to address the impact of potential loss of soil fertility and economic returns generated by strategies included in the Amendment to combat these losses. Economic surplus methodology is preferred to the more common approach (using enterprise budgets to estimate changes in net returns per acre then multiplying by the expected acreage of new varieties), due to its ability to quantify the benefits of lower food prices to consumers and the benefits of agricultural resource substitution to more highly valued uses. Norton et al developed the following equations for estimating changes in economic surplus (consumer surplus and producers surplus) resulting from the development and dissemination of new varieties that lower a crop's cost of production:

$$(1) \quad CTS = 0.5kpq(1+Zn)$$

$$(2) \quad Z = ke/(e+n)$$

$$(3) \quad k = arc.$$

Substituting (3) into (2) and (2) into (1),

$$(4) \quad CTS = 0.5arcpq(1 + (ke/(e+n)n)).$$

In PC spreadsheet notation, (4) becomes

$$(5) \quad A1 = 0.5*(B1*C\$1*D\$1)*E\$1*F\$1(1+((B1*C\$1*D\$1)G\$1/(G\$1+H\$1)H\$1))$$

¹ Norton et al., American Journal of Agricultural Economics, May, 1987.

where:

A1 = CTS = change in total net economic surplus,
k = proportionate vertical shift in supply (%),
B1 = a = new variety adoption rate,
C\$1 = r = probability of research success (%),
D\$1 = c = expected cost reduction for new variety (%),
E\$1 = p = equilibrium price before supply shift,
F\$1 = q = equilibrium quantity before supply shift,
G\$1 = e = supply elasticity, and
H\$1 = n = absolute value of demand elasticity.

Equation (5) is the expected change in economic surplus resulting from the generation and transfer of a new crop variety. The variable, k, represents the vertical shift in supply in percentage terms. Change in economic surplus is used to quantify the benefits of investments in new crop variety research and extension programs.

In many areas of the world, both in developed and developing countries, advances in new varieties are often negated, to some degree, by deterioration of the resource base. To the extent that farmers do not conserve or enhance their soil, the vertical downward shift of supply from new varieties is offset by a vertical upward shift from soil degradation. The benefits to natural resource conservation investments, as included in the Natural Resources Element, can be quantified as the damage avoided. The latter is the difference between economic surplus with and without loss of soil fertility net the costs of the soil conservation investment. The soil degradation factor can be quantified as:

$$(6) \quad s_n = s + (s^{n-1})$$

where:

s = annual soil degradation factor (%) and
n = time period.

Equations (4) and (5) can be adjusted to quantify the change in economic surplus due to loss of soil fertility:

$$(7) \quad ACTS = 0.5sarcpq(1 + (ke/(e+n)n))$$

In PC spreadsheet notation, (7) becomes

$$(8) \quad AA1 = 0.5*J1*(B1*C$1*D$1) \\ *E$1*F$1(1 + ((B1*C$1*D$1)G$1/(G$1+H$1)H$1))$$



where:

ACTS = AA1 = change (loss) in economic surplus from soil degradation

$s_n = J1 =$ annual soil degradation factor (%) in year n.

Tables C1-3 summarize the calculation of IRR and NPV for the three major research and extension programs of SENARAV. The decreases in IRR and NPV demonstrate the ability of the loss of soil fertility to negate research and extension benefits. The baseline assumptions are shown at the top of the Tables. These results do not consider potential benefits of soil-conserving practices. They are the calculations that would have been included in the Project Paper had soil degradation factors been explicitly considered. The IRR's and NPV's from the "0% soil degradation" row in Table 1, from the "without soil conservation" results in Tables C1-3, and from the Project Paper are the same.

The cash flows shown in Tables C1-3 illustrate the method used to calculate IRR's and NPV's included in Tables 1 and 3. Sensitivity analyses can be computed on the spreadsheet using "/DATA TABLE", if there is a proper link between the key parameter or "input cell" and the cell containing the desired evaluation criteria (eg. IRR and NPV).

To address the returns to the Natural Resource Element, Equation (8) must be further adjusted to reflect the adoption rate for conservation practices on new varieties.

$$(9) \quad d_n = d + (d^{n-1})$$

$$(10) \quad \text{DACTS} = 0.5dsarcpq(1 + (ke/(e+n)n))$$

In PC spreadsheet notation, (10) becomes

$$(11) \quad \text{AB1} = 0.5*K1*J1*(B1*C\$1*D\$1) *E\$1*F\$1(1+((B1*C\$1*D\$1)G\$1/(G\$1+H\$1)H\$1))$$

where:

DACTS = AB1 = change in economic surplus from soil degradation avoided by use of soil conserving practices

$d_n = K1 =$ soil conserving practices adoption factor.

Table C-1. Internal Rate of Return and Net Present Value for RAV II

Groundnut Research Program

DEMAND ELASTICITY (ABSOLUTE VALUE)	1.00
SUPPLY ELASTICITY	1.00
INITIAL QUANTITY (1000 TONS)	430.09
INITIAL PRICE	\$250.00
COST REDUCTION	25.0%
PROB. RESEARCH SUCCESS	75.0%
MAX. % AREA UNDER IMPROVED VARIETIES	50.0%
SOIL DEGRADATION FACTOR	1.0%

YEAR	COST REDUCTION	ADOPTION RATE	PNL COSTS	TOTAL SURPLUS W/OUT SOIL DEGRADATION	NET BENEFIT W/OUT SOIL DEGRADATION	SOIL DEGRADATION FACTOR	TOTAL SURPLUS WITH SOIL DEGRADATION	NET BENEFIT WITH SOIL DEGRADATION
1	0.000	0.000	2515728	0	-2515728	0.990	0	-2515728
2	0.003	0.017	1675792	171637	-1504155	0.980	168222	-1507570
3	0.008	0.045	1719040	455524	-1263516	0.970	441995	-1277045
4	0.015	0.078	1275680	792008	-483672	0.961	760800	-514880
5	0.023	0.120	1141584	1223236	81652	0.951	1163286	21702
6	0.033	0.174	1027344	1782572	755228	0.941	1678256	650912
7	0.045	0.241	882912	2484224	1601312	0.932	2315459	1432547
8	0.053	0.280	849184	2896555	2047371	0.923	2672781	1823597
9	0.056	0.300	464304	3109122	2644818	0.914	2940237	2375933
10	0.059	0.316	464304	3279720	2815416	0.904	2966120	2501816
11	0.062	0.332	464304	3450802	2986498	0.895	3089635	2625331
12	0.065	0.344	464304	3579431	3115127	0.886	3172753	2708449
13	0.067	0.356	464304	3708332	3244028	0.878	3254139	2789835
14	0.068	0.364	464304	3794417	3330113	0.869	3296384	2832080
15	0.070	0.372	464304	3880623	3416319	0.860	3337562	2873258
16	0.071	0.380	464304	3966950	3502646	0.851	3377691	2913387
17	0.073	0.388	464304	4053398	3589094	0.843	3416785	2952481
18	0.074	0.392	464304	4096668	3632364	0.835	3418726	2954422
19	0.074	0.396	464304	4139967	3675663	0.826	3420311	2956007
20	0.075	0.400	464304	4183297	3718993	0.818	3421548	2957244

NPV = 7604436 NPV = 5792183.4
 IRR = 20.9% IRR = 19.0%

Discount Factor = 10.0%

Table C-2. Internal Rate of Return and Net Present Value for RAV II
Cassava Research Program

DEMAND ELASTICITY (ABSOLUTE VALUE)	0.20
SUPPLY ELASTICITY	1.00
INITIAL QUANTITY (1000 tons)	3728.00
INITIAL PRICE	\$90.00
COST REDUCTION	35.0%
PROB. RESEARCH SUCCESS	60.0%
MAX. % AREA UNDER IMPROVED VARIETIES	40.0%
SOIL DEGRADATION FACTOR	1.0%

YEAR	COST REDUCTION	ADOPTION RATE	PROMAM COSTS	TOTAL SURPLUS W/OUT SOIL DEGRADATION	NET BENEFIT W/OUT SOIL DEGRADATION	SOIL DEGRADATION FACTOR	TOTAL SURPLUS WITH SOIL DEGRADATION	NET BENEFIT WITH SOIL DEGRADATION
1	0.000	0.000	3699600	0	-3699600	0.990	0	-3699600
2	0.004	0.017	2464400	599260	-1865140	0.980	587334	-1877066
3	0.009	0.045	2528000	1587829	-940171	0.970	1540669	-987331
4	0.013	0.078	1876000	2755411	879411	0.961	2646836	770836
5	0.025	0.120	1678800	4245308	2566508	0.951	4037245	2358445
6	0.037	0.174	1510800	6167282	4656482	0.941	5806373	4295573
7	0.051	0.241	1298400	8561950	7263550	0.932	7980296	6681896
8	0.059	0.280	1248800	9960958	8712158	0.923	9191421	7942621
9	0.063	0.300	682800	10679853	9997053	0.914	9756230	9073430
10	0.066	0.316	682800	11255680	10572880	0.904	10179435	9496635
11	0.070	0.332	682800	11832137	11149337	0.895	10593765	9910965
12	0.072	0.344	682800	12264895	11582095	0.886	10871417	10188617
13	0.075	0.356	682800	12698008	12015208	0.878	11142769	10459969
14	0.076	0.364	682800	12986947	12304147	0.869	11282356	10599556
15	0.078	0.372	682800	13276044	12593244	0.860	11418172	10735372
16	0.080	0.380	682800	13565298	12882498	0.851	11550279	10867479
17	0.081	0.388	682800	13854711	13171911	0.843	11678734	10995934
18	0.082	0.392	682800	13999476	13316676	0.835	11682756	10999956
19	0.083	0.396	682800	14144281	13461481	0.826	11685561	11002761
20	0.084	0.400	682800	14289126	13606326	0.818	11687175	11004375

NPV = 164226052 NPV = 38467774

IRR = 42.5% IRR = 40.3%

Discount Factor = 10.0%

Table C-3. Internal Rate of Return and Net Present Value for RAV II Maize Research Program

DEMAND ELASTICITY (ABSOLUTE VALUE)	0.40
SUPPLY ELASTICITY	1.00
INITIAL QUANTITY (1000 tons)	781.00
INITIAL PRICE	\$139.50
PROB. RESEARCH SUCCESS	70.0%
MAX. % AREA UNDER IMPROVED VARIETIES	40.0%
COST REDUCTION	40.0%
SOIL DEGRADATION FACTOR	1.0%

YEAR	COST REDUCTION	ADOPTION RATE	PNM COSTS	TOTAL SURPLUS W/OUT SOIL DEGRADATION	NET BENEFIT W/OUT SOIL DEGRADATION	SOIL DEGRADATION FACTOR	TOTAL SURPLUS WITH SOIL DEGRADATION	NET BENEFIT WITH SOIL DEGRADATION
1	0.000	0.000	2404740	0	-2404740	0.990	0	-2404740
2	0.005	0.017	1601860	259652	-1342208	0.980	254485	-1347375
3	0.013	0.045	1643200	688853	-954347	0.970	668393	-974807
4	0.022	0.078	1219400	1197152	-22248	0.961	1149980	-69420
5	0.034	0.120	1091220	1847923	756703	0.951	1757356	666136
6	0.049	0.174	982020	2690954	1708934	0.941	2533479	1551459
7	0.067	0.241	843960	3746829	2902869	0.932	3492289	2648329
8	0.078	0.280	811720	4366487	3554767	0.923	4029153	3217433
9	0.084	0.300	443820	4685700	4241880	0.914	4280468	3836648
10	0.088	0.316	443820	4941774	4497954	0.904	4469251	4025431
11	0.093	0.332	443820	5198472	4754652	0.895	4654391	4210571
12	0.096	0.344	443820	5391406	4947586	0.886	4778860	4335040
13	0.100	0.356	443820	5584691	5140871	0.878	4900684	4456864
14	0.102	0.364	443820	5713743	5269923	0.869	4963790	4519970
15	0.104	0.372	443820	5842951	5399131	0.860	5025279	4581459
16	0.106	0.380	443820	5972315	5528495	0.851	5085174	4641354
17	0.109	0.388	443820	6101836	5658016	0.843	5143501	4699681
18	0.110	0.392	443820	6166655	5722835	0.835	5146158	4702338
19	0.111	0.396	443820	6231513	5787693	0.826	5148280	4704460
20	0.112	0.400	443820	6296410	5852590	0.818	5149877	4706057

NPV = 16668441 NPV = 13938439
IRR = 31.3% IRR = 29.2%

Discount Factor = 10.0%

Equations (10) and (11) represent the damage avoided on new varieties by adopting soil-conserving practices. Equations (7) and (8) are the total loss in economic surplus from soil loss on new varieties, whereas Equations (10) and (11) are only the part of that total loss that is avoided through the use of soil-conserving techniques.

Benefits to soil conservation must also be considered on traditional varieties by substituting

$$(12) \quad k = (1-a)d(1-s)$$

for Equation (3) in Equation (1), resulting in

$$(13) \quad TCTS = 0.5(1-a)d(1-s)pq(1 + (ke/(e+n)n))$$

In PC spreadsheet notation, (13) becomes

$$(14) \quad AC1 = 0.5*((1-B1)*k\$1*(1-J1)) \\ *E\$1*F\$1(1+((B1*C\$1*D\$1)G\$1/(G\$1+H\$1)H\$1))$$

where:

TCTS = AC1 = change in economic surplus from damage avoided by adopting soil conservation practices on traditional varieties

Total change in economic surplus as a result of soil-conserving practices will be the sum of Equations (13) and (10) for the crops receiving research and extension attention under the Natural Resource Element. These results are shown in Table C4, using a baseline conservation adoption rate (d) of 1%.

These results were calculated based on aggregate, national data for three important crops. There are additional crops on which soil-conserving techniques might be considered, however, these are the crops that received most of the research and extension effort of SENEARAV and are thus most likely to receive the greatest attention in soil conservation efforts also. Soil conservation efforts on many other crops would be pursued through other agencies. Returns presented here are specific to SENARAV programs. Regional and sub-regional analyses would be useful in targeting areas where farmers are more likely to adopt soil conservation practices and where these practices would have their greatest potential impact on economic well-being.

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Table C-4. Internal Rate of Return and Net Present Value for RAV II Natural Resource Element

YEAR	NEW GMUT VARIETY AMEND BENEFIT	OLD GMUT VARIETY AMEND BENEFIT	TOTAL GMUT AMEND BENEFIT	NEW CASSAVA VARIETY AMEND BENEFIT	OLD CASSAVA VARIETY AMEND BENEFIT	TOTAL CASSAVA AMEND BENEFIT	NEW MAIZE VARIETY AMEND BENEFIT	OLD MAIZE VARIETY AMEND BENEFIT	TOTAL MAIZE AMEND BENEFIT	AMEND NET BENEFIT NEW VARIETY	AMEND NET BENEFIT OLD VARIETY	TOTAL AMEND BENEFIT G+M+C	AMEND COST	AMEND NET BENEFIT G+M+C
1	0	5376	5376	0	16776	16776	0	5448	5448	0	27600	27600	565000	-537400
2	69	21249	21318	241	66297	66538	104	21529	21633	414	109075	109489	1935800	-1826311
3	413	46536	46949	1439	145172	146610	624	47145	47769	2475	238853	241328	1052800	-811472
4	1277	79964	81240	4442	249400	253842	1930	80999	82929	7648	410363	418012	753400	-335388
5	3083	119358	122441	10699	372177	382875	4657	120884	125541	18438	612419	630857	609000	21857
6	6471	161452	167923	22389	503301	525690	9769	163489	173258	38629	828242	866872	407300	459572
7	12279	202064	214343	42319	629747	672066	18519	204582	223101	73117	1036393	1109510	415600	693910
8	18704	250535	269239	64322	780576	844898	28196	253608	281804	111222	1284719	1395941	415600	980341
9	25416	308511	333927	87303	960867	1048170	38303	312224	350527	151022	1581602	1732624	415600	1317024
10	33106	372473	405580	113617	1159624	1273241	49883	376860	426744	196607	1908957	2105564	415600	1689964
11	42157	440521	482678	144549	1370904	1515453	63508	445590	509098	250214	2257015	2507229	415600	2091629
12	52052	515303	567355	178356	1602897	1781252	78402	521080	599482	308809	2639280	2948090	415600	2532490
13	63303	594265	657567	216760	1847623	2064383	95333	600741	696074	375396	3042628	3418024	415600	3002424
14	75138	681343	756481	257170	2117236	2374406	113145	688534	801679	445452	3487113	3932565	415600	3516965
15	88236	773147	861383	301864	2401174	2703039	132854	781028	913882	522954	3955348	4478303	415600	4062703
16	102652	869441	972093	351025	2698665	3049690	154544	877975	1032519	608221	4446081	5054302	415600	4638702
17	118440	969990	1088430	404835	3008935	3413770	178296	979130	1157426	701571	4958056	5659627	415600	5244027
18	134239	1081744	1215982	458731	3353346	3812077	202067	1091467	1293534	795037	5526557	6321594	415600	5905994
19	151193	1198957	1350150	516553	3714092	4230645	227576	1209189	1436766	895322	6122239	7017560	415600	6601960
20	169331	1321538	1490869	578393	4090827	4669220	254865	1332192	1587057	1002588	6744558	7747146	415600	7331546

NPV = 9,046,831

Discount Factor = 10.0%

IRR = 25.0%

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ANNEX D. PROCUREMENT PLAN AND DETAILED BUDGETS

A. Procurement Plan

Procurement for the NRM Amendment to RAV II will follow the same plan established in the RAV II PP. This amendment provides for the purchase of additional commodities and services which are similar in nature to those procured under RAV II. The same contractor, SECID, will provide the additional TA and handle the purchase of all goods and services. Air freight will be used for all but the heaviest and lowest priority items.

Like RAV II, the amendment will be funded through the Development Fund for Africa, which grants special waiver pertaining to U.S. Source rules for the purchase of goods and services. All waivers needed for project implementation are incorporated within the provisions of the blanket waiver for "Procurement of U.S. Goods and Services under the DFA; the AID Blanket Transportation Waiver, and the Blanket Source/Origin Waiver for project procurement of certain vehicles and motorcycles, plus spare parts purchased with these vehicles.

All USAID project-procured commodities will become the property of the GOZ (unless other agreements are made by both parties) at the end of the project.

For convenience, the Authorized Procurement table from the RAV II Project Paper is reproduced below. The commodity lists presented in the detailed budgets which follow, represent all commodities which will be purchased under the expanded \$24.853 million project.

Table D-1. RAV II Authorized Procurement Under The Development Fund for Africa.
(PP Table 2)

<u>Goods or Services to be Procured</u>	<u>Authorized Source (or Origin)</u>	<u>Expected/Preferred Source (if different from Authorized Source)</u>	<u>Documentation Requirement</u>	<u>Comments</u>
1. Participant Training	935	USA for most all long-term training.	Special DS/IT approval is not required.	
2. Technical Assistance	935	U.S. Universities for long-term TA.		
3. Ocean Shipping (Cargo Preference)	50% Gross tonnage of AID financed commodities to be shipped on U.S. Flag commercial vessels.	Zaire Blanket Transportation Waiver 89-B-4 permits expanded use of code 935 Flag vessels.	Normal rules apply.	
4. Air Travel and Transportation.	U.S. Flag Carriers.		Mission Director may approve exceptions.	Exceptions to be used sparingly.
5. Motor vehicles	935	AID/W Blanket Vehicle Waiver permits use of code 935 source/origin.	Procurement plan for DFA activity should indicate whether U.S. manufactured vehicles are available to meet the needs of the activity; Procurement PIL.	No FFA section 636(1) Waiver is required
6. Construction/Rehabilitation Service	935	Local constructor/rehabilitation of less than \$1 mil.	Mission Director Approval.	
7. Imported Shelf Items	935			
8. Laboratory Equipment, Furniture, Household and Office Equipment.	935, however U.S. source equipment may not be financed if the U.S. domestic price is less than parity.	Mission Director may approve exceptions.	No unit price limitation or total cost limitation on Code 935 Procurement of non-code 941 origin; Procurement PIL.	

B. Detailed Budgets Including Commodity Lists

Four budgets are presented in the following pages:

- Table D-2. A detailed revised budget for dollar expenditures in RAV II.
- Table D-3. A detailed budget for dollar expenditures in the NRM Amendment.
- Table D-4. A detailed budget for local currency expenditures in RAV II.
- Table D-5. A detailed budget for local currency expenditures in the NRM Amendment.

These budgets present detailed cost estimates on which the summary budgets in Chapter IV are based. Tables D-2 and D-3 are the basis for the USG contribution summary budgets found in tables 5, 8 and 11. Tables D-4 and D-5 are the basis for the GOZ contribution summary budgets found in tables 6, 9 and 12. The Chapter IV summary budgets are linked directly to these detailed budgets, using the linking feature provided in Quattro Pro software.

These budgets include detailed commodity lists taken from the workplan of the SECID TA team which replace the commodity lists in the original Project Paper.

TABLE D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	Total
A. TECHNICAL ASSISTANCE/PERSONNEL									
1) COP	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	1,600,000
2) RDT SPEC	200,000	200,000	200,000						600,000
3) Financial Mgmt	200,000	200,000	200,000						600,000
4) Plant Breeder/Pathologist	200,000	200,000	200,000						600,000
5) Legume Breeder	200,000	200,000							400,000
6) Agronomist	200,000	200,000							400,000
7) Ag. Economist	200,000	200,000	200,000						600,000
8) Entomologist	200,000	200,000							400,000
9) Research Station Mgmt	200,000	200,000	200,000						600,000
10) FSR Spec	200,000	200,000	200,000						600,000
11) Home Office	180,000	180,000	180,000	60,000	36,000	36,000	24,000	24,000	720,000
Subtotal	2,180,000	2,180,000	1,580,000	260,000	236,000	236,000	224,000	224,000	7,120,000
Inflation (5 %/yr)		109,000	161,950	40,976	50,858	65,207	76,182	91,190	595,364
Total	2,180,000	2,289,000	1,741,950	300,976	286,858	301,207	300,182	315,190	7,715,364
B. SHORT-TERM TA									
1) In-Country (\$20000/pm)	180,000	120,000	120,000	90,000	90,000	90,000	80,000	60,000	830,000
2) On-campus (\$10000/pm)	30,000	20,000	20,000	20,000	20,000	20,000	10,000		140,000
Subtotal	210,000	140,000	140,000	110,000	110,000	110,000	90,000	60,000	970,000
Inflation (5 %/yr)		7,000	14,350	17,336	23,705	30,393	30,609	24,426	147,819
Total	210,000	147,000	154,350	127,336	133,705	140,393	120,609	84,426	1,117,819
TOTAL TA	2,390,000	2,436,000	1,896,300	428,312	420,563	441,600	420,791	399,616	8,833,183

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Table D-2. RAV II BUDGET REVISED (Detailed U.S. Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
C. TRAINING									
1) LT Participants									
MSc	100,000	277,500	405,000	392,500	352,500	195,000	37,500	0	1,760,000
PhD	10,000	70,000	120,000	145,000	225,000	165,000	150,000	37,500	922,500
RAV I carry-over	193,000	176,000	25,000						394,000
English training	99,000	54,000	45,000						198,000
2) ST US and Third Country	96,000	160,000	48,000	8,000	8,000	8,000	8,000		336,000
3) ST In-Country	60,000	90,000	40,000	7,000	7,000	7,000	4,300		215,300
Subtotal	558,000	827,500	683,000	552,500	592,500	375,000	199,800	37,500	3,825,000
Inflation (5 %/yr)		41,375	70,008	87,074	127,684	103,613	67,952	15,266	512,971
Total	558,000	868,875	753,008	639,574	720,184	478,613	267,752	52,766	4,338,771
D. FACILITIES REHABILITATION									
1) M'Vuazi Station	100,000	110,000							210,000
2) Kaniameshi Station									0
3) Gandajika Station	100,000	150,000							250,000
4) Kinshasa Office	100,000	100,000							200,000
Subtotal	300,000	360,000							660,000
Inflation (5 %/yr)									0
Total	300,000	360,000							660,000
E. RESEARCH EQUIPMENT AND SUPPLIES									
1) SOIL LAB.			0						0

Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
2) TISSUE CULTURE LAB.		62,209							62,209
1 Fisher Stirring Bars	50								
1 Multimatic Microwave Oven	500								
1 Hygrothermograph, portable	689								
1 Distillation Apparatus	2,850								
1 Mega-pure collection	1,020								
5 Mega-pure filters	450								
2 Flexible Tubing Adapter Kit	200								
1 Sterilmatic Sterilizer Chamber	5,300								
1 Sterilizer Stand	405								
2 Sterilizer Tray	234								
1 PH meter, digital	854								
2 ATC Probe-Epoxy	400								
1 Fisher Steromaster Zoom Microscope	1,198								
1 Katy Illuminator w/extra bulbs	233								
1 Moisture Balance	1,205								
2 Heavy Duty Utility Cart	500								
2 Glassware carts	720								
4 Nuova II stirring plate	1,320								
2 Bacti-Cinerator III	404								
1 Reichert-Jung Colony Counter	635								
2 Gyro Shaker w/access. platform	5,640								
3 Flask platform w/ clamps	1,935								
1 Frost Free Refrigerator	600								
1 Chest Type Frost Free Freezer	700								
2 Forced Draft Oven	2,190								
2 Laminar Flow hood	4,378								
1 Queue Walk-in Growth Chamber	14,000								
1 Pressure/Vacuum Pump	424								
1 Nikon camera w/autozoom	600								
3 File cabinets	1,005								
1 Epoxy balance table	997								
1 Calibration wet set	1,168								
1 Fisherbrand tool kit	142								
1 Clean room table	863								
1 Trinocular microscope	3,400								
Miscellaneous	5,000								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
Shipping	24,884								
Chemicals and Supplies		5,500	5,500	5,500	1,000	1,000	1,000	750	24,884
Tissue Culture Lab Subtotal	87,093	5,500	5,500	5,500	1,000	1,000	1,000	750	20,250
Inflation (5 %/yr)		275	564	867	216	276	340	305	107,343
Tissue Culture Lab Total	87,093	5,775	6,064	6,367	1,216	1,276	1,340	1,055	2,843
3) ENTOMOLOGY	19,853								
1 Portable pressure/vacuum pump	580								19,853
1 Refrigerator	1,500								
1 Freezer	1,500								
6 TI-55 III calculator	300								
1 Camera (Nikon)	500								
15 Drawer Kit sets	900								
4 Insect stretching board	50								
60 Insect rearing cage	4,500								
1 Stockinette sleeve, roll	50								
2 Insect vacuum w/ spare parts	315								
3 File cabinets	1,000								
9 Polystyrene jars, cases	486								
1 Qorpac clear bottle, case	100								
6 Qorpac cleaning brush	30								
3 formula gloves, pks	45								
3 Polypaper pocket, pks	135								
8 Nalgene polypaper labels, pks	148								
3 Metal lab stool	396								
3 Petri-dish baskets	297								
2 Clear lab tubing, pks	225								
2 Forced draft oven	3,000								
10 No. 1 insect pins, pks	100								
10 No. 2 insect pins	100								
8 Vials, gross	128								
4 Transparent PVC bottles, cases	340								
1 Nalgene Autoclave	74								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
2 Light duty cart	256								
2 Disposable petri-dishes, case	144								
1 Spring balance	50								
2 2-speed blender w/glass container	380								
3 Polypropylene rack	42								
3 Magnifier, fixed focus	102								
4 Hand-held counter	80								
Miscellaneous	2,000								
Shipping		7,941							7,941
Entomology Subtotal	27,794								27,794
Inflation (5 %/yr)									0
Entomology Total	27,794								27,794
4) LAB SUPPLIES	81,600								81,600
Assorted Glassware									
120 Media bottles	675								
12 Flint dropping bottles	113								
1 Glass alcohol burner	50								
16 Kimax graduated cylinders	845								
4 Dessicator plates	42								
96 Pyrex petri dishes	331								
72 Erlenmeyer flasks	211								
32 Cylindrical bulbs	1,138								
24 Kjeldahl flasks	206								
530 Volumetric flasks	6,298								
4 Pipette Dispensers	960								
1000 Pipette tips	50								
10 Sellstrom Safeguards	35								
24 Culture media flasks	241								
2 Tissue grinder kit	716								
24 Pyrex plus reagent bottles	282								
72 Wheaton media bottles	306								
84 Pyrex beakers	684								
18 Tapered wall polypropylene beaker	352								
Miscellaneous	2,000	15,535							

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
30 Sulfuric acid, liter	256								
1 Silver nitrate	600								
24 Toluene, liter	200								
6 Sodium Hydroxide, liter	76								
6 Chloramine	165								
6 Pyridine, liter	280								
12 Glacial acetic acid	250								
2 Potassium Cyanide	70								
5 Sodium Hydroxide, kg	90								
6 Phosphoric acid, liter	225								
6 Ammonium sulfate, liter	130								
3 Potassium Nitrate, kg	126								
3 Potassium Nitrate, kg	190								
3 Calcium Chloride, kg	120								
3 Manganous Sulfate, kg	170								
1 Potassium Iodine, kg	200								
1.5 Potassium Biphosphate, kg	95								
3 Magnesium Sulfate, kg	170								
1 Boric Acid, kg	50								
1 Zinc Sulfate, kg	58								
.5 Sodium Molybdate, kg	152								
1 Copper Sulfate, kg	82								
1 Cobalt Chloride, kg	300								
1 Ferrous Sulfate, kg	72								
2 Potassium Hydroxide	96								
500 Tween 80, ml	40								
4 Hydrochloric Acid	1,065								
100 2,4 Dichlorobenzoic Acid, gm	20								
20 Ethyl Alcohol, liter	120								
12 Sucrose, kg	212								
20 Agar, Bacto	1,680								
Potato Dextrose Agar	700								
Miscellaneous	2,000	10,060							

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
400 Magenta vessel	630								
8 Vessel for tissue culture, case	52								
800 Magenta B-cap	200								
16 Culture tubes, case	720								
4 Closure for tubes, case	164								
6 Culture tube racks, case	485								
20 Culture tube rack	60								
200 Indole-3-acetic acid, g	162								
1 Indole-3-acetyl glycine, kg	400								
400 Naphthaleneacetic acid, g	4,590								
400 Adenine (6 Aminopurine), g	400								
400 Adenine hemisulfate, g	400								
100 6-Bensylaminopurine, g	640								
50 Kinetin, g	520								
10 Colchicine crystals, g	250								
1 Myo-inositol, kg	125								
1 Thiamine.HCL, kg	175								
1 Nicotinic acid amide, kg	42								
2 Glycine, kg	50								
40 Tip rooting medium, liter	1,250								
40 Shoot multiplication medium, l	1,025								
40 Basal salt mixture, liter	1,025								
40 Basal medium, liter	1,025								
Miscelanecus	2,000	16,390							
5 Hygrothermograph Charts	950								
20 Scalpel handle #4	200								
20 Scalpel handle #3	200								
12 Scalpel blades, pk	804								
6 Sterilizer boxes	312								
20 Braun Microforceps	784								
10 Braun Microforceps	438								
20 Protective glasses	500								
10 Chemical splash goggles	1,200								
10 Measuring tapes	500								
2000 Sterile Sample bags	526								
2000 Whirl pak bags	162								
2 Tissue culture nosepiece	94								
20 Drierite absorbent	196								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR							Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	
10 Voltage converters 1000W	1,780							
10 Voltage Converters 500W	945							
30 Lab coats	750							
10 Wire Shelving sets	1,500							
6 Kik Stools	1,350							
2000 Plastic gallon pots	3,000							
4000 plastic labels	800							
10 Waste Baskets w/ lids	470							
10 Waste Basket liners, pk	200							
20 Rubber boots, pr	500							
6 Pencil sharpeners	60							
20 Garden hose	500							
20 Hand-held counters	400							
2000 Weighing dishes	274							
Aluminum weighing dish	655							
6 Sink Matting	822							
3 Sparkleen detergent	280							
100 Hoffman open side tubing clamps	200							
100 Vacuum tubing clamps	135							
100 Connector clamps	120							
96 Flat-jaw pinchcocks	680							
2 Alconox powder	150							
12 Heavy duty brushes	173							
12 Funnel or graduated brushes	92							
24 Test tube brushes	44							
8 Separatory funnels	500							
10 Rainproof suits	500							
8 Clavis terry-cloth gloves	212							
8 Scissors	252							
4 Multiple tape dispensers	80							
168 Colored labeling tape	480							
1 Inventory label tape	80							
1 Autoclave identification tape	92							
2 Seven speed commercial blender	656							
10 Cast iron rings	310							
100 Rubber stopper for Kjeldahl	70							
20 Cast iron supports	1,250							
12 Marking pens, pk	250							
8 Permanent markers, pk	240							

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
10 Kimwipes tissue, pk	515								
10 Kimwipes tissue, pk	525								
3 Terry Wipes, pk	370								
6 Stainless steel utility trays	510								
20 Clip-boards	100								
10 Metal detector sticks	100								
6 Tin Snips	124								
20 Transparent foot ruler	80								
Miscellaneous	9,573	39,615							
Shipping		32,640							32,640
Annual Supplies			5,500	5,500	5,500	1,100	1,100	1,100	825
Lab Supplies Subtotal	114,240	5,500	5,500	5,500	1,100	1,100	1,100	825	134,865
Inflation (5 %/yr)			275	564	867	237	304	374	336
Lab Supplies Total	114,240	5,775	6,064	6,367	1,337	1,404	1,474	1,161	137,821
5) RESEARCH SUPPLIES		229,136							229,136
4 Landscaper	7,200								
4 Landscaper w/ backfill blade	6,800								
6 Utility rear blade	8,400								
3 Landscape rake	5,400								
6 Disk harrow	16,400								
3 Heavy duty disk harrow	11,500								
6 Field cultivator	9,600								
6 Rotary cutter/mower	12,000								
4 Reversible scoop	4,000								
3 Spiked tooth harrow	4,800								
6 Two-disk plow	8,400								
3 Trailer, 2-wheel rubber tire	4,800								
3 Planter, 2-row	2,700								
		102,000							

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
3 Seed cleaner w/hand attach.	10,200								
3 Platform scales	2,700								
6 registering thermometers	180								
6 moisture tester	2,100								
24 9-volt batteries for tester	48								
2 Hand grinder	220								
8 Wire ties sets	400								
6 Push brooms	300								
8 Fire Extinguisher	480								
6 Step ladder, 6'	480								
12 Aluminum baskets	240								
16 Hand-held tally counters	320								
6 wheel barrow	540								
		18,208							
12 Triple beam balance	480								
15 Plastic buckets w/ lids	180								
72 Rubber boots, pair	2,880								
24 Knapsack sprayer w/ spare nozzle	6,000								
32 Protective respirators	960								
64 cartridges for respirators	640								
32 Protective goggles	160								
20 Protective hard-hats	640								
72 Waterproof suits	3,600								
20 Manual hill planters, jab-type	1,200								
16 Row planter, push-type	3,200								
16 Seed plates for row planter	400								
20 Measuring tape, fiberglass	2,000								
25 Water hoses	500								
20 Magnifying glasses, head-band	200								
80 Rakes	1,200								
80 Hoes	1,200								
80 Machetes	1,200								
80 Shovels	1,200								
80 Picks	1,200								
40 Flagging tape, boxes	400								
40 Metal stake tags, boxes	150								
6 Cotton sacks, 12" x 30", bales	12,000								
6 Cotton sacks, 6" x 12", bales	4,500								
6 Woven plastic sacks, bales	12,000								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	FY-91	FY-92	PROJECT YEAR					Total
			FY-93	FY-94	FY-95	FY-96	FY-97	
4 Petri-dish, cases	288							
40 Germination paper, pks	400							
40 Aluminum clip-board, closing	1,240							
40 Nylon string	200							
40 Milk scales	480							
25 Tripod for milk scales	300							
8 Wheel barrows	800							
160 Plastic jars, sm. screw-cap, cs	1,920							
40 Plastic jars, med. screw-cap, cs	480							
80 Plastic jars, lrg. screwcap, cs	960							
2800 Plastic pots, var. sizes	2,475							
40 Plastic pot labels, box	600							
		68,233						
6 Tool box, all purpose	240							
6 Tool box, low profile	90							
3 Tool bags	120							
3 Carpentry tool sets	1,200							
3 Service tool sets	480							
1 Maintenance tool set	500							
3 Electrician tool sets	600							
3 Electrical maintenance tool sets	750							
3 Basic tool sets	480							
1 Computer service tool set	100							
3 Trouble lights	60							
3 Machine lights	120							
6 Plunger	30							
3 Heavy duty plunger	30							
3 Pipe wrench, 10"	42							
3 Pipe wrenches, 24"	105							
3 Pipe pliers	105							
3 Wrench set, combination	300							
		5,352						

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR							Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	
3 Hand hoist	1,200							
3 Standard puller set	2,100							
3 Battery tester	180							
3 Cable set	270							
3 Tube cutter	180							
3 Tube flaring tool	270							
3 Tap and die set	270							
3 Metric tap and drill set	300							
5 Ratchet drive stud remover	600							
3 Screw extractor set	30							
3 Jobber's drill set	600							
3 Heavy duty hand drill	150							
2 Drill Press	1,400							
3 Center Punch set	60							
3 Pin punch set	60							
3 Rivet punch	15							
3 Metal and wire shearing kit	180							
3 Tight spot hack saw	30							
3 Deep throat hack saw	90							
2 Bench grinder	600							
3 Metric hex key	6							
3 Metric hex key	15							
3 Hex key set	90							
3 Ridge reamer w/carbide cutter	120							
3 glass breaker w/ replacement stone	120							
3 Piston ring compressor	60							
3 Piston groove cutter and cleaner	60							
3 Battery tester w/replacement float	45							
3 Valve grinder	60							
3 Strap-type oil filter wrench	18							
3 Lug wrench	30							
3 Tire tool service board set	750							
10 Standard range pressure gauge	120							
3 Heavy duty lever grease gun	300							
10 Tire pump	150							
3 Heavy duty extension	36							
3 3600 coupler adapter	90							
3 Standard coupler	21							
3 Small diameter coupler	18							

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
3 Pin type coupler	60								
3 Needle type nossle	6								
3 Hydraulic fitting assortment	45								
3 Metric assorted grease fittings	150								
3 Metric grease fitting assortment	180								
3 Kleen seal grease fittings	180								
3 Grease fitting asortment	180								
3 Volume bucket pump	300								
3 Heavy duty handled pump oiler	36								
3 Lubricant dispenser w/ meter	1,500								
8 bump caps	48								
18 Bump caps	90								
3 Flammable liquid pump	240								
3 Pump repair kit	60								
3 Rotary hand pump counter	900								
3 Heavy liquid pump	900								
3 Pump repair kit	60								
1 Stationary air compressor	1,500								
3 Shoe magnet assortment	300								
3 Multi-line outlet box	60								
3 Hydraulic quick couplers, type 4	60								
3 Hydraulic quick couplers, type 5	90								
12 Hydraulic hose swivel adapters	36								
3 Feeler gauge	60								
3 Feeler gauge, metric	90								
3 Screw checkers	90								
3 Level	120								
2 Variable speed drill	400								
3 Electric hand die grinder	750								
3 Silicon carbide grinding wheel	150								
12 Aluminum Oxide grinding wheel	144								
9 Cone grinding wheel	54								
3 Welder	3,000								
3 Arc welder	750								
6 Arc welder electrode holder	120								
3 Arc welder cable	15								
6 Ball point type lugs	60								
9 Quick portable ground clamps	135								
3 Center punch set	90								
3 Multipurpose mechanics bench vise	900								
3 Battery charger	1,500								
3 Steel tape	240								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
3 Indicating weather station	9,000								
Miscellaneous	8,864								
Shipping	95,200								95,200
Annual Supplies		34,000	34,000	34,000	16,800	6,800	6,800	5,100	137,500
Research Supplies Subtotal	333,200	34,000	34,000	34,000	16,800	6,800	6,800	5,100	470,700
Inflation (5 %/yr)		1,700	3,485	5,358	3,620	1,879	2,313	2,076	20,432
Research Supplies Total	333,200	35,700	37,485	39,358	20,420	8,679	9,113	7,176	491,132
Research Support									
Journals (4 sites)	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	96,000
Books (4 sites)	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	64,000
Subtotal	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	160,000
Inflation (5 %/yr)		1,000	2,050	3,152	4,310	5,526	6,802	8,142	30,982
Total	20,000	21,000	22,050	23,152	24,310	25,526	26,802	28,142	190,982
TOTAL RESEARCH EQUIPMENT/SUPPLIES	582,327	68,250	71,663	75,244	47,283	36,885	38,729	37,534	957,915

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
F. OFFICE EQUIPMENT AND SUPPLIES									
1) Office Equipment		204,184							204,184
12 Conference desks	5,856								
12 Executive chairs	4,980								
12 Utility tables	2,940								
12 Computer work station	2,028								
12 Hutch for computer work station	1,320								
10 Printer console - computer work s	1,800								
20 Clerical support swivel chair	3,600								
5 Secretarial desk	1,260								
5 Typewriter tables	750								
24 4-drawer file cabinet	6,144								
96 Hanging file folder uniframe	480								
4 Security safes	2,000								
1 Drafting table	350								
1 Drafting instruments set	400								
1 Mobile map roll files	200								
12 Storage cabinets	2,748								
24 Chair mats	1,200								
18 Utility tables	1,620								
100 Chairs	4,600								
6 Machine stands	1,800								
36 Waste baskets	720								
24 Desk lamps	1,320								
24 Portable box fans, 20"	1,440								
24 Bookcases	4,800								
4 Photocopy machines	20,000								
10 Printer basket	290								
5 Large capacity forms basket	175								
1 Mobile security cabinet, accting	329								
4 Electronic stencil machines	10,000								
4 Mimeograph machines	6,000								
2 Electric typewriters	3,000								
2 Manual typewriters	800								
1 Telex machine	2,500								
1 Fax machine	900								

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
10 Desktop computers, 386 w/ access.	40,000								
10 Laptop computers	25,000								
6 Dot-matrix printers	4,200								
4 Laserjet printers	5,800								
UPS and peripherals	10,000								
Computer software	17,175								
12 Letter tray	528								
12 Drawer Trays	48								
12 Desk caddies	60								
48 Book ends	384								
12 Vertical sorters	384								
20 File storage boxes	300								
60 Magazine files	300								
12 Roladex files	192								
5 Disk head cleaners	100								
5 Screen cleaners	80								
5 Keyboard cleaners	70								
12 Diskette files	156								
12 File carrying cases	48								
12 Pencil sharpeners	168								
15 Scissors	68								
5 Knife sets	73								
12 Utility knives	45								
4 Knife blades	6								
5 Metal T squares	48								
12 Plastic T squares	15								
Triangles									
5 45 degree, 6"	7								
5 45 degree, 10"	12								
5 30 degree, 6"	6								
5 30 degree, 10"	9								
15 Rulers, 12" wood	10								
12 Ruler, 6" plastic	17								
12 Ruler, 15" plastic	14								
5 Ruler, 15" steel	26								
5 Tape label kits	144								
12 Bulletin boards	324								
24 Staplers	288								

Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
G. Networking/Research Grants	75,000	125,000	125,000	100,000	75,000	35,000	25,000		560,000
Inflation (5 %/yr)									0
Total	75,000	125,000	125,000	100,000	75,000	35,000	25,000		560,000
H. In-Country Travel									
1) Vehicles & Parts									0
a. Land Cruiser/Sation Wagon					105,000				135,000
b. Land Cruiser/2-seat PU	30,000				170,800	28,000			397,600
c. Motorcycles	170,800	28,000			68,950	7,000			133,150
d. Spare Parts	50,200	7,000							
Subtotal	251,000	35,000			344,750	35,000			665,750
Inflation (5 %/yr)		1,750			74,294	9,671			85,714
Total	251,000	36,750			419,044	44,671			751,464
2) Vehicle Maintenance, Repair and Fuel	384,000	384,000	288,000	64,000	64,000	64,000	64,000	48,000	1,360,000
3) Air Fare	50,000	50,000	35,000	3,000	3,000	3,000	3,000	2,250	149,250
4) Per Diem	92,080	92,080	60,040	7,000	7,000	7,000	7,000	5,250	277,450
Subtotal	526,080	526,080	383,040	74,000	74,000	74,000	74,000	55,500	1,786,700
Inflation (5 %/yr)		26,304	39,262	11,662	15,947	20,446	25,167	22,594	161,383
Total	526,080	552,384	422,302	85,662	89,947	94,446	99,167	78,094	1,948,083

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR									Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98		
5 Tacker guns	150									
24 Tape dispensers	110									
12 Planning calendars	150									
24 Staple removers	18									
5 Heavy stapler	330									
5 Long-arm stapler	171									
30 Stylus	84									
2 Overhead projector	1,300									
1 Portable overhead	1,000									
4 Slide projectors	3,200									
30 Slide trays	323									
5 Multi-purp. easels	1,475									
1 Portable easel	78									
5 Paper punch, heavy	253									
3 Replacement heads	26									
5 Paper trimmers	300									
5 Utility stands	565									
5 Colators	200									
2) Office Supplies	45,000	45,000	45,000	9,000	9,000	9,000	9,000	6,750	177,750	
Shipping	103,674								103,674	
3) TA Household Furnishings	106,090								106,090	
6 Dining tables	6,000									
6 Sets of 10 chairs	6,000									
6 Buffet	3,600									
6 Sofa	6,000									
24 Armchairs	4,800									
24 Coffee tables	4,420									
12 Bookcases	2,400									
12 Storage Cabinets	3,600									
12 Desk and chair	3,600									
6 Queen-size bed	1,800									
6 Queen-size mattress + box springs	3,000									
10 Single bed	2,000									
20 Single mattress and bos springs	4,000									
10 Dressers	3,000									
10 Chest of drawers	3,500									

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
10 Nightstands	2,500								
10 Mirrors	1,500								
16 Small mirrors	1,600								
10 Water filter and purifier	2,000								
30 Table lamps	4,500								
12 Floor lamps	2,400								
10 Desk lamps	1,400								
10 Pedestal fans	1,400								
12 Oscillating fans	720								
5 Chest Frezzer	2,500								
5 Refrigerator	6,000								
5 Electric range	3,000								
5 Electric clothes washer	3,000								
4 Electric clothes dryer	2,400								
1 Electric hot plate	100								
3 King-size mattresses	900								
14 Wardrobes	5,600								
10 Transformer	800								
6 Carpets, 5' x 12'	2,400								
5 Carpets, 8' x 12'	1,250								
6 Vacuum cleaner	2,400								
Shipping	42,436								
4) TA Household Repair	13,000	10,000	7,000	1,000	1,000	1,000	1,000	750	42,436
									34,750
5) Radio Phone Systems	24,000								24,000
Shipping	9,600								9,600
Office Equipment Subtotal	547,984	55,000	52,000	10,000	10,000	10,000	10,000	7,500	702,484
Inflation (5 %/yr)		2,750	5,330	1,576	2,155	2,763	3,401	3,053	21,028
Office Equipment Total	547,984	57,750	57,330	11,576	12,155	12,763	13,401	10,553	723,512

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Table D-2. RAV II BUDGET REVISED (Detailed USG Contribution)

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
I. CONTRACTOR LOGISTICAL SUPPORT									
1) Communications	14,560	20,800	20,800	15,600	15,600	15,600	15,600	11,700	130,260
2) Admin. Support									
admin/acct/logistics	1,200	2,400	2,400	2,400	1,200	1,200	1,200	900	12,900
secretaries	1,800	3,600	3,600	2,400	1,200	1,200	1,200	900	15,900
drivers	6,000	12,000	8,400	1,200	1,200	1,200	1,200	900	32,100
drivers per diem	12,000	24,000	21,600	2,400	2,400	2,400	2,400	1,800	69,000
3) Utilities	18,200	19,700	16,900	1,200	1,200	1,200	1,200	900	60,500
4) Security	8,100	11,800	11,800	3,000	3,000	3,000	3,000	2,250	45,950
5) Misc. Supplies	3,300	4,800	4,800	2,200	600	600	600	450	17,350
Subtotal	65,160	99,100	90,300	30,400	26,400	26,400	26,400	19,800	383,960
Inflation (5 %/yr)		4,955	9,256	4,791	5,689	7,294	8,979	8,061	49,025
Total	65,160	104,055	99,556	35,191	32,089	33,694	35,379	27,861	432,985
J. AUDITS/EVALUATIONS									
	60,000			218,000		50,000		177,000	505,000
YEAR TOTALS									
	5,355,550	4,609,064	3,425,157	1,593,559	1,816,265	1,227,671	900,219	783,425	19,710,911
K. CONTINGENCY (5 % simple)									
	267,778	230,453	171,258	79,678	90,813	61,384	45,011	39,171	985,546
GRAND TOTAL									
	5,623,328	4,839,517	3,596,415	1,673,237	1,907,078	1,289,055	945,230	822,596	20,696,457

* Travel and Per Diem for training budgeted under In-Country Travel.

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TABLE D-3. RAV II NRM AMENDMENT: Detailed USG Contribution Budget

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
TECHNICAL ASSISTANCE/PERSONNEL									
A. Long-Term TA									
1) Soil Scientist	100,000	200,000	200,000	100,000					600,000
2) NR Specialist	100,000	200,000	200,000	100,000					600,000
Subtotal	200,000	400,000	400,000	200,000					1,200,000
Inflation (5 %/yr)		20,000	41,000	31,520					92,520
Total	200,000	420,000	441,000	231,520					1,292,520
B. Short-Term TA									
1) In-Country (\$20000/pm)	40,000	60,000	60,000	60,000	40,000	40,000	40,000	40,000	380,000
Subtotal	40,000	60,000	60,000	60,000	40,000	40,000	40,000	40,000	380,000
Inflation (5 %/yr)		3,000	6,150	9,456	8,620	11,052	13,604	16,284	68,166
Total	40,000	63,000	66,150	69,456	48,620	51,052	53,604	56,284	448,166
TOTAL TA	240,000	483,000	507,150	300,976	48,620	51,052	53,604	56,284	1,740,686
C. TRAINING									
1) LT Participants									
2) ST US and Third Country General OTS Course		40,000	30,000 20,000	30,000	30,000 20,000	30,000	20,000	15,000	195,000 40,000
3) ST In-Country*	2,000	6,000	6,000	4,000	2,000	2,000	2,000	2,000	26,000
Subtotal	2,000	46,000	56,000	34,000	52,000	32,000	22,000	21,500	261,000
Inflation (5 %/yr)		2,300	5,740	5,358	11,303	8,842	7,482	6,921	47,940
Total	2,000	48,300	61,740	39,358	63,303	40,842	29,482	23,921	308,946

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total	
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97		FY-98
D. FACILITIES REHABILITATION									
1. Soils Lab Rehabilitation, repairs, installation of equipment		80,000							80,000
2. Multi Purpose Labs: Tissue Culture, Seed Tech., Seed Testing Repairs, painting, setup		30,000							30,000
3. Agro-forestry Facility Rehab Herbarium cabinets, lights, painting, repairs		15,000							15,000
4. Screenhouse/Greenhouse remodelling building		25,000							25,000
5. Office and Other Rehab		60,000							
SUBTOTAL		210,000							210,000
Inflation (5 %/yr)		10,500							10,500
TOTAL		220,500							220,500

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	
E. RESEARCH EQUIPMENT AND SUPPLIES								
1. Soils Lab								
a) Equipment, Chemicals, Glassware		160,000						160,000
1 Atomic Absorption Unit	30,000							
1 Visible/UV Spectorphotometer	7,000							
1 Kjeldahl Digestion Unit with Distilation	5,000							
1 Precision Balance (0-8000g)	3,000							
1 Analytical Balance (0-250g)	3,000							
1 Freezer	1,000							
1 Refrigerator	1,000							
1 Drying Oven (forced air)	1,500							
1 Muffle Furnace	2,500							
1 Exhaust Fume Hood	4,000							
1 Centrifuge (small sample, high speed)	3,000							
1 Centrifuge (large sample workhorse)	7,000							
1 Soil Grinder	1,500							
1 Wiley Mill leaf tissue Grinder	2,000							
1 Industrial Blender	600							
1 carbon-Hydrogen Analyser	14,500							
1 N,P,K analyser	6,000							
2 Water Distilation Unit	3,000							
1 Industrial Hotplate	700							
1 Set (12) Sedimentation Cylinders	800							
1 Set Sedimentation Hydrometers	100							
1 Set Soil Seives	300							
2 Chemical Drying Ovens	2,400							
3 Soil Augers (2 Bucket, 1 Dutch)	600							
1 386 computer with accessories and software	11,000							
1 computer (notebook)	2,500							

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	
Chemicals	20000							
1000 Calcium chloride, g								58
1000 Calcium carbonate, g								82
1000 Potassium chloride, g								34
6 Potassium dichromate, l								100
6 Sulfuric acid, l								140
6 Hydrochloric acid, l								140
6 Phosphoric acid, l								3044
1000 Phenanthroline ferrous, ml								144
300 Barium diphenylamine sulfate, g								1920
6 Ferrous sulphate, kg								266
6 Sodium hydroxide, l								96
1000 Phenolphthalein indicator, ml								32
2 Acetic acid, l								116
Ammonium hydroxide, l								1608
1 Ammonium chloride, kg								48
1200 Stannous chloride, g								250
1 Ammonium molybdate, kg								234
6 Sodium bicarbonate, kg								54
1 Carbon black, kg								64
1 Mercury catalyst tablets,kg								100
6 Boric acid, l								62
6 Bromocresol green, l								150
6 Methyl red, l								130
6 Ethanol, l								150
600 Potassium sulfate, g								268
50 Brucine, g								128
1200 Potassium nitrate, g								142
1200 Mg standards, g								170
1 Zn standards, kg								54
6 Cu standards, kg								66
3 Ca standards, l								128
3 Mn standards, l								128
300 Ascorbic acid, g								92
6 Monobasic potassium phosphate, kg								240
8 Toluene, l								84
30 Orthophenanthroline monohydrated,								394
1200 Hydroxylamine hydrochloride, g								260
6 Sodium citrate dihydrate, kg								172
1 Pure elemental iron wire, kg								60

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total	
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97		FY-98
1 Aluminon, kg									72
1200 Thioglycollic acid, ml									188
1 Metallic aluminum sheet, kg									128
1200 Barium chloride, ml									120
1 Triethanolamine, l									48
6 Ammonium acetate, kg									390
1 Hydroquinone, kg									60
6 Permanganate of Potassium, kg									270
1 Sodium sulfide, kg									54
1 Na2 S2 O3, kg									60
200 Mercury oxide, g									108
1 Salycic acid, kg									66
1 Hydrogen peroxide, l									92
1200 Nitric acid, ml									170
12 Perchloric acid, lb									500
6 Ammonium molybdate, kg									1124
Miscellaneous									5142

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total	
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97		FY-98
Assorted Glassware 20,000									
16 Media bottles	684								
12 Flint dropping bottles	113								
1 Glass alcohol burner	50								
72 Kimax graduated cylinders	2572								
4 Dessicator	1092								
8 Dessicator plates	84								
96 Pyrex petri dishes	331								
304 Erlenmeyer flasks	1346								
32 Cylindrical bulbs	1138								
24 Kjeldahl flasks	206								
20 Pyrex burrettes	2950								
6 Automatic burrettes	912								
84 Pipettes	511								
2 Pipette Dispensers	416								
1000 Pipette tips	50								
10 Sellstrom Safeguards	35								
24 Culture media flasks	241								
1 Tissue grinder kit	358								
12 Pyrex plus reagent bottles	147								
72 Wheaton media bottles	306								
844 Pyrex beakers	2908								
26 Tapered wall polypropylene beaker	324								
2 Hemacytometer	160								
1 Hemacytometer cover glass, case	342								
2 Pyrex perforated plate, case	544								
2 Pyrex funnels, case	227								
24 Glass Crucibles	910								
24 Glass crucible covers	310								
30 Glass bottles	234								
4 Nalgene carboy	304								
Miscellaneous	195								
b) Shipping		64,000							64,000
c) Chemicals and Supplies		7,500	7,500	7,500	1,500	1,500	1,500	1,125	28,125

Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR							Total	
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97		FY-98
2. Multi Purpose Labs: Tissue Culture, Seed Tech., Seed Testing									
a) Seed Lab Equipment									
2 Sheller	2,000								21,220
1 Bates Aspirator	2,600								
1 Seed Dryer	3,200								
1 Air Conditioner	1,500								
2 Moisture tester	700								
1 L-D Germinator	900								
1 Batch Treater	200								
1 Boerer Divider	800								
1 Bushel Tester (Metric)	150								
1 Seedburo Control Oven	1,750								
1 Computer Grain Scale	2,045								
1 Rotap Testing Sieve	1,325								
1 Push Type Cone Seeder	1,550								
Misc. equipment	2,500								
b) Tissue Culture Equipment									
1 Fisher XL-3KD Toploading Balance	1,845								80,280
1 Balance, XE 100A	1,395								
2 Fisher Touch Mixer	274								
2 Fisher Stirring Bars	100								
1 Multimatic Microwave Oven	500								
1 Hygrothermograph, portable	689								
1 Distillation Apparatus	2,850								
1 Mega-pure collection	1,019								
5 Mega-pure filters	450								
2 Flexible Tubing Adapter Kit	200								
1 Sterilmatic Sterilizer Chamber	5,300								
1 Sterilizer Stand	405								
1 PH meter, digital	854								
2 ATC Probe-Epoxy	400								
1 Steromicroscope	1,198								
1 Katy Illuminator w/extra bulbs	233								
1 Moisture Balance	1,205								
2 Heavy Duty Utility Cart	500								
1 Polypropylene Carboy Bottles, case	304								

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
5. Miscellaneous Research Equipment		25,000	5,000		5,000				35,000
seed storage									
extra lab equip. (scales, microscopes, glassware)									
water distillation									
repair existing equipment and instruments									
Shipping		29,800							29,800
6. Research Equipment for NR Specialist									
386 computer and accessories	6,000	12,200							12,200
scanner, digitizing tablet	1,700								
battery packs, power unit	1,000								
software	3,500								
notebook computer		2,500							2,500
Field Equipment		2,700							2,700
binoculars, range finder	800								
altimeter, brunton compass	600								
tele-thermometer	300								
camp gear	1,000								
Other Equipment		9,700							9,700
microscope	6,000								
refrigerator, freezer	2,500								
camera, slide projector	1,200								
Shipping	9,840	9,840							9,840
7. Research Support									
journals		3,000	3,000	3,000	3,000	3,000	3,000	3,000	21,000
books		2,000	2,000	2,000	2,000	2,000	2,000	2,000	14,000
SUBTOTAL		525,340	43,000	39,500	22,500	11,500	11,500	9,875	663,215
Inflation (5 %/yr)		26,267							26,267
TOTAL		551,607	43,000	39,500	22,500	11,500	11,500	9,875	689,482

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	FY-91	FY-92	PROJECT YEAR						Total
			FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
F. OFFICE/HOUSEHOLD EQUIPMENT AND SUPPLIES									
1. Office Equipment and Supplies (Mulungu)		37,000							37,000
copy machine	5,000								
computer w/ laser printer									
accessories and software	11,000								
electric stencil machine	2,500								
mimeograph	1,500								
fax, typewriter	3,000								
air conditioners	4,000								
office furniture	10,000								
Shipping	14,800								14,800
Office supplies		10,000	10,000	10,000	5,000	2,000	2,000	1,500	40,500
2. Other Mulungu Station Equipment		20,450							20,450
radio phone system with									
dedicated computer	15,450								
dark room equip.	5,000								
Shipping	8,180								8,180
dark room supplies		1,000	1,000	1,000	500	200	200	150	4,050
SUBTOTAL		91,430	11,000	11,000	5,500	2,200	2,200	1,650	124,980
Inflation (5 %/yr)		4,572	1,128	1,734	1,185	608	748	672	10,646
TOTAL		96,002	12,128	12,734	6,685	2,808	2,948	2,322	135,626
G. NETWORKING/RESEARCH GRANTS									0

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
H. IN-COUNTRY TRAVEL									
1. Vehicles and Parts									
a) Land Cruiser/Station Wagon					36,000				0
b) Land Cruiser/2-seat PU		18,000			47,600				54,000
c) Motorcycles		47,600			20,900				95,200
d) Spare parts (25 % vehicle cost)		16,400							37,300
SUBTOTAL		82,000			104,500				186,500
Inflation (5 %/yr)		4,100			22,520				26,620
TOTAL		86,100			127,020				213,120
2. Vehicle Maintenance, Repair and Fuel									
	48,000	96,000	96,000	48,000	19,200	19,200	19,200	14,400	360,000
3. Non-Vehicle Travel									
4. Per Diem									
	5,000	10,000	10,000	5,000	2,000	2,000	2,000	1,500	37,500
	16,290	32,580	32,580	16,290	3,250	3,250	3,250	2,438	109,928
Subtotal	69,290	138,580	138,580	69,290	24,450	24,450	24,450	18,338	507,428
Inflation (5 %/yr)		6,929	14,204	10,920	5,269	6,756	8,315	7,465	59,859
Total	69,290	145,509	152,784	80,210	29,719	31,206	32,765	25,803	567,286

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Table D-3. RAV II NRM AMENDMENT: Detailed USG Budget

Item	PROJECT YEAR								Total
	FY-91	FY-92	FY-93	FY-94	FY-95	FY-96	FY-97	FY-98	
1. CONTRACTOR LOGISTICAL SUPPORT									
1) Communications	1,000	5,000	5,000	5,000	1,000	1,000	1,000	1,000	20,000
2) Admin. Support									
admin. assist.	720	1,440	1,440	1,440					5,040
secretary	360	720	720	720					2,520
drivers	1,080	2,160	2,160	2,160					7,560
3) TA House Rehab, Repair	10,000	10,000	2,000	2,000					24,000
4) Utilities	1250	2500	2500	2500					8,750
5) Security	1200	2400	2400	2400					8,400
Subtotal	15,610	24,220	16,220	16,220	1,000	1,000	1,000	1,000	76,270
Inflation (5 %/yr)		1,211	1,663	2,556	216	276	340	407	6,669
Total	15,610	25,431	17,883	18,776	1,216	1,276	1,340	1,407	82,939
J. AUDITS/EVALUATIONS									0
YEAR TOTALS	326,900	1,656,449	794,685	491,554	299,062	138,683	131,640	119,611	3,958,584
K. OTHER COSTS/CONTINGENCY	16,345	82,822	39,734	24,578	14,953	6,934	6,582	5,981	197,929
GRAND TOTAL	343,245	1,739,271	834,419	516,132	314,015	145,617	138,222	125,592	4,156,514

* Travel and Per Diem for training budgeted under In-Country Travel.

Estimates adjusted for a 5.0 percent annual rate of inflation, except as indicated.

TABLE D-4. RAV II (REVISED): GOZ Contributions (Detail)

Item		CALENDAR YEAR									Total	
		1990	1991	1992	1993	1994	1995	1996	1997	1998		
1. Personnel												
	A0/MS/PhD											
	Salary	357	22,384	187,264	201,894	204,820	204,820	204,820	204,820	204,820	122,892	1,558,534
	Benefits	227										
	A1/A2/A3											
	Salary	172	54,501	307,216	75,327	75,327	75,327	75,327	75,327	75,327	45,196	858,876
	Benefits	227										
	Non-Professional Staff											
	Salary	154	63,719	406,028	353,142	353,142	353,142	353,142	353,142	353,142	211,885	2,800,484
	Benefits	227										
	Temporary Labor		85,000	85,000	85,000	85,000	85,000	85,000	85,000	85,000	85,000	765,000
	Subtotal		225,604	985,508	715,363	718,289	718,289	718,289	718,289	718,289	464,973	5,982,894
	Inflation (5 %/yr)				73,325	113,202	154,791	198,463	244,290	292,415	222,025	1,298,512
	Total		225,604	985,508	788,688	831,491	873,080	916,752	962,579	1,010,704	686,998	7,281,406
2. Training												0
	Inflation (5 %/yr)											0
	Total											0
3. Facilities Rehabilitation (Maintenance)				9,900	21,780	21,780	21,780	21,780	21,780	16,335		135,135
	Inflation (5 %/yr)			1,015	3,433	4,694	6,018	7,407	8,867	7,800		39,233
	Total			10,915	25,213	26,474	27,798	29,187	30,647	24,135		174,368

TABLE D-4. RAV II (REVISED): GOZ Contributions (Detail)

Item	CALENDAR YEAR									Total
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
4. Research Equipment and Supplies and in-country shipping	52,000	85,000	35,000	35,000	35,000	35,000	40,000	40,000	40,000	397,000
Inflation (5 %/yr)		4,250	3,588	5,516	7,543	9,671	13,604	16,284	19,100	79,555
Total	52,000	89,250	38,588	40,516	42,543	44,671	53,604	56,284	59,100	476,555
5. Office Equipment and Supplies and in-country shipping	15,000	191,000	105,000	118,000	95,000	95,000	95,000	95,000	71,250	880,250
Inflation (5 %/yr)		9,550	10,763	18,597	20,473	26,249	32,310	38,675	34,022	190,636
Total	15,000	200,550	115,763	136,597	115,473	121,249	127,310	133,675	105,272	1,070,886
6. Networking										0
Inflation (5 %/yr)										0
Total										0
IN COUNTRY TRAVEL										
7. Vehicles and Parts (in-country shipping)		20,000				35,000				55,000
Inflation (5 %/yr)						7,543				7,543
Total		20,000				42,543				62,543
8. Fuel, Repair, Air Fare and Per Diem										
1) Fuel and Repairs	123,000	360,000	380,400	380,400	380,400	380,400	380,400	380,400	375,300	3,140,700
Inflation (5 %/yr)		18,000	38,991	59,951	81,976	105,105	129,374	154,861	179,206	767,463
Total	123,000	378,000	419,391	440,351	462,376	485,505	509,774	535,261	554,506	3,908,163

TABLE D-4. RAV II (REVISED): GOZ Contributions (Detail)

Item	CALENDAR YEAR										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total	
2) Air Fare	19,750	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	37,500	407,250
3) Per Diem	59,250	148,200	148,200	148,200	148,200	148,200	148,200	148,200	148,200	111,150	1,207,800
Subtotal	79,000	198,200	198,200	198,200	198,200	198,200	198,200	198,200	198,200	148,650	1,615,050
Inflation (5 %/yr)		9,910	20,316	31,236	42,712	54,763	67,408	80,687	70,980	378,012	
Total	79,000	208,110	218,516	229,436	240,912	252,963	265,608	278,887	219,630	1,993,062	
TOTAL FUEL, TRAVEL, PER DIEM	202,000	586,110	637,907	669,787	703,288	738,467	775,382	814,148	774,136	5,901,225	
9. CONTRACTOR LOGISTICAL SUPPORT											0
10. AUDITS/EVALUATIONS											0
YEAR TOTALS	494,604	1,881,418	1,591,859	1,703,604	1,760,857	1,891,479	1,948,062	2,045,458	1,649,641	14,966,982	
11. OTHER COSTS/CONTINGENCY	24,730	94,071	79,593	85,180	88,043	94,574	97,403	102,273	82,482	748,349	
TOTAL	519,335	1,975,489	1,671,452	1,788,784	1,848,900	1,986,053	2,045,465	2,147,731	1,732,123	15,715,331	
Percent of Total		12.57%	10.64%	11.38%	11.76%	12.64%	13.02%	13.67%	11.02%	100.00%	

* All estimates are adjusted for a 5.0 % annual rate of inflation.

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TABLE D-5. RAV II NRM AMENDMENT: GOZ Contributions (Detail)

Item	CALENDAR YEAR									Total
	1991	1992	1993	1994	1995	1996	1997	1998		
1. Personnel										
3 Kivu R & D Teams										
Level A0 (1)	357									
Level A1 and A2 (6)	172									
Soils Management Staff										
Masters (1)	357									
Level A0 (4)	357									
Natural Resources Management Staff										
Masters (1)	357									
Level A0 (4)	357									
Subtotal	26,234	52,468	52,468	52,468	52,468	52,468	52,468	39,351	380,393	
Inflation (5 %/yr)		2,623	5,378	8,269	11,307	14,497	17,844	16,020	75,938	
Total	26,234	55,091	57,846	60,737	63,775	66,965	70,312	55,371	456,331	
2. Training	2,500	5,000	5,000	5,000	5,000	5,000	5,000	3,750	36,250	
Inflation (5 %/yr)		250	513	788	1,078	1,382	1,701	1,527	7,237	
Total	2,500	5,250	5,513	5,788	6,078	6,382	6,701	5,277	43,487	
3. Facilities Rehabilitation (Maintenance)			6,930	6,930	6,930	6,930	6,930	5,198	39,848	
Inflation (5 %/yr)			710	1,092	1,493	1,915	2,357	2,116	9,683	
Total			7,640	8,022	8,423	8,845	9,287	7,313	49,531	

TABLE D-5. RAV II NRM AMENDMENT: GOZ Contributions (Detail)

Item	CALENDAR YEAR								Total
	1991	1992	1993	1994	1995	1996	1997	1998	
4. Research Equipment and Supplies and in-country shipping	40,000	3,000	3,000	3,000	3,000	3,000	3,000	2,250	60,250
Inflation (5 %/yr)		150	305	473	647	829	1,020	916	4,342
Total	40,000	3,150	3,308	3,473	3,647	3,829	4,020	3,166	64,592
5. Office Equipment and Supplies and in-country shipping	30,000	2,000	2,000	2,000	2,000	2,000	2,000	1,500	43,500
Inflation (5 %/yr)		100	205	315	431	553	680	611	2,895
Total	30,000	2,100	2,205	2,315	2,431	2,553	2,680	2,111	46,395
6. Networking									0
Inflation (5 %/yr)									0
Total									0
IN COUNTRY TRAVEL									
7. Vehicles and Parts (in-country shipping)	36,000				36,000				72,000
Inflation (5 %/yr)					7,758				7,758
Total	36,000				43,758				79,758
8. Fuel, Repair, Air Fare and Per Diem									
1) Fuel and Repairs	40250	80500	80500	80500	80500	80500	80500	60375	583,625
Inflation (5 %/yr)		4,025	8,251	12,687	17,348	22,242	27,378	24,579	116,510
Total	40,250	84,525	88,751	93,187	97,848	102,742	107,878	84,954	700,135

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TABLE D-5. RAV II NRM AMENDMENT: GOZ Contributions (Detail)

Item	CALENDAR YEAR								Total
	1991	1992	1993	1994	1995	1996	1997	1998	
2) Air Fare	15,000	15,000	15,000	15,000	15,000	15,000	15,000	11,250	116,250
3) Per Diem	21,252	30,360	30,360	30,360	30,360	30,360	30,360	22,770	226,182
Subtotal	36,252	45,360	45,360	45,360	45,360	45,360	45,360	34,020	342,432
Inflation (5 %/yr)		2,268	4,649	7,149	9,775	12,533	15,427	13,850	65,651
Total	36,252	47,628	50,009	52,509	55,135	57,893	60,787	47,870	408,083
9. CONTRACTOR LOGISTICAL SUPPORT									0
10. AUDITS/EVALUATIONS									0
YEAR TOTALS	211,236	197,744	215,272	226,031	281,094	249,208	261,665	206,061	1,848,311
11. OTHER COSTS/CONTINGENCY	10,562	9,887	10,764	11,302	14,055	12,460	13,083	10,303	92,416
TOTAL	221,798	207,632	226,036	237,332	295,149	261,668	274,749	216,364	1,940,726
Percent of Total	11.43%	10.70%	11.65%	12.23%	15.21%	13.48%	14.16%	11.15%	100.00%

* All estimates are adjusted for a 5.0 % annual rate of inflation.

ANNEX B

INITIAL ENVIRONMENTAL EXAMINATION

or

CATEGORICAL EXCLUSION

PROJECT COUNTRY: The Republic of Zaire

PROJECT TITLE: Applied Agricultural Research and Outreach II
(660-0124)

FUNDING: FY 1990 - 1995 (Total) US \$25 Million
(Natural resource element) US \$5 Million

IEE PREPARED BY: Richard A. Macken
Mission Environmental Officer, USAID Zaire

ENVIRONMENTAL ACTION RECOMMENDED:

Positive Determination		Negative Determination	
Categorical Exclusion	<input checked="" type="checkbox"/>	Deferral	<input checked="" type="checkbox"/>

SUMMARY OF FINDINGS:

The technical assistance and training activities of the natural resource management element of the Applied Agricultural Research and Outreach II (RAV II) Project are eligible and recommended for categorical exclusion pursuant to 22 CFR 216.2(c)(2)(i). Most of the on-going project activities in this project are eligible and recommended for categorical exclusion pursuant to 22 CFR 216.2(c)(2)(iii), as they involve controlled experimentation exclusively for the purpose of research and field evaluation which are confined to small areas and carefully monitored.

The NRM activities will be confined to developing, and integrating into the project, environmentally-sound technologies that will reverse the environmental degradation and negative impacts that in the past have been associated with the agricultural practices now being used in country. These technologies will be carefully selected and then developed under controlled experimentation. Consequently this project element is recommended for a negative determination.

CONCURRENCE:

John J. Gaudet
Bureau Environmental
Officer



Approved: ✓
Disapproved:
Date: 23/5/91

CLEARANCE:

GC/AFR: MA Kellyan Date: 23 May 1991

2. ISSUES AND IMPACTS

This Project Paper Supplement to the Applied Agricultural Research and Outreach II (RAV II) Project adds a natural resource management element to the existing project, which focuses on strengthening and improving the capacity of the Government of Zaire's Department of Agriculture and Rural Development and collaborating institutions to develop and transfer agricultural technologies for selected food crops, on a sustainable basis, to farmers. By adding a natural resource management element to the project's ongoing activities in outreach and technology transfer, applied research in agricultural technology, research management, and human resources development, RAV II will increase its ability to provide farmers with environmentally sound, sustainable agricultural technologies. Positive impacts that are expected to result from the addition of this natural resource element to the RAV II Project are: 1) improved soil fertility, 2) greater soil stability, and 3) increased supplies of fuelwood and wood for construction.

In the process of developing the Project Paper Supplement, a number of proposed project initiatives and activities were identified that it was thought needed to be more closely looked at in order to determine whether they could possibly have an adverse impact on the environment. This list included some seemingly very positive interventions that it was felt required careful examination to make sure they did not harbor unintended negative environmental consequences. Possible negative impacts that were considered, and that are discussed separately below, were: (1) increased soil erosion, 2) contamination from improper use of herbicides, 3) algae growth from fertilizer use, 4) uncontrolled spread of exotic plant species, 5) diminished supplies of fuelwood and wood for construction, 6) decreased biological diversity, 7) health risks from improper handling of chemical reagents, and 8) environmental degradation caused by building rehabilitation.

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Soil Management The RAV II natural resource management element seeks to intensify farming techniques, which will lead to more intensive soil use. To prevent this more concentrated and more continuous use of the soil from causing erosion, agricultural techniques will be introduced that will increase soil stability. The chief methods employed will be to foster the use of contour cultivation, crop rotations, agroforestry, and grass buffer strips, and to increase the amount of organic matter in the soil by the use of compost and green manure. These techniques are well proven, efficacious, and capable of implementation by local small holder farmers. The volcanic soils of North Kivu and the lateritic soils of South Kivu are particularly suitable for these types of interventions. No significant impact on the environment is foreseen from the soil management techniques introduced under the project.

Herbicides The Service National de Recherche Agronomique Appliquée et Vulgarisation (SENARAV) systematically carries out field trials with plant varieties on station. To maintain uniformity in varietal screening field tests, each test field has to be completely weeded in a single day before. The research stations do not have enough manpower to do the required same-day weeding of the test fields, making the use of herbicides the only practical way of preparing the land. The project's institutional contractor, the Southeast Consortium for International Development (SECID), has technical assistance who will closely supervise all herbicide use at research stations and train appropriate SENARAV staff in the proper application of herbicides. This technical assistance is experienced in the use of herbicides and knows how to apply them without harming the environment. The herbicides will be used only for limited field evaluation purposes, and crops from the treated fields will not be used for human or animal consumption. No significant impact on the environment is foreseen arising from the use of herbicides.

Fertilizers Intensification of cultivation will in some cases be accompanied by the use of mineral fertilizers to help maintain soil fertility on land being continuously farmed. To prevent harm to the environment, outreach agents from organizations affiliated with the project will provide guidance to farmers on the correct use of fertilizers. The danger of downslope eutrophication (algae blooms caused by too many nutrients washing into water supplies) will be prevented by improved soil stability and contour cultivation, which will ensure that the fertilizers stay on the land and do not wash away. No significant impact on the environment is foreseen being caused by the use of fertilizers.

Exotic Plant Species The project will investigate the use of various exotic plant species, both trees and herbaceous vegetation, to enhance soil fertility, improve soil stability, and provide fuelwood and construction material. All research on exotic plant species will take place under strictly controlled field trial conditions that will determine the growth characteristics and patterns of the plants and allow guidelines to be drawn up on the correct use of exotic species. No exotic plant material will be made available to farmers until it has been fully tested in field trials and found to pose no danger of crowding out native species by taking over their ecological niches. No significant impact on the environment is foreseen arising from the introduction of exotic plant species.

Farm Wood Lots More intensive cultivation of land will require that certain plots be set aside as wood lots for the production of fuelwood and construction material. Such farm wood lots can provide a convenient, assured supply of wood at a reasonable cost. Increased population pressure in North and South Kivu have already made it more difficult and more expensive for farmers to find the wood they need for cooking and building. In establishing farm wood lots, it is especially important to choose the right tree species. Some species, such as calliandra and leucaena, which are being extensively introduced in North and South Kivu by projects currently under way there, produce wood that burns too quickly, makes less charcoal, and produces charcoal that burns too fast. The project will pay particular attention to finding exotic and native tree species with a better fuelwood and charcoal making potential. No significant impact on the environment is foreseen from the establishment of farm wood lots.

Biological Diversity More intensive land use brings with it a need to protect flora and fauna habitats and prevent the loss of biological diversity. The project will help to do that by promoting the planting of sustainable farm wood lots that will provide food and habitats for wildlife, as well as fuelwood and construction materials for farmers. The project will make a special effort to locate, improve and disseminate local tree species that make good wildlife habitats while at the same time meeting the farmers' needs. No significant impact on the environment is foreseen with regard to biological diversity as a result of project activities.

Chemical Reagents The soil and plant pathology laboratories at the Mulungu research station in South Kivu contain expired and improperly stored chemical reagents, both liquids and solids, used in laboratory testing. Some containers are leaking, others have their labels missing, and most reagents appear to be very old. The project plans to rehabilitate these laboratories and use them in support of the natural resource management element and other activities under RAV II. The institutional contractor, SECID, will send a qualified technical expert to Mulungu to make

a complete inventory of the chemical stocks in the laboratories. For the reagents that can be identified--which should be the great majority--this expert will determine whether or not they are still usable. For the usable ones, he/she will supervise their proper storage. For the unusable ones, he/she will obtain from a SECID member instructions for their proper disposal. For those reagents that cannot be identified, the technical expert will take samples which will be sent to a SECID institution for analysis and instructions on disposal for those chemicals that have outlived their usefulness. Once it has been determined for all of the reagents which ones are still good and which ones have expired, SECID will arrange for the proper disposal of the unusable chemicals, either by providing an experienced technical expert of its own or contracting the work out to a qualified firm. No significant impact on the environment is foreseen from the disposal of the chemical reagents.

Building Rehabilitation The soil and plant pathology laboratories at the Mulungu research station in South Kivu need to be rehabilitated to allow them to function efficiently and effectively. Most of the equipment in the laboratories is more than 30 years old, dating from the time before Zaire's independence, and is either broken or outmoded. The rehabilitation work will include the modernization and upgrading of the laboratories through the installation of new equipment and the improvement of the physical working environment by repairs to floors, walls, and ceilings, including the provision of better lighting fixtures. The buildings themselves are sound, though some limited areas of roofing may have to be replaced. No new construction is planned. No significant impact on the environment is foreseen being caused by the building rehabilitation activities.

Other Concerns The project will have no significant impact in any other area of environmental concern. The project will not impact significantly on endangered or threatened animal species or on critical habitats. There will be no expansion of disease exposure opportunities or vector habitats. There will be no significant adverse environmental impact on either global climate change or water quality. Short-term, localized increases in levels of noise, vibration and dust during building rehabilitation are expected to be insignificant. The project is not expected to have any adverse impact on historically or archaeologically significant sites, areas of religious importance, at-risk populations, plant species, or rare or unique ecosystems.

3. RECOMMENDED ENVIRONMENTAL ACTION

The technical assistance and training activities of the project are eligible and recommended for categorical exclusion pursuant to 22 CFR 216.2(c)(2)(i). The technical assistance part of the project will involve advising and monitoring and will include suitable environmental guidance and controls in the job descriptions of the advisors. The training component will have no immediate impact on the environment, but should, over the long run, be beneficial as trainees apply the sound environmental practices they have learned. Most project activities are also eligible and recommended for categorical exclusion pursuant to 22 CFR 216.2(c)(2)(iii) as they involve controlled experimentation exclusively for the purpose of research and field evaluation which are confined to small areas and carefully monitored.

Project activities and components recommended for a negative determination are soil management, herbicides, fertilizers, exotic plant species, farm wood lots, biological diversity, chemical reagents, and building rehabilitation. The use of contour cultivation, compost, and green manure will act to counter erosion. The limited use of herbicides to prepare land for field trials will be closely supervised by on-site technical assistance. Better guidance to farmers on usage, improved soil stability, and more contour cultivation will help prevent damage to the land from the increased use of fertilizers. No exotic plant species will be made available to farmers until full field trials have been completed. The establishment of farm wood lots with carefully selected tree species will help prevent the loss of fuelwood and construction materials from the intensification of cultivation. The same farm wood lots will help promote biological diversity by providing food and habitats for wildlife. All chemical reagents will be safely stored or properly disposed of. Building rehabilitation will be limited in scale and involve no new construction.

July 6, 1990

Ronald Harvey, ARD, Richard Macken, PDO

Amending the Applied Agricultural Research and Outreach
II Project (660-0124)

Charles W. Johnson, DIR

A meeting was held in the Director's office on June 27, 1990, with the following people in attendance,

Charles W. Johnson, DIR
Baudouin de Marcken, DDIR
Ronald Harvey, ARD

Stephen Haykin, PEP
Allan Fleming, ARD
Richard Macken, PDO

to discuss amending the Applied Agricultural Research and Outreach II Project (660-0124)--better known by its acronym in French, RAV II. Everyone present agreed that RAV II should to be amended in order to add a Global Climate Change component to the project and that when the amendment was undertaken any other changes needed in the design should also be made. In order not to delay project implementation, the consensus was that the signing of the Project Authorization and the Project Grant Agreement should proceed as planned and that the project would be amended over the next six to twelve months.

Regarding Global Climate Change, it was pointed out that the draft on the USAID Zaire Global Climate Change Initiative (the Winterbottom Report) suggested four areas in which the Mission might want to work:

the sustainability of traditional slash and burn agricultural systems;

forest conservation;

renewable energy; and

setting up appropriate monitoring systems.

Both AID Washington and the South-East Consortium for International Development (SECID) were to be contacted about the amendment, with AID Washington being informed that the amendment might require an increase in LOP funding and an extension of the PACD. The amendment to the project is to be called the Global Climate Change Amendment.

It was suggested that when the Global Climate Change Amendment was undertaken other elements of the project design should be examined for possible revision. Among the questions that need to be posed are:

is the level of GOZ contributions realistic and how sensitive is project implementation to receipt of those contributions;

is the project time frame, especially the time allocated for technical assistance (TA), too short and is the project adequately funded;

does the training plan fit with the TA schedule (most of the TA will be gone by the time the trainees return);

does the TA team have the correct mix of skills and are participants being training in the right fields; and

is the Project Paper's discussion of setting up a research endowment well thought out and realistic.

The meeting ended with confirmation that USAID Washington and SECID would be notified immediately about the Mission's intention of amending the project.