PDBAM 945

UNCLASSIFIED

INTEGRATED PEST MANAGEMENT

(625-0928)

PROJECT PAPER

AMENDMENT

August , 1983

AGENCY FOR INTERNATIONAL DEVELOPMENT

UNCLASSIFIED

1

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AFR/PD, Norman Cohen

SUBJECT: Integrated Pest Management Project (625-0928), Project Authorization Amendment

I. Problem: Your approval is requested to extend the life-of-project by three years to a total of 10 years, and to increase the authorization by $3.553 million from funds available under Section 121 of the Foreign Assistance Act (FAA) of 1961, as amended, Sahel Development Appropriation, for the Integrated Pest Management Project (625-0928) for a new total authorization of $28,833,000.

II. Discussion

A. Project Description

The purposes of the Sahel-wide Integrated Pest Management project are, (a) to help establish and strengthen Sahelian institutional capacity to carry out integrated pest management (IPM) research; and (b) to produce research on high priority pests in a form suitable for extension to small food producers in Sahelian countries. AID funding is through a Project Grant Agreement with CILSS. The project supports a cadre of technical experts located in each participating country and at the regional level; general administrative and operating expenses including those of the CILSS Regional Project Directorate; long and short-term training for Sahelian researchers; construction and commodity procurement needed to build national IPM research infrastructure; and expenses associated with regional seminars, technical working groups and research publications.

Authorized in FY 1978, the IPM project was delayed almost two years, because AID and the technical implementing agent, the FAO, could not agree on certain operating modalities. When project implementation did begin in the third year of project life, serious design flaws began to become apparent. The first of these was a divided regional management structure which placed project administrative direction under the CILSS Executive Secretariat at Ouagadougou, while technical direction was located with the Sahel Institute in Bamako. The second design error was a highly centralized, inadequately staffed regional management structure. Together these factors created continuing, serious implementation

X
2

delays.

To find solutions to these problems AID, CILSS and FAO mounted a major independent evaluation of the IPM and the closely related Regional Food Crop Protection projects in 1981. The 1981 evaluation reconfirmed the importance of the Agency's long-termprogram to strengthen food crop protection in the Sahel initiated in 1975 by the AID Administrator. The evaluation also noted the continuing urgent need for IPM research to feed into the Sahel Regional Food Crop Protection program. On the strength of this finding, the third and final phase of the Regional Food Crop Protection program is now under design for FY 1984 authorization and obligation. This will help insure availability of channels for extension of IPM research results to Sahelian small farmers.

CILSS, AID and FAO met at Ouagadougou in January 1982, to agree on implementation of the evaluation recommendations, and again in Washington in September 1982, to develop terms of reference for a comprehensive IPM project restructuring. A redesign team worked from November 1982 - February 1983 to produce a PP Amendment which was reviewed by the ECPR on August 8, 1983, and recommended for FY 1983 authorization.

B. Financial Summary

The FY 1983 obligation will be $8,484,000, with a new authorized life-of-project total of $28.833 million. This includes a $3.553 million increased authorization to cover a 3-year extension of the Project Assistance Completion Date. The revised project budget is broken down as follows:

AID Input	($ 000) (FY 83)	($ 000) LOP
Technical Assistance (FAO)	1,637	7,637
Training	1,350	2,700
Commodities	500	2,080
Construction	350	1,026
Administration and Other Costs	4,647	13,588
Contingency	-	1,802
Total	$8,484	$28,833

The CILSS Member States are contributing an estimated $3,032,000 to cover salaries of counterpart personnel, laboratory and observation facilities, and other local costs, over the life-of-project.

C. Socio-Economic, Technical and Environmental Description

The PP Amendment provides specific country and regional workplans for conducting research on 7 pests which are major contributors to Sahelian food crop losses, as well as various pests of particular significance within the respective countries. The FAO technical advisors and national project counterparts will participate in joint working groups to produce manuals on IPM

practices which have proved effective against the priority Sahelian food crop pests identified. These research results will be passed on to the Regional Food Crop Protection project for local adaptation and extension to small farmers. Results will also be made available to any other interested organizations.

The updated economic analysis confirms the original project premise that a systematic IPM approach would produce substantial economic advantages for local governments and small farmers. The PP Amendment states that the 1977 estimate of food crop losses from the standpoint of projected future crop damage, and the estimated cost of relying on chemical pesticides, probably were on the conservative side. This suggests an even stronger case for development of IPM research capacity, because pay-off from non-chemical crop protection methods in particular is potentially greater than estimated in the earlier analysis. The revised economic analysis points to the urgent need to develop good baseline statistics on food crop losses in the Sahel, as well as to identify appropriate economic thresholds for chemical and non-chemical pest control interventions. Both are high on the list of priority activities under the extended project.

The social and technical analyses recognize the importance of insuring farm-level acceptability of IPM methodologies. The FAO will provide a long-term socio-economic expert to study the factors affecting acceptability, and to modify research packages accordingly. Among other things, the socio-economist will focus on women's roles in agricultural production, to insure that IPM methodologies are suited to their needs.

A principal purpose of IPM research is to identify cost effective alternatives to chemical pest control which can be very costly and damaging to a fragile ecology, such as exists in the Sahel. Therefore, this is a project aimed at protecting the environment. The updated IEE has been approved by the AFR Bureau Environmental Officer.

D. Implementation Plan; Implementing Agencies; Conditions and Covenants

A detailed plan for project implementation over the extended LOP was prepared for the PP Amendment. It clearly shows all actions which must be taken and by whom, over the next 4 years. As the project Grantee, CILSS continues to be responsible for overall project implementation. The FAO continues to provide all necessary technical advisory assistance, and oversees the long-term training program, according to the terms of a formal protocol with the CILSS.

X
4

The Conditions Precedent to future disbursement included submission of mutually agreed terms of reference to clarify responsibilities and relationships between CILSS and FAO project personnel; a detailed plan for recruiting remaining FAO experts; and a schedule for carrying out all long-term training within the extended life-of-project. Documents submitted by CILSS and FAO in satisfaction of these CP's were incorporated into the PP Amendment. No additional CP's to disbursement are considered necessary. The Project Agreement Amendment will contain one Covenant to the effect that CILSS and its Member States will insure that returning participants are employed in the IPM Program for at least 5 years following their project-financed academic training.

E. Responsible Offices

Following the recommendations of the 1981 evaluation, the redesign provides for consolidation of project management responsibility under a Regional Project Directorate in Ouagadougou. A formal letter of application submitted by the CILSS Executive Secretary includes a signed Delegation of Authority to the Regional Project Directrice to manage all technical and administrative aspects of project implementation. At the national level, tripartite Country Task Forces have been established consisting of the IPM national project director, the senior FAO technician in-country and the USAID IPM Liaison Officer. This, along with decentralization to the Missions of procurement, construction supervision and project financial management, is expected to expedite day-to-day implementation, and improve coordination of IPM with other AID-financed agricultural activities in the participating countries. The exception to the decentralized implementation mode is Mauritania. Special arrangements for oversight of this national component are described in the PP Amendment, (Section III-A.6). A tripartite Project Task Force, made up of the Regional Project Directrice, the senior FAO technical advisor and USAID/Upper Volta Regional IPM Project Officer, will coordinate oversight activities at the regional level. Policy and budget guidance will be provided by a high-level Tripartite Consultative Committee.

In AID/W, a project officer in AFR/PD/SWAP will continue to backstop the project.

III. Waivers

Justification for a source/origin waiver for Code 935 procurement of vehicles is included as Annex C-2(e) of the PP Amendment and in the Project Authorization Amendment for AA/AFR signature. The value of vehicles for which a waiver is sought is estimated to be $545,000.

5

IV. Justification to the Congress

Congress was notified on July 18, 1983, of AID's intent to obligate up to $8,484,000 for the IPM project in FY 1983. The Congressional Notification waiting period expired on August 2, 1983. Two million five hundred thousand dollars ($2,500,000) in FY 1983 SDP funds have been obligated to date on the basis of existing funding authorization for the project, and an AA/AFR determination that the current IPM financial management and accounting system met the requirements of FAA Section 121(d). A second determination that the new decentralized project financial system will meet 121(d) standards was signed on August 9, 1983, and covers all participating countries except Senegal and Mauritania. This will permit obligation of an additional $5,984,000 by August 31, 1983. No funds will be disbursed to Senegal or Mauritania, until an appropriate 121(d) determination has been made for these two countries.

V. Clearances Obtained

AFR/PD/SWAP:JRMcCabe draft
AFR/SWA:FGilbert draft
PPC/B:RKramer phone
ST/AGR:CCollier subs
AFR/DP:HJohnson draft
A/DAA/AFR:JJohnson [illegible]
AFR/TR:DReilly subs
AFR/TR/ARD:ABurgett subs
AFR/TR/SDP:GThompson phone
AFR/TR/ENGR:JSnead subs
SER/COM/ACI:GFuller phone
AFR/SWA:JBierke draft
GC/AFR:LDeSoto draft

VI. Recommendation:

That you sign the attached Project Authorization Amendment, approving a 3-year PACD extension to September 30, 1987, and an increase in authorized funding of $3,553,000 (to a new LOP total of $28,833,000); and that you sign a waiver for Code 935 source/origin procurement of vehicles up to a value of $545,000 for the Sahel Regional Integrated Pest Management project (625-0928).

Attachments: (A) Project Authorization Amendment
(B) Project Paper Amendment (Annex C-2, Vehicle Procurement Waiver, for AA/AFR signature)

Drafted by:AFR/PD/SWAP:AMcDonald:fn:8/11/83 ext 27887 0561M

INTEGRATED PEST MANAGEMENT

(625-0928)

PROJECT PAPER

AMENDMENT

August 1, 1983

PROJECT AUTHORIZATION AMENDMENT NO. 1

Country: Sahel Regional (CILSS)

Project: Integrated Pest Management

Project No.: 625-0928

1. Pursuant to Section 121 of the Foreign Assistance Act of 1961, as amended, the CILSS Integrated Pest Management Project was authorized on December 8, 1977. That authorization is hereby amended as follows:

Life of Project (LOP) funding is increased by $3,553,000 from $25,280,000 to $28,833,000.

2. Paragraph c. of the authorization is amended to add a covenant providing in substance that CILSS and its Member States shall make every reasonable effort to employ national personnel trained under this project in suitable positions performing IPM research on their return.

3. Paragraph d. of the authorization is amended to approve a waiver of the requirement set forth in Handbook 1, Supplement B, that vehicles procured with grant funds have their source and origin in the U.S., and to permit procurement of six (6) liaison-type passenger automobiles and 32 pick-up/4 wheel drive vehicles at an approximate cost of $545,000 which have as their source and origin countries included in Geographic Code 935. It is hereby determined that special circumstances exist which justify a waiver of the requirements of Section 636(i) of the Foreign Assistance Act of 1961, as amended; and that exclusion of procurement of these vehicles from Free World countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of United States foreign policy objectives and the objectives of the foreign assistance program.

4. The authorization cited above remains in force except as hereby amended.

Aug 15, 1983

Alexander R. Love
Acting Assistant Administrator
for Africa

Clearances: As shown on Action Memorandum

Drafted by: GC/AFR:LDeSoto

CONTENTS

Page

Face Sheet

Part I: Introduction

A. Summary and Recommendation I-1
B. Background and Priority I-7
1. Project Evolution I-7
a. History of U.S. Involvement I-7
b. The Evaluation I-7
c. Tripartite Meetings I-9
d. Progress to Date I-10
2. Justification for Continuing Technical Assistance . I-11
C. Issues I-17
1. The Nature of AID Participation I-17
a. Discussion I-17
b. Conclusion I-19
2. Increase in Project Costs I-20
a. Discussion I-20
b. Conclusion I-21
3. Redesigned Project Management I-21
a. Discussion I-22
b. Conclusion I-23
4. Funding for Future Phases I-24
a. Discussion I-24
b. Conclusion I-25

Part II: Project Analyses

A. Technical Analysis II-1
1. Detailed Project Description II-1
a. Duration and Scope II-1
b. Objectives II-1
c. Research II-3
d. Surveillance and Forecasting II-20
e. Demonstration, Feedback, and Extension Liaison . II-24
f. CILSS/FAO Staffing II-27
g. Training of Sahelian Personnel II-29
h. Environmental Monitoring II-39
2. Institution Building II-40
a. Introduction II-40
b. Description of 15-Year Program II-41
c. Future AID Participation II-41
B. Social Analysis II-43
1. Beneficiaries II-43
2. Role of Women II-44
C. Economic Analysis II-47
1. Introduction II-47

X
9

Contents, continued

	Page
2. Update of the Original PP Economic Analysis	II-47
a. Crop Production Projections	II-47
b. Pest Damage Estimates	II-48
c. Chemical Pesticide Prices	II-49
d. Conclusion	II-49
3. IPM as an Economic Crop Protection Approach	II-50
D. Logical Framework Narrative	II-55
Part III: Implementation	
A. Organization and Management	III-1
1. History	III-1
2. Organization and Decentralization	III-2
a. Introduction	III-2
b. New Regional Management Structure	III-3
c. New National Management Structure	III-5
3. Project Finances, Construction, and Commodity Procurement	III-8
a. Documentation	III-9
b. Budgetary Control	III-10
c. Accounting Systems	III-11
d. Construction	III-13
e. Procurement	III-14
4. Financial Plan	III-15
5. Reports	III-16
a. Project Task Force	III-16
b. Technical Working Groups	III-16
c. Country Task Force	III-16
d. USAIDs	III-17
6. Mauritania Arrangements	III-17
B. Implementation Plan	III-19
C. Evaluation Plan	III-33
1. General	III-33
a. Administration Reviews	III-33
b. Intermediate Research Evaluation	III-31
c. Final Evaluation	III-33
2. Benchmarks	III-34
a. Administrative Reviews	III-34
b. Research Evaluation	III-32
c. Final Evaluation	III-34
D. Conditions and Covenants	III-38

10

Contents, continued

Annexes

	Page
A. Grant Application and Associated Documents	
1. CILSS Formal Letter of Application	A-3
2 a. Draft Project Agreement Amendment	A-7
b. Congressional Notification	A-14
3. Organization Chart	A-16
4. Project Checklist	A-27
5. 1981 Evaluation Recommendations and Current Status	A-37
B. Technical Back-Up	
1. Updated Initial Environmental Examination	B-1
2. Economic Analysis	B-9
3. History of the CILSS Plant Protection Program	B-27
4. Guidelines for the Development and Application of the IPM Programs	B-35
5. An Overview of Worldwide IPM Activities by FAO and Others	B-41
C. Program Back-Up	
1. Program Component Work Plans	C-2
a. Regional Directorate	C-2
b. Cape Verde	C-3
c. The Gambia	C-6
d. Mali	C-9
e. Mauritania	C-12
f. Niger	C-15
g. Senegal	C-18
h. Upper Volta	C-22
2. Program Component Budgets/Schedules	C-27
a. 1984-1986 Budget - All Components	C-27
b. 1984-1986 Budget - FAO	C-43
c. Determination of 121(d) Requirements	C-53
d. Construction Schedules - 1984-1986 and Summary	C-59
e. Vehicle Procurement Waivers	C-63
f. 611(e) Certification	C-67
g. General Procurement Schedule	C-69

11

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete)

Amendment Number: 1

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Sahel Regional (CILSS)

3. PROJECT NUMBER: 625-0928

4. BUREAU/OFFICE:

5. PROJECT TITLE (maximum 40 characters): Integrated Pest Management

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 87

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 83 B. Quarter 4 C. Final FY 86

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

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	4,284	4,000	8,484	14,079	14,754	28,833
(Grant)	(4,284)	(4,000)	(8,484)	(14,079)	(14,754)	(28,833)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		600	600		3,322	3,322
Other Donor(s)						
TOTALS	4,284	4,600	9,084		18,076	32,155

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) SH	S121	080		10,650		3,553		28,833	
(2)									
(3)									
(4)									
TOTALS				10,650		3,553		28,833	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 080, 960, 970

11. SECONDARY PURPOSE CODE:

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

A. Code

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

A. To help create and strengthen Sahelian institutional capacity to carry on integrated pest management research.

B. To produce research packages on priority regional and national food crop pests suitable for adaptation and extension to Sahelian small farmers.

14. SCHEDULED EVALUATIONS

Interim MM 11 YY 84 MM YY

Final MM 11 YY 85

15. SOURCE/ORIGIN OF GOODS AND SERVICES

[X] 000 [X] 941 [X] Local [ ] Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a 270 page PP Amendment.)

a. Restructuring of project administration.

b. Focusing research on agreed priorities.

c. LOP extension to achieve original objectives.

17. APPROVED BY

Signature: for

Title: Director, USAID/Upper Volta

Date Signed: MM 08 DD 12 YY 83

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM 07 DD 17 YY 83

PART I

INTRODUCTION

A. Summary and Recommendation

In the mid-1970's, the Comite Permanent Inter-Etats de Lutte contre la Secheresse dans Le Sahel (CILSS-Permanent Interstate Committee for Drought Control in the Sahel) recognized that chronic high food crop losses, both in the field and after harvest, were a serious risk for the low-income, drought-prone Sahelian countries. With help from AID and the Food and Agriculture Organization (FAO), the CILSS formulated a comprehensive program for Crop and Post Harvest Protection for the Sahel. The program consists of eight sub-projects, called Annexes; each directed to a different priority problem within the overall area of food crop and post-harvest protection.

Starting in 1975, AID provided approximately $14 million to carry out the first and second phases of CILSS Annex A (Regional Food Crop Protection) in conjunction with other donors, such as Canadian International Development Agency (CIDA), working in Upper Volta and Niger, and the German Technical Cooperative Agency (GTZ), operating in Niger. The third and final phase of AID's portion of Annex A is now under design. Authorization is anticipated during 1983. The Annex A-RFCP program is intended to assist national crop protection services in the participating countries (Senegal, Mali, Mauritania, The Gambia, Cape Verde and one non-Sahel country, Guinea Bissau) become capable of responding to pest outbreaks, and extending economical, environmentally safe methods of pest control to farmers.

To provide farmers with useful, (economically and environmentally sound) means of controlling pests, it is necessary to conduct research which will identify, test, and adapt integrated pest management (IPM) techniques for the wide variety of local ecological and socio-economic conditions found in West Africa. It is the purpose of Annex B of CILSS' global program to produce such research. AID authorized $25.3 million for the first phase of Annex B-IPM Research in 1977. The grantee was the CILSS itself, and the technical implementing agent was the FAO. Called the IPM project, this activity was in five years' time to form the institutional base for ongoing capacity for IPM research in each participating Sahelian country, and produce initial research results suitable for extension to small farmers starting under the third phase of Annex A-Regional Food Crop Protection.

As described in detail elsewhere in this Project Paper Amendment, the IPM project ran into unexpected difficulties primarily in the area of administration. The first two years of project life were not devoted to active implementation because AID and the FAO could not come to agreement on operating relationships. The next one-two years saw halting implementation primarily because original project design assumptions were unrealistic about the ability of very small central staffs to handle day-to-day management of a project operating in seven countries.

In the Summer of 1981, the CILSS, AID, and FAO authorized a major independent evaluation of both Annex A (Regional Food Crop Protection)

X
14

and Annex B (IPM Research). Results of that evaluation are described in this PP Amendment. The evaluation confirmed the validity and urgency both of CILSS' Sahel-wide crop protection effort, and of AID's role in it. It was decided that RFCP's second phase would be extended by one year in order to provide a transition and do the groundwork leading to third phase emphasis on extension of IPM concepts and techniques. The year's time was also necessary to see whether the three parties to the IPM project could successfully redesign it to produce the research results needed for extension activities under RFCP's third and final phase.

The CILSS, AID, and the FAO held high-level, tripartite meetings in January and September, 1982, to discuss the 1981 evaluation recommendations. Results of these meetings are described in detail elsewhere in this paper. A redesign team was sent to the Sahel in November-December, 1982, and the PP Amendment was drafted during January-April, 1983.

This PP Amendment is based on the recommendations of the 1981 Evaluation Report as modified by the parties at the 1982 tripartite meetings, and further refined in field discussions between the redesign team and participating AID Missions, IPM national Project Directors in each country, senior FAO representatives, and the Regional Project Directorate and Regional Management Unit (RMU) of the CILSS Executive Secretariat in Ouagadougou. Both FAO and CILSS provided members of the redesign team. All AID Sahel Missions, except Chad, received drafts. The draft was also translated by OECD in Paris into French, and sent to all AID Missions, IPM national Project Directors, FAO/Rome, and the CILSS Secretariat in Ouagadougou for review and comment prior to being put in final form for AID authorization. A final tripartite review and approval of the draft was undertaken from July 11-14, 1983, in Ouagadougou. Thus, this document represents a collaborative effort by all the parties to structure the IPM project so it may produce research results and create Sahelian institutional capacity to carry on that research, in accordance with the project's original purposes.

The PP Amendment describes in detail plans for organizing and focusing the technical work being done by the CILSS and the FAO in each country and the regional components. Key pests and research priorities have been identified, and the program of activities will lead to publication of manuals on selected IPM problems for wide distribution. Working relationships with CILSS Annex A (RFCP) have been defined (and will be further refined by country in the RFCP Phase III Project Paper). The project administration structure has been revised to give the Regional Project Director adequate authority and resources to operate, to define clearly the CILSS-FAO working relationships and to decentralize much day-to-day implementation monitoring to the local USAIDS. In addition, coordinating mechanisms are proposed at all levels to insure a flow of communications and problem solving between all parties. USAIDs should also become more aware of how the IPM project complements their respective bilateral programs.

In July, 1983, at Ouagadougou the three parties to the IPM project agreed to the proposed restructuring. Therefore, it is recommended that the Assistant Administrator for Africa authorize a three-year extension of project life and an increase of $3.5 million in the life of project authorization bringing the total authorized level to $28.8 million. The extended project life and increased authorization will enable AID, the CILSS, and FAO to complete the first phase of the IPM Research project, realize the project's original objectives for that phase and provide research needed for extension of crop protection technology to small farmers under the AID-funded Regional Crop Protection (Annex A) program. In one important aspect, academic training of Sahelian researchers, the three years will enable FAO to administer funds for academic programs not completed by the anticipated completion date of Phase I field work in the fall of 1986.

X
16

TABLE I-1
PROJECT FUNDING

	Major Component	Current	%	Proposed	%
I.	Technical Assistance	$11,803	46.7	$ 7,637	26.5
	Long-Term	(9,873)		(7,033)	
	Short-Term (Consultants)	(1,350)		(604)	
	Other	(580)		(--)	
II.	Training	749	3.0	2,700	9.4
III.	Commodities	3,040	12.0	2,080	7.2
IV.	Construction	1,521	6.0	1,026	3.6
V.	Other Costs	6,294	24.9	11,026	38.2
	Local Personnel			(2,435)	
	Local Operations			(8,591)	
VI.	Admin. Costs	1,873	7.4	2,562	8.9
	FAO	(1,573)		(1,662)	
	CILSS	(300)		(900)	
VII.	Contingencies			1,802	6.2
		$25,280	100.0	$28,833	100.0

N.B.
1. Drop in T/A is the result of reducing numbers of FAO long- and short-term expert personnel.
2. Training increase is due to the project picking up the costs of long-term academic originally planned, but later dropped, by the Netherlands.
3. Reductions in commodities and construction stem from economies selected by the participating countries.
4. Increases in other costs are due mainly to the effects of inflation on operating costs, e.g., fuel prices.
5. Contingency item consists entirely of FAO estimates of the inflation factor over the three year period.
6. Other costs consist of salaries for local project support personnel, in-country travel and per diem, research incentives (PRIMES), local operations (rent, utilities, etc.) and vehicle operation and maintenance.

B. Background and Priority

1. Project Evolution; 1981 Evaluation and Re-Design

a. History of U.S. Involvement

In the mid-1970's, CILSS with assistance from the Food and Agriculture Organization (FAO) and the U.S. Agency for International Development (AID) formulated a comprehensive program for Crop and Post-Harvest Protection. Anticipating this Program, AID launched a 10-year, three-phase Regional Food Crop Protection (RFCP) Project in 1975 assisting five Sahelian and two neighboring West African countries. This project served goals and objectives outlined by CILSS, and was part of Annex A of the CILSS Program.

CILSS-FAO-AID deliberations also produced the Integrated Pest Management research project aimed at providing the Sahelian farmer with the best available methods for crop protection through integrated pest control. AID authorized $25.3 million in FY 1977 for the five-year, first phase of the IPM project (known as Annex B of the CILSS Program). The Project Agreement was signed with CILSS in February, 1978. However, implementation was delayed for a variety of reasons. (These are discussed in more detail in sections which follow on Technical and Organizational Analyses).

By the third year of the project, all three parties, AID, CILSS, and FAO, had become concerned that IPM was seriously behind in implementation and achievement of its objectives, with the result that the RFCP project was not receiving IPM research results for extension to small farmers as planned.

b. The Evaluation

In April, 1981, CILSS-FAO-AID policy makers decided to engage an independent team of experts to evaluate administrative and technical progress under both the RFCP and IPM projects, as the two must be very closely linked. The Evaluation Team was in the Sahel from July-September, 1981, and was charged with producing recommendations that would (a) serve as guidelines to design RFCP Phase III and (b) provide a basis for the revision and restructuring of IPM.

Copies of the Evaluation Report are available in AFR/PD/SWAP. A list of its recommendations, along with the specific decisions taken and disposition of each appears in Annex A to this PP Amendment. The redesign response to those recommendations is discussed in detail in appropriate parts of the PP Amendment's Technical and Organizational Analyses. To summarize here, the Evaluation Report noted that:

(1) A CILSS contract with the Food and Agriculture Organization (FAO) to provide the technical advisory cadre under IPM was a Condition Precedent to first disbursement. Contract negotiations took 20 months from the time the project was authorized. The problem seems to have

X
18

been that project designers did not realize that, as an international organization, the FAO could not accept certain U.S. Government requirements (e.g., using American air carriers for international travel, and access to project books for audit purposes). AID/Washington's Legal Counsel could not waive these requirements, due to statutory constraints. The debate between legal experts for both parties could not be resolved by compromise. As a result, AID and CILSS retained much more control over project administration than had originally been expected, and implementation delays seem to have "snowballed" from that point;

(2) While the AID-FAO legal discussions were underway, the responsible regional Mission, USAID/Ouagadougou, saw no point in recruiting a project manager. The present project manager was not brought on-board until the project was over two years behind schedule. He had appropriate academic credentials, but had not received training in AID project management. Yet this individual was expected to guide the inexperienced CILSS organization through the complexities of AID procedures for financial and administrative management of a diverse Sahel-wide research project. For its part, CILSS-IPM representation in each country was understaffed and overburdened;

(3) Day-to-day implementation of a number of loosely knit, national sub-projects spread across the Sahel could not be handled efficiently from one central point in Ouagadougou. Very real problems of transportation and communication caused delays of weeks and even months in approvals and actions needed to obtain project goods and services. FAO slowed recruitment of technical advisors, because facilities and supplies were not in place for them to work with. Without funds or staff for the purpose, AID Missions in the participating countries provided little or no assistance to facilitate IPM implementation. They also tended to regard this regional project as Ouagadougou's problem, rather than an important adjunct to their own bilateral programs;

(4) Consistent with original conceptions of its Global Crop Protection Program, CILSS assigned IPM's Technical Directorate to Bamako (the Sahel Institute), while a Regional Management Unit in Ouagadougou retained administrative and financial control of the project on behalf of the Executive Secretariat. After AID and FAO resolved their dispute over statutory matters, it soon became apparent that this split between CILSS technical and administrative management was destined to contribute further to implementation delays. For compelling political reasons, however, the CILSS found it difficult to consolidate project management in one place;

(5) At the same time, CILSS and FAO project representatives were uncertain as to the proper division of responsibilities and authority between them. Thus, working relationships at the national and regional levels were somewhat less than smooth; and

(6) Because of IPM's delays, the Regional Food Crop Protection project (Annex A) was not receiving tested IPM packages. As a consequence, that project focused on assisting governments to increase

TABLE I-2
ESTIMATED LOCAL CURRENCY CONTRIBUTIONS
(Total Life of Project)

Regional Directorate (CILSS)	$300,000
Cape Verde	220,000
The Gambia	290,000
Mali	378,000
Mauritania	410,000
Niger	480,000
Senegal	464,000
Upper Volta	490,000

N.B. 1. These totals represent salaries of civil servants assigned to the project and best estimates of in-kind contributions of buildings and sites and their operating and maintenance costs.
2. These estimates will be revised and refined in the course of CILSS/FAO preparation of Country Operational Plans due for approval in October-November 1983.

their use of chemical pest control means. Without IPM alternative technologies, RFCP could not move toward its ultimate objective of extending IPM concepts and methodologies to Sahelian small farmers. In addition, provision needed to be made to link IPM, RFCP, and other crop protection activities in the Sahel, in order to establish mutually agreed priorities and focus many diverse efforts on producing specific results of primary importance for the Sahel.

In summary, the Evaluation's principal conclusions were that:

- The IPM project's technical and developmental rationale(s) remained valid and even more urgent than when the project was designed; and

- IPM's problems were primarily administrative, rather than technical, attributable mostly to errors in initial assumptions and design.

c. Tripartite Meetings

The Evaluation Report was formally presented in Ouagadougou to representatives of AID, CILSS, and FAO in September, 1981. It was circulated for review and comment to AID's bilateral Missions in the Sahel, CILSS national IPM project representatives, and FAO technical and administrative staff. In January, 1982, the parties convened a high-level tripartite meeting in Ouagadougou to reach agreement on the Evaluation's recommendations. It was decided that FAO assumption of key implementation responsibilities, as recommended in the Evaluation Report, was not possible given known statutory constraints which had not changed. However, three recommendations to improve project management were made by the tripartite group to the CILSS Council of Ministers:

(1) That the Technical Directorate be moved from Bamako and a consolidated technical/administrative directorate be established at Ouagadougou;

(2) That the CILSS and FAO arrive at formal agreements with respect to the responsibilities and authority of their respective personnel under the project; and

(3) That implementation oversight of project financial management, procurement, and construction supervision be decentralized from the regional to the national level.

The second and third propositions were accepted quickly. However, the Council of Ministers was not able to endorse consolidation of the project directorate at Ouagadougou until late April, 1982. When that approval was given, the groundwork was laid to resolve the project's major administrative problems, and all parties were anxious to commence project redesign.

Before the redesign got underway, however, the parties decided another high-level tripartite meeting was needed to reach agreement on

X
21

general principles for reorganization of project structures and working relationships. Scheduling problems delayed this meeting until mid-September, 1982, when AID, CILSS, and FAO representatives assembled in Washington. The results of that meeting are discussed in detail elsewhere in this paper. However, its primary products were an agreed-to revision of the project's organization chart (see Annex A), and approval of the Terms of Reference (drafted by AID) for the redesign effort.

With these pieces in hand, AID was able to field a redesign team early in November, 1982. The team completed its field work in December, and returned to Washington to draft a PP amendment in January-February, 1983. The document was translated into French by the OECD in Paris for circulation to Sahelian participants in the IPM project. The document was also circulated to the FAO and to all AID bilateral Missions in the Sahel. Guidelines for joint AID-CILSS-FAO review in each country were provided with the idea that this effort would constitute the first step in transition to the new, decentralized project management model. A joint CILSS-FAO-AID review and approval of the draft was held in Ouagadougou, Upper Volta, on July 11-14, 1983.

d. Progress to Date

In spite of delays and difficulties described above, there has been considerable implementation activity under the project to date:

- The project has a firm enough human resource and physical infrastructure base to make use of an extended life of project:
  - Ten senior Sahelian researchers are assigned to national components along with 10 FAO advisors. Some 70 field observers have been trained and three Sahelian researchers are in long-term training.
  - Four laboratories and 10 observation posts have been built.
  - Approximately $3 million in procurement of supplies and equipment has been completed or is planned.

- Senior regional and national IPM managers and FAO advisors convened in Dakar in December, 1982 to review and revise Country Work Programs containing research priorities for the 1983 campaign and the remainder of the project (see Annex C). Revised budgets were also prepared.

- IPM researchers and FAO advisors assembled in Bamako from February 28-March 5, 1983, to review 1982 campaign results and refine and set 1983 campaign goals accordingly (a copy of their report is available in AFR/PD/SWAP).

- Twenty-one of a prospective total of 33 Sahelian candidates for long-term academic training have been nominated by participating national components and are awaiting departure notices.

- Many of the administrative developments treated in the paragraph above on tripartite meetings and later in Part III under Organization and Management (and decentralization) are regarded as progress because they facilitated agreements reached in the July, 1983, meetings in Ouagadougou.

- Referring to the Implementation Plan (Part III below), the entire list of activities scheduled between April and July 1983 has been virtually completed, marking definite progress.

- And finally, accord on the delegation of authority during the Ouaga meetings puts into place a key building block in the framework for cooperation and restructuring commenced after the 1981 evaluation.

2. Justification for Continuing Technical Assistance

The major thrust of recommendations for both the technical and administrative aspects of the IPM project stem from the 165-page joint RFCP/IPM Evaluation performed by an independent team of experts in 1981 (see Annex A). Part II of this PP Amendment deals with continuing validity of the technical findings of that Evaluation and the economic and social analyses in support thereof. Administrative findings are discussed in Part III.

In examining the question of continuing relevance of the IPM project, the 1981 Evaluation Team noted that the original Project Paper listed certain objectives:

- Long-term:
  - To increase food crop production in the Sahel by reduction of crop losses due to insects, plant diseases, and weeds.

- Short-term:
  - To strengthen national research capability toward developing appropriate IPM technical packages for use by extension structures so that farmers might gain maximum profit from their farming activities. This was to be accomplished by:
  - establishment of a surveillance system on the occurrence of major pests;
  - evaluation of crop losses and the relative economic importance of pests;
  - establishment of the on-going research capability to develop integrated pest management techniques, including the analysis and evaluation of traditional cropping systems and crop protection methods;

establishment of preliminary "out-reach" in the form of demonstration areas to show farmers the benefits to be drawn from integrated pest management;
development, in close collaboration with plant protection services, of a mechanism to extend and implement results at the farmer level.

The Evaluation Team found that combined donor support of Sahelian crop protection services, including the RFCP Project, had resulted in what appeared to be an increase of pesticide use on food crops without adequate consideration of economics or of environmental and applicator safety. Government personnel distributed pesticides or provided free applications on farmers' fields, and an attitude of dependence on pesticides seemed to be growing. This posed a possible ecological and health threat to the Sahel region, and ran counter to the environmental regulations governing AID-funded programs.

The Evaluation Report pointed out that neither farmers nor national governments can afford to adopt a technology that does not pay for itself; and the costs/benefits of using imported pesticides on food crops in the Sahel remain untested and doubtful. The Evaluation Report noted that pesticide use often entails environmental and health hazards which Sahelian countries are not equipped to monitor or deal with. The Team's IPM experts warned that heavy use of pesticides, especially insecticides, had accentuated pest problems in many regions of the world. Pests have developed resistance to once-effective chemicals, and destruction of their natural enemies leads to rapid and more severe outbreaks as well as the achievement of pest status by other usually innocuous species.

The IPM project was intended to develop effective low-cost pest management systems evolving out of traditional cropping and pest control practices, plus the maximum use of additional non-chemical means of pest control. Under an IPM system pesticides are applied judiciously and only when necessary. This approach appears to be far and away the most appropriate for an economically and ecologically fragile environment such as the Sahel. Thus, the Evaluation determined that the long- and short-term objectives of the IPM project continued to be valid; and indeed of pressing importance for the Sahel in the face of apparent increasing dependence on chemical interventions for crop protection.

According to the Evaluation Report, strong technical coordination was essential, but was not provided at the beginning of the IPM project to insure proper focusing of activities, adequate liaison between national programs and regional uniformity of approach. Project staff were recruited as follows:

CILSS Regional Project Director:	May 1980
FAO Principal Technical Expert:	February 1980
USAID Project Officer:	February 1980

The Evaluation Report noted that there appeared to be much socioeconomic preparatory work to be done to support demonstration/study efforts. Information is needed on:

- land tenure and its implications for extension of new farm practices;
- village level social structures, labor distribution, sex roles, and identification of ultimate decision-makers;
- traditional lines of communication at village level;
- attitudes for and against changes or adoption of new technologies;
- cost of production of target crops in subsistence terms;
- farmers' perceptions of principal constraints on production;
- farmers' experience with, and perceptions of, previous research and extension efforts in their areas.

The Evaluation Report pointed out that the rationale behind traditional cropping systems must also be understood by IPM researchers so that care is taken to preserve their desirable features when pilot IPM packages are designed. Although urgently needed, none of this basic socioeconomic work has been undertaken in the IPM Project nor has a socio-economic expert yet been recruited by the FAO. The Evaluation Report recommended immediate recruitment of this expert on grounds that it is not necessary to wait for research to produce pilot IPM packages. Socio-economic research could begin with existing cropping systems and extending the best of current agricultural practices with respect to pest control.

Other FAO recruitment of experts in IPM, entomology, plant pathology and weed science has also been slow. Only 10 posts are presently filled. FAO encountered difficulties finding candidates, especially for certain specialties such as crop loss assessment and weed science. Requirements for French-speaking capability and up to seven years of prior experience aggravated these difficulties by unduly limiting the pool from which expertise can be drawn. The Evaluation Report noted that IPM research programs are particularly well developed in some anglophone countries. Agricultural researchers already several years into their careers are often reluctant to move overseas. Therefore, the Evaluation Team thought it might be better to recruit well-trained, but less experienced researchers. In any case, recruitment of experts clearly needed to be accelerated.

As pointed out in the Evaluation Report a variety of cropping patterns, including intercrops of many sorts, occur in the Sahel. Ecological conditions and pest problems differ in monocrop and intercrop situa-

X
25

tions. Experiments in intercrops are complicated by plant species interactions such as competition for water, light, or nutrients, and enhancement of soil fertility by nitrogen-fixing legumes. These affect plant physiology and morphology, which in turn influence the severity of pest problems. Field microclimate, availability of space, food supply and food quality for pests all vary with the cropping system, thus complicating pest control research in the diverse systems. There must be agronomic input as well as a cooperative effort between entomologists, plant pathologists, and weed scientists. These considerations caused the Evaluation Team to recommend inclusion of agronomic expertise in the project. The most important contribution of agronomists to IPM lies in beneficial modifications of cultural practices. Changes in crop rotations, planting dates, field sanitation, soil tillage, etc., that work to the detriment of pests are a very important IPM tool.

According to the Evaluation Report, crop loss assessment should be a main priority of Phase I of the IPM Project. IPM research can proceed without the data, however, crop loss assessment methodology must be developed sooner rather than later to provide the essential underpinnings for determination of economic thresholds (i.e., the point at which application of one or another crop protection methodology is economically appropriate). Such methodology is especially critical for deciding at what point a chemical intervention may or may not be justified. Giving national crop protection services the analytical tools for deciding when to use pesticides could go a long way toward reducing their indiscriminate use.

One of the main goals of the IPM project is creation of Sahelian capacity to carry on future research. To this end, the original design called for:

- national counterparts to learn from on-the-job counsel of FAO experts;
- advanced training in other Sahelian countries, in African institutions, or overseas to be funded through scholarships.

The provision of trained cadre, obviously, is a sine qua non of a permanent institutional capacity. The dearth of trained Sahelian personnel to work with and benefit from on-the-job contact with highly skilled technical advisors remains a critical problem. However, the original PP included little in the way of long-term, advanced training funds. The Government of the Netherlands was expected to finance such training under Annex G-2 of CILSS' Global Plant Protection Program. As described elsewhere in this document, it subsequently developed that the Dutch decided to limit support for training. Thus, there was no real source of the advanced technical preparation necessary for IPM's Sahelian cadre. The Evaluation Team recommended that funding be found for required training.

The Evaluation Report noted continuing problems in finding enough skilled counterparts to work with the FAO researchers while other

Sahelians are being trained. In addition, it was pointed out that in most of the participating countries, the Sahelian national Project Director was also the chief of crop protection. These officials had been expected to continue running their existing programs, while assuming responsibilities as counterparts to the FAO researchers. This was clearly an unrealistic expectation, and an inappropriate way to go about creating a fully-staffed, permanent Sahelian IPM research cadre.

Due to the long delay in getting project implementation underway and to conflicts arising from split project technical and administrative management, FAO researchers were working with little or no guidance on priorities. The Evaluation Report noted that some individual experts seemed to have decided that priority pest problems lay in one area, while other sources (notably crop protection experts under the RFCP project) thought the real priorities lay elsewhere. The Evaluation Team recommended creation of Technical Working Groups to focus IPM research on mutually agreed priorities; and to insure that specific end-products would be forthcoming in the form of manuals and other publications. The research was also to become more of a collaborative effort, bringing together experts working in related fields at regular intervals to avoid duplication of effort, and to insure that findings were broadly disseminated to all researchers in the field. The Working Groups were also to constitute an important linkage for adaptation and transfer of materials to the RFCP project for extension to small farmers.

The specific technical recommendations of the 1981 evaluation of the IPM project are at Annex A, along with a statement of status on each. The following section, Part II, describes the way in which the technical recommendations will be implemented under the restructured and extended Phase I IPM project. Detailed Country Work Plans and budgets are at Annex C. Major modifications in the project's administrative and financial structure, both at regional and national levels, along with an outline of a more direct and active role for the local USAIDs are found in Part III and Annex A.

C. Issues

1. The Nature of AID Participation

Should AID continue to support development of IPM research capacity on a regional basis; or would it be more cost-effective to provide for project-specific IPM research within AID's bilateral programs in the Sahel?

a. Discussion

The principal conclusions of the 1981 Evaluation were (a) that the technical and developmental rationales remained valid and more urgent; and (b) that errors in initial assumptions and design with regard to administration lay at the root of the project's problems. A basic tenet of the technical rationale was that research results produced in one country--under regional coordination--should be easy to replicate in another, given the similarity among Sahelian countries of crops and cropping systems, pests, climate, growing seasons, and so forth. The very fact of the similarity would reduce the necessity to duplicate, i.e., many proven results could probably be applied without rigid testing. None of the activities or findings to date are known to have shown this rationale to be incorrect. The administrative-financial difficulties evolved mainly at the regional level because the project management was split, geographically and functionally. Two years of concerted tripartite effort culminated in July 1983 in a new management structure at the regional level under which delegated authority for all administrative, financial, and technical aspects of the project is vested in a single individual, supported by a tripartite task force. To reduce the communications span across the Sahel--also a weakness in the original administrative design--similar task forces work in each participating country.

Considerable political as well as financial capital has been invested by the three partners in achieving the modifications necessary to "make the regional-national system work," while recognizing its hybrid nature. While the Evaluation Team estimated the cost of a restructured project at $33.6 million, this PP Amendment prices the redesigned and extended Phase I at $28.8 million. The difference involves economies of expatriate advisory assistance and some commensurate trimming of ambitious research goals. At the same time, however, the redesign offers academic training for Sahelian researchers that was not even foreseen in the original design and not costed in the Evaluation Team's proposal. The tripartite review of this PP Amendment draft in Ouagadougou in July 1983 produced solid agreement among the senior CILSS-FAO-AID representatives on the continuing validity of the technical goals and the potential for success of the regional-national management structure. IPM Directors and FAO Senior Experts from each participating country endorsed this agreement.

Pursuing IPM research on a bilateral basis would, first of all, postpone further the date by which positive results can enter the hands

X
28

and fields of Sahelian farmers. Replacing FAO with a single entity (or perhaps seven such) would undoubtedly raise the total combined project cost. Some duplication of start-up costs would be inevitable and any saving in technical personnel would be unlikely. In disciplines, such as socio-economics, weed science, and crop loss assessment, where "regional responsibilities" are now exercised, each bilateral project would be on its own. Exchange of research results between bilateral projects, while an often-vowed wish, seldom achieves fruition.

Seen regionally, however, results achieved in one country can be easily replicated, probably without further testing in many instances. Bilateral missions can easily apply appropriate regional results and certainly national research results to bilateral projects, especially those dealing with staple food crop production. Missions could also encourage other donors to use the same results in their activities. Ready access to IPM results, both regional and national, should produce positive effects in preparation of the CDSS and other planning documents. A regional mechanism, the Technical Working Group, has already begun to produce results and planning guidelines, first in December 1982 in Dakar with the redesign team and then in Bamako in February-March 1983 as a full-fledged IPM Project entity.

Progress has been registered in the regional mode in terms of physical infrastructure delivered or in process, supplies and equipment in place or on order, and management systems undergoing transformation toward decentralization. An oft-mentioned shortage of candidates for training is being addressed in positive fashion: 21 of a planned 32 candidates are awaiting call-forward from FAO (which only awaits the funds provided by an approved Phase I extension). A full complement of FAO experts is virtually assured (delayed only by funding approval from AID). Recurrent costs also arouse considerable discussion, however, consider the following:

- By the time an extended Phase I is completed (and certainly by the end of a possible Phase II), all national personnel will be trained--to graduate level overseas and technician level either in-country or in the region--and be serving on the public rolls as members of national research agencies;

- Completed and equipped physical facilities should require little maintenance;

- Decentralized locations of observation posts and some laboratories has been planned to reduce travel and vehicle expense;

- Expatriates will be few in number, if in fact present at all.

The foregoing transition factors plus the time remaining in any extended project should allow participating countries to integrate recurrent operating costs into their annual national budgets.

Coordination among activities under the various CILSS Program Annexes has been less than adequate. The revised charter (see Part III) for the Executive Secretariat's Regional Management Unit stresses the need for CILSS to become more active. Activities that are underfunded, e.g., birds and locusts, require more support, while unfunded Annexes require priority attention. The U.S. through the Club du Sahel should keep this issue before regular Sahel donors and should use other forums to enlist support from other donors.

In IPM terms, a proposal to include FAO and AID representatives at national levels as observer-members of national Coordinating Committees will fill an existing coordination gap and bolster crop protection priorities in each country. U.S. and other donor activities under CILSS Annex A are already producing some salutary effects in the teaching of safety in use and applications of pesticides as intervention against major infestations, e.g., grasshoppers. National crop protection services are working with national extension agencies to foster greater awareness of alternatives to pesticides in controlling insects and diseases. Slow progress is also being made toward controlling introduction and distribution of chemical controls by decrees and legislation. IPM Coordinating Committees discuss these and similar matters in their periodic meetings.

Farm-level feasibility of IPM techniques and methodologies looms high as a challenge to IPM researchers. Lines of inquiry will be established by an FAO socio-economist based at the regional level who in turn will be aided by short-term consultants for particular problems or investigations. Three countries, Mali, Niger, and Upper Volta, will also engage agronomists to supervise their IPM surveillance programs and contribute to assessments of farmer acceptability of techniques tested or undergoing tests in demonstration plots administered in conjunction with the observation post networks. Although external to this project, crop protection services will be working with national extension agencies in the extension of basic IPM techniques, e.g., traditional cultural practices, pending availability of formal IPM research results. In this process, farmer feedback will play an important role in integrating IPM and crop protection information into specific extension packages and in testing the efficacy of both the information and the agencies dispensing it.

b. Conclusion

The technical accomplishments under this project have not materialized as originally anticipated for want of effective admin-financial practices and procedures. Nevertheless, the technical organization has gone forward at the national level and regional cooperation on technical activities is in evidence. Tripartite organization consolidates administrative, financial, and technical responsibilities at three levels: a high-level Consultative Committee; a Project Task Force; and Country Task Forces. AID should not consider any management proposals that seek to dismantle the regional-national combination endorsed in the final clearance of this PP Amendment in Ouagadougou in July 1983.

X
30

This design retains the advantages of controlled research over a broad regional area characterized by similarity and analogy of condition and research targets, yet places the management of daily affairs at the local level where dialogue is more readily assured. In other words, regional goals are being sought through a system supported by bilateral management systems. Given the attention, time, effort, and resources already applied and an expectation that correction of administrative ills will facilitate the achievement of positive technical results, AID should continue with the regional approach.

2. Increase in Project Costs

Phase I estimated costs rose from $25.3 million in 1977 to $28.8 million to cover extension of the Project Assistance Completion Date from 1983 to 1987. Should AID fund the increase?

a. Discussion

The original project costs were estimated on the basis of Country Operating Plans developed by FAO in 1977 in collaboration with CILSS. The 1981 Evaluation estimated approximately $8 million more would be needed above the original authorization in order to realize Phase I project objectives.

In 1977, FAO costs ranged from $52,000 to $65,000 per expert. The current cost is $78,000 to $87,000.

Offshore procurement costs for equipment, e.g., vehicles, were affected by long lead times of six months to one year required for source waivers which threw this support aspect behind the originally planned schedule with a consequent rise in cost. Most of these increases can be attributed to inflation. Other costs of general operations, e.g., fuel, have risen as a result of the upward trend of international petroleum prices.

On the other hand, a new cost element not previously factored into the project budget is participant training at a level of $2.5 million. In the original design of the Sahel-wide CILSS Crop Protection Program, the Netherlands proposed financing all long-term, undergraduate and graduate researcher, and technician training under Annex G-2, which would have provided the trained Sahelian cadre necessary to take over the running of an IPM research program. During the 1981 Evaluation, it was learned that the Dutch had decided, instead, to limit support to training of middle level technicians in African institutions. Thus, the 1981 Evaluation Report recommended that AID fund long-term academic preparation of research counterparts under the IPM Project to insure creation of a cadre of Sahelians to form the human/institutional base for managing IPM research when AID assistance is completed. Details on numbers and types of trainees required are outlined in Part II of this paper.

The redesign team did not simply re-cost project elements at a higher level. In view of the fact that AID funds for the Sahel in general are experiencing pressure from many competing, equally worthy projects, the team carefully scrutinized all IPM project goals, and modified some to help restrain cost increases. For example, the number of FAO expert advisors was cut from 37 to 23 by redistributing their placement in the Sahel to expand coverage, and by transferring certain of their duties to capable host country nationals seconded to the project by their governments (e.g., surveillance personnel). Facilities and equipment to support the non-essential advisors were also deleted. It was decided to forego funding a Chad national component for the remainder of IPM's Phase I because internal upheaval essentially destroyed all previous crop protection and research infrastructure. AID assistance in that country is limited to specific rehabilitation activities. Proposed funding for a Senegal and a Niger River Basin sub-regional component was also dropped, because the administrative infrastructure necessary to link a multi-country sub-project has not yet been developed. Should the Senegal or the Niger River Basin's management capacity evolve appropriately, AID would consider financing these components. When security conditions in Chad stabilize, AID would entertain a formal proposal for a renewal of IPM work in that CILSS member country.

Also omitted from the budget was a proposal to strengthen the computer capacity of AGRHYMET at Niamey in order to provide the data processing capability necessary to a comprehensive pest surveillance and outbreak forecasting system for the Sahel. It is proposed instead to use IPM project funds to finance a feasibility study of this proposal with the idea that CILSS may use the results to seek other donor financing.

Through rigorous examination and cutting of IPM project expenses, the redesign team managed to restrain significantly the increased costs of an extended first phase foreseen by the 1981 Evaluation Team. Nonetheless, it is not possible to carry on a 1983 project at 1977 prices. The proposed net increase of $3.5 million in life-of-project funding for IPM's first phase represents only a 13% rise over the past 6 years--well below the average 10% annual inflation rate. No other donors appear to be interested in funding a part of IPM presently, and the CILSS does not have resources to meet even this modest cost increase. The redesigned budget would allow AID, CILSS, and FAO to achieve project objectives with the least possible increase in cost.

b. Conclusion

AID should increase IPM Project funding by $3.3 million for a total of $28.8 million in order that the project may meet the objectives outlined for Phase I.

3. Redesigned Project Management

Will the project's revised organizational/managerial structure substantially improve project implementation?

X
32

a. Discussion

It must be recognized that no structure can guarantee managerial success with a project as diverse, complex, and dispersed as IPM. Nor can any system eliminate all problems. The question is whether the new structure and mechanisms proposed for implementation in this PP Amendment will permit the parties to reach project objectives within a four-year extended life-of-project?

The 1981 Evaluation Report signaled some principal administrative impediments to implementation: extremely difficult transportation and communication conditions, and lack of adequate AID or CILSS staff to manage a major research project across seven countries from one central point; lack of Grantee preparedness to cope with the complexities of AID regulations and documentation; and the physical division of project technical direction (Bamako) from administrative/financial control (Ouagadougou). In a nutshell, the problems of IPM management probably can be traced to overly ambitious but unrealistic design assumptions about management of a major regional project.

Three different solutions to these problems were considered. The first, proposed in the 1981 Evaluation Report, was to consolidate project direction in Ouagadougou, and turn over to the FAO implementation responsibility for procurement and financial management. Consolidation was accepted by all of the parties, but AID statutory requirements and FAO's operating mandate turned out to the incompatible. Therefore, AID had to retain control over project procurement and financial management. The second option was to "bilateralize" the project, i.e., turn IPM into a series of discrete country projects, each forming part of an AID Mission's bilateral program. The third solution was to transfer all project direction responsibility to the regional level.

Although preferred by some Missions, the bilateral option would imply withdrawal of AID support from the CILSS. It would also make it difficult to achieve regional coordination which is needed to avoid duplication and gaps in research, provide standardized overall technical guidance, and facilitate important intra-regional and international working contacts. On the other hand, a totally regional project would involve transferring control of laboratories and other facilities from national to a central regional entity; and essentially cutting national research organizations out of active participation in the project. This would have presented virtually insurmountable management problems, and would fail to create Sahelian institutional capacity to continue IPM research as intended.

The structure proposed in this PP Amendment is a middle way between the bilateral and regional extremes. The proposal attempts to address known implementation problems, and to provide flexibility for responses to new ones as the project moves from its initial stages of obtaining goods and infrastructure to one of actually producing research results. An important piece of streamlining has already occurred, i.e., the consolidation of project administrative and technical management under one

Project Director through delegation of authority from the CILSS Executive Secretary. This should eliminate the conflict inherent in the original technical/administrative project management split.

Day-to-day implementation can be greatly speeded up by engaging AID's field Missions. Thus, the CILSS-FAO-AID partners agreed to decentralize the key implementation functions of procurement, construction supervision, and financial management to the USAIDs. Creation of a Country Task Force in each country will permit USAIDs, CILSS national IPM Project Directors, and FAO technical advisors to work together regularly to insure mutual agreement on the project budget, follow the progress of research, and solve implementation problems quickly on a face-to-face basis. While Missions will not be in the same position of final authority as with a bilateral project, their control over project disbursements necessarily will give them an interest in programmatic concerns. The Country Task Force and the Project Task Force (at regional level) are bound together by the annual process of agreeing on work plans and budgets which provide the framework and targets for all activities under the project. In turn, the plans and budgets are submitted to a high-level CILSS-AID-FAO Consultative Committee for final approval and appropriate policy guidance.

What is difficult about the new structure is precisely that it is new (no precedent exists for such a model); and that it is neither fish nor fowl. It is, and will remain, partly a bilateral and partly a regional project with a large, tripartite roster of interested parties, none of whom can have absolute authority over the other. Successful implementation under the new system requires the considerable good will of all parties, and a consistent effort to approach project management and problems in a collegial spirit.

The new system requires very substantial changes in operations and working relationships at all levels. It will certainly need a period for "de-bugging", and problems will no doubt arise which require in-course adjustments. The project's redesigners are concerned to see that these adjustments are identified and action taken quickly to avoid disrupting the relatively short 4-year project life remaining. The quarterly reporting system described in Part III of this PP Amendment is intended to flag any management problems, as are the semi-annual Administrative Reviews to be conducted by AID's Regional Project Officer during the first year of the Phase I extension.

b. Conclusion

The problems experienced with project management to date require major revisions in structure and decentralization of implementation monitoring. Conversion to a new system will require considerable cooperation from all parties, and very close monitoring to catch problems early. Enabling the necessary dialogues to go forward in each country rather than over the broad expanse of the Sahel offers an excellent opportunity for success.

X
34

4. Funding for Future Phases

Should AID consider funding Phase II or III of the IPM Project?

a. Discussion

For reasons set forth extensively elsewhere in this Project Paper Amendment, specifically in Part IIA2 and Part IIC below, it is clear that IPM can make an important contribution to food availability at much lower cost than purely chemical controls and with much less foreign exchange, now spent for food imports and basic chemical inputs to pesticides. This is especially important as the cost of pesticides is likely to continue to increase. IPM can also forestall significant environmental problems which are the products of indiscriminate pesticide use. Experience elsewhere in the world tells us that a viable institutional capacity for on-going IPM research is an important element of any overall program to increase food production and availability. The continuing, and growing, need for such institutional capacity in the Sahel was reconfirmed in the 1981 Evaluation of the IPM Project.

It is unlikely, however, that the Sahelian countries will have developed the human resource capacity to carry on IPM research on the needed scale by themselves at the end of Phase I of this project, although the physical infrastructure will be virtually complete. Participants will just be returning at that time, and Sahelian personnel already in place will have had a relatively limited opportunity to work in collaboration with and learn from the FAO advisors. Additional on-the-job training will be required, plus additional advanced training to bring some counterparts from the B.S. level (at the end of Phase I) to the M.S. level. Those fully trained and qualified Sahelian personnel available by the end of Phase I could hardly perform both their professional duties and train others and do full justice to both. The absence of highly trained and experienced FAO advisors would also slow the pace of research.

Cooperating governments, in the face of minimal usable results, might lose interest in continuing to finance the research. This danger would be enhanced if few results have actually reached farmers by the end of Phase I (this depends to a large extent on AID's Regional Food Crop Protection project, the third and final phase of which is being designed to provide for extension of IPM results).

The fact that an extended Phase I will afford national researchers four full cropping years--three before any go-ahead has to be made for a Phase II--in which to conduct field experiments, analyze results, and devise useful extension packages, offers every expectation that the economic and social viability of IPM can be confirmed. Similarly, the participating governments will have had ample opportunity to integrate the IPM program into their organized research efforts.

The original designers of IPM's Phase I seem to have assumed that AID would support a second and even a third phase over about 15 years to

insure proper installation of the institutional capacity and human resources needed for a truly Sahelian IPM research system. The 1981 Evaluation and this project redesign both acknowledge this long-range objective. However, AID financial support for any subsequent phase should be contingent on the effectiveness of the project during the balance of Phase I, both from the administrative and technical standpoints. The revised Evaluation Plan in this PP Amendment is aimed, in part, at assessing whether future investment would be productive beyond the extension of Phase I.

b. Conclusion

The reasons for supporting IPM research, along with the slow, painstaking nature of any institution building process, suggest that Phase II support, at least, would be highly desirable to derive maximum benefit from AID and CILSS' investment in IPM. However, future funding by AID must depend on performance under the extended first phase. Assuming it is satisfactory, another design team should be fielded to write a Project Paper for Phase II. Phase III funding, similarly, would depend upon performance under the second phase.

PART II

PROJECT ANALYSES

A. Technical Analysis

1. Detailed Project Description

a. Duration and Scope

The creation of institutional capacity for IPM research Sahel-wide was originally foreseen as approximately a fifteen-year program. The AID-financed IPM Project was intended to be the first of a possible three 5-year phases to install such research capacity. The first phase falling short of its original objectives for reasons described previously, this Project Paper Amendment provides the basis for extending the IPM Project by an additional four years in order to achieve first-phase objectives.

The project consists of three major inter-related components:

- Research
- Demonstration and feedback
- Pest surveillance and forecasting, including economic loss assessments and economic threshold determination

The technical implementing agent is the FAO which has an accord with the CILSS to provide qualified technical experts for the participating countries and sub-regional activities, as well as a cadre of technical experts to provide advice and perform research at the regional level. The work of the CILSS and FAO technical advisors focuses on sedentary arthropod pests, weeds, and diseases attacking basic food crops in the field: sorghum, millet, cowpea, maize, peanuts, and rice. Testing and demonstrations related to rice will be undertaken in close collaboration with WARDA. For the control of other major pests of importance to agricultural production in the Sahel, proposals are put forward in other projects under the CILSS Crop and Post-Harvest Protection Program.

The project is Sahel-wide in scope, but will work mainly through national representatives and institutions in each of the countries. A Regional Project Directorate, which has been transferred to Ouagadougou, will be responsible to the CILSS Executive Secretary and a high-level tripartite Consultative Committee for effective technical and administrative supervision and coordination of project activities. AID Missions in participating countries will provide day-to-day implementation, monitoring, and support for the project in their respective countries.

b. Objectives

As described in the 1981 evaluation, crop protection measures presently being used are oriented essentially toward short term solutions. Particular emphasis is placed on the supply of pesticides and equipment for their application. Before the 1968-1973 drought period.

X
38

chemical control was rarely considered as a major means of protecting food crops. Some research efforts have been and are being undertaken to achieve a better knowledge of the biological and physical factors regulating the development of pest populations. This research is currently conducted by the national agricultural research organizations; and some limited, high priority research was begun under Regional Food Crop Protection (RFCP) (Annex A) while awaiting IPM research results which had been delayed under the IPM Project. Generally, large scale basic studies were not undertaken due to lack of funds, competent personnel, equipment, or well coordinated programs at either the national or regional level. Broadly stated, this project proposes to improve this situation by increasing knowledge of the major pests in food crops and their economic importance, and using this knowledge to develop better crop protection methods for farmers.

Toward this end, the first phase of the IPM Project has as its objectives to:

- Establish a research capability in the Sahel for the study of the biology and ecology of the major pests, including natural mortality factors which affect them and the relative importance of parasites and predators. Integrated pest control techniques will be developed for use in national plant protection programs. These techniques suitable for differing national ecological and other conditions will represent the most effective and appropriate control methods under prevailing ecological and economic conditions.

- Establish a network of experimentation/demonstration areas in each of the Sahelian countries to study and demonstrate integrated pest management systems, obtain farmer input to the research program, and assist in the introduction of IPM techniques at the farmer level.

- Provide IPM research results in packages suitable for adaptation and extension under RFCP (Annex A) and Information Dissemination (Annex G-1) components of the CILSS Crop and Post-Harvest Protection Program.

- Develop a methodology for, and initiate in each of the countries, the establishment of a surveillance and forecasting system providing current information on the occurrence of major pests.

- Organize in each country the capability to evaluate the relative economic importance of these pests through crop loss assessment experiments, and to determine the economic damage thresholds for each species in order to guide the optimum application of control measures.

Phase I technical objectives have changed in only one respect from the original design. Involvement in pest management extension is

limited to providing research results to crop protection services for extension to farmers through appropriate national extension agencies and conducting periodic follow-up to assess effectiveness.

For the attainment of project objectives, certain practical criteria have guided the development of the implementation plan:

- The program is a regional effort; however, the basic principle is the strengthening of national institutions and capabilities within a well-coordinated effort in the development of IPM technology and methodologies.

- Activities to be undertaken must be compatible with existing national crop protection programs and research and extension facilities. Type and level of activity will vary according to numerous factors, resulting in variations from country to country. No single "model" research activity can be proposed, because of these variations.

- The pest management program should have close links with other crop protection and improvement projects. Where facilities and staff of other projects are not within convenient distance from each other (as is often the case), steps must be taken to provide opportunities for working contacts.

c. Research

To establish a Phase I regionally-coordinated, ongoing integrated pest management research effort in the CILSS member countries, national pest management research programs are being given infrastructural and training support. Laboratories and observation posts are being built and equipped, and vehicles and budget provided for field work. FAO advisors are helping national scientists conduct appropriate research programs and providing on-the-job training for their Sahelian counterparts. FAO experts and national counterparts are expected to collaborate closely at all times. Overseas scholarships will be provided to bring counterparts up to the M.S. level, so that the expatriate advisors can gradually be replaced.

Laboratories will be located in areas representative of differing ecological zones. Complementary research programs will be put into operation at each of the stations which, taken as a whole, will address the full range of pest problems which the project seeks to encompass as they appear in varying ecological circumstances. Expatriate research teams are proposed for each of these laboratories in function of the current or planned presence of other research workers in the participating countries.

In order to make sure that the research will produce results that are practical and compatible with real small farm circumstances, special emphasis will be placed on the evaluation and improvement of traditional pest control methods, and on farmers' field research in traditional

X
40

cropping systems. The tendency to avoid experimentation in intercrops will be resisted.

Care will be taken to avoid duplication of effort between the IPM Project and the AID-financed West African Rice Development Agency (WARDA) IPM program on rice. To this end, certain facilities were deleted from the original IPM Project budget. For instance, a rice entomology/weed science laboratory at Richard Toll, Senegal, has been cancelled because WARDA has such a laboratory there already.

By the end of Phase I, the project will have provided the foundation of a comprehensive integrated pest management research capability in the Sahel. The participating institutions will have begun to develop a body of locally relevant research results in support of plant protection programs.

(1) Principal Avenues of Research

Specific work plans for each country are presented as Annex C to this PP Amendment. There follows a detailed description of the kinds of investigations and other activities to be carried out under the project.

(a) Crop Loss Assessment. A major problem in formulating a plant protection policy for food crops in the Sahel is the lack of information regarding the distribution of pests and the corresponding economic losses they inflict. The development of pest/disease surveillance systems, including estimation of losses, is a basic prerequisite to the development of any plant protection program. During the course of such a program, economic thresholds can be determined and a data base accumulated to identify and quantify pest and disease development patterns in the area.

Crop loss assessment is the highest priority topic for Phase I research in the IPM Project. Simply stated, it is the determination of the relationship between various population levels of a pest or pest complex in the field and the yield loss caused by each level. This data allows researchers to distinguish between genuine pests, i.e., those that cause significant economic damage, and nonpests, which may appear to do significant damage, but which in reality have little impact on final yield.

The assignment of individual damage levels and potential to each pest attacking a given crop leads to the final step in considering the array of pests that confront the farmer. This is to rank the common species in their order of importance. This may be only to single out the most important for more intensive research. (The long-range goal of a fifteen year IPM program would be to design a system which controls all major pests in an ecosystem). Ranking pests is important, because it establishes the priorities for research. Also, it is by this means that the interrelationship of the status of one pest with that of others can be determined.

Two FAO Crop Loss Assessment experts have been recruited, one in Senegal and one in Niger. The methodology developed in these two countries will be employed, with necessary modifications, in other Sahelian countries. This will be facilitated by the placement of an integrated pest management expert in each of the other countries who will be responsible for implementing surveillance systems and crop loss experiments.

A two-thrust system will be developed consisting of an experimental and a survey phase. In the experimental phase, a network of field experiments in farmers' fields will be conducted to estimate the current constraints to production associated with pests, weeds, and diseases of the major food crops. The network can also be used to establish the potential constraints on new varieties. For example, pre-release varieties of sorghum and millet from ICRISAT and the Texas A&M/AID Sorghum Project will be planted alongside traditional varieties to assess the current and potential production constraints. A comprehensive set of data will be generated for each experiment to characterize the pest, weed, and disease status through the growth of the crop. After two to three years, there should be sufficient experimental data accumulated to allow the relationships between different pests/pathogen levels and production to be characterized, and economic thresholds established.

Wide-area yield losses caused by pests can be calculated by surveying pest population levels in the field and projecting the losses that the observed populations are known to cause. The limited number of experiments in the network will not allow detailed conclusions to be drawn regarding the importance of pests, weeds, and diseases on a national or regional basis. Therefore, the experimental data will be supplemented by a survey. IPM Project observers working out of the regional network of project observation posts, and perhaps assisted by crop protection service or extension personnel, will survey a large number of representative fields where the incidence or severity of pests, weeds, and diseases will be assessed at appropriate times throughout the season, utilizing the same assessment methods used in experiments, so that the data are compatible. With the aid of yield determinations from the network of experiments, the survey data can then be interpreted to assess the importance of crop losses occurring widely in farmers' fields. Survey data can also be extremely useful to identify variations in pest populations from year to year, between regions, or differences due to crop variety, cultural practices, etc.

During the survey phase, researchers can perfect simple and accurate sampling and pest/disease assessment methods for use in surveillance systems, which can then be implemented in other countries. This will allow a pest/disease data base to be developed for the whole of the Sahel, utilizing standardized assessment methods.

For the first time, starting in 1986 for the Phase I priority pests and for an ever-increasing proportion of major pests, accurate yield loss statistics will be available on a national and regional basis.

CILSS and the national governments will be able to make informed economic decisions on crop protection policy: the amount of resources that can justifiably be devoted to crop protection programs, and which programs should receive the highest priority. In addition, if farmers' crop protection costs are subsidized in order to boost overall national production, crop loss assessment information combined with a knowledge of the cost of various levels of pest control will enable governments to adjust the subsidies according to the results desired.

(b) Economic Thresholds. An economic threshold is the level at which crop damage is more costly than control measures, and hence the level of pest infestation at which it is desirable to apply deliberate protection measures. The determination of these thresholds is prerequisite to the development of any system of pest management for two main reasons. First, one must know the level of pest populations below which damage may be tolerable. This defines the ultimate objective of the control system. Second, one must know the level above which control measures must be applied to avert significant injury or an outbreak of the pest organism.

There have been few analyses of the economics of crop production relative to pest problems for any region, and none in the Sahel countries. Principles have rarely been developed or limits clearly defined. Consequently, it is not unusual for more to be spent to control a pest than the value of increased yield produced by the treatment. Even worse, as mentioned earlier, the application of a pesticide to destroy a major pest may well upset the ecological balance to such an extent that new (originally minor) pests are created, which in turn require still more money to control. This strains boundaries of even the most liberal margin of profit. These types of interactions can only be clearly exposed by a detailed analysis of the economics of crop production in relation to pest control.

On the basis of available fragmentary evidence, it may be concluded that economic threshold levels are almost invariably higher than one would expect. Too frequently, the visual threshold, i.e., the population level at which individuals of the pest species are obvious, is taken to be synonymous with the economic threshold. However, the assumption that if a pest feeds on a plant it is causing economic injury, is not always true.

Ideally, it would be desirable to have biological control systems that are so effective and self-perpetuating that the necessity for action is avoided. Most systems, however, will probably require periodic action. Hence the determination of the economic threshold is of great and continuing importance.

To determine thresholds, a clear understanding of crop production economics is vital. The margin of profit on which the farmer is operating must be determined so that the amount of yield he or she can afford to lose to pest damage can be assessed. It must be determined how much the farmer can afford to pay for protection compared with this

level of loss. For example, if a grower can afford to lose X hundreds of dollars per acre to pests and still turn a reasonable profit, the same grower can afford to pay up to, but not exceeding, X hundreds of dollars for protection for the crop. If the crop can be protected for less than this amount, the difference will be added to profit. This knowledge defines the problems for the scientist and sets the limits on the cost and value of the management system that may be profitably implemented.

Such calculations do not apply at the Sahelian small farm level when farmers are given pesticides gratis, or the Crop Protection Service sprays for free upon request. However, the Crop Protection Services should use thresholds to avoid squandering scarce government funds on uneconomic pesticide applications. When pesticides for food crops cease to be completely subsidized, farmers will be motivated to use thresholds as well.

By 1986, provisional economic thresholds should be established for all seven regional priority pests. This should be done conservatively, based on the results of the project's field experiments and the accumulated experience and judgment of the researchers. These thresholds should be continuously refined and adjusted after 1986, but in the meantime they can begin serving as guidelines for field surveillance and pesticide application. The Sahelian crop protection services badly need reasonable methods for deciding when to spray, and this information must be provided as soon as possible.

IPM is very location-specific. Although the broad principles of an IPM system will very probably apply throughout the region, these must be adapted in detail to each of the varying conditions in each of the countries. Thus, crop loss assessment experiments must be replicated throughout the project zone, and economic thresholds can only be determined by taking local economic conditions into account.

(c) The Role of Socioeconomists in IPM Research and Implementation. The services of the socioeconomist are necessary under the project in order to assess the appropriateness of all crop protection measures, including thresholds. Farm level socioeconomic and environmental conditions are dynamic, and threshold levels and other crop protection decisions have to change accordingly. Without good work at this level, IPM remains "theory" instead of "practice".

The problem must be approached in a global manner. IPM is only one part of the total agricultural production system. Any new production or plant protection technique must be suitable for immediate integration into the system, or farmers will not accept it.

Farmer perceptions and priorities must be surveyed, and researchers should use this information to guide their research and in choosing the pest control methods they ultimately propose. For example, what are farmers' perceptions of high-yielding or otherwise improved varieties? Biological control? Proposed village-level organizational and training

X
44

efforts? What are their economic constraints and production priorities? How will these constraints and priorities vary according to whether the producer(s) are men or women? These factors will affect the acceptability and ultimate utilization of proposed methods. Work forms for planning IPM Project experiments require that an economic analysis be done each time a crop protection method is tested. The project socioeconomist should help with planning these analyses.

On the local level, socioeconomists must work with the project researchers, observers, and crop protection service and extension agents to develop crop production budgets that include crop protection. This requires monitoring of labor costs, insecticide costs, land value in terms of possible alternate use patterns, farm gate prices for crops, interest rates, etc. This must ultimately be done locally on an ongoing basis by national cadre, in order to evaluate and adjust the totality of extension recommendations.

Economic thresholds cannot be set without this information. They will naturally vary from place to place, and even from time to time (in areas such as river basins where agriculture is changing from traditional to irrigated patterns). Once crop loss assessment methods provide information on local yield loss associated with various levels of pest infestation, the cost of control will determine the level at which the pests can be controlled economically. Mechanical, biological, or chemical control methods are applied when pest population will exceed this "threshold" level.

(d) Sampling Methods. The development of accurate, appropriate sampling methods, both for IPM research and for field surveillance, is crucial. It is also often ignored in research programs; however, the IPM Project technical cadre will make sure that it receives adequate attention.

Sampling methods used in field experiments can be rather sophisticated and time-consuming. For example, samples are often brought back to the laboratory and counted under a microscope. Complicated methods may be necessary and are acceptable if technicians are available to handle the workload. However, the project researchers should standardize and simplify their methods as far as possible, to save time and effort and so that experimental results can be compared directly between national programs. If possible, indiscriminate sampling that involves a lot of sorting and counting--light traps, for instance--should be replaced by more direct and specific methods, such as field observation or pheromone* traps.

Experiments must be carried out in order to verify the accuracy of sampling methods chosen. How large must samples be in order to give statistically significant data? Which of several alternative methods estimates field populations most accurately? Not only the sample size,

*Chemically baited insect traps using sex-attracting scents.

but where, when, and how the samples are taken must be justified. Sampling methods chosen arbitrarily may turn out to be worthless.

An extremely important output of this project will be development of quick practical, simple methods for use in field surveillance by farmers and field technicians. Without such methods, IPM cannot practically be implemented on a Sahel-wide scale. Sequential sampling plans are very helpful because no time is wasted in taking unnecessary observations. Project working groups that are researching IPM systems for major pests must make appropriate field surveillance (sampling) methods a top priority.

(e) Biology and Ecology of Pests and Their Natural Enemies. Once the economic status of the pests in an ecosystem has been determined, their biology and ecology and that of their natural enemies is to be studied. It is very important to determine the impact of natural enemies upon the pests. These studies have two purposes: manipulation and prediction.

Both nonchemical and chemical pest control methods are designed to affect pests at vulnerable stages in their life cycle. For instance, certain life stages of pests may escape effective parasitism, and parasites that will attack those stages can be imported and established; crop-free periods can deprive pests of food and thereby reduce the number of generations per year; chemical applications against Rhaguva (millet head borer) must be applied before the larvae become large and difficult to reach and kill. A good knowledge of pest biology and behavior can help make pesticide applications more specific and minimize the quantities applied.

It is necessary to be able to predict pest and natural enemy population trends so that control measures are taken only when required to dampen potential outbreaks. Surveillance must be predictive. Sampling must be done at a time when the pest can still be prevented from reaching damaging population levels. Treatments are applied only if samples show that the pest population is likely to exceed the economic threshold in spite of natural enemy activity. When natural enemies are present, active, and multiplying rapidly, the economic threshold should be adjusted upward.

(f) Nonchemical Control Methods. Nonchemical control methods are most appropriate for the Sahel from economic, public health, and environmental points of view. Unfortunately, they have largely been ignored in Sahelian crop protection research programs because virtually nothing was available by way of proven alternatives in adapted, extendable form. The IPM Project will emphasize them and make maximum use of nonchemical control in the crop protection methods it proposes.

Environmental manipulation through changes in cropping practices, use of pest-resistant crop varieties, introduction of predators and parasites, etc., are basic to the establishment of integrated systems. One must be able to determine the factors in a crop ecosystem that

X
46

affect pest numbers, or that have the potential to do so. Those with the greatest utility should be selected to manipulate the ecosystem as a whole, so that their regulatory effect will be maximized. Modifying time of planting, for example, is promising for control of sorghum midge and several other pests; smuts can be controlled by soaking the seed in water; stalk destruction reduces carry-over of the stem borer species so damaging and common to millet, sorghum, maize, and other crops. Crop rotation may determine to a large extent the composition of weed populations. When this has been done (when the most value is being obtained from natural factors of the ecosystem), one may find that the pest populations involved are reduced to tolerable levels without further action on the part of the farmer. Pest control measures should be taken only when these preventative measures fail to keep pest populations below the threshold level.

(g) Pesticides Research. Three categories of pesticide-oriented research contribute directly to the goals of the IPM Project: crop loss assessment/economic threshold determination, environmental studies, and enhancing the specificity of pesticide application. The first two topics are discussed elsewhere in this section.

Pesticide specificity depends on what is applied, and how it is applied. Perhaps the most important topic of pesticide specificity research is determination of the impact of various pesticides on key natural enemies. This is done in the laboratory or with cage experiments in the field.

Pesticides that have little impact on natural enemies should be preferred. "Biological" pesticides such as hormones, growth regulators, and microbial pesticides should be investigated thoroughly. *Bacillus thuringiensis* and similar microbial sprays are very specific.

Dosages can be adjusted in order to minimize natural enemy mortality. Pesticide applications can be timed and placed so that natural enemies do not encounter the chemical. They can be applied as baits, which will attract the pests but not other organisms, or at a time of day when natural enemies are inactive, or just to the part of the plant where pests occur. All efforts should be made to minimize the area covered and the amount of pesticide used, and to spare non-target organisms.

Two types of pesticide experiment are not appropriate for IPM Project research. These are traditional comparative pesticide trials, and any experiment in support of systematic pesticide application, i.e., applications timed according to the calendar or the stage of the crop. These are the types of experiment which many Sahelian crop protection programs have, heretofore, emphasized. Under the IPM Project, FAO experts advise national researchers (when necessary), and help train Sahelian counterparts to change to an emphasis on testing pesticide specificity and determining optimum timing and conditions for application.

Pesticide trials to test impact on pests are useful, but this topic is already comparatively well-researched in the Sahel. Most national research programs have already identified effective pesticides for major pests of food crops. Unfortunately, crop protection services do not know when and how to apply them for optimal results. The IPM Project must provide this information. In view of the number of IPM topics to be researched in order to attain project goals, and the limited personnel and resources of the project, traditional pesticide trials are not an optimum use of project resources. To the extent that more such trials are needed, they will be carried out by the national crop protection services, possibly with the assistance of national or expatriate researchers who do not work for the IPM Project.

One of the specific goals of the IPM Project, however, is to provide alternatives to "blind" pesticide application; i.e., applications according to the calendar or the stage of the crop, regardless of what is happening in the field. Blind application would be replaced with surveillance and the use of thresholds to determine when pesticide application is worthwhile. Thus, experiments to determine "correct timing" of applications by applying pesticides at various stages of crop growth, in order to see which applications prevent the most yield loss, are not appropriate under IPM. In fact, they are probably counterproductive because time and resources are spent researching an approach that should be abandoned. To give a specific example, a well-known recommendation to spray cowpea weekly starting at flowering should be replaced by surveillance systems for the major cowpea pests, and treatments applied only when these pests exceed threshold levels. In the short term, for some crops, blind pesticide applications may be the most practical approach available. This is another topic to be covered by the crop protection services, while the IPM Project is developing more appropriate and economical crop protection methods for the medium and long term.

(h) Plant Pathology and Potential for Pest Management. The basic concepts of pest management for plant pathology are the same as those for entomology. Major diseases and most minor diseases of the basic food crops in the Sahel have been identified. About 30 diseases have been described on sorghum and millet. On millet, downy mildew is the disease of prime importance. The most important on sorghum (and less on millet) appears to be smuts.

Other diseases have caused important damage in localized areas or on certain varieties. On cowpea, virus diseases and leaf spots can result in substantial economic losses. There seems to be a rather delicate balance between the ability of the pathogens to cause damage. Changes in varieties or cultural practices are likely to upset the balance for some of the minor diseases so that they will become important. For example, grain molds and head molds are of major importance on early maturing varieties being introduced by breeders; but these diseases are of little importance on traditional varieties. The addition of nitrogen fertilizer greatly increases the level of susceptibility to certain diseases, e.g., rusts on millet. The rusts will

X
48

become important if farmers begin fertilizing their fields. Assessment of losses caused by diseases is needed as a basis for deciding how much effort to place on the control of various diseases and on evaluating benefits from disease control. There seems to be little doubt, however, that smuts are causing important losses, and the most rapid results could be obtained by a concentrated program to control smuts. Chemical seed treatments are available, but a non-chemical method should also be tried. Before fungicides were used for this purpose, cereal smuts were generally controlled by soaking the seed in water. In areas of the Sahel where mean temperatures are 25 degrees C or above, smuts and many other seed-borne fungi could be controlled by soaking the seed in water for about 24 hours. At lower mean temperatures longer soaking periods may be required. This is an excellent example of the useful application of a non-chemical pest management measure which requires no extra expense. Since some smuts may be soil-borne as well as seed-borne, seed treatments may need to be integrated with other control measures such as crop rotation and the use of more resistant varieties.

Breeding programs have been under way for some years to develop sorghum and millet varieties that are resistant to downy mildew. Indications are that different races of the downy mildew fungus exist and that the cereal varieties with a high degree of resistance probably have vertical, or specific, genes for resistance. This type of resistance is usually not very stable. Therefore, an effort should be made to maintain as high a degree of horizontal, or non-specific, resistance as possible in the new varieties. Basic studies on the epidemiology of the disease and the biology of the causal organism are needed to see if other control measures might be employed to help reduce losses from this disease.

For the other diseases of food crops in the Sahel, the main objective should be to keep them from becoming important when changes are made in varieties or cultural practices. Thus, plant pathologists should work in close cooperation with plant breeders and agronomists to evaluate the changes resulting from the introduction of new varieties or cultural practices.

Very little is known about the damage caused by diseases of cowpea in the Sahel. Work in northern Nigeria indicated that two virus diseases may be of sufficient importance to warrant control measures. Short-term consulting funds are available under the project to hire a plant pathologist with background in plant virology to do practical work with virus diseases of plants and coordinate with the research done along these lines at IITA.

(i) Management of Weeds. Weeds generally constitute a problem at the beginning of the growing season. The labor needed for weeding at that period interferes with a great deal of other agricultural and domestic activity. This results in a delay of weed control and a consequent impact on crop yield. Well-adapted and simple methods of weed management will be researched with the expectation that, once extended, they will have a considerable impact on the improvement of agricultural production at the small farm level.

Striga, the major weed problem, offers another good target for a successful pest management system. Chemical control is not a realistic approach because of the present economic condition of the small farmer. A combination of approaches will be tried, of which varietal resistance and breaking of Striga seed dormancy seem the most promising. Possibilities for biological control also will be looked into, as this would undoubtedly be the least-cost method best adapted to Sahelian conditions.

For Striga, as well as for early season weeds, considerable attention will be given to the impact of certain crop rotations. However, implementation of these measures can only be achieved if they do not diverge too far from traditional practices. Possibilities for increased use of animal power would allow for the study of equipment for mechanical weeding. The feasibility of these options will be examined under the project, drawing heavily on other agricultural research efforts on these topics.

(2) Research Activities to Date

Where IPM experts have been stationed, they investigated the pest management literature and prepared a bibliographical report containing results and progress to date in their respective countries. This is to serve as a basis for future research, and prevent duplication of work previously done. Also included in these reports are a summary of pest management activities and organizations in each country.

Wide-scale inventories of pest and natural enemy species and their population levels on food crops have been prepared, and reference collections made for use by researchers and observers.

In Mauritania and Senegal, field research has been carried out for two cropping seasons, and good progress has been made toward determining the economic importance of various pest species, as well as with work on methods of control. Research programs have also begun in Upper Volta and Mali, with emphasis on varietal resistance. No researchers had been posted to Niger until very recently. National counterparts there have continued their previous program.

GTZ activities in Cape Verde, which receive infrastructural and staffing support from the IPM Project, continue to achieve significant success in pest control for vegetable crops and corn. Emphasis is placed on biological control and the complementary use of microbial pesticides.

Project research activities have been documented in the following reports:

- Summaries of work on Crop Protection have been prepared for Senegal, Mauritania, Mali, and Upper Volta.

X
50

- National IPM Components in Senegal, Mali, and Mauritania prepared reports on the 1981 Agricultural Campaign.

- National IPM Components in Mali, Niger, Mauritania, Senegal, and Upper Volta prepared reports on the 1982 Agricultural Campaign.

- Observation Notebooks have been prepared on Entomology, Plant Pathology, and Weed Science.

- Impact on the Environment of the Sahel Region of Integrated Management against Pests of Principal Crops, I.W. Everts, A.C. Van Edsen, Y.O. Doumbia, and J.H. Koeman.

- Brief Account of Biological Controls Against Pests of Crops and Agricultural Products, G. Pierrard, Dakar Seminar, February 1981.

- "New record of chafer beetle (Rhinypta infuscata) as a pest of sorghum and pearl millet in Senegal", R. Gahukar et G. Pierrard. FAO Plant Protection Bull. (in press).

- "A selected bibliography of insect pests of sorghum and pearl millet and their natural enemies in Africa", R. Gahukar (in press).

- "Current status of entomological studies on cassava in Senegal", V. Bhatnagar, M. Ndoye, and G. Pierrard, Workshop ITTA Ibadan (Nigeria), December 1982.

- "Management and Control of Inspect Pests of Stored Grain Legumes", G. Pierrard, Workshop, Goiana (Brazil), April 1983.

- "Conservation and augmentation of natural enemies in grain legume crops", V. Bhatnagar, Workshop, Goiana (Brazil), April 1983.

- Report of Annual Conference of Technical Working Groups, Bamako, March 1983.

(3) Research Organization and Technical Goals

The CILSS Crop and Post Harvest Protection Program was created in response to the alimentary crisis precipitated by the drought (which still persists). The IPM Project is to find solutions as soon as possible for the need to protect crops from pests, while minimizing expense and pesticide use. All three parties to the project, CILSS, FAO, and USAID, expect concrete, practical results within as short a period as possible as return on their investment of personnel and resources.

Thus, while the parties continue to support the principle of establishing over the long term a Sahelian institutional capacity for on-

going IPM research, the mere existence of an IPM research program is not sufficient. The emphasis under AID-funded Phase I of IPM is applied research expected to produce practical and very specific results within the space of a few years.

To achieve project objectives, the research must be efficient and well-organized. With these necessities in mind, the choice of regional priority research topics and the inauguration of regional technical working groups have been undertaken to improve the effectiveness of the research program.

(a) Regional Priority Topics. An IPM Project Technical/Redesign Conference was held December 10-14, 1982 at Dakar. Representatives from each national program and the AID, and Canadian and German-financed CILSS Program Annex A projects (which also do limited applied crop protection research) chose priority research topics that will be the focus of a concerted, well-coordinated Phase I regional effort. These priorities do not apply to Cape Verde, whose basic food crops are different (corn and vegetables).

Project staff are full-time IPM researchers, accountable through reports and evaluations to the FAO, AID, and CILSS for 100% of their time. Each national contingent (FAO experts and national counterparts) agreed to spend at least 50% of its time researching one or more of the regional priority topics and the other 50% on IPM research in control of other important national pests (not necessarily regional priorities). Thus, a balance is struck between the broader spectrum of national research priorities and a concerted, in-depth regional program designed to streamline the research effort and produce useful results as quickly as possible.

The criteria used to choose regional priority topics were the following:

- Regional importance
- Substantial work on the topic underway already
- Economic importance
- Probability of achieving useful results
- Level of control desired
- Availability of expertise
- Adequacy of facilities
- Possibilities of cooperation with other research programs

During discussions, it became obvious that a score of insect pests, many diseases, and several weed problems would make good topics for regionally coordinated research. They will be considered for future emphasis under the IPM Project.

An important special case is the problem of grasshoppers, accepted at the Dakar conference as the most serious regional pest of food crops. AID's Regional Food Crop Protection Project has begun a substantial program investigating microbial control of grasshoppers. The GTZ funded

X
52

project in Niger has made grasshopper research one of its top priorities. Grasshoppers are a main theme of the Senegal River Basin subregional IPM component's research program. Finally, the GERDAT predictive model is ready for adaptation and application regionwide and once functioning, will clarify the role of various potential control measures in a grasshopper IPM scheme. The consensus of the Dakar meeting was to wait until the results of the ongoing work were available as the basis for more comprehensive planning on grasshoppers.

Selections for Phase I IPM Project regional priority were two pests, four diseases, and one weed:

- Insect pests:
  - Rhaguva albipunctella, the millet-head miner (la mineuse de la chandelle du mil)
  - Contarinia sorghicola, the sorghum midge (la cecidomyie du sorgho)

- Diseases:
  - Sclerospora graminicola on millet, downy mildew (mildou)
  - Tolyposporium spp. and Sphacelotheca sorghi on millet and sorghum, smuts (charbons)
  - Pyricularia oryzae on rice, blast (pyriculariose)
  - Xanthomonas oryzae on rice, bacterial blight (bacteriose)

- Weeds:
  - Striga hermonthica attacking millet and sorghum
  - S. gesnerioides attacking cowpea

These topics accurately reflect the regional priorities in the view of the assembled national research teams. These regional priorities can be changed according to perceived need and the flexibility of a global IPM approach; however, any changes must safeguard the regional coherence of the program.

(b) Technical Goals. The conference adopted a Phase I technical goal of developing promising IPM systems for each of the priority pests. Among the topics discussed were crop loss assessment methods (including accurate, practical sampling techniques for use in crop loss assessment surveys and surveillance), provisional economic thresholds, and economically sound pest management methods for use by farmers that maximize non-chemical control. These promising systems will be field-tested on project research plots during the 1986 cropping season. Once they are validated and further refined on project experimental plots in each country they will be fed into the national multilocal trial networks for further testing and adaptation to specific local conditions.

Research will continue on these regional topics during subsequent phases of the project, in order to improve the IPM systems and change them in response to changing agricultural conditions. However, as progress is made and initial IPM systems are developed for Phase I priority pests, new regional priority topics will be chosen for con-

certed effort in Phases II and III. The final long-term goal is IPM systems that control all major pests of the important Sahelian food crops.

(c) Working Groups. An IPM Project researchers meeting will be held annually between January and March (began February 28-March 5, 1983) to review results to date and plan field experiments to be conducted during the next immediate cropping season. All project researchers--FAO experts and national counterparts--will be present; the Regional Directorate budget contains funds for this purpose. Collaborators from other regional and international crop protection programs, applied researchers from the CILSS Program Annex A projects, and appropriate outside consultants will be invited to attend (but not financed).

The participation of scientists from other research projects in IPM Project working groups should ensure liaison and cooperation between the various programs. The annual working group meeting will thus secure the first genuine regional coordination of crop protection research--a long sought-after goal.

Each annual conference will maximize the effectiveness of the research program by assuring that:

- Problems and observations receive a regional analysis
- Crop protection information and experimental results are disseminated widely within the project and between crop protection projects across the Sahel
- The opportunity for discussion stimulates initiative and new approaches on the part of the researchers
- Duplication of effort is avoided
- All important aspects of priority topics are addressed
- Planned research contributes to the IPM Project goals
- The workload is distributed among national contingents as appropriate
- Researchers understand their roles and responsibilities as well as the overall research program
- Coordination and cooperation prevails with Annex A applied research programs and other appropriate researchers
- Key experiments are replicated regionally
- Experimental design and methods (including sampling) are standardized as appropriate to achieve comparability of results produced within the different national programs

X
54

- Advantage is taken of comments and suggestions from the more experienced national researchers, FAO experts, and the CILSS/FAO regional technical team

- Observation data forms used in the observation post network are standardized and updated as necessary

- Agroclimatological and field observers' data are related

In order to achieve the desired organization of research, the participants will form working groups according to regional priority topics and to expertise. Procedures suggested below are illustrative and subject to change consistent with changes in project activities, or as deemed advisable by the IPM Regional Directorate.

Working groups by topic. For the first two or three days of the meeting, researchers will divide into five working groups according to priority research topic:

1. Rhaguva (Entomologists)

2. Contarinia sorghicola (Entomologists)

3. Sclerospora graminicola (Plant pathologists)
   Tolyposporium spp. (Plant pathologists)
   Sphacelotheca sorghi (Plant pathologists)

4. Pyricularia oryzae (Plant pathologists)
   Xanthomonas oryzae (Plant pathologists)

5. Striga (Weed scientists)

These groups will review progress and plan and apportion future research accordingly. Researchers will submit proposed experiments on a standardized form to assure ease of comparison. Researchers must be aware of their individual roles and specific responsibilities vis-a-vis the total program.

Key experiments will be identified and standardized for regional replication to promote rapid experimental progress and the collection of information on regional variability. Such replication will help insure that drought or other adverse local conditions do not block progress on major aspects of the research program.

Each working group will have a coordinator and a secretary. The coordinator will direct group meetings and assure that all important aspects of priority topics are covered, tasks are distributed appropriately, duplication of effort is avoided, and experiments are consistent with project goals. The secretary will record group discussions and decisions.

Each working group, under the direction of the coordinator, will be responsible for the production of an IPM manual to be available at the end of Phase I in 1986. The manuals must describe the IPM systems developed for priority pests with supporting experimental data.

Note: Although formal working groups are suggested only for the regional priority topics, it is hoped that researchers from the national IPM contingents and other projects will take advantage of the conference to collaborate on other topics of mutual interest: grasshoppers, Acigona (stem borer), ergots, weed pests of irrigated rice, and others.

Functional working groups. Participants should assemble on the fourth and fifth days in groups reflecting their areas of expertise in the overall IPM program:

- Modification of cropping systems for better pest management (suggested participants: weed scientists, agronomists; also IPM experts, plant pathologists, entomologists, and consultants as appropriate)

- Biological control (suggested participants: biological control experts; also IPM experts, entomologists, weed scientists, and consultants as appropriate; GTZ, CIBC)

- Varietal resistance (suggested participants: plant pathologists, entomologists; also agronomists, weed scientists, and consultants as appropriate; ICRISAT, IITA, SAFGRAD, CIMMYT)

- Crop loss assessment/economic thresholds/surveillance and forecasting/pesticide specificity/environmental monitoring (suggested participants: crop loss assessment experts, IPM experts, bioclimatologist, socioeconomists, selected observers; also entomologists, plant pathologists, agronomists, weed scientists, and consultants as appropriate; AGRHYMET)

These groups provide for peer review of planned experiments by fellow experts in the appropriate specialty fields and by the CILSS/FAO regional technical team. For example, the regional crop loss assessment experts can review planned crop loss assessment experiments for all the regional priority pests and give their comments and suggestions. Experimental designs and methods can be adjusted accordingly. The regional socioeconomist must assure that plans for economic evaluation of experimental pest control methods are complete and appropriate. At this juncture, the skills and experience of the FAO experts and the entire CILSS/FAO regional technical team must be brought to bear. Experimental plans will not be considered final until this stage has been passed.

Functional working groups also have to arrange for regional replication of key experiments under the supervision of fellow researchers skilled in the specialty in question.

Working group on crop protection policy. Senior project staff will meet during the conference to formulate crop protection policy recommendations. Subjects such as crop protection subsidies, extension programs, activities of other Annexes of the CILSS Program, and better coordination between relevant organizations, are examples of this group's focus. The recommendations of this group will be reported to the CILSS Executive Secretary for consideration for the agenda of meetings of the Council of Ministers.

Conference final summary. Each conference will critique its own course of events as preparation for the next annual session. Recommendations will be made for changes in working groups, for new topics of discussion or research, and for procedures to assure effective research management. The CILSS/FAO regional technical team must continually analyze the working group concept to guard against unnecessary duplication, while assuring the realization of well-founded research plans.

d. Surveillance and Forecasting

One of the main long-term objectives of the IPM Project is to develop a surveillance and forecasting system for major Sahelian food crop pests. This system will be responsible for advising farmers, transmitting pest infestation alerts, monitoring crop losses to pests, taking meteorological, crop phenological, and biological observations, and transmitting, storing, and analyzing the resulting data.

The observation post network (reseau), with its hub at the coordination center for data analysis and interpretation at AGRHYMET, Niamey, is the basis of the surveillance and forecasting system and the site of many other important project activities.

(1) Infrastructure

Most arable areas in the CILSS member countries are covered by the observation post network. Posts have been placed according to these criteria:

- Important agricultural areas
- AGRHYMET and/or Crop Protection Service posts at same location
- Other desirable infrastructure available
- Contrasting areas chosen, but these representative enough to eliminate unnecessary variability

Locations will no doubt change and/or grow in number as experience better defines the needs of the system.

Fifty-five observation posts will be established within the project areas during Phase I. The distribution: Mauritania-13, Senegal-4, The Gambia-6, Mali-11, Upper Volta-11, Niger-10. No posts will be con-

57

structed in Cape Verde, where crop protection service and agricultural agents stationed in key cropping areas will take the necessary observations.

The posts will be outfitted with standardized agro-meteorological equipment (the same as is used at AGRHYMET posts) and basic pest collection and observation gear. Although light traps and other sampling equipment are not now standardized, this will be done as soon as possible in order to facilitate comparison of data from throughout the region.

Appropriate vehicles are necessary for observers and for project staff who tour the network in their countries at frequent intervals. Mobylettes are used where observation posts are relatively accessible and road conditions permit. Very sandy areas or those with flooding or deep mud in the rainy season require four-wheel drive vehicles so that observation posts are reachable and observers can leave major roads and take data from representative farmers' fields. One boat will be purchased for use along the Senegal River by the Mauritanian contingent.

(2) Staffing

Each observation post will have a staff of two, consisting of an observer and an assistant. They will be trained sufficiently by national researchers and AGRHYMET staff in entomology, plant pathology, weed science, agronomy, and meteorology so that they can take the required observations and supervise field experiments in a competent manner. A high priority must be given to assuring the quality and reliability of the information gathered at this level.

Observers will also be responsible for demonstration, liaison with farmers, gathering of socioeconomic data and information on traditional pest control methods, crop loss assessment surveys, and participation in ecological monitoring programs.

Activities at observation posts will be directed and supervised by project researchers, who must visit each post at least twice a month to make sure that experiments are being conducted properly, and to deal with unexpected problems. This role is shared by the experts in surveillance (and experimentation), who have as additional duties:

- Assuring that observation forms are filled out correctly
- Advising on agronomic aspects of the research program, both at field level and in project working groups
- Calibration and repair of instruments at observation posts (special training is available from the national meteorological services)

In Phase I, only three positions are foreseen for surveillance (and experimentation) experts, all to be filled by Sahelian agronomists: one

X
56

each in Mali, Niger, and Upper Volta.* Because this is a key job involving major project activity, the remaining four (or five) countries will require a surveillance expert in place in Phase II and Phase III.

(3) Activities

Observation post activities include:

- Experimentation. Experiments should be done on representative farmers' fields in the areas around the observation posts.

- Demonstration/liaison with farmers and extension agents. This includes gathering of socio-economic data and information on traditional pest control methods.

- Data gathering, using regionally standardized observation forms. AGRHYMET has produced computerized forms for meteorological and crop phenological** observations. IPM Project researchers are to design standardized forms for taking observations on pest incidence and damage. These forms should be kept simple and practical, especially early in the program. Experience will show which sorts of observations are most useful, and how much data collecting can be handled capably by the staff at hand. Farmers' fields will be surveyed for pest population levels. When combined with crop loss assessment data, this information can be used to determine losses to pests in the areas covered. This and other information collected will be used to facilitate research, create and test predictive models of pest activity, and to monitor the appearance of new pest strains and the development of pest resistance to pesticides.

- Surveillance and intervention alerts. Samples taken during field surveys will show whether pest populations threaten to exceed the economic threshold level. If so, the observers will alert farmers, extension agents, and/or the Crop Protection Service so that pest control interventions can be made. If IPM's second phase and the AGRHYMET IPM computer capability find funding, predictive models will become available. These will be used to alert observers, field technicians, and farmers to the danger of damaging pest infestations at a given time and place. Intensive surveillance can then be arranged until the danger is past.

- Environmental monitoring activities

---

* These appointments must be negotiated by the Regional IPM Directorate with the countries concerned. Without these personnel, more expensive FAO positions would have to be restored to the budget.

**Phenology is the study of the relation between climate and periodic biological phenomena, e.g., bird migrations.

(4) The Role of LANDSAT

The IPM Regional Directorate will establish liaison with the LANDSAT Regional Center for Remote Sensing in Ouagadougou to relate satellite technology to the project. Satellite imagery may help identify and delineate areas of origin for large populations of pests, such as grasshoppers, and help predict and/or monitor vegetation changes, cropping patterns, disease outbreaks, and pest infestations.

(5) The Role of AGRHYMET

Data storage and analysis facilities at AGRHYMET will be used to store relevant region-wide surveillance and other data in a standardized way, so that these can be readily retrieved and critically analyzed. Much waste of effort will be avoided in this way, and it should be possible to extract hitherto unavailable information (pest forecasting models and regional and national crop loss reports, for example). The transmission network radiating from AGRHYMET will aid the flow of useful action information to farmers and crop protection services.

Long-term activities include:

- Collection, storage, analysis, and interpretation of meteorological, crop phenological, and biological observation data
- Transmission of immediate pest infestation alerts and longer-term pest activity forecasts to observation posts and extension/intervention programs
- Rainstorm alerts, so that intervention teams will not apply pesticides just before a storm
- Monitoring the occurrence and extent of new pest and disease biotypes and the development of pest resistance to pesticides
- Creation and testing of predictive models of the occurrence of major pests
- Preparation of crop loss assessment reports for each CILSS member country

These functions will be investigated in a feasibility study to be prepared with IPM project funds. If positive, the study will be presented to other donors for possible funding.

Two Sahelian post prediction models already exist and are ready to be tested and adapted for regionwide application:

- A GERDAT grasshopper model (Agronomie tropicale 37(2): 159)
- A Cercospora leaf spot model for peanuts, developed in The Gambia (Phytopathology 64: 385-388, March 1974)

Work can also begin on adapting European predictive models for pests that also occur in the Sahel.

e. Demonstration, Feedback, and Extension Liaison

(1) Experimentation/Demonstration/Feedback

While research is an essential element of an effective integrated pest management program, it is equally important that from the outset it be intimately associated with outreach efforts to strengthen the linkages between research, plant protection services, extension and other dissemination services, and the farmer. The project proposes to achieve this in part by using the experimental fields near observation posts for demonstration and extension liaison, as well. Activities based there will:

- Establish a dialogue with farmers for the correct assessment of their growing practices, including pest control, and draw upon their knowledge
- Provide the research effort with the inputs and contacts needed for its effective adaptation to practical requirements
- Assess economic and social constraints to the adoption of proposed practices
- Facilitate and evaluate the effectiveness of the flow of information from research to extension and back
- Assess the needs for plant protection training of extension staffs
- Conduct field trials for various ecological zones
- Serve as information collection stations for the research centers

The first-phase project will thereby establish a mechanism for carrying out farm level field trials, guiding the adaptation of research information to outreach needs and assuring a continuing feedback from the farmer/extension level. It will also test, or provide a model for, organizational and operational links between research and plant protection services which can be more generally applied in a second phase.

IPM researchers and observers will be responsible for assuring liaison with crop protection extension programs by means of: farmer surveys, demonstrations, assistance with training courses, and seminars for crop protection and agricultural personnel. These activities should be undertaken with the participation of the IPM Project's regional socioeconomist and national socioeconomic programs.

(2) Participation by Socioeconomists

During Phase I, one FAO socioeconomist will be based on Ouagadougou. This person and a Sahelian counterpart, with the help of consultants as needed, will plan, coordinate, and monitor farmer surveys and demonstration and perform socioeconomic evaluation of experimental IPM techniques. By socio-economic evaluation is meant, evaluation of the fit between new techniques and farmer practices, values, dietary preferences, labor demands, and economic needs, possibilities, and incentives.

Simple crop protection budgets should be compiled to test the economics of proposed crop protection measures, including the use of different economic thresholds. Thresholds must be continually adjusted for changes in farm-gate prices for food crops, labor costs, interest rates, pesticide prices, etc. The IPM Project Socioeconomist should help CILSS Program Annex A project technicians devise a program of ongoing monitoring of these factors by observers and extension personnel, so that the latter become able to assure the local profitability of the pest control advice they dispense.

Advice and participation should be sought from national or other international programs active in the individual CILSS member countries. This will assure a stronger socioeconomic component that is also better adapted to particular local circumstances. Examples of programs that might be approached include the ICRISAT socioeconomist/anthropologist team based at Kamboinse, Upper Volta, the Socioeconomic Section at the Sahel Institute, and the Department of Socioeconomy at the Center for Agrarian Studies, Cape Verde, and other Sahelian universities and technical schools.

(3) Extension Liaison with Annexes A and G1

AID's Annex A will partially finance CILSS Annex G1 and will be responsible for extension to farmers of the IPM techniques developed under this project. By "extension" is meant, not simply dissemination through extension agents, but through media, farmer training centers, cooperatives, and similar agencies. Annex A-supported Crop Protection Services will take advantage of the planned AGRHYMET-based pest forecasting system, when and if financed.

In general, under Phase I, IPM techniques will be developed through the experimentation/demonstration aspect on the IPM Project's experimental plots. Proven techniques will be passed to Annex A staff and national research and extension programs for testing and evaluation in multilocal trials. When the techniques have been tested and adjusted for local conditions, they should be included in the extension program and taught to farmers with the help of extension aids produced under Annex G1. Note that this unit will also receive and disseminate findings for extension resulting from research done under other Annexes, if and when funded.

In Cape Verde, Mauritania, Senegal, and The Gambia, Annex A is the USAID-funded Regional Food Crop Protection (RFCP) Project. It is expected that during RFCP's third and final phase, beginning in 1983, Extension/Training Officers in each country, working under the guidance of one or more Regional Training Officers, will supervise and facilitate the transfer of successful crop protection methods from IPM Project demonstration fields to the national pre-extension (prevulgarisation) testing network of multilocal trials. IPM Project staff should help train the technicians who will be responsible for these trials.

Under RFCP II, an IPM extension program was to be established in each country, working with the Crop Protection Service, agriculture agents, pilot farmers (paysans pilotes), and development project staff and using audiovisual extension aids produced under Annex G1. IPM Project researchers will give high priority to testing simple, extendable pest control methods that can be adopted quickly for use in the early stages of the RFCP program, Phase III.

In Mali, political problems appear to have prevented CIDA from funding Annex A-type activity. At present, multilocal trials are supervised by the Ministry of Research and proven pest control methods are extended by the Crop Protection Service through "train-the-trainer" programs for agricultural agents employed by development projects (operations de development). Without an Annex A program, the national IPM technicians will have to monitor the effective targeting of research results for extension.

In Upper Volta, Annex A support is funded by CIDA. The Crop Protection Service is responsible for all crop protection activities, including extension. CIDA's plans call for a 1983-88 Phase III, with a Canadian advisor based in Ouagadougou to supervise the extension program. Multilocal trials/demonstrations will be held on Office of Regional Development (ORD) plots, Centre de Formation des Jeunes Agriculteurs* fields, or farmers' fields. Crop protection methods to be tested and demonstrated will be determined jointly by the chefs d'unite, and the Canadian extension and technical advisors. IPM Project staff will pass tested methods on to them and help arrange for competent demonstration/evaluation. Successful techniques will be taught to farmers by extension agents (encadreurs), village group (groupements villageois) delegates, and CFJA masters (maitres), with the help of radio programs.

In Niger, Annex A is funded by CIDA and GTZ. GTZ has started crop protection extension to farmers in Phase III of its program (Phase IV is to begin in January, 1984). The IPM Project will provide tested pest control methods to the Institute National de Research Agronomique de Niger (INRAN) at the annual national research meeting, and INRAN will run multilocal trials. From that stage, a Niamey-based GTZ extension

*A Ministry of Rural Development department that operates special agricultural-oriented schools in large villages

63

expert, German volunteers, and their national counterparts will transmit crop protection methods to farmers through extension agents and farmer training centers with the help of handout sheets and radio and television programs.

f. CILSS/FAO Staffing

This project paper proposes the recruitment of 23 FAO experts in the areas of IPM, biological control, plant pathology, weed science, crop loss assessment, bioclimatology, and socioeconomics. These estimated needs were based on expert technical judgment, in consultation with project staff from each country, mainly during the Dakar technical meeting in December 1982. Changes in the recruitment plans contained in original FAO proposals were made according to current regional and national program priorities. The necessity for keying expatriate staff to research priorities and the difficulty in filling some posts were also considered in final redesign decisions.

The present status of staffing and recruitment appears in Table II-1. Notes on changes are made as follows:

(1) The posts of the experts in Surveillance will be filled by Sahelian host country agronomists, who should be quite capable of doing the required work. They can, in addition, contribute valuable agronomic expertise to the Mali, Niger, and Upper Volta programs and through the working groups to other national components. They should be trained by IPM advisors (FAO) in their respective countries and be pledged by their national services to continuing IPM should Phase II of the project not eventuate.

(2) The Regional Training/Liaison Officer's post was deleted because:

(a) Technicians and observers are trained by national components staff (national researchers and FAO experts) and AGRHYMET personnel.

(b) Annex A advisors will train extension personnel on pest control topics, aided by IPM staff.

(c) Annex G-I will be partially funded under AID's Annex A activities and will disseminate the IPM results acquired to agricultural schools, rural agents, and farmers.

(d) The administrative assistant will assist the project director on matters related to training within the project.

(3) Expert posts were deleted where the national component had a plant pathologist already (Senegal and Niger).

(4) In Mauritania, in view of the size of the technical workload, the IPM expert will be assisted by an entomologist, a plant pathologist, and an extension expert.

TABLE II-1
ASSIGNMENT AND RECRUITMENT OF FAO EXPERTS

Unit Assignment	Title		1983 J A S O N D	1984	1985 J F M A M J J A S O N D	1986 J F M A M J J A S
Regional	Principal IPM Expert	X				
	Bio-Climatologist	X				
	Socioeconomist					
	Weed Scientist					
Cape Verde	IPM Expert					
The Gambia	IPM Expert					
	Weed Scientist (Regional Duties)					
Mali	IPM Expert	X				
	Plant Pathologist					
Mauritania	IPM Expert	X				
	Entomologist					
	Plant Pathologist					
	Extensionist					
Niger	IPM Expert					
	Entomologist	X				
	Crop Loss Assessor	X				
	Weed Scientist (Regional Duties)					
Senegal	IPM Expert					
	Entomologist	X				
	Bio-Control Expert	X				
	Crop Loss Assessor	X				
Upper Volta	IPM Expert					
	Entomologist	X				
	Plant Pathologist					
Total		10	1983 22	1984 23	1985 23	1986 20

X -- On board, June 30, 1983

(5) Weed science, identified as one regional priority topic, will be provided for as follows:

(a) From 1983-1985, two weed scientists with regional responsibilities will be assigned to the project, one based at Tarna, Niger, and the other at Sapu, The Gambia.

(b) In 1986, one weed scientist will be assigned to the CILSS/FAO regional technical team in Ouagadougou.

(6) An IPM expert will be recruited by FAO for Niamey, Niger.

(7) At government request, an FAO-recruited IPM expert will be posted to Cape Verde.

g. Training of Sahelian Personnel

The Sahelian countries, like many others in the Third World, lack adequate numbers of trained people. This limits the short-term activities of the IPM Project, and defines one of the major longer term goals: trained personnel are essential at all levels in order to create an adequately staffed, multidisciplinary regional research capability.

The original FAO project design used as the basis for Phase I in 1977-78 foresaw academic training for project researchers and technicians being funded through bilateral aid, i.e., from resources outside the project. During the course of Phase I thus far, the national components have gone unassisted in this important aspect of project activity. The Dutch, who originally proposed to fund all training activities under CILSS Program Annex G2, have limited their support to technician training in-countries and within the region. (The redesign team was advised by Sahel Institute personnel in Bamako that the Dutch had given no positive signs of planning to expand their efforts beyond those now underway.) Thus, the upper level researcher training conceived as part of Annex G2 remains unfunded.

A formal training plan has been prepared as a basis for achievement of the academic training requirements outlined below and appears as Table II-2 (with Attachment). The 1984-86 FAO budgets include funds for all training outside the Sahel as set forth in the Table.

Within the project, several forms of training are provided on an ongoing basis:

- Each expatriate FAO expert and corresponding national counterpart are to collaborate on a single common research program, so that the counterpart receives on-the-job guidance.

- Consultants will be called in to advise project staff on solving special problems.

X
66

TABLE II-2
TRAINING OF SAHELIAN RESEARCHERS

Discipline	Years	The Gambia	Mali	Mauritania	Niger	Senegal	U. Volta
Entomology (Taxonomy)	1984	X	X X (X)	X X X X	X X (X)	X	X X
	1985	X	X X (X)	X X X X	X X (X)	X	X X
	1986	X	X X (X)	X X X X		X	X X
	1987	X		X X X X			
Plant Pathology	1984	X	X X	X X	X X		X
	1985	X	X X	X X	X X		X
	1986	X	X X	X X			X
	1987	X		X X			
Weed Science	1984		X	X	X X	X	X
	1985		X	X	X X	X	X
	1986		X	X		X	X
	1987			X			
Bacteriology-Virology	1984		X	X			
	1985		X	X			
	1986		X	X			
	1987			X			
Integrated Pest Management	1984					X	X
	1985					X	X
	1986					X	X
Total: 32		2	7	8	7	3	5

X -- Single scholarship trainee

N.B. -- All trainees from The Gambia and Mauritania are four-year candidates for undergraduate degrees.

Attachment: Status of Recruitment of Sahelian Trainees

67

ATTACHMENT TO TABLE II-2
STATUS OF RECRUITMENT OF SAHELIAN TRAINEES

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
The Gambia:							
Mustapha E. NJIE	Entomology	B.S.	Sep/Oct 1983	45	3	University: - Texas A.M. - Riverside (California) - Berkeley (California) - Stillwater (Oklahoma)	Entomologist
Momodou BS. CANTHE	Plant Pathology	B.S.	Sep/Oct 1983	45	3	University: - Gainsville (Florida) - Texas A.M. - Davis (California) - Raleigh (North Carolina)	Plant Pathologist

Attachment to Table II-2, continued

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
Mali:							
Dramane COULIBALY	Entomology	Doctorate (3e cycle)	Sep/Oct 1983	- 9 m. (83/84) - 1 m. (84/85) - 1 m. (85/86)	25	University and ENSA in Toulouse, France University et ENSA in Montpellier, France	Entomologist
Bourema DEMBELE	Weed Science	"	"	"	"	"	Weed Scientist
Abdoulaye HAMADOUN	Entomology	"	"	"	"	"	Entomologist
Yacine-Badian KOUYATE	Bacteriology-Virology	"	"	30	6 m. over 2 years	University: - Montpellier - Strasbourg - Toulouse, France	Bacteriologist-Virologist
Kadiatou TOURE	Entomology/Taxonomy	"	"	"	"	University: - Montpellier - Toulouse, France	Taxonomist
Abdoulaye TRAORE	Plant Pathology	"	"	"	"	University of Grembloux, Belgium	Plant Pathologist
Fatou SACKO	Plant Pathology	Graduate Agronomic Engineer	"	"	"	National School of Agriculture: - Toulouse - Montpellier, France	Plant Pathologist (Projet Lutte Integree)

Attachment to Table II-2, continued

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
Mauritania:							
Moulaye Ahmed ULD CHEICKNA	Entomology	B.S.	Sep/Oct 1983	45	3	Hassan II University, Morocco	Entomologist
Abou-Yero KIDE	Entomology	"	"	"	"	"	"
Aly SY	Plant Pathology	"	"	"	"	"	Plant Pathologist
Baba DIOP	Entomology	"	Sep/Oct 1984	"	"	University of California: - Berkeley - Riverside - Davis	Entomologist
Salif BA	Bacteriology-Virology	"	"	"	"	University of: - Texas A.M. - Davis (Cal.)	Bacteriologist-
Ismael KANE	Weed Science	"	Sep/Oct 1985	"	"	University of Florida, Gainsville	Weed Scientist
Mohamed SARR	Entomology	"	"	"	"	University of California: - Berkeley - Riverside - Davis	Entomologist
Mohamed BOUYA CHEICK	Plant Pathology	"	"	"	"	University of - Purdue - Texas A.M.	Plant Pathologist

Attachment to Table II-2, continued

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
Niger:							
None yet selected	Entomology	M.S.	Jan 1984	24	11 in the U.S.	University of California: - Berkeley - Riverside - Davis	Entomologist
	Entomology-Taxonomy	"	"	"	"	"	"
	Entomologie	"	Oct 1984	"	"	"	"
	Plant Pathology	"	Jan 1984	"	"	Texas A.M. University	Plant Pathologist
	Plant Pathology	"	Oct 1984	"	"	"	"
	Weed Science	"	"	"	"	University of Florida, Gainsville	Weed Scientist
	Weed Science	"	"	"	"	"	"

Attachment to Table II-2, continued

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
Senegal:							
None yet selected	Weed Science	M.S.	Sep 1984	24	3	University of California, Davis	Weed Scientist (Projet Lutte Integree)
	Integ. Pest Management	"	"	"	"	University of California, Riverside	IPM Specialist
	Plant Pathology	"	"	"	"	University of: - Davis - Texas A.M.	Plant Pathologist

*Six additional months at beginning for English language training for all three candidates.

Attachment to Table II-2, continued

Candidates' Names	Discipline	Diploma Objective	Date of Departure	Duration Academic (months)	Duration Practical (months)	Institutions Requested	Future Function in IPM Project
Upper Volta:							
Abdoulaye COMBARI	Weed Science	Doctorate (3e cycle)	Sep/Oct 1983	- 9 m. (83/84) - 1 m. (84/85) - 1 m. (85/86)	25	University and ENSA, Nancy, France	Weed Scientist
Amidou OUEDRAOGO	Entomology	Doctorate (3e cycle)	Sep/Oct 1983	- 9 m. (83/84) - 1 m. (84/85) - 1 m. (85/86)	25	University and ENSA, Montpellier, France	Entomologist
Denis PARE	Plant Pathology	Doctorate (3e cycle)	"	"	25	"	Plant Pathologist
Alassane ZAMPALEGRE	Entomologist	Doctorate (3e cycle)	"	"	25	"	Entomologist
Candidature a presenter	Integ. Pest Management	M.S.	Jan 1984	33	3	University of California: - Davis - Riverside - Berkeley	Supervisor of Project Observation Posts

- Seminars will be held for national policymakers and agricultural and crop protection organizations in order to explain project goals and achievements, and enlist support.

- At the annual Conference of Technical Working Groups, research teams working on common problems will discuss results and plan future experimental programs with the participation of all Project FAO experts, consultants, and representatives of relevant outside organizations. It is an important learning opportunity for young researchers.

- Formal training is planned for both national counterpart researchers and technicians:

(1) Training of Host Country Technicians and Observers

(a) At country level, each national component will train technicians and observers annually in basic entomology, plant pathology, weed science, and climatology. This training will be repeated each year for new personnel and for continuing personnel to improve and expand knowledge of the subject matter. National Meteorology Services will arrange specialty training for observers.

(b) A certain number of technicians and observers will take part in seminars and training courses organized by national, regional, and international research organizations. This includes the training of laboratory and field technicians under Annex G2 (financed by the Dutch).

(2) Training of Host Country Researchers

Accomplishment of project objectives requires availability of an adequate number of skilled local research personnel. The goal is to bring members of each national research team up to at least M.S.-level, i.e., completion of formal research training involving hands-on field work for the thesis. Where counterparts are available at the B.S. level they will study for a M.S. during Phase I. In many countries, however, counterpart slots cannot even be filled at the B.S. level, and Phase I academic training will rectify the problem. In Phase II, after further work within the project, these trainees should go abroad again for M.S. studies. (This assumes, of course, authorization of a Phase II). All thesis fieldwork of counterparts in academic training will be done within the project on Sahelian problems. Thus, their workplans will include returning to the Sahel each year during the cropping season (June-September).

After academic studies, the trainees will join and work directly with the FAO experts for about a year on practical aspects of their scientific discipline. Once this is accomplished, the FAO experts will be phased out and replaced by national counterparts. (By the end of Phase II, the majority of project researchers should be Sahelian).

X
74

(3) Long-Term Academic Training

Table II-2 (with Attachment) contains the details by country and discipline on formal post-secondary school training requirements, totalling 32 potential students: 13 entomologists (two in taxonomy); nine plant pathologists; six weed scientists; two bacteriologist/virologists; and two IPM specialists.

(a) Candidate qualifications. Candidates from Upper Volta, Mali, and Niger will have a diplome d'Ingenieur d'Agriculture or a licence en sciences naturelles (both three to four years after the baccalaureat). This will permit them to study for a diplome en maitrise or a Doctorat de 3eme cycle. Candidates from The Gambia and Mauritania will be technicians or students at the baccalaureat level. They will receive training for a bachelor's degree. Candidates must either have already worked in the IPM Project or had training in the project.

(b) Selection of candidates. It is highly desirable that each country propose two candidates for each scholarship. The nominations will be forwarded through the Project Task Force to FAO for evaluation and selection.

(c) Terms. After the candidates are selected, and prior to beginning training, they will be asked to sign a document of agreement to work for the project for a period of no less than five years after training of two to four years. In the event that a Phase II is not approved, nominating countries will give assurances to the CILSS Executive Secretary that such personnel will be assigned upon completion of training to ongoing national IPM research activities. The Regional Directorate will endeavor to arrange such commitments.

(4) Regional Subjects

The following regional subjects have been recommended to scholastic advisors as thesis subjects for work in the Sahel:

- Entomology:
  - Raghuva sp. (Millet)
  - Contarinia sorghicola (Sorghum)
- Plant Pathology:
  - Pyricularia oryza (Rice)
  - Sphacelotheca sorghi (Sorghum)
  - Sphacelotheca cruenta (Sorghum)
  - Tolyposporium ehrenbeigii (Sorghum)
  - Sphacelotheca reiliana (Sorghum)
  - Tolyposporium penicilanae (Millet)
- Weed Science:
  - Striga hermontica
  - Striga gesneroides

(5) Special Note

The proposed date of termination of the Phase I extension--September 30, 1987--enables the FAO to continue administering training programs, even though Phase I field work will cease on September 30, 1986, assuming there is no Phase II. The Gambia and Mauritania, for example, have nominated candidates for undergraduate training requiring four years, i.e., until 1987. Some graduate training, if not initiated at the beginning of the 1983-1984 academic year, may also continue past September 1986.

h. Environmental Monitoring

It has been learned through the introduction of IPM programs in a number of crop situations that even in modern agriculture we can rely to a large extent on the factors governing natural/ecological balances. Natural enemies play a far larger role than expected. The judicious choice of control measures which will allow these regulatory mechanisms to exercise their action fully will enable humans to achieve optimal agricultural production with a minimum of environmentally disruptive chemicals.

Even when all available non-chemical pest control methods are being used, conditions may develop wherein pests multiply explosively because of shifts in the environmental conditions regulating pest development, changes in physiological resistance, or other causes. All evidence suggests that pesticides will need to be utilized in the future. They provide the crop insurance that permits the farmer to invest in other inputs, i.e., irrigation, fertilizers, new varieties, and mechanization. Chemicals are part of the production inputs that must be further perfected to meet the growing demands for food and fiber.

Use of pesticides in the CILSS member countries has been minimal in comparison to that in other areas of the world. Yet GTZ residue sampling of foodstuffs in Niger indicates that pesticide contamination may already present a significant public health problem.

Certainly, the region and its population are particularly vulnerable to the hazards of pesticide abuse. Farmers and the general public do not understand these hazards, and extension services are weak. Legislation concerning proper pesticide management is non-existent or unenforced. Means of identifying and treating pesticide poisoning are not available, and applicators often do not take safety precautions. The ecology of the Sahel is especially fragile, and environmental damage such as fish and wildlife mortality may be difficult to reverse. This will be especially important in the proposed subregional river basin programs, since pesticides tend to be heavily used in intensive irrigated rice culture and information on water pollution and impacts on fish and wildlife in these environments is inadequate. Last but not least, neither the Sahelian governments nor small food crop producers can afford unnecessary or uneconomic use of increasingly expensive imported pesticides.

76

The establishment of a complementary activity to monitor the environmental impact of the use of agricultural pesticides is essential to the rational development of an integrated pest maragement program. It will contribute to the enhancement of environmental quality, and will ameliorate the environmental impacts of agricultural pesticide use. The impact monitoring activity will be linked with the IPM Project, but should be expanded to cover other aspects of pesticide use in the Sahel. A joint program will be proposed with Annex A because the Crop Protection Services apply a substantial amount of the pesticides used. Cooperation with the agencies responsible for pesticide application is essential for the success of the program.

FAO has chosen Wageningen University, The Netherlands (Section de Toxicologie de l'Universite Agronomique de Wageningen) for this research.* An ecotoxicology team spent two three-week periods in Mali during 1981, doing fieldwork that led to the preparation of a plan for environmental monitoring. This plan includes:

- Research on the harmful environmental effects of pesticide application on Sahelian food crops
- Advising the IPM Project on pesticide application with respect to risks of environmental damage
- Expanding knowledge on the distribution of pesticides within the Sahelian environment and the composition and dynamics of the ecosystems concerned
- Creation of a surveillance system for monitoring ecosystems threatened by pesticides
- Help with ecotoxicological training on the local and regional levels

These studies will be carried out in Senegal, The Gambia, and Mali, mainly through monitoring population fluctuations of indicator species, and residue sampling of vegetation, soil, and animals.

2. Institution Building

a. Introduction

The CILSS IPM Project was conceived and planned as an institution-building program to put into place an integrated pest management research capacity and a regional pest surveillance and forecasting

*The detailed workplan is presented in Everts, J.W., van Elsen, A.C., Doumbia, Y.O., and J.H. Koeman, "l'Impact sur l'environnement de la region du Sahel de la lutte integree contre les ennemis des principales cultures vivrieres," Toxicology Section, Wageningen University of Agronomy.

77

capability--personnel and infrastructure--that did not previously exist. All parties involved--AID, CILSS, and FAO--realized that this is a long-term undertaking, and that it must be given a high priority in view of economic and food deficits in the Sahel. Approval of AID funding for IPM's first phase does not, however, commit the Agency to future support of subsequent phases.

b. Description of 15-Year Program with emphasis on institutional capacity

The Phase I log frame describes the institutional capacity to be in place by the end of an extended Phase I of the 15-year project (presumably to encompass 18 years due to Phase I extension). A large part of expenditures for infrastructure--construction, equipment, initial vehicle outlays--will have been made in Phase I. Indeed, all high-priority construction should be finished or underway before the beginning of this FY1984-1986 Phase I redesign period. Not only were these laboratories, observation posts, greenhouses, and other physical facilities necessary to field the research program from the beginning, they are the base for research activities for the long-term life of the project. Implantation of this infrastructure is a significant accomplishment of lasting value.

A long term aspect of the program lies in the needs for training and research guidance. This justified bringing FAO in to provide technical guidance and advisory assistance. A perusal of the description of the research program necessary to implement IPM in the Sahel makes it clear that the whole thrust of crop protection research will be changed.

Not only do a large proportion of Sahelian researchers need assistance with changing their priorities and learning new techniques, but there are simply not enough of them. Training some thirty-two Sahelians to the M.S. level, so that effective multidisciplinary IPM research teams will be in place at project's end, is requisite for attaining project goals. Cadre is so inadequate in some countries at present that B.S. level training must be provided in order to have candidates for later M.S. level studies. Reorientation of research and academic studies are of necessity a long-term undertaking.

Crop protection research has to be an ongoing activity, because agricultural conditions and pests are continually changing. This means that there is no alternative to creating national and regional capacity capable of assuming this task at the end of the project; i.e., institution-building. Anything else, the posting of expatriate researchers without training of Sahelians, for instance, would simply institutionalize a requirement for foreign assistance.

c. Future AID Participation

AID is not "mortgaging its future" with the extended Phase I program. Valuable infrastructure will have been put in place. Some Sahelians will have been trained to the B.S. or M.S. level. The

X
78

research program will have produced and documented useful results and some farmers will have begun to benefit. All these are accomplishments which have lasting value regardless of future investment.

Nevertheless, it is clear that Phase I alone will not meet the project's long-term goals, and without continuation of the project, many important benefits of the groundwork laid will be lost. Nothing like the full complement of required, trained, research cadre will yet be in place. Crop loss assessment methods and economic thresholds will be available only for some pests. Research will have been organized and streamlined along regional lines for the first time, and crucial methodologies developed, but if the project ends with Phase I, research activity will largely terminate just when it has reached the threshold of a high level of productivity.

The quality as well as the quantity of crop protection research would be jeopardized if the project ended after the first phase. The IPM orientation of crop protection research in the Sahel--acknowledged by all parties to be an economic and environmental necessity--would probably not be sustained. Many Sahelian researchers, left without longer-term IPM guidance from the FAO experts and the CILSS/FAO regional IPM team, would have no recourse but to resume chronically understaffed programs that do not resolve some important pest control issues, most notably those surrounding the economics and environmental impacts of pesticide application.

Phases II and III would place less emphasis on "hardware" such as construction and procurement, and much more on producing useful research results while providing on-the-job training for Sahelian researchers. Long-term training should be fairly well completed by the end of Phase II, thus reducing the number of foreign experts required. A progressively greater proportion of recurrent costs will be assumed by the recipient countries during Phases II and III, as well. Phase II should see even fewer foreign advisors monitoring a Sahelian IPM research effort that justifies recipient country funding. Phase III will see the hoped-for institutional capacity "going it on its own." The funding level required should be less in Phase II than in Phase I, and very low in Phase III.

Nonetheless, AID should not be committed to continued funding of this project, unless it is clearly demonstrated that earlier problems in implementation have been resolved and research results are widely applicable and useful.

Extended Phase I will be carefully evaluated to determine whether the new management structure works well and whether an effective, well-coordinated research effort has been fielded. Those accomplishments will constitute the principal signals that the groundwork has been laid for increasing research productivity through additional investment. This in turn will contribute to the desired nutritional and economic well-being of the small farmer majorities in the CILSS member countries.

B. Social Analysis

1. Beneficiaries

The initial beneficiaries of the IPM Project will be the governments and researchers whose research capabilities in integrated pest management will be improved. In the future, such research capabilities will also allow the development of better crop protection methods for other crops. Improved protection of basic food crops using the IPM approach will result in improved food self-sufficiency and a reduction of the use of expensive imported chemicals, both of which benefit national balance-of-payments. In addition, this will be accomplished with minimal environmental disturbance.

The real, long-term beneficiaries of all project activities, however, are the rural people of the Sahel, male and female, whose income is derived from subsistence farming. They constitute the vast majority of the area's population:

Cape Verde	55%
The Gambia	55%
Upper Volta	91%
Mali	85%
Mauritania	25%
Niger	75%
Senegal	58%

The project promises to increase available yields of the crops which form the alimentary base of rural life now and in the foreseeable future: millet, sorghum, cowpeas, rice, maize, and peanuts. These are the primary source of energy and proteins. Furthermore, they are not the agricultural target of richer farmers who would hardly invest in food crops consumed largely in the rural communities.

Drought and its drastic effect on the Sahelian ecology, combined with the scarcity of energy sources available for farm production, have led to a food production deficit and an increasing dependence on imports. A deficit of one million tons is predicted for 1985. An important part of this deficit is yield loss to pests.

Pesticides have begun to be used in large quantities on export crops, and to a lesser extent on food crops as well. Farmers are abandoning the traditional pest control methods which are well-suited to the environment, which preserved the ecological equilibrium, and which did not depend on high levels of imported inputs.

Currently, farmers who are already weighing the advantages of leaving their farms to find work in the capital, and who are disadvantaged agriculturally by modern phenomena such as compulsory schooling for children who otherwise work in the fields, are being further drawn into a losing situation through pesticide use. They incur expense which is not justified by farm-gate prices for crops, while changing their

X
80

environment and habits such that ever-increasing dependence on chemicals and external aid is inevitable. At bottom, however, the objective of Sahelian staple crop protection is more a social than an economic one, i.e., keep the families from abandoning the land, at least until the results of IPM research make more refined economic estimates possible.

The application of IPM research will benefit Sahelian small farmers by protecting yields and raising their income without leading to unnecessary dependence on imported inputs or adverse environmental or public health consequences. Moreover, it aims at giving farmers control over their affairs by teaching them how to survey their own crops for pest problems and make rational pest control decisions.

The principal immediate, non-economic benefit of IPM technology is that it more than any other aspect of modern farming helps farmers start the transition from traditional to scientific agriculture.

Far more than scientific farming, traditional agriculture relies to a considerable extent on customary, habitual, cultural, and collective influences on the farmer's management decisions. These are more embedded in their social and cultural matrix, while economic and scientific factors are less articulated as such, hence less frequently manipulated as discrete ends in themselves. In contrast, IPM teaches questioning and constant re-evaluation, concise measurement, the distinction of strict agronomic economic values from other ones, and individual, independent management decisions. Beginning to acquire some of these skills is a major leap to modern farming, a potential benefit of the IPM research and training, and to the extension components of the CILSS Crop Protection Program.

2. Role of Women

In the Sahelian countries involved in the IPM program, women play important roles in agricultural and economic production and in family health and education. To ignore women would be both wasteful and self-defeating because a potential human resource would not be utilized, and development should bring benefits to society as a whole.

Rural women are heavily involved in Sahelian crop production. However, since they are rarely systematically targeted to receive training, information, or new technologies, they often cultivate in the traditional manner which results in a lower level of productivity. In the Senegal River Basin (which includes ethnic groups in Mali, Mauritania, and Senegal), Soninke, Tukulor, and Peul women gain esteem for their skill in cultivation. Men and women rarely work in each other's fields; women often cooperate in working fields together and have formed mutual aid societies to increase their savings. Soninke women often control their own parcels of land, and in some villages where men are absent, women heads of household have joined men's cooperatives.

In the Senegal Peanut Basin, women cultivate up to 23% of agricultural land devoted to peanuts and also play a major role in cereals pro-

duction (applying fertilizer, irrigation, sowing, weeding, harvesting). The Senegal parastatal extension agency in that area is setting up a women's extension unit to direct village extension and training programs relevant to women.

In the Casamance region, women are the rice producers, and have decision-making responsibility regarding that crop. They also grow the vegetable crops, and sell what is left after household consumption. The Mandinka women in The Gambia are also the traditional cultivators of rainfed and tidal rice, but recent introduction of irrigated rice projects aimed at male farmers has resulted in women losing land and therefore their production. Women are still responsible for vegetable gardening and are becoming more involved in peanut production.

Sahelian women have already shown themselves receptive to new information and technologies. In the Casamance region, for example, Gambian and Senegalese women teach each other new methods, exchange varieties, and experiment with new technologies. Women are almost always involved in weeding and in activities related to checking for pests and driving them off.

Thus, women as farmers can directly benefit from IPM methodologies. Some methods may reduce back breaking and time-consuming labor, and increased yields will provide additional food and family income. In another light, mothers are the traditional guardians of family health, preparers of food, and teachers of hygiene, sanitation, and disease prevention. Because of this, they have an inherent interest in knowing more about the health hazards of pesticides and precautions to be taken regarding their use.

There are women's groups which have taken some initiatives in these countries which provide direction for further movement. In Mauritania, some women's groups have been successful in dealing with the government to get pumps which were originally supplied only to men. In The Gambia, women's groups pursued the government for the Mixed Vegetable Scheme in which women joined The Gambia Cooperative Union. By 1974 there were 83 schemes with 4,000 members.

In the process of recruitment of scientists and technicians for research, a special effort will be made to identify and train women candidates. Under other AID-financed projects, women are already in short and long term academic training in the U.S., in country, or in third countries. The involvement of women in the research and transfer of the technical packages should be encouraged so that they can derive the maximum benefit for improvement of diet, education, social, and financial gain. Note is taken that trained women already occupy key positions within the IPM Project, e.g., the Regional Project Director, the Cape Verde National IPM Director. Cape Verde has sent a woman to the United States for long-term training; she has since returned to work in crop protection-related research. The Gambia crop protection service has worked with women farmers in rice production and grain storage, and has two women working in its plant quarantine section.

C. Economic Analysis

1. Introduction

It will be helpful in reading the following analysis to bear in mind that in addition to developing alternatives to pesticides, the project will assure the judiciousness of pesticide use and associated costs by identifying economic thresholds (the levels at which the benefits of specific pesticide application exceed their costs), and determine the optimum timing and amount of pesticide applications.

2. Update of the Original PP Economic Analysis

This section was prepared by S&T/AGR (P.E. Church, January 17, 1983) at the request of the team contracted for redesign of Phase I of the project. Because no provision was made for the team to include an agricultural economist for this analysis and because so little new data are available for analysis of the potential economic pay-off of the project, S&T/AGR's input is limited here of necessity to an assessment of the current validity of the economic analysis presented in the original 1977 Project Paper (see Annex B-2).

Writers of the 1977 Project Paper suffered equally from the sparsity of data on food grain production potential and potential pest damage savings from effective project intervention. The writers of the 1977 Project Paper, therefore, were equally unable to undertake a conventional analysis into the project's cost effectiveness.

a. Crop Production Projections

The strongest part of the 1977 Project Paper is its projection of crop production into 1990 as a result of agricultural development measures expected to be taken in the seven CILSS countries to be covered by IPM research. Available evidence from experimental crop production trials has amply demonstrated the potential for expanded yields and acreage in the Sahelian region.

The failure of food crop production to expand significantly in the 1977-82 period can be traced to the administrative difficulties in starting up government agricultural production programs and not to technical parameters on outputs. Well documented are AID's own difficulties at fostering development of new applicable agricultural technologies to fit into Sahelian farmers' existing production systems and at supporting the training, hiring, and retaining of capable national technicians to deliver these technologies. Other donors and the host country counterparts have confronted similar problems.

The original project projections of crop production potential, given assumptions about the pace of African national agricultural development programs, appear now to be ambitious, but attainable. A rescheduling of projects, putting crop production targets further into the future, is clearly required. Slower attainment of production targets

X.
83

would be concurrent with slower implementation of IPM research and should not, therefore, alter the relative picture of events as perceived by the original project designers.

The original economic analysis takes the only course possible in valuing projected Sahelian food crop output on the basis of mean local prices within the CILSS IPM participating countries. While relative prices among crops today differ somewhat from those in 1977 and those forecast for 1990, there is no new evidence to suggest such differences are more than normal cyclical fluctuations in very fluid African food crop markets. Variations, as they are, appear well within any limits beyond which basic projections of project benefits would require alteration. Whether from added population pressures, from added purchasing power, or a combination of both, prolonged depression of food crop prices below levels projected for 1990 in the 1977 analysis are unlikely.

b. Pest Damage Estimates

Even greater data limitations confront analysis of potential reductions in pest damage loss. Aside from the problems of attribution to project inputs, loss reduction assessments are complicated by the dynamics of pest/crop interaction as output expands. Specifically it is not accurate to use current average pest crop loss figures when projecting possible benefits from future reductions in these losses. Account must also be made of the change in the rate of pest damage associated with added projected crop output under assumptions of IPM and no IPM program interventions.

The 1977 economic analysis did not, however, provide for this possible change in the rate of pest damage loss that could be expected at higher levels of projected output. Important to consider in this regard is the question: On the margin will added output be associated with a higher, lower, or equal rate of pest damage? That is, if pest damage at current production levels is, say, 10 percent, will it be 10 percent at higher output levels or will it rise to 12, 15, or 20 percent? or decline? The 1977 project analysis "straightlined" pest losses at two levels--10 percent and 25 percent.

The likelihood is real that pest damage losses will rise as a share of added crop output. Studies from other regions indicate that particularly under the expansion of irrigated agriculture such as that which is planned in several CILSS countries, pest populations do relatively more damage where more intensive farming offers opportunities for pest populations to colonize host plants year-round. The added use of fertilizers for expanding crop yields also has been shown to relate directly to pest population build-up and crop damage losses.

The 1977 analysis of crop losses from the stand-point of projected future (1990) food crop damage is, if anything, conservative. How conservative, of course, is not possible to determine in the absence of data on pest population dynamics.

c. Chemical Pesticide Prices

The 1977 Project Paper analysis must be taken to task on the issue of pesticide pricing, an issue that has received growing attention by the Agency in recent years. Specifically, it is Agency policy to discourage subsidizing agricultural inputs by pricing them below cost in the belief this encourages artificial incentives for excessive use of scarce resources which government budgets cannot support in the long run and which discourages the use of economically more efficient use of productive resources. This is particularly true in the case of costly petroleum-based chemical pesticides which not only are beyond the financial reach of many small African food crop producers, but also by the excessive use of which the development and adoption of more cost effective cultural and biological measures for controlling insect pest populations could be retarded.

The 1977 Project Paper, however, states that "In certain circumstances...the farmer...may have to purchase pesticides and equipment. In some instances, a subsidy on one or both of these purchased items may be necessary if they are to be used to the optimum technical degree." (Pages 54 and 55 of the IPM Project Paper.) Both the reasoning and the strategy are incorrect. It is the optimum economic degree to which chemical pesticides should be used; and this is based on the true market cost, not subsidized market prices of the chemicals.

Design of any funded extension of the CILSS IPM Project must rectify this error to avoid distortions in the course of IPM research and development. The result should lead to even greater emphasis on the use of non-chemical means of pest management in Africa where pesticides are expensive and import revenues scarce.

d. Conclusion

The original Project Paper economic analysis is realistic in its forecast of potential food crop production, conservative in its treatment of possible food crop losses due to pests, and at fault in its consideration of chemical pesticide subsidies as a component of effective project intervention in reducing pest damage. On balance, this suggests an even stronger case for IPM research capacity development through the project as pay-off particularly of non-chemical IPM interventions is potentially greater than that estimated in the earlier analysis.

The scarcity of solid technical and economic data on food crop pest dynamics, their impact on food crop losses, and the effectiveness of alternative control measures, heightens the need, and urgency, for prompt and well coordinated IPM research and development. This need for a good data base has received special attention in project design.

X
85

3. IPM as an Economic Crop Protection Approach

Where integrated pest management is not implemented (generally the case in the Sahel at present), two other crop protection approaches are used at the farm level:

- Prophylactic sprays by the calendar or according to stage of crop growth, sometimes government-recommended or enforced. Often, there is little or no pest infestation and the sprays are worthless. Environmental and economic costs are then incurred for nothing.

- Government crop protection teams scout fields or are summoned by farmers or extension agents. Damage may already be significant when the alarm is given. The time between the alarm and the spray is sometimes too long to prevent crop losses. If no economic threshold (IPM practice) is used, the profitability of sprays and the actual pest status of "harmful" organisms are unknown. Many treatments are made unprofitably or when unnecessary.

Both of these approaches waste money and resources, needlessly expose farmers and government applicators, and constitute extra hazards to public health and the environment. Uncalled for spraying may lead to increased future pest control expenses if the natural enemies of pests are harmed or resistance to pesticides develops.

The IPM approach minimizes expense by emphasizing relatively cheap nonchemical means of pest control and ensuring that pesticides are applied only when pests threaten to cause significant damage and it is profitable to do so. Crop loss assessment and pest control cost data are correlated with current farm economic conditions in order to determine economic thresholds for spray decisions. Ongoing field surveillance and pest forecasting enable farmers and crop protection personnel to take control action before unacceptable crop losses occur. (See II.A.1.d.).

The science of using natural enemies in integrated control programs shows great promise for the control of many key pests. For example, in 1975 there were 213 cases worldwide of partial to complete success involving the introduction of natural enemies of important pest insects and arthropod relatives, snails, and weeds that had become pests where they had not previously occurred. Complete control has been achieved with 42 insect pests, which means there is no need for any type of treatment against these formerly harmful organisms except under unusual circumstances. The results of these programs save millions of dollars annually.

The substantial economic advantages for the farmer of IPM systems are illustrated by the following pest control budgets (Tables II-3 and II-4) from the FAO Intercountry Program for the Development and Application of Integrated Pest Control in Rice Growing in South and Southeast

TABLE II-3

ANNUAL REPORT OF THE IPPC RICE PROGRAM

Peralta, C., Fontanilla, W., and L. Ferrer

Regional Crop Protection Center, Bureau of Plant Industry, Region 12

Bambad Village, Isulan Town, Sultan Kudarat Province

Irrigated rice, wet season 1982; 9 pesos = $1.00

Treatment	Gross Yield (tons/ha)	Net Yield After Landlord Share	Gross Income (pesos/ha)	Net Income After Fixed Expenses	Number of Applications	Chemical Costs	Labor Costs (Including Surveillance for Thresholds)	Cost of Insect Control (Plus Interest)	Net Return	Net Profit or Loss Compared to Untreated Control	Marginal Benefit-Marginal Cost
Prophylactic sprays, full dosage	7.54	5026	7790.3	5423.21	9	1573.48	112.50	1989.46	3433.75	-999.01	
Prophylactic treatments, fewer sprays	7.66	5107	7915.85	5548.76	7	1223.66	87.5	1547.17	4001.59	-431.17	
Prophylactic treatments, fewer sprays still	7.20	4800	7440	5077.07	4	412.03	50.00	545.19	4527.88	+95.12	.17
Prophylactic sprays, 1/2 dosage	7.20	4800	7440	5072.91	9	786.74	56.25	994.73	4078.18	-354.58	
Threshold (1)	7.27	4847	7512.85	5145.76	1	174	137.50	404.3	4741.96	+309.20	.75
Threshold (2)	7.32	4880	7564	5196.91	1	174	137.50	404.3	4791.20	+358.44	.90
Check (no spray)	6.58	4387	6799.05	4432.76	0	0	0	0	4432.76	0	

X 87

TABLE II-4

REPORT: "COMPARISON OF ECONOMICS OF PRODUCTION IN DIRECT-SEEDED RICE"

Santiago, A.
Ministry of Agriculture, Region 3
Pulong Palazan Village, Candaba Town, Pampanga Province
Average figures taken from ca. 15 farmers' fields, wet seasons 1981 and 1982
9 pesos = $1.00
Farmers did surveillance of their own fields.

	Gross Yield (tons/ha)	Net Yield (tons/ha)	Gross Income (pesos/ha)	Fixed Costs	Net Income	Chemical Costs	Labor Cost (Not Including Surveillance)	Total Pest Control Cost	Net Income	Net Profit Compared to Untreated Control
Integrated pest management thresholds used	6.10	5.12	6149	3715	2433	190	60	250	2183	+834.8
Customary farmers' practices	5.56	4.67	5604	3715	1888	237	120	357	1531	+183.0
Control (no sprays)	5.02	4.22	5064	3715	1348	0	0	0	1348	

Asia. They compare economic returns to the farmer with and without the use of IPM thresholds, and show that the use of the thresholds protects crops while minimizing pesticide use and raising farmers' income manifold. This data is of special interest since developers are planning to greatly expand irrigated rice acreage in the Sahelian river basins.

These budgets indicate yield losses to pests on untreated fields of only 15-20%, chemical applications being applied primarily against a complex of seedling pests. This is because insect- and disease-resistant rice varieties developed by IRRI are now grown in most areas. This resistance sometimes breaks down, as evidenced by more destructive outbreaks of viruses and brown planthopper. Such outbreaks have been spotted by surveillance personnel and new resistant varieties were substituted for the vulnerable ones. This is a good illustration of the fact that pest management research must be a permanent regional and national priority.

D. Logical Framework Narrative

The ultimate Goal of this project is identical to that of CILSS' Crop and Post-Harvest Protection Program: to increase the yield of food crops produced in the Sahel through the reduction of crop losses (due to pests).

Goal achievement will be measured by actual reduction in crop losses due to insect, disease, and weed pests. This will require establishment of baseline crop loss data for key pests; an activity to be undertaken under IPM's extended Phase I. Monitoring goal achievement over time is, in fact, very important to the long-range usefulness and success of CILSS' crop loss reduction program. Without current, reliable data on crop losses due to specific pests, ongoing research and extension efforts will have no basis for establishing priorities and directing resources. Extended Phase I of the IPM project will, therefore, develop crop loss assessment methods for key insect, weed, and disease pests. Observation posts will be constructed and staffed to monitor crop losses in each country. Additional information for the research system will come through feedback from crop protection/extension programs established under CILSS Program Annex A (RFCP) and related activities. Crop loss in the Sahel due to pre-harvest pests is estimated to be very high (e.g., 25-40% of potential yield). Accurate crop loss data does not yet exist, therefore no effort has been made to set specific reduction targets at the Goal level. It will be the task of IPM to estimate actual crop loss levels and establish targets for future reduction based upon what IPM research can do when applied by small farmers, and upon economic thresholds (i.e., the point at which it pays the farmer to use various technological options).

Ability to achieve the project Goal assumes continuing support from CILSS Member States who will pick up the recurring costs both of IPM research/observation systems and of crop protection/extension in CILSS Program Annex A (RFCP) countries. It must also be assumed that extension of research results to small farmers is carried out effectively by other entities, especially in countries such as Niger and Upper Volta where Annex A activities are financed by the Germans and Canadians. Some percentage of yearly crop loss in the Sahel is due to pests other than those covered under the IPM research project. For instance, in some areas, birds are heavy contributors to crop loss in the field, and rats account for a great deal of post-harvest (storage) loss. These pests come under the jurisdiction of other CILSS Program Annexes, some of which remain to be funded by donors. It will be necessary for the CILSS to re-emphasize efforts to find donor funding for these Annexes (primarily through the efforts of the restructured Regional Management Unit of the CILSS Secretariat) for the full potential of the crop loss reduction Goal to be realized. Finally, Goal achievement assumes no catastrophic events occur to disrupt the work in progress, such as another major drought which would invalidate much of the research, or political upheavals which would make it impossible for research institutions to operate.

The Purposes of IPM Phase I (extended) are, (1) establishment of a functioning, coordinated IPM research program in the Sahel through which economically and environmentally sound pest control methods appropriate

X
90

for small farmer use will be developed for dissemination and extension; and (2) production of tested research packages on selected key pests suitable for extension to small farmers under CILSS Program Annex A and other means. This differs from the original Phase I purpose only in the addition of specific technical objectives to institutional development aims. In theory, it would be possible to produce only IPM research packages on selected key pests without being concerned for the institutional capacity of Sahelians to carry on this kind of research. However, the level of research which could realistically be expected by the end of the fourth year of IPM's extended Phase I would be a negligible contribution to the overall Goal to which CILSS and AID subscribe. Therefore, creation of permanent institutional capacity is considered to be of equal importance with production of technical packages.

Conditions that will indicate project Purpose has been achieved include:

- Established working relationships between the regional project directorate and national IPM research entities, and with crop protection/extension/information services in each country and regionally, to arrive at mutual agreement on IPM research priorities; and provide regular crop protection/extension feedback to IPM research activities

- Trained Sahelian cadre in place prepared to assume research, demonstration/feedback, surveillance/forecasting, economic threshold, and crop loss assessment functions performed by FAO advisors, as well as administer IPM research in their respective countries

- Phase I technical goals met, including: (a) reasonable progress in developing tested research packages and economic thresholds for seven priority regional pests (two insects, four plant diseases, and one weed species); (b) completed, distributed manuals containing recommended IPM packages on key pests, including findings on modification of cropping systems for better pest control, biological control, varietal resistance, crop loss assessment and economic threshold determination, surveillance, and forecasting

Achievement of both the institutional and technical objectives of extended Phase I will be a key factor in deciding whether it is advisable to consider second phase AID support for CILSS' 15-year IPM research program. The kinds of considerations which will be taken into account in making that decision are described in detail in the Evaluation Plan (Part III-C).

In order to reach the project's Purpose-level goals in the relatively short span of four years, it is necessary for most of the planned infrastructure, commodities, and staffing to be in place or process by September 30, 1983 (the starting date of extended Phase I). Most of the construction is already underway or plans have been approved. An estimated

91

2/3 of project-financed commodities have been received or are on order. FAO and counterpart staffing have chronically lagged behind schedule. Both CILSS and the FAO will have to give staffing the highest priority in order to achieve Phase I objectives. FAO recruiting and Sahelian training schedules appear in Part II above in the technical analysis.

Since project management has been at the heart of IPM's problems, the ability of the revised implementation system to function smoothly and efficiently is crucial to future success. Prospects for this are discussed as an Issue in Part I above. A corollary to the management issue is working relationships between CILSS, AID, and the FAO for the remainder of the project. Responsibilities and authorities of CILSS and FAO project personnel were not clearly delineated at the outset. This produced uncertainty and conflict. To remedy this problem, new job description/functional statements were jointly approved by CILSS and the FAO. In addition, a certain amount of mutual mistrust built up among the parties as the IPM Project moved further and further into its authorized life without being able to operate effectively. It is hoped that the experience of the past two years, working together to carry out an independent evaluation and meeting at the high, tripartite level to resolve problems, has helped set the tone of helpful cooperation necessary for such a large and complex project to succeed. Formal separation of the Regional Project Directorate from the administrative and financial control of the Regional Management Unit assures a uniformity of technical and administrative direction to the project. In addition, it is expected that working relationships will improve as the participating USAIDs join forces with national IPM Project Directors and FAO personnel to help make sure the IPM Project moves smoothly at local levels. Above all, it will be essential for all parties to subordinate their own institutional, national, or other interests for the good of the project.

Project Outputs include:

- Construction, equipping, and staffing of 14 research laboratories (most with administrative offices), seven insectaries/screen houses, and eight greenhouses; and development of demonstration areas attached thereto

- Construction, equipping, and staffing of 55 observation posts to constitute the backbone of the pest surveillance and pesticide monitoring system; and development of demonstration areas attached thereto

- Training of Sahelian cadre to assume research, surveillance, and administration functions after the withdrawal of project-financed technical advisors. Funds are provided to train 13 entomologists, nine plant pathologists, six weed scientists, two bacteriologists, two IPM specialists, and 110 observers.

As with Purpose-level objectives, realization of this ambitious list of outputs depends on the majority of infrastructure, commodities, and staffing (both CILSS and FAO) being in place or ready to commence by

X
92

September 30, 1983. Although it has proven somewhat difficult to locate a sufficient number of qualified Sahelian counterparts to work with FAO researchers, identification of 21 of the 32 Sahelians scheduled to pursue B.S. and M.S. degrees during Phase I has already been completed. This potential trouble spot for regional and national project management appears to be on the road to resolution.

Project inputs are described in detail in the project financial plan, Part III below, and in the detailed Country Workplans and Budgets at Annex C. Provision of inputs assumes that sufficient AID funds are available, and are provided in time to cover scheduled expenditures. The size and timeliness of the yearly allowances from AID/Washington will be particularly crucial. Provision of inputs also depends heavily on timely receipt and approval of necessary planning and implementing documents from CILSS, the FAO, and the USAIDs. Items required, deadlines for each, and the action office or groups responsible are laid out in the Implementation Plan, Part III below, which will be used by regional and national project management to insure that all requirements are met on time.

Table II-5 will serve as an important implementation and evaluation tool over the extended Phase I life of the project.

TABLE II-5

PROJECT DESIGN SUMMARY--LOGICAL FRAMEWORK

Life of Project: From FY83 to FY87

Total U.S. Funding: $28.8M

Date Prepared: July 25, 1983

Project Title & Number: CILSS-IPM Research 625-0928 PHASE I EXTENSION

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: The broader objective to which this project contributes: To increase the availability of domestically-produced food crops in the Sahel by reduction of crop losses due to pests	Measures of Goal Achievement: Farm surveys will document the reduction of crop losses due to pests.	- Continuous monitoring of crop losses using assessment methods developed under the IPM Project for key insect, plant disease, and weed pests - Farmer feedback through national crop protection/ extension services	- CILSS Member States continue to support crop protection and use of IPM methodologies. - Remaining Annexes of CILSS' Sahel-wide crop protection program receive adequate funding and competent execution. - Organizations responsible for disseminating/extending research results to small farmers do so effectively. - No catastrophic political or natural event interrupts or invalidates the research.
Project Purpose: - To establish a functioning coordinated, integrated pest management and research program Sahel-wide through which economically/environmentally sound pest control methods appropriate for small farmer use will be developed for dissemination and extension - To produce tested research packages on selected key pests for extension through CILSS Annex A and other channels	Conditions that will indicate purpose has been achieved: End of project status. - Established working relationships between regional-national IPM research entities, and with crop protection/extension/information services to arrive at mutually agreed research priorities and provide feedback to researchers from crop protection/extensionists - Trained Sahelian cadre prepared to carry out IPM research, demonstrations, surveillance, economic thresholds and crop loss assessments, and to administer research programs - Integration of state-of-the-art research results into technical packages for control of priority pests	- CILSS/FAO/USAID annual budget and programming documents, reports - Annual regional and national research workplans and results - Periodic AID evaluations - Monitoring by AID missions, CILSS Executive Secretariat, and FAO - Production of IPM manuals and publications	Assumptions for achieving purpose: - Most project infrastructure, FAO staff, and counterparts in place or scheduled by 30 Sept. 1983. - Restructured project management will facilitate implementation. - CILSS, AID, and FAO develop cooperative working relationships. - No catastrophic political or natural event prevents completion of research within prescribed schedule.

Table II-5, continued

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Outputs: - Research facilities constructed/equipped; demonstration areas developed and in use - Observation network constructed/staffed; demonstration areas developed and in use - Sahelian cadre trained	Magnitude of Outputs: - 14 laboratories 7 insectaries/screenhouses 8 greenhouses - 55 observation posts - 110 observers - 13 entomologists - 9 plant pathologists - 6 weed scientists - 2 bacteriologists/virologists - 2 IPM specialists	- Project reports, site visits - Evaluation of workplans, results, annual regional work group meetings; site visits - Approved training plans and reports on participant progress/employment	Assumptions for achieving outputs: - Majority of construction approved or underway by Sept. 1983. - Majority of commodity procurement finished or ready to begin by Sept. 1983.
Inputs: - Construction of laboratories and observation posts - Commodities (lab and observation post equipment, vehicles) - Technical assistance - Training	Implementation Target: Refer to financial plan, Annex C	AID/FAO/CILSS Annual budgets, reports; evaluations	Assumptions for providing inputs: - AID funds available and provided on timely basis. - Restrucutred project management will facilitate implementation. - FAO recruits experts rapidly. - CILSS/FAO/AID produce necessary plans/documentation on schedule.

PART III

IMPLEMENTATION

A. Organization and Management

1. History

In addition to implementation delays caused by administrative difficulties, the 1981 Evaluation noted major structural problems traceable primarily to unrealistic project design. Principal among the incorrect initial assumptions were a) that a complex research project involving large amounts of commodity procurement and construction, with a very large complement of local and foreign personnel spread across the Sahel could be managed efficiently with implementation and administrative support from one central source (Ouagadougou); b) that administrative and technical management could be split between two different locations, and still coordinate and operate the project effectively; and c) that CILSS and FAO personnel could quickly learn to work with the complex of AID regulations governing project implementation. The Evaluation Report indicated that these unrealistic design assumptions caused day-to-day implementation to suffer chronic, serious delays (3-4 months in processing country requests for funds, and 6-9 months approving construction, for example).

The situation was further complicated by legitimate misunderstandings of AID's complex implementation regulations (leading in one case to an audit finding against a participating country for inadvertent mishandling of an architectural design contract); by inability of the project's divided technical and administrative units to coordinate with each other, with AID or with participating countries; and by repeated misunderstandings on the part of CILSS and FAO project personnel as to their respective roles, authorities and responsibilities. Finally, because the CILSS' Regional Management Unit (UGR) was too heavily involved in day-to-day implementation of IPM, there was no real oversight of the global CILSS program. This resulted in a lack of coordination between the Annexes and limited efforts to find donor funding for other Annexes and other regional and international research efforts of importance to IPM.

To resolve implementation difficulties and role confusions, the Evaluation Report recommended a) that technical and administrative direction of the project be consolidated in Ouagadougou and the direction of RFCP (CILSS Annex A) be merged into a joint RFCP/IPM directorate; b) that FAO be re-confirmed as technical implementing agent for the project, and assume all responsibility for project financial management and procurement (using FAO rather than AID procedures); c) that a tripartite Technical-Administrative Advisory Committee be formed to oversee project management and operations along with a high-level tripartite Regional Management Committee to resolve any policy and procedural differences; and d) that the CILSS' Regional Management Unit (UGR) divest itself of IPM implementation responsibilities and return to its original function of finding funds for and coordinating all the Annexes of CILSS' global crop protection program.

X
97

At the January, 1982, high-level meeting of CILSS, AID and FAO in Ouagadougou, it was agreed that the project's Technical Directorate would be transferred from Bamako and a consolidated Regional Project Directorate would be formed at Ouagadougou (subject to approval of the CILSS Council of Ministers). The FAO and CILSS agreed to negotiate and arrive at a resolution of the responsibilities and authorities of their respective personnel under the project. A high-level tripartite Consultative Committee was formed (equivalent to the Evaluation-proposed Regional Management Committee). AID representatives noted that statutory limitations made it impossible to relinquish full control of project procurement and financial management to the FAO. It was agreed, instead, to decentralize these functions and day-to-day implementation monitoring to the hands of USAIDs at the national level.

In April, 1982, the CILSS Council of Ministers agreed to consolidation of the Project Directorate, and the Technical Office moved from Bamako to Ouagadougou the following summer.

2. Organization and Decentralization-

a. Introduction

In September, 1982, the Tripartite Consultative Committee met in Washington to discuss progress in carrying out decisions of the January meeting, and to approve a framework and terms of reference for the project re-design. The Committee agreed to:

-- Assume responsibility for monitoring IPM project progress, reviewing and approving all annual workplans and budgets, and deciding any issues which could not be resolved at the Regional Project Directorate level. The Tripartite Consultative Committee will meet once a year (or more often if needed), consisting of the CILSS Executive Secretary (as chairperson), the Director of USAID/Ouagadougou and a high-level representative from FAO/Rome; the AID RFCP Manager (Annex A) will attend the meeting (the latter is in lieu of merging the RFCP and IPM Project Directorates in Ouagadougou as recommended in the Evaluation Report). The Committee will depend on the Regional Project Director to provide executive secretariat support for meetings (preparation of agendas, documents, etc.). The Committee may invite observers, e.g., IPM National Project Directors, to their meetings as appropriate, however, project funds will not be used to pay for travel or expenses of such observers.

-- Create a Project Task Force (equivalent to the Evaluation-proposed Technical-Administrative Consultative group). The PTF will be chaired by the Regional Project Director and will consist of the IPM Project officer from USAID/Ouagadougou and the FAO Senior Technical Advisor. The Task Force will meet every three months (or as often as needed) to review project progress against current workplans for each national and regional component; identify and correct any administrative or implementation problems which have arisen; and identify any issues which need to be put before the Tripartite Consultative Committee, along

with a report on progress against the previous year's goals. On the basis of decisions by the Committee, the Task Force will prepare formal technical, budget and other administrative guidance to serve as policy framework and objectives for each national project component (see discussion of of Country Task Forces below). The PTF will provide guidance to all national components to ensure submission of standardized annual work plans and budgets, as well as quarterly reports of progress. The Task Force will also authorize minor line item budget adjustments not involving policy matters; and will reapportion funds among countries to adjust to any changes in funds allowances from AID/Washington. The PTF will be responsible for seeing that required project evaluations, financial management certifications and audits are carried out on schedule, providing the results to the Tripartite Consultative Committee for review and approval, and for monitoring all project components for compliance.

b. New Regional Management Structure

The revised project Organization Chart (Annex A), as agreed to by the Tripartite Consultative Committee at Washington in September, 1982, reflects decentralization and new coordinating arrangements at the regional and national levels. The rest of this section consists of elaboration of the new project organization and management structure as worked out by the redesign team based on the September, 1982 revised organization chart, contacts with all parties during their team's November-December, 1982 field work and discussion and agreements during the July 1983 meeting in Ouagadougou.

The delegation of authority from the CILSS Executive Secretary to the consolidated Regional Project Directorate (Annex A) in Ouagadougou gives the Director of this office responsibility for overall management of all technical and administrative resources available to the project. This includes authority to:

- Represent CILSS on all matters concerning FAO participation under the September 1978 accord in collaboration with the Senior FAO expert and all other FAO experts

- Make all technical, administrative, and financial decisions in the day-to-day implementation of the project and consult with the CILSS Regional Management Unit on administrative and financial matters before reaching final decisions

- Provide overall supervision and coordination of all aspects of project administration, including, but not limited to financial accountability, procurement, construction, and logistics support; and initiate annual audits of all project components

- Act as Executive Secretary to the Tripartite Consultative Committee and assure the implementation of its decision; chair the Project Task Force

X
00

- Formulate technical and administrative policy and procedural guidance for all project components

- Represent CILSS at regional or international meetings concerning IPM in general and/or the project in particular

- Receive all communications and correspondence concerning the Project and prepare and dispatch all answers over the Executive Secretary's signature

In addition to delegating these responsibilities to the Director of the Regional Project Directorate, the CILSS Executive Secretary will transfer administrative (financial and procurement) responsibilities from the Regional Management Unit (UGR) of the Secretariat to the consolidated Regional IPM Project Directorate. This will give the Project Directorate the mission and staff necessary to perform overall supervision of administration and permit the UGR to withdraw from day-to-day IPM implementation concerns. The Project Directorate will have an appropriate support staff to help carry out its duties.

The Regional Management Unit (UGR) will resume its original functional responsibilities (as envisioned in the 1977 Project Paper) as follows:

- Monitor progress and coordination among all Annexes under the CILSS Crop and Post Harvest Protection Program, keeping the Executive Secretary of the CILSS and appropriate others informed of overall progress of the program

- Insure that acceptable feasibility studies and/or project proposals are prepared for unfunded Annexes; present these studies/proposals to potential international donors and take all steps necessary to insure that the remaining Annexes are financed to completion

- Serve as Executive Secretary to the Executive Committee for the overall CILSS Crop and Post Harvest Protection program; arrange annual meetings of the Committee, prepare agendas and other materials for it, issue minutes of meetings and see that the Committee's decisions are carried out, and

- Represent the CILSS Executive Secretary on Secretariat administrative and financial matters at the annual IPM Project Task Force meeting that presents the annual budget to the Tripartite Consultative Committee (attendance at other PTF meetings is not required)

The salary of the UGR Director will be paid out of AID Project 625-0911. General travel and operating expenses of the office and costs of its personnel will be absorbed within CILSS' annual operating budget. As indicated above, CILSS should through the UGR seek other donor support to fund feasibility studies and/or project proposals needed to

launch the remaining Annexes under the Sahel-wide Crop and Post Harvest Protection program. Assistance to the UGR to carry out this function will be provided by the IPM Regional Project Officer in USAID/Upper Volta.

The FAO Regional and National Role

CILSS and FAO representatives agreed in January and again in September 1982 that the Project Director and FAO Senior Technical Advisor will consult on all questions pertaining to the scientific and technical aspects of the Project. Terms of reference (TOR) prepared by FAO and concurred in by CILSS are at Annex A. These TOR govern the relations between senior CILSS and FAO personnel at both the regional and national levels.

The role of FAO experts is described elsewhere in this section as related to administrative and management activities, and in Part II as related to technical matters.

c. New National Management Structure*

In order to carry out the Tripartite Consultative Committee's agreement to decentralize IPM project administration and implementation monitoring, a Country Task Force chaired by the country IPM Project Director and consisting of the Senior FAO Advisor and AID's IPM Project Liaison Officer will be established in each participating country to follow the implementation of the project. The CTF will meet once a month, or as often as needed, to discuss and prepare budgets for the planned program (covering both national and regional project activities) for submission to the Project Task Force; and to address administrative and financial problems arising during implementation. A quarterly report, signed by the CTF members, will synthesize the results of monthly meetings and describe progress on construction, procurement and expenditures in support of the project. The report will be transmitted to the Project Task Force for information and appropriate action.

IPM is a regional project subject to high-level tripartite policy guidance and regional technical and administrative supervision. Therefore, AID Mission representatives will not exercise the same degree of control over project direction as is usually the case with bilateral projects. However, through the mechanism of the Country Task Force, AID Missions will have a voice in planning and programming of AID-financed project activities to insure that both the activities, and the means proposed to carry them out (technical assistance, construction, commodity procurement), complement AID's rural development strategy in-country, and are consistent with AID priorities and regulations. All members of the CTF shall strive to develop mutually supportive working

*Due to internal difficulties at the time of this Amendment's authorization, the Mauritania national component will be managed differently from the other components. See Section III-A(6).

X
101

relationships which will help advance the project. This PP Amendment will not specify working procedures for the CTF, as these should be the product of mutual agreement by the members in each country. Agreements and decisions will, however, be documented in Memoranda of Understanding, with copies forwarded to the Project Task Force in Ouagadougou.

In addition to functions described above, the CTF will collaborate regularly with representatives of CILSS Annex A (Regional Food Crop Protection) and other related crop protection, research and extension efforts in-country to insure agreement on research priorities and to avoid duplication or conflict of efforts. In this regard, observer membership for the Senior FAO Technical Advisor and the IPM Liaison Officer on the National Committee of Coordination would be desirable.

USAID/Upper Volta will continue to serve as headquarters for AID field coordination of the IPM project. AID/W's project funds allowances will be based on USAID/Upper Volta's recommendations for the participating AID Missions. The Ouagadougou Mission will execute Project Agreement Amendments with the CILSS and execute Letters of Commitment with the FAO. The AID Regional Project Officer in USAID/Upper Volta serves as the principal coordinator of AID resources approved for the IPM Project, performing all duties attributed to AID project management personnel, along with specific duties outlined elsewhere, such as serving as IPM Liaison Officer in Upper Volta. The Regional Project Officer will provide other USAID IPM Liaison Officers with reports--drawn from the regular Quarterly Reports described below--on the overall status of the Project. IPM Liaison Officers will go through the Regional Project Officer to present problems to or seek policy clarifications from the Project Task Force. A sense of communication and cooperation must govern working relationships between participating regional and country AID entities in order to achieve the full benefits envisioned in the design and redesign of this project.

Each AID Mission will monitor the project financial management system, execute all off-shore procurement orders and supervise project construction. To insure these actions take place on time and in accordance with AID regulations, each Mission will identify an IPM Project Liaison Officer. This person will probably be assigned to the Agriculture and Rural Development Office and must be an AID U.S. direct hire employee; location of the IPM Liaison Officer within the Mission structure will obviously be up to each USAID. The IPM Liaison Officer will monitor, directly or through another mission staff member, all daily project implementation matters; prepare PIO/C's and PIO/T's against project funds available to the Mission; prepare Project Implementation Letters and/or Memoranda of Understanding to the IPM National Project Director and/or transmit PIL's received from Ouagadougou; obtain engineering services to approve construction contracts and to supervise construction; prepare procurement waivers and certify vouchers for goods/services delivered in-country in accordance with AID regulations; make sure the Mission controller receives and processes all project financial documentation; maintain regular contact with AID's Regional Project Officer to report progress and problems; participate as USAID's regular

representative on the Country Task Force (described above); and report regularly to the Director and staff of the Mission on project status. It is estimated that a composite of one full person-year of time will be needed by each Mission for each year of the extended Phase I project to carry out these functions. PSC slots have been added to the budget for Missions which indicated possible difficulty in absorbing the decentralized IPM workload (Senegal, Mali, the Gambia and Niger.) PSC's will report to the IPM Liaison Officer who must be a member of each USAID's direct-hire staff. The IPM Liaison Officer will be a knowledgeable and experienced individual who can speak for the AID Mission Director in Country Task Force meetings. PSC's will help carry the day-to-day IPM implementation monitoring workload .

The redesign team also considered the possibility of using the RFCP Country Project Officers (CPO) as IPM Liaison Officers in Missions with RFCP activity. This proved unworkable because (a) RFCP is changing emphasis and greatly accelerating activities under Phase III; (b) CPO's are not AID direct hire employees; (c) RFCP project management requires skills distinct from those needed for IPM (RFCP emphasizes training, extension and information dissemination, while IPM focuses primarily on management plus some experience with research); and (d) the Country Project Officers are employed under an AID-funded PASA with the U.S. Department of Agriculture. It is inappropriate to assign technical personnel justified under one project to monitor host country and foreign technical personnel under another project.

Nevertheless, the IPM Liaison Officer and RFCP Country Project Officer, where assigned, will have to coordinate very closely to make sure that IPM-funded research focuses on appropriate priorities; that research produces results transmissable through national extension channels to small farmers; and that RFCP provides useful farmer feedback on a regular basis to IPM researchers. The IPM Liaison Officer and RFCP Country Project Officer will each insure that appropriate counterpart(s) in the national research, crop protection, extension and other agricultural services are trained to carry on these mutual cooperation and information sharing functions after AID-funded advisory presence withdraws. Such channels of communication among host country participants will be a key to post-project continuation of IPM research and IPM-oriented crop protection. In countries such as Niger, Upper Volta, and Mali, where CILSS Annex A is other-donor funded the IPM Liaison Officer will establish equivalent contacts and regular working relationships through the donor(s) in question, e.g. CIDA and GTZ.

Finally, the 1981 Evaluation Report noted that the IPM project appeared to be consistent with AID agriculture priorities and strategies. The participating USAIDS seem to be generally, favorably disposed to IPM concepts for the same economic and environmental reasons as are the cooperating governments. However, there has been a tendency for Missions to regard IPM as "regional", and therefore outside their immediate interests. Complementarity of the IPM project to Mission programs has remained largely potential rather than actual. Taking IPM fully into consideration in connection with other projects should assume greater

importance as effective IPM measures are developed and proven IPM methods become available under the project. Identification of a Mission IPM Liaison Officer, regular participation by that individual on the IPM Country Task Force, and involvement of other Mission personnel in project implementation all should help USAIDs learn how their bilateral programs may benefit from the IPM project.

The IPM Liaison Officer will help insure that the project and its concepts are a regular subject of discussion in Mission meetings; and that personnel responsible for other AID-financed agriculture projects are put in touch with IPM technicians so as to take integrated pest management implications into consideration in connection with other agricultural research and crop production activities. Research into new varieties and cultivation practices, for example, should take cognizance of their consequences for pest management, and production projects should be able to draw on tested IPM methods.

3. Project Finances, Construction and Commodity Procurement

The decentralization proposed in this revised Project Paper resulted from a need to overcome project implementation delays and a desire to correct a number of program management and administrative weaknesses in the original project design. The revised financial management system described here is designed to assure more effective control and more rapid access to funds as needed by the project components. This is to be accomplished by discontinuing the system of direct grant fund releases to the CILSS Regional Project Directorate for subsequent allocation and distribution to its national components in various Sahel countries, and implanting a new procedure whereby (1) AID/Washington will issue direct budget allowances to the participating USAIDS after advice of budget approvals from USAID/Upper Volta, (2) the participating USAIDs will be responsible for authorizing direct disbursements to their respective IPM national components, based on approved budgets and workplans; and (3) the participating USAIDs will be involved in budget planning, management and monitoring of project funds within their respective countries.

Under the decentralized system of financial management, annual country work plans and budgets (Annex C) will serve as a basis and justification for AID/Washington budget allowances to the participating USAIDs. The country work plans and budgets will be developed by each Country Task Force (see preceding section) and forwarded to the Project Task Force in Ouagadougou for review. The Project Task Force will pass all project work plans and budgets to the high level Tripartite Consultative Committee for final approval, and USAID/Upper Volta will submit a request to AID/Washington for budget allowances for each country component, based on the final approved figures. Each participating USAID will release funds to the local IPM component based on these centrally approved budget ceilings for each cost category (budget line item).

USAID/Upper Volta's Director, through the Regional Project Officer, will assure that the Project Task Force conducts detailed bud-

get reviews (annually, or more frequently if necessary) of the overall IPM project and its component parts, using financial reports submitted by the Country Task Forces.

USAID/Upper Volta will continue to disburse funds directly to the Regional Project Directorate to cover regional-level operating expenses and to the Upper Volta IPM national component for activities within that country. The USAID/Upper Volta will also continue to authorize disbursements against existing Letters of Commitment for the FAO technical assistance.

The IPM financial management responsibilities of participating USAIDs will be the same as those relating to their bilateral projects, including monthly and quarterly reporting to AID/Washington, e.g., Flash Reports, Quarterly Project Funding Status (PAIS) and others as required, (AID Handbook 19). The noted exception is that participating USAIDs will transmit information on detailed project expenditures and accruals, by budget line item, to USAID/Upper Volta for consolidation. USAID comments on the financial and implementation status of the IPM project and will be incorporated into the Country Task Force Quarterly Activity Report on research performance (see following section on Reports).

For the purposes of AID/Washington's Project Accounting and Information Systems, the IPM project will keep identification code 625-0928 for reporting project obligations and expenditures. However, participating USAIDs will be using a decimal designator after the project number using the last three digits of the country code: e.g., Cape Verde 625-0928.55, the Gambia 625-0928.35, Mali 625-0928.88, etc. USAID/Upper Volta will confirm the project number identification to be used by each USAID prior to the signing of Memoranda of Understanding (discussed below) and the issuance of direct budget allowances by AID/Washington.

The USAID/Upper Volta will be responsible for analysis and reconciliation of the total IPM Project Accounts. This will include component project obligations, expenditures, and encumbrances by budget line item, and dollar costs incurred under Letters of Commitment for the FAO technical assistance, and procurement of commodities and local services.

a. <u>Documentation for Decentralized Programming</u>

At the country level, the basis for financial management of the IPM project will be clearly defined in a Memorandum of Understanding signed by the participating USAID with the national IPM component. The content of the Memorandum of Understanding will be drawn from the AID/CILSS basic Project Grant Agreement (especially the Detailed Project Description annexed thereto) and related amendments, the redesigned Project Paper, Project Implementation Letters and advices of allotment or budget allowances issued by AID/Washington. The Memorandum of Understanding will contain the basic specifications and standard USAID provisions required for reporting and managing AID resources; and it will

also fix the amounts budgeted for the operating year and the life of the project.

Memoranda of Understanding will also be used by participating USAIDS to set forth for the national IPM Project Directors, the procedures, timing, conditions to be met and the documentation required in connection with USAID releases of funds for the project. All such releases of funds will be pursuant to and in accord with operational plans and budgets concurred in by the Country Task Force and approved by the Project Task Force Directorate and Tripartite Consultative Committee.

b. Budgetary Control

Participating USAIDs must get involved in the IPM project well before the implementation of the redesign periods begins on October 1, 1983. As a starting point, each Country Task Force (CTF) will conduct an early review of the Work Plan and proposed budget for FY 1984-1986 (Annex C) in the course of joint review of the draft PP Amendment. This is needed to confirm final country budget line items and proper timing of releases of funds, given differences in local prices, exchange fluctuations and other special local conditions. The CTFs will need to adapt final budgets to allow for variations in the rate of program development and execution, arrival of FAO technicians, deliveries of equipment, completion of observation posts and laboratories and recruiting of local personnel. The in-country operational budget reviews prescribed here will enable CTF's to refine local cost projections in accordance with local conditions. This work will lead to signature of the Memorandum of Understanding, (following CILSS-AID execution of an Amended Project Agreement), which will serve as the basic implementation guidance document in each country.

The Project Task Force (PTF) in Ouagadougou will coordinate the annual fund allocation process--based on overall planning levels provided by AID/Washington--among the regional and national components and FAO. In the event the AID/Washington allotment and the proposed operating budget level do not coincide during a given year, Project Task Force will calculate revised ceilings for the regional and country components as a straight line percentage from the revised Project Paper budgets (unless a more satisfactory formula can be devised). Country Task Forces will then revise their respective operating plans and budgets for resubmission and concurrence by the PTF, which will aggregate the budgets as a basis for USAID/Upper Volta's request for country allowances from AID/Washington. Should the final AID/Washington allotment again differ from the planning level, the process of revision will be repeated. Once approved and concurred by both the CTF and PTF, these work plans and budgets provide the basis for annual implementation and for country budget allowances from AID/Washington to the Sahelian USAIDs. Project Implementation Letters and Memoranda of Understanding issued by participating USAIDs covering financial management, procurement and construction should be consistent with the final, approved work plans and budgets.

c. Accounting Systems

The minimum fiscal accountability requirements described here are designed to provide a system of financial reporting that will enable the USAIDs to monitor project implementation, meet the project's cash requirements and periodically assess project financial status. The system will provide internal financial controls so as to prevent misuse or waste of AID resources and ensure compliance with the IPM Project Agreement. The system will further enable USAID/Upper Volta and the participating USAIDs to meet annual FAA Section 121(d) financial certification requirements.*

To assure that the CILSS national components maintain adequate project accounting records, the USAIDs will use guidelines contained in the "User's Manual for Basic Accounting Systems" specifically designed by AID/Washington for application in the Sahel countries. This manual is available to all Sahelian USAIDS.

AID/Washington will not make budget allowances and the participating USAIDs will not make releases of funds for project implementation beginning October 1, 1983 until the necessary certification requirement has been met.

Accounting transactions by the IPM components will be reflected in three accounting books: (1) a Donor Receivable Account, (2) an Encumbrances Journal, and (3) a Cash Receipts and Disbursements Control Ledger. The essential feature of this basic accounting system is that it should reflect a permanent, clear and accurate record of available funds received, cash disbursements, and balances on hand in the bank. Project expenditures will be accounted for in accordance with the budget line items specified in the Memorandum of Understanding.

According to the 1981 Evaluation, the existing accounting and reporting system used by CILSS was inadequate in providing support for forward planning and efficient project administration. Delays of up to three months in processing replenishments of advances through a transit account caused country IPM Project Directors to ration funds for such important functions as travel, local purchases and recruitment of personnel. Given the short four-year project life left to achieve Phase I research objectives, administrative delays in funds releases cannot be allowed to impede implementation any further.

Accounting operations at the Country Task Force level will begin after the following general sequence of actions:

---

* FAA Section 121(d) requires annual certification by Missions managing Sahel Development Program funds that the recipient (Grantee) is maintaining a system of accounts which provides adequate identification and control over the receipt and expenditure of AID funds.

X
107

(1) Arrangements to have a full-time country project accountant as a prerequisite to USAID release of project funds. (Funds to employ local accountants are provided in regional country component budgets)

(2) Country Task Force review of the accounting system currently being used by the national components. Modification of the system as considered necessary to meet the USAID's financial reporting, and certification requirements (see Annex C for reference)

(3) Establishment of a separate bank account for national or regional component operations and agreement on a system for requesting, processing and replenishing advances to the project. (Some discretion is needed in the fund replenishments systems where the local USAID Controller is able to agree on more frequent replenishments, e.g., monthly)

(4) Establishment of a system that will permit the recording of encumbrances to reflect outstanding obligations under Purchase Orders and Travel Authorizations and Contracts

(5) Establishment of property records and inventories of expendable and non-expendable property acquired since inception of the project

(6) Review of the existing format for financial portions of quarterly reports submitted to the Project Task Force. Project expenditures should be reported on a cumulative basis by budget line item. The quarterly financial reporting system should be one that easily adapts to AID's standard internal requirements.

(7) Establishment of a format by the CTF for a quarterly activity report which outlines progress made toward achieving the goals and objectives stated in the technical work plans and signals problems (See Reports below)

(8) Identification of specific (rather than "in-kind") Host Government Contributions

(9) Updating by the national component and approval by the CTF of procurement and construction plans

(10) Arrangements for annual audits funded by the Regional Directorate

The specific project budgets and financial plan for each project component are detailed in the FY1984-86 budget at Annex C. Participating USAIDs will monitor expenditures for the following line items:

Salaries of Local Personnel. (Including a decision as to the type(s) of worker indemnities, incentives or allowances which may be deemed eligible for financing under the project)

Local Travel Costs. Including per-diem rates and accountability for travel advances. (All international and intra-regional travel by FAO experts will be approved and funded by the CILSS Regional Directorate.)

Contract Services. Printing and local labor (seasonal) for national IPM research activities.

Materials and Supplies Costs. Office, library, laboratory, observation post, etc.

General Operating Expenses. Vehicle operation and maintenance, communications, rental costs, utilities, office expenses, etc.

Construction. Observation posts, laboratories and other physical facilities.

Construction

It is expected that, by the beginning of FY1984, most of the major construction work by national components will be either authorized, in process, or completed. Many of the construction plans, costs and specifications have already been reviewed and approved by the REDSO/WCA Engineering Office in Abidjan or local USAID. To the extent possible, the Country Task Force should see that design and construction contracts are let on a competitive basis in accordance with FAA Sec. 611(c). The construction work on observation posts (a simple and inexpensive structure, usually located in isolated areas) may be financed under a Fixed Amount Reimbursement (FAR) procedure, as described in AID Procurement Regulations. See Annex C-2(d) for the basis of construction cost estimates.

The Country Task Force will review construction plans to assure that the buildings and facilities will serve the desired functions. In reviewing construction plans, the local CTF will make sure that the total cost of construction is within the approved budget allocation. The services of the Ministry of Public Works, or other such agency as appropriate, will be negotiated to assist in issuing calls for bids and serving as supervisory engineers on actual construction. REDSO engineers (or engineers from nearby USAIDs) will be available for inspection visits on an ad hoc basis, but responsibility must reside with the national Ministry of Public Works to assure that construction is properly executed. (AID Handbook's 11 and 14 will be used as a guideline and arranging for construction).

e. Procurement

There are three major commodity procurement elements in the project: vehicles, laboratory equipment and equipment for field work, offices and observation posts. Procurement in the US (mostly vehicles and laboratory equipment) has been carried out until now by the procurement specialist at CILSS/Regional Management Unit. The Afro-American Purchasing Center (AAPC) in New York has been conducting the U.S. procurement actions under a contract with CILSS. Local procurement has been carried out on an ad hoc basis by the national components. Their basic procurement authority was the annual budget and the advances of funds received thereunder. The national components purchased office equipment, motor bikes and, on the basis of code 935 waivers, some motor vehicles at the local level.

As of June 3, 1983, the status of PIO/Cs channelled through the AAPC was as follows:

Approved Planning Level	$ 1,849,350
PIO/Cs Issued	701,928
Balance	$ 1,147,422
FY 1984-86 Commodity Requirements	$ 1,089,000

Under decentralized project management, each Country Task Force will prepare a detailed list of commodities and equipment to be purchased locally and in the U.S., with the total cost of items budgeted to be approved by the Regional Directorate. To the extent waivers are not included in and approved as part of this PP Amendment, the local USAID will be responsible for obtaining appropriate appropriate waivers for procurement outside approved sources with assistance from REDSO/WCA or USAID/Upper Volta. (See Annex C)

Beginning October 1, 1984, USAIDs will monitor off-shore procurement from authorized sources, i.e., U.S. and West Africa (Code 941 modified) using appropriate AID procurement procedures, AID Handbook 14. As a member of the Country Task Force, the senior FAO technical advisor in each country will review all proposed procurements to assure that appropriate equipment is acquired. The national IPM Project Director will prepare and submit to the USAID all standard AID procurement documentation such as the PIO/C. Where the national Director is not readily able for any reason to prepare correct PIO/C's or interpret AID procurement regulations, the USAID's IPM Project Liaison Officer will provide assistance. The USAIDs will use REDSO/WCA's logistic supply and equipment specialist (or their own personnel, where available) to comply with AID regulations. Procurement of locally available (West Africa) items will follow AID's "off the shelf" rules.

Each USAID will use Memoranda of Understanding to advise the Country Task Force of AID regulations concerning procurements and to

110

transmit specific guidance contained in the AID-CILSS Project Grant Agreement and/or PILs issued by the USAID.

4. Financial Plan

The PP Amendment extends Phase I implementation through the end of Fiscal year 1987, bringing the total cost of the IPM project to an estimated $28.8 million. Detailed country and regional budgets and the budget for FAO technical assistance are at Annex C. The cost increase is approximately 14% above the original authorization of $25,280,000. The primary reason for the increase in the total project cost is inflation since the original cost estimates were made in 1977. Inflation affected the cost of building materials and labor; salaries of FAO personnel plus the cost of recruiting and placement of technical personnel and related travel costs; and costs for vehicles, equipment and general operating expenses e.g., fuel, used by the project components.

The major outlay of IPM project funds will be for FAO technical assistance which, with the four-year extension of Phase I, will cost an estimated $12.0 million for 23 experts. The FAO budget also includes a 13% management fee (applied to the gross amount of the technical assistance budget where an overhead factor is relevant) and an escalating 10% contingency applied annually to cover inflation. It has been agreed that the contingency charge will be adjusted annually based on FAO's annual technical assistance cost reviews. Additionally the total project cost increased by approximately $3.5 million because of the inclusion of long term training previously scheduled for funding by the Government of the Netherlands within the framework of CILSS Annex G2. The proposed type and schedule of training is discussed in Part II.

A concerted effort was made by the redesign team to hold the line on project costs and stay as near as possible to the original project authorization and reasonably within the estimates made during the 1981 Evaluation. This was accomplished by reducing the number of FAO experts and improving position placement and functional distribution of such technicians without significant impairment of the original scope and thrust of the research work plans; downward modifications in the number and/or extent of physical facilities to be constructed, and the corresponding equipment to be purchased.

Following is a summary of project costs since inception of the IPM project and the cost estimates through completion of Phase I at the end of Fiscal Year 1987:

X
III

Status Projected Thru 9/30/83:

Obligations		$10,650,000
Disbursements--6/30/83	$6,230,441	
-Accrued	952,981	
Estimated Total	1,086,460	
Total	8,269,460	8,269,460
Estimated Pipeline--9/30/83		$ 2,380,540
Project Requirements Thru EOP:		
FY 1984-1986 Budgets		$20,563,594
Less Estimated Pipeline		2,380,540
Estimated FY 1984/86 Requirement		$18,183,054
Total Project Funding Thru EOP:		
Allotments to Date		$10,650,000
Estimated FY 1984/86 Requirement		18,153,054
Total		$28,833,054

5. Reports

a. Project Task Force: The Project Task Force is responsible for the following reports:

(1) A once-yearly report to the Tripartite Consultative Committee advising of progress and problems in the project. The report will be available at least one month before the scheduled annual meeting of the Committee. The report will be accompanied by the formal agenda for the meeting along with all proposed work plans and budgets for Committee approval.

(2) An annual status report on technical aspects of the project for the Country Task Force, suggesting measures for strengthening the research program. These reports will also be used by the Technical Working Groups.

(3) Periodic results of evaluations on project progress and annual audits of overall project activities will be provided to the Consultative Committee at its annual meeting or on an interim basis, should the Task Force so decide.

b. Technical Working Groups: Reports of the Working Group meetings setting forth conclusions reached and recommendations offered, with supporting reasons and issues to be resolved will be provided to the Regional Project Director within one month of the annual meeting.

c. Country Task Force: Each Country Task Force will send to the Regional Project Task Force a quarterly progress report signed by all TF members and detailing: research and dissemination activities accom-

112

plished during the quarter; problems and issues encountered and measures agreed upon to resolve them; steps taken on problems cited in previous quarterly reports; disbursements and commitments made; items procured; and status of construction, recruitment and training. The quarterly reports will be submitted to the Regional Project Task Force within one month of the end of the quarter to which the report relates. Replenishment of funds by local USAIDs will be based on these reports.

d. USAIDS: USAIDs will submit all appropriate financial management reports required by AID regulations.

6. Mauritania Arrangements

Due to internal difficulties at the time this Amendment was authorized, the Mauritania national component will not operate on the decentralized management model being used in the other IPM countries. Until such time as the situation in Mauritania changes enough to permit decentralized management, the following arrangement will exist:

a. The Regional Project Directorate (Ouagadougou) will oversee all technical, financial and administrative aspects of the project in Mauritania; the Regional Project Directorice or her designate will travel to Mauritania at least twice a year to review operations;

b. The Regional Project Officer (USAID/Ouagadougou) will approve all plans and contracts for project-financed construction in consultation with the AID Engineer at REDSO/WCA. A private A&E firm will be contracted with project funds on behalf of CILSS to produce designs for construction and to conduct site visits to supervise progress;

c. A public accounting firm will be contracted by USAID/Ouagadougou using project funds to verify Mauritania local procurement and other local project accounts semi-annually on behalf of CILSS. This firm will also insure that FAA Section 121(d) requirements are met each year.

d. The Regional Project Officer (USAID/Ouagadougou) will carry out all off-shore procurement for Mauritania through standard operating agreements with AAPC; and

e. One FAO expert will be recruited in addition to the original number planned to help develop potential extension channels and mechanisms to transmit IPM research results to Mauritania's small farmers.

B. Implementation Plan

It should be kept in mind that IPM is an active project. Implementation activities must proceed at a rapid pace even while project redesign and amendment actions are going on. In order to produce essential research results within the proposed 4-year extended LOP, for example, the FAO commenced recruitment of remaining experts and formulated a training plan for counterparts even before the project extension was authorized. Hence, the implementation schedule which follows combines both redesign and implementation actions. The schedule, especially through Calendar Year 1983, is extremely tight, and places considerable demands on all parties. The dates provided are the latest times by which certain actions should occur in order to keep the rest of the project on track. Any significant slippage may result in a lengthening of time needed to complete project work, resulting in further cost increase (especiallly in personnel expenses). Therefore, it is in the interests of all parties--but especially the Regional Project Directorate and the Country Task Forces--to pay close attention to the implementation schedule , and act to correct slippage as soon as it is detected.

For the most part, actions listed in the Implementation Plan for the period April-June 1983 were completed as a part of the preparatory process for the Tripartite Conference in Ouagadougou from July 11-14, 1983. Some actions, however, require formal confirmation:

a. USAID Mission designations of IPM Liaison Officers (with info notices to AID/Washington and USAID/Upper Volta)

b. USAID Dakar designations of RFCP Liaison Officer to the IPM Tripartite Consultative Committee

c. Country Task Force formulation of operating procedures, appropriate Memoranda of Understanding and PIL where necessary.

X
114

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PP Amendment translated and distributed to CILSS, FAO and AID Missions.	Apr-May								
AID Missions - All Countries									
Designate IPM Liaison Officer.	Upon rec'pt of draft								
AID/Washington - cables guidance to all Missions for joint CILSS-AID-FAO review of PP Amendment, and regional meeting to approve.	"	"							
AID Mission - Ouagadougou									
Designates Regional IPM Project Manager.	"	"							
Drafts Project Implementation Letters (PIL) outlining basic financial management, procurement and construction requirements in regional context.	"	"							
AID Mission - Dakar									
Designates RFCP Liaison Officer to Tripartite Consultative Committee.	"	"							
FAO Rome:									
Nominates Principal FAO Adviser to IPM Project.	"	"							
Nominates project Socioeconomist.	"	"							
Obtains CILSS concurrence on Terms of Reference for Regional and National IPM Directors and their respective FAO Advisers for inclusion in PP Amendment.	"	"							
Prepares three year academic training plan for regional and national IPM participants (33 in number) to fulfill Condition Precedent to allocation of training funds.	"	"							
Prepares schedule of recruitment and assignment of remaining FAO advisers (to full complement of 26) as CP to release of new funds.	"	"							
Regional Project Task Force (PTF) (CILSS-FAO-USAID/Ouaga)									
Convenes and formulates and approves its own operating procedures, formalized in a PIL for issuance to all Country Task Forces.	"	"							
Country Task Force (CTF) (each National IPM-FAO-USAID)									
Convenes and formulates and approves its own operating procedures, formalized in joint national-USAID Memoranda of Understanding; identifies necessary procurement waivers for rest of LOP and drafts same for inclusion in the PP Amendment	"	"							

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Project Task Force:									
Reviews PP Amendment		May-June							
Summarizes--by national component--historical administrative procurement, construction and financial data as background file for each CTF; for inclusion in PP Amend.		"	"						
Reviews draft PILs and approves same including: Annual work program and budget preparation guidelines with standard budget format;		"	"						
Design of Quarterly Activities and Financial report for format, content and scheduling.		May-June "	"						
Prepares guidelines on purpose, functions and conduct of Annual Working Group Conferences and required follow-up.		"	"						
Issues instructions on conduct of regional meeting to review and approve PP Amendment, based on guidance from AID/Washington.			June						
Country Task Forces:									
Convene necessary local meetings to review PP Amendment and prepare formal CTF positions for regional meeting. Review concentrates on CY 1983 work program and campaign plan and FY1984-1986 budgets.		May-June							
AID/Washington: Distribute PP Amendment for review by Washington offices		May-June							
Regional Meeting to review PP Amendment, Ouagadougou. Chaired by IPM Regional Project Director; attended by IPM National Project Directors, USAID Liaison Officers, FAO/Rome and redesign Team Leader and Financial Analyst.				o/a July 1-5					
Regional Task Force prepares : Meeting agenda; advises all principals of date and venue.			June						
Formulates final revised delegation of authority for Regional IPM Project Directorate and Regional Management Unit (RMU) for CILSS Exec. Sec. approval and inclusion in the PP Amendment.			" "						

116

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Regional Task Force (cont'd):									
Drafts Consultative Committee message advising all CILSS National Coordinators and IPM Directors to accelerate local tripartite collaboration toward full introduction of decentralized management (message to be issued after July 1-5 meeting).			"						
Drafts all procurement and waiver requests to be included in PP Amendment for AA/AFR authorization.			"						
Prepares for Exec Sec signature a formal CILSS letter requesting amendment of the IPM project to extend Phase I and add funding; and finalizes draft Project Agreement for inclusion in the PP Amendment.			June						
AID/Washington: Convene Project Committee to review PP Amendment and cable views/questions/changes to Ouagadougou for regional meeting.			June 15						
Redesign Contract Team:									
Convenes in Washington (o/a July 7), prepares and delivers PP amendment and associated documents for final AID/W review and approval.				July 7-31					
AID/Washington:									
ECPR to review Project Paper Amendment; submit CN; authorize Phase I extension.					Aug. 1-31				
Regional Project Directorate:									
Sub-Regional Activities:									
Formulates proposal (with FAO and USAID assistance) for organization and management structure to direct activities of Senegal River Basin sub-regional IPM component.		May-June-		July					
Obtains formal concurrence of CILSS members concerned (Senegal, Mali, Mauritania) and local USAIDs in proposed arrangements; and		May-June							
Obtains Tripartite Consultative Committee concurrence				July 1-15					

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Regional Project Directorate: (cont'd)									
Establishes formal liaison relationship with the LANDSAT office and staff and initiates appropriate exchange of information and coordination of activity.					Aug. 31				
Prepares a draft agreement specifying the type, nature and extent of working relationships between the CILSS IPM project and AGRHYMET. Obtains CILSS Exec Sec concurrence to negotiate the agreement.					Aug. 31				
Discusses with CIDA and GTZ the possibilities for funding within the concept of Annex G-1 of academic training (under direct or FAO auspices) for researchers in Upper Volta, Niger and C. Verde.					Aug. 31				
AID Regional Project Manager:									
Prepare Project Agreement amendment to extend the project and provide for decentralization through authority for national components and local USAID Missions to formulate Memoranda of Understanding governing working relationships and responsibilities between national IPM components and their FAO advisory staff and local USAIDs.				July 31					
Secure USAID/Upper Volta and CILSS Exec Sec signature of Project Agreement Amendment when CN expires.					Aug. 31				
Country Task Forces:									
Formulate Memorandum of Understanding and clear format and content with all appropriate agencies in preparation to execute upon approval of PP Amendment.				July-August					

Country Task Forces: Actions listed below under major headings should be completed between July and September (in all events, prior to October 1, 1983) in preparation for formal decentralization at the beginning of FY 1984.

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Country Task Forces: (cont'd)									
Financial Management:									
FM Project Implementation Letter drafted and ready for issue.									
IPM Project accountant on board and working.									
Project accounting system reviewed and modified for annual certification.									
Separate project bank account established.									
System established for recording encumbrances.									
Property records prepared based on inventories of non-expendables and stock levels of expendables.									
Financial reporting schedules and procedures reviewed and updated as required.									
Schedule of annual audits prepared and forwarded to Regional Project Manager for planning and funding from CILSS regional accounts.									
Identify and record host country contributions to LOP funding with FY 1985 and 1986 subject to revision and updating.									
Discuss and explore prospects of host country paying research indemnities/bonuses to project-funded personnel as suggested in PP Amendment Paper Issue No. 8, stressing importance of planning future requirements and covering recurrent costs.									
Construction:									
Construction Project Implementation Letter drafted and ready for issue.									
Preliminary discussions with Ministry of Public Works other appropriate agency for support of required construction work.									
Prepare for submission to the Regional Project Manager a one-time report showing expenditures or budgeting of project funds for:									

119

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY — 1983

FY — 1983 — 1984

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Construction: (cont'd)									
Completed construction by facility and cost;									
Construction underway, showing agency responsible for monitoring, cost and estimated completion date;									
Construction planned, showing planning actions required, a calendar of events and budgeted costs.									
(The latter two items should be up-dated in the Quarterly Activities and Financial Report)									
Procurement:									
Procurement Project Implementation Letter drafted and ready for issue.									
Review of procurement data by respective USAIDs for each IPM national component for accuracy and timeliness.									
USAIDs prepare for submission to AAPC or other appropriate supply source PIO/C's for:									
Major equipment items, such as vehicles, lab equipment, including dollar costs;									
Major equipment items procured locally, e.g., mobylettes, office furnishings and equipment, with dollar equivalent costs;									
Report to Regional Project Directorate on major items on order (by PIO/C), but not delivered.									
Prepare a procurement plan for all PIO/C purchases from FY 1985 - FY 1986 funds.									
Country Task Forces in Bamako, Nouakchott and Ouagadougou:									
Prepare formal proposals to appropriate country agencies to second agronomists (one in each country) to serve on the IPM Project staff as Surveillance and Experimentation Experts (effective October 1, 1983).					Aug. 15				

X 120

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY —————————————1983————————————

FY ————————1983———————— ————1984————

ACTION/RESPONSIBLE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FAO-CILSS complete revision of Country Operating Plans							X		
First Quarterly IPM-RFCP Coordination and Planning Meeting							X		
First Quarterly Financial Flash Report due									31st

N.B. Recurring requirements of a regular nature, such as quarterly reports, have only been listed at the first point at which they occur in the Implementation Plan. It is assumed that implementing agencies will list such requirements ad seriatim as they fall due in each implementation year.

121

IMPLEMENTATION PLAN
(IPM RESEARCH)

	CY: 1984											
	FY: 1984										1985	
ACTION/RESPONSIBLE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
First Quarterly Activities and Financial Report submitted by Country Task Forces.	31st											
Each CTF convenes all IPM researchers, reviews 1983 campaign results and prepares for Annual Working Groups Conference.	X											
Annual Working Groups Conference		X										
PTF reviews Conference results and prepares field campaign, work program and budget guidelines for 1984/1985			X									
PTF forwards to CILSS Exec Sec crop protection or pesticide control data for policy consideration by the Council of Ministers.			X									
Regional Project Manager's First Quarterly Summary Report of Project Activities forwarded to all CTF			15th									
First annual audit (arranged by Regional Project Directorate)								X				
Regional Project Manager's Administrative and Management Evaluation		X						X				
Each CTF revises and submits the 1984 campaign and work plan and 1984/1985 budgets.				X								
PTF integrates national plans and budgets, modifies regional budgets accordingly and prepares agenda for the Consultative Committee.					X							

123

IMPLEMENTATION PLAN
(IPM RESEARCH)

	CY: 1984											
	FY: 1984										1985	
ACTION/RESPONSIBLE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Consultative Committee convenes, approves 1984/1985 program and issues appropriate policy guidance.						X						
Each CTF launches 1984 field campaign. Terminates 1984 field campaign.							X					X
CILSS Exec Sec transmits (presents) crop protection and pesticide control recommendations to the CILSS Council of Ministers.							X					
Evaluation of Research Activities and Results begins											X	

123

IMPLEMENTATION PLAN
(IPM RESEARCH)

	CY: 1985											
	FY: 1985										1986	
ACTION/RESPONSIBLE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Each CTF convenes all IPM researchers, reviews 1984 campaign results and prepares for Annual Working Groups Conference.	X											
Annual Working Groups Conference		X										
PTF reviews Conference results and prepares field campaign, work program and budget guidelines for 1985/1986.			X									
PTF forwards to CILSS Exec Sec crop protection and pesticide control information for policy consideration by the CILSS Council of Ministers.			X									
Each CTF revises and submits the 1985 campaign and work plans and 1985/1986 budgets.				X								
Second annual audit (arranged by Regional Project Directorate).								X				
PTF integrates national plans and budgets, modifies regional budgets accordingly and prepares agenda for the Consultative Committee.					X							
Consultative Committee convenes, approves 1985/1986 program and issues appropriate policy guidance.						X						
Each CTF launches 1985 field campaign.							X					
Terminates 1985 field campaign.												X

IMPLEMENTATION PLAN
(IPM RESEARCH)

CY:	1986											
FY:	1986										1987	
ACTION/RESPONSIBLE	JAN	FER	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CILSS Exec Sec refers policy matters to CILSS Council of Ministers.							X					
Each CTF convenes all IPM researchers, reviews 1985 campaign results and prepares for Annual Working Groups Conference.	X											
Annual Working Groups Conference		X										
PTF reviews Conference results and prepares field campaign, work program and budget guidelines for 1986/1987.			X									
PTF forwards appropriate policy recommendations to the CILSS Exec Sec for the Council of Ministers.			X									
Each CTF revises and submits the 1986 campaign and work plans and 1986/1987 budgets.				X								
PTF integrates national plans and budgets, modifies regional budgest accordingly and prepares agenda for the Consultative Committee.					X							
Consultative Committee convenes, approves 1986/1987 program and issues appropriate policy guidance.						X						
Each CTF launches 1986 field campaign.							X					
Terminates 1986 field campaign.												X
CILSS Exec Sec refers policy matters to CILSS Council of Ministers.							X					

IMPLEMENTATION PLAN
(IPM RESEARCH)

	CY: 1985											
	FY: 1986										1987	
ACTION/RESPONSIBLE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Third annual audit (arranged by Regional Project Directorate).								X				
Project Task Force prepares and publishes manuals describing IPM systems developed for seven priority pests and containing all supporting experimental data.							July thru Sept.					
Project Task Force assembles and integrates accurate yield loss statistics on most major pests.									X			
Project Task Force establishes provisional economic thresholds for seven regional priority pests.									X			
Evaluation of Phase I begins. N.B. Should Phase II be approved, this evaluation should be postponed until March 1987 to take advantage of all 1986 research results. Before Dec. 1985												X

C. Evaluation Plan

1. General

There will be three kinds of evaluations under the extended project: (a) two administrative reviews (at six month intervals) during the first year of the project to spot and deal with any problems in the functioning of the restructured organizational and management systems; (b) an evaluation of the functioning of the research effort no later than November 1984 to determine whether research operations are functioning smoothly; and (c) a final evaluation giving particular attention to research results and utilization, efficient management and institutional arrangements which would tend to indicate that Phase II investment would be worthwhile.

a. Administrative Reviews

The administrative reviews will be conducted by the AID Regional Project Officer in February and August 1984 and reports forwarded to AFR/PD/SWAP in AID/Washington. These reviews will summarize the status of procurement, construction, recruitment, and research under the project, highlight organizational and management problems, and recommend solutions. Particular importance is attached to their timely completion and to initiation of any recommended remedial measures so as to forestall prolonged administrative problems that delayed the project earlier. The immediate attention of the Project Task Force will be required to deal with significant problems; major issues will require Consultative Committee review.

b. Intermediate Research Evaluation

The purpose of this internal AID evaluation will be to determine whether, from a technical point of view, research is proceeding in a reasonably sound and expeditious manner, to identify problems and propose solutions. It will be conducted in November 1984 under contract by personnel knowledgeable about the project, who will spend up to five weeks on the task and up to three days in each country. The Agriculture and Rural Development Officers (ADO's) in each USAID will be asked to provide technical input to this evaluation. Evaluation costs will be funded under the revised project budget for the Regional Directorate. As in the case of the administrative reviews, the timeliness of this evaluation is important. The progress of research, of course, depends in part on timely completion of construction and procurement, the prompt availability of funds and the adequacy of staffing. Problems with these prerequisites will be identified in the research evaluation. AID will have to consider the prospects for Phase II of the project based on the evaluation results and any other issues affecting development programming at this time. Congressional notification will also have to be prepared, if appropriate.

c. Final Evaluation

The results produced by the project will be evaluated by a tripartite team to assess the quantity, quality, and utility of results, to

X
127

examine efforts or preparations made to disseminate the results and to make recommendations related to an eventual Phase II of the Project. This evaluation will be completed prior to December 1985 and will be an important input to any Phase II project design. All participating USAIDs, Regional Project Direction, IPM national Project Directors and FAO technical personnel will be asked to contribute time and expertise to the final evaluation. Eight weeks will be allowed for this evaluation, for which funds are also provided under the Regional Directorate budget.

2. Benchmarks

a. Administrative Reviews

It is not feasible or necessary to specify quantitative benchmarks, however, it is possible to pinpoint things that the evaluator should look at. With respect to the organization and management changes made by the project redesign and the problems they were intended to redress, the evaluator will examine:

(1) The effect of decentralization on expeditious implementation of procurement and construction plans; and efficient budgeting for financial management

(2) Effectiveness of merged administrative/technical functions in the Regional Project Directorate; and ability to identify/resolve operating problems rapidly

(3) Expeditious recruitment of qualified FAO advisors and national counterparts, and other cooperating country and regional officials and trainees

(4) Problems, if any, encountered in organizing the work of the Technical Working Groups; effectiveness of coordination with Annex A (Regional Food Crop Protection)

(5) Effectiveness of the Tripartite Consultative Committee mechanism for setting project policy and monitoring progress.

b. Research Evaluation

Research efforts will be evaluated against the following benchmarks to be incorporated into the annual country workplans:

(1) Pest management methods

(a) Regionally coordinated research underway in each of the crop seasons preceding the evaluation and for the control of the priority pests (two insects, four plant diseases, and one weed) specified in the technical section of this paper

128

(b) Each national contingent spending at least half-time on one or more of the seven regional research priority topics agreed upon and the remainder of their time on other IPM research.

(c) Possible avenues of research for management of the seven selected pests explored and research begun on the most promising avenues. (By "avenue of research" is meant an approach to controlling the particular pest, e.g., use of natural enemies, resistant varieties, or cultivation practices)

(d) Research on pesticides limited to enhancing specificity of use, i.e., improving the timing and minimizing amounts applied and use of biological insecticides, and not including traditional research on comparative effectiveness of various pesticides or on calendar applications (applications on particular dates or at a particular stage of the crop, regardless of the pest situation in the field).

(e) Experiment planning forms completed describing experiments and objectives, including plan for analysis of socio-economic and environmental implications of each crop protection method tested.

(f) Data on outcome of every experiment available on standard regional data form (fiche)

(g) Initial outreach (in the form of demonstration/study areas attached to laboratories and observation posts) begun. Regular solicitation of farmer reactions/opinions practiced

(2) Crop Loss Assessment, Surveillance and Forecasting

(a) Iterative crop assessment and economic threshold experiments underway for each of the seven pests identified as regional research priorities

(b) For priority pests, sampling methods for surveillance and forecasting, usable by crop protection technicians and farmers, being developed. (Will include number and location of samples to be taken, methods for recognizing the critical stages for sampling, and methods of determining infestation levels.)

(c) Regionally standardized observation post data sheets.

(d) Every observer entering complete hydrological, meteorological, crop phenological, pest incidence and crop loss data on standard data forms (fiches).

(3) Institutional Infrastructure

(a) Completeness of staffing in accordance with Table II-1, Assignment and Recruitment of FAO Experts

129

(b) At least one qualified national counterpart in place for every FAO advisor

(c) Guidance of FAO advisors and regional project managers being effectively utilized by counterpart personnel

(d) Each of the national (55) observation posts in place and staffed by two trained observers

(e) Laboratories built, equipped and adequately staffed with trained technicians

(f) Long term masters degree level training begun for counterpart researchers in the numbers agreed to in each country operational plan

(4) Miscellaneous

(a) Working Groups meeting and bringing together principal FAO and national project technicians, along with outside researchers in subjects of mutual interest, technical manual preparation underway

(b) Research program for regional topics well coordinated: duplication of effort being avoided, and adequate replication of experiments ocurring

(c) Annual planning/revision of Country Operating Plans carried out smoothly and closely coordinated with research users/disseminators, e.g., RFCP; other donor programs

(d) Cooperation agreements in effect between organizations responsible for IPM research at national level and cooperating government and other donor organizations concerned with extension and dissemination of agricultural information, particularly RFCP. Means of providing feedback from extension and dissemination experience to IPM researchers being developed

(e) Complementarity of IPM research and other AID-financed agricultural programs being identified by participating USAIDs

(f) Member States planning/beginning to assume costs of supporting IPM research operations

c. Final Evaluation-

(1) The content of the Research Evaluation will be repeated for subsequent cropping seasons and, in addition, the following benchmarks will be observed

(2) Reasonable progress of work in developing IPM technical packages for the regional priority pests; manuals containing research results and recommendations published for wide dissemination.

The technical packages will naturally vary widely in both substance and extent because the ecology of, and optimum control methods for, each pest are unique. For example (hypothetical!!) recommendations for Rhaguva control may center on forecasting coupled with mechanical control in fields known to be at risk. In contrast, sorghum midge may be controlled through judicious choice of planting dates and/or selective insecticide application to the earliest flowering panicles when adult midges present exceed threshold levels.

Regardless of individual details, the packages will represent the integration of state-of-the-art research results into practical and economical recommendations for control of priority pests. Even with satisfactory progress of Phase I research, the level of control achieved for some pests may not be ideal. Work after Phase I should improve pest control recommendations and adapt them to changing field circumstances.

(3) Economic analysis of crop loss assessment data will have been performed and provisional economic thresholds established for pest control treatment by national crop protection services

(4) All project-financed facilities constructed, equipped and staffed by qualified Sahelian personnel

(5) Trained research cadre in place and performing functions in support of IPM research system; or positions identified for trainees returning after the Phase I PACD

(6) Established, smoothly functioning working relationships among regional and national IPM research entities, as well as with crop protection and extension services; systems for arriving at mutually agreed priorities and for providing crop protection/extension feedback to IPM researchers

(7) CILSS and participating Member State assumptions of recurring costs worked out

X
131

D. Conditions and Convenants

In the topic above on Training of Sahelian Personnel, this PP Amendment contains "Conditions of Training" as outlined to the redesign team by the Regional Directrix and FAO representatives during team deliberations in January 1983 in Washington, D.C. The principal "condition" is that candidates selected for academic training would sign agreements to work within the IPM project for a period of five years upon completion of training, ranging from two to four years, financed under the project.

A covenant to this effect has been incorporated into the draft ProAg in which the Executive Secretary of CILSS will enlist cooperation from national IPM Directors in obtaining such engagements from the prospective researchers proposed for academic training under the auspices of FAO as the principal source of technical assistance to the project.

ANNEX A

GRANT APPLICATION AND ASSOCIATED DOCUMENTS

1. CILSS Letter of Application and Delegation of Authority

2. a. Draft Project Agreement With Project Description and (First Year) Financial Plan

   b. Congressional Notification

3 Organization Chart With CILSS/FAO Functional Terms of Reference

4. Revised Statutory Checklist

5. 1981 Evaluation Recommendations and Latest Status

Annex A-1
CILSS Formal Letter of Applicatio

(Unofficial Translation of French Language Original)

CILSS File 869

Ouagadougou, July 15, 1983

Sir,

As a result of the 1981 evaluation, an intensive redesign effort in 1982-83 and through combined endeavors of CILSS, AID, and FAO, the modifications necessary to the pursuit of the Integrated Pest Management Project have now been accomplished. The attached Delegation of Authority gives the Regional Project Directrix the responsibility for the technical, financial, and administrative aspects in the project's implementation. The project is now ready to produce the research results that continue to be so vitally necessary across the Sahel.

The 1981 evaluation recommended a funding increase of about $8 million in the total project budget for an extension of three years to achieve the original project goals. A review of project activity undertaken by CILSS, FAO, and AID representatives allows for a reduction in that required financial augmentation for an extension of four years.

Considering the importance that CILSS and the Sahel region attach to this project plus the agreed efforts for limiting increased expenditures to the strict minimum necessary to realize project objectives, I request that AID approve supplementary financing for the adjustments agreed among the three partners for the IPM project and an extension of the project until September 30, 1987.

/s/ _____

Executive Secretary
Seck Mame N'DIACK

Director
USAID Mission
Ouagadougou, Upper Volta

(A Delegation of Authority is attached although not specifically listed as an enclosure)

X
135

Attachment to Annex A-1
CILSS Executive Secretary's Delegation of IPM Project Authority
to the Regional Project Directrix

(Unofficial Translation of French Language Original)

CILSS File 869 Ouagadougou, July 15, 1983

DELEGATION OF AUTHORITY

I, the undersigned, Seck Mame N'DIACK, Executive Secretary of CILSS, delegate to the Regional IPM Project Directrix all responsibilities for the technical, administrative, and financial management of the implementation of the IPM Project (Annex B of the Program for Crop Protection).

In conformity with the Terms of Reference describing the position, the Regional Project Directrix reports to the Executive Secretary on project implementation, directing and coordinating all associated activities, including administrative decisions relative to the project.

The Regional Project Directrix is invested with all the authority necessary or useful to the exercise of her responsibilities, including the power to:

a) Act as CILSS representative in all matters concerning services rendered by the FAO in conformity with the September 1, 1978 accord and in relations with the Principal and all other FAO experts (in the project);

b) Make all technical, administrative, and financial decisions in day-to-day project implementation and to submit administrative and financial questions to the Regional Management Unit for its views before taking a final decision;

c) Supervise and coordinate all administrative aspects of the project, including (but not limited to) preparation and adjustments in the annual budget, financial accountability, procurement, construction and logistical support, and initiate annual audits;

d) Act in the capacity of Executive Secretary of the Tripartite Consultative Committee and ensure the implementation of the Committee's decisions; chair the Project Task Force and the Conference of IPM Technical Working Groups;

e) Formulate technical and administrative directives for the various project components; national, sub-regional, and regional;

f) Represent CILSS in conferences concerning IPM in general or the project in particular;

g) Receive all communications and correspondence concerning the IPM project and prepare and dispatch all pertinent responses over the signature of the Executive Secretary.

/s/ _____

Executive Secretary
Seck Mame N'DIACK

Director
USAID
Ouagadougou, Upper Volta

a. Draft Project Agreement Amendment

The Project Grant Agreement between CILSS and the United States of America for this project will be amended as follows:

1. Section 2.1(a) Delete "six"

2. Section 3.1 is amended to change the grant to an amount not to exceed $28.8 million.

3. Section 3.3 is amended to change the PACD to September 30, 1987.

4. Section 5.5 will be amended by adding the following paragraph:

"Evaluation of the extension of Phase I of the project for the period October 1, 1983 through September 30, 1987 will be in accordance with the Project Paper Amendment covering that extension."

5. Section 5.6 will be added to General Covenants, reading as follows:

"Cooperation of national IPM Directors will be enlisted by the Grantee in obtaining the signed agreement of all trainees approved for academic programs under FAO supervision for periods ranging from two to four academic years, to serve in the IPM Program in their respective countries for at least five consecutive years after completion of such academic training."

Substitute the Attachment, Project Description, for the Project Description attached to the original Project Agreement.

Attachment: Project Description and Financial Plan.

Attachment to Annex A-2
Project Description

This project is designed to help establish Sahelian institutional capacity to carry out integrated pest management research for the protection of food crops within the CILSS Member States and to produce technical packages of IPM control methods suitable for extension to small farmers. Integrated pest management, which involves the maximization of non-chemical control methods such as adjusted planting schedules, post harvest stalk destruction, crop rotation, animal traction for weeding, plant breeding and seed soaking, has been tested elsewhere in the world and proven effective; and it is the best alternative to increased use of chemical pest control, which may be too costly, ineffective, and environmentally damaging.

Although this is a discrete, self-contained project, with AID funding totaling $28.8 million from 1978-1987 subject to the availability of funds, it fits into a comprehensive CILSS program for protection of crops in the Sahel. Called Annex B of that program, this project will use AID funding to help accomplish the first phase of creation of a Sahelian IPM research system. Other related elements of the global CILSS program include strengthening national plant protection services, IPM extension delivery systems, rodent control, and control of grain-eating birds.

The IPM project consists of four main components: applied research, initial outreach (demonstrations), establishment of pest monitoring (surveillance) systems, and training of a permanent Sahelian IPM research cadre. Research objectives are to develop and validate the most effective integrated pest control techniques for major food crops of the Sahel. To achieve this it will be necessary to build and equip laboratories and observation posts with nearby demonstration areas (test plots), provide expert technical/advisors researchers, and arrange long-term advanced academic training for qualified Sahelian counterparts. The research activities will be carried out by national agricultural research organizations in the various Sahelian countries who will collaborate with each other and with regional research entities, e.g., WARDA, IITA, and ICRISAT.

The outreach component of this project will be focused on setting up a researcher-farmer dialogue and on preparing the mechanism for the transfer of the results of the field and laboratory research to the small farmer through national crop protection delivery systems. The project will cooperate closely with crop protection service and extension activities under CILSS Annex A in the CILSS countries. Project financed technical experts will help train technicians who will be responsible for the testing and extension of IPM methods from the multi-local trial stage. Results will be transmitted to the Sahel Institute and other appropriate recipients for dissemination to researchers and for the production of extension aids to reach small farmers. Sahelian

observers will coordinate the collection of pest surveillance data (including base line data for pesticides/environmental monitoring) and participate in crop loss assessments. Funds will be made available under the project for a feasibility study to determine the nature/extent of support needed by AGRHYMET to complete the Sahel-wide pest surveillance system with computerized forecasting. The study will be prepared for presentation to potential donors for financing.

A Regional Project Directorate located in Ouagadougou will be headed by a Sahelian and will be responsible for overall project technical, administrative, and financial management. Research coordination is the responsibility of the Regional Project Directorate through the use of regional cooperative research programs, and regular meetings of Technical Working Groups which are charged with producing manuals on pest management methods for priority pests in the Sahel.

AID funding will be provided for FAO technical advisors; equipment (principally laboratory, field, and vehicles); construction, e.g., small laboratories and observation posts; training; local personnel; and some country operational costs such as vehicle maintenance, fuel, and per-diems. These inputs will be coordinated by the Regional Project Director/trix working through the Regional Project Task Force (consisting of the Regional Director/trix, the Senior FAO Advisor, and the IPM Project Officer for USAID/Ouagadougou). Country Task Forces (chaired by the national IPM Project Director/trix and consisting of the senior FAO technical advisor and USAID IPM Liaison Officer) will plan and implement the project.

Overall surveillance and policy guidance of the project will be provided by a high-level CILSS-AID-FAO Tripartite Consultative Committee. The Regional Project Director/trix will serve as Executive Secretary to the Committee, which will be chaired by the CILSS Executive Secretary. A representative of the AID-financed Annex A (Regional Food Crop Protection) project will attend meetings of the high-level Tripartite Consultative Committee. National IPM Directors/trices may attend these meetings as observers.

By the end-of-project, effective pest management techniques should be locally available in the Sahel to control crop losses, and trained Sahelian counterparts should be in place able to continue the research and refinement of results. FAO was confirmed by CILSS as coordinator of technical advisory services because of the experience that FAO brings to the project as a result of its role in establishing the global FAO-UNEP Program on Integrated Pest Control, which has been effective in coordinating IPM research on several crops in various locations around the world.

The ultimate beneficiaries of this project are the small farmers in the Sahel who will be able to draw upon tested pest control techniques to protect their food crops. The direct beneficiaries will be the national agricultural research agencies, which will receive expatriate advice and logistical support coordinated through CILSS. Another direct

X
140

beneficiary will be the CILSS, which will gain operational experience in coordinating and managing this regional crop protection program.

The technical assistance grant input called for in this project totals $28.8 million for the extended life of Phase I. Counterpart contributions from the eight CILSS Member States are described in the annual project financial plan annexed to this project description. Such contributions consist primarily of salaries for research and administrative personnel and allocation of certain real estate and facilities to the Project. It is expected that CILSS and the participating Member States will assume responsibility for all recurring costs of continuing IPM research at the level established by the end of this project.

With respect to project implementation, the Regional Project Director/trix is appointed by, and responsible to, the CILSS Executive Secretary, and will take charge of the project with technical assistance from FAO and administrative support from USAID/Upper Volta. In accordance with agreements reached during the 1982-83 redesign, all incoming and outgoing correspondence regarding the IPM Project will be handled by the Regional Project Director/trix. All project-related correspondence and documents will be prepared by the staff of the Regional Project Directorate. All administrative and finance matters of the IPM Project will be referred by the Regional Project Director/trix to the Regional Management Unit (U.G.R) of the CILSS Executive Secretariat for advice and comment; and then returned to the Regional Project Directorate which will prepare the final response for the signature of the Executive Secretary and forwarding by the Regional Project Director/trix to the recipient. The Regional Management Unit attends (as representative of the Executive Secretary for administrative and financial matters) that annual meeting of the Project Task Force dealing with the annual project workplan and budget. The U.G.R will not attend remaining meetings of the Project Task Force, because they deal only with project implementation. AID will assign a Project Manager to Ouagadougou who will be responsible for project implementation and liaison with CILSS and FAO. Day-to-day procurement, construction supervision, and financial management implementation responsibility will be decentralized to the AID Missions in the participating countries which will also monitor the project at the national level and maintain close liaison with the national components through a Country Task Force arrangement.

Specific project purposes will be to:

(a) Establish a surveillance system on the occurrence of major pests

(b) Evaluate the relative economic importance of these pests through crop loss assessment

(c) Establish experimentation/demonstration areas to study and demonstrate the benefits to be drawn from integrated pest control

141

(d) Assist the CILSS Annex A projects and national extension and crop protection services to implement results at the farmer level

(e) Establish and train a permanent Sahelian research cadre to study the bionomics of the major pests and develop the best integrated control techniques

(f) Produce tested research packages in the form of manuals covering all integrated control concepts for two insect pests, four plant diseases, and one weed identified as priority problems in the Sahel

To achieve these project objectives and assure that an integrated pest management activity is ready to go in each country, it will be necessary to have the following outputs in place at the end of Phase I of the IPM Project:

(a) Research laboratories for plant protection will have to be built and/or equipped in Senegal, Mali, Upper Volta, Mauritania, Niger, The Gambia, and Cape Verde and an operating research program will be generating and testing, on a continuing basis, improved and adapted crop protection practices for the principal food crops.

(b) Some 32 African professionals will have begun, and some of those have finished, training toward the M.S. level in various disciplines; and permanent research positions will have been identified for these individuals by the host governments.

(c) Local assistants or technicians will have been trained and assigned to the research programs.

(d) A methodology will have been developed for operating a surveillance and pesticide monitoring system, quantifying production constraints, assessing crop losses, and determining economic thresholds to guide the implementation of plant protection programs in the Sahel.

(e) Fifty-five observation posts for surveillance and loss assessment will have been built, equipped, and staffed in the Sahelian countries.

(f) Experimentation/demonstration plots will have been established near laboratories and observation posts and will be carrying out a continuous program of outreach and feedback involving small farmers.

(g) One hundred ten field agents, appropriately qualified in plant protection, will have been trained to conduct the work in the observation posts and demonstration areas.

X
142

(h) A system of information flow on major diseases and pests will have been set up to guide research.

In order to achieve these outputs, inputs in terms of technical assistance, commodities, training, construction, and other elements as defined in the Financial Plan that follows will be required to be provided on a timely basis from AID and the host governments involved.

FY 1984 Financial Plan
$7,293,401

Project Inputs

	AID ($000)	B/G	Other	Total
I. Technical Assistance				
FAO Personnel	1,875			
Consultants	168			
II. Training	921			
III. Commodities	897			
IV. Construction	506			
V. Other Costs	1,958			
VI. Administrative Costs				
(A) FAO	369			
(B) CILSS	280			
VII. Contingency	319			
TOTAL	$ 7,293 (1)	(2)	(3)	$7,293

(1)See Annex C-2(a)
(2)To be determined during USAID/FAO/CILSS/host country negotiations of individual country component operational plans, due for completion in October-November 1983.
(3)FAO/UK expression of future interest in the project $280,000.

X
144

b. Congressional Notification

AGENCY FOR INTERNATIONAL DEVELOPMENT

ADVICE OF PROGRAM CHANGE

15 JUL 1983

Country	: Sahel Regional
Project Title	: Regional Food Crop Protection (Integrated Pest Management)
Project Number	: 625-0928
FY 1983 CP Reference	: Africa Programs, page 125
Appropriation Category	: Sahel Development Program
Life-of-Project Funding	: $42,550,000* (Grant)
Intended FY 1983 Obligation	: $8,974,000

This is to advise that AID intends to obligate $8,974,000 in Sahel Development Program funds for the Regional Food Crop Protection-Integrated Pest Management project. This will include an increase of $8.7 million in the authorized life-of-project total for the IPM component and an increase of up to $500,000 in the authorized life-of-project total for the Regional Food Crop Protection component.

A comprehensive evaluation of the Regional Food Crop Protection project recommended that the Integrated Pest Management component be redesigned to correct administrative and structural problems which had seriously delayed implementation. The redesigned component calls for additional life-of-project funding to cover the cost of a three year extension in order to achieve its original objectives. The second phase of the Regional Food Crop Protection component requires an additional year and increased life-of-project funding to continue technical assistance and to complete construction and commodity procurement for the participating national crop protection services.

On July 15, 1983, in accordance with the requirements of Section 121(d) of the Foreign Assistance Act, the Acting Assistant Administrator for Africa determined that project components for which Sahel Development Program funds are disbursed to host governments meet AID criteria for sound financial management and accounting.

An Activity Data Sheet is attached.

*The authorized life-of-project total was inadvertently reported as $31,251,000 on the previous Activity Data Sheet (Africa Data Base for FY 1981, page 202). The authorized life-of-project total should have been reported as $33,300,000.

145

AGENCY FOR INTERNATIONAL DEVELOPMENT
ACTIVITY DATA SHEET

PROGRAM: Sahel Regional

TITLE 625-0928 Regional Food Crop-Integrated Pest Management	FUNDING SOURCE: Sahel Development Program	PROPOSED OBLIGATION (In thousands of dollars): FY83 8,974	LIFE OF PROJECT (Auth): 42,550
NUMBER: GRANT ☒ LOAN ☐ / NEW ☐ CONTINUING ☒	PRIOR REFERENCE: Africa Data Base, Page 202	INITIAL OBLIGATION FY 78 / ESTIMATED FINAL OBLIGATION FY86	ESTIMATED COMPLETION DATE OF PROJECT FY 87

Purpose: To develop environmentally sound food crop protection alternatives which minimize chemical pest control and to extend these alternative practices to small farmers in the Sahel.

Background: Estimates of pest-caused food crop losses in the Sahel run as high as 25-40% of production. To help bring food security to this drought-prone, ecologically fragile area, the CILSS formulated a multi-component, $67 million program for crop protection throughout the Sahel. AID is financing the Regional Food Crop component which consists of two separate but closely related components. The first of these supports creation and strengthening of national crop protection services, as well as extension channels for transmitting IPM technologies to small farmers. The second component supports creation of Sahelian institutional capacity to conduct IPM research on a regional and country basis.

Project Description: The component which supports crop protection will be extended by one year and an increase of up to $500,000 will be added to the life-of-project authorization for completion of the second phase. Crop protection services have been established or strengthened in 4 Sahelian countries and 2 West African countries; and regional training centers are established and operating in one Sahel and one West African country. The third and final phase of this component, emphasizing development of IPM-oriented training and extension, is under design for authorization in the near future. The IPM research component has undergone a major redesign to correct administrative and structural impediments to implementation. A 3 year life-of-project extension for this component, along with a $3.2 million increase in funding will permit the project to achieve its original objectives.

Relation of Project to AID Strategy: A.I.D. collaborated with CILSS, the FAO and other donors in designing the Sahel-wide CILSS crop protection program. The Agency has provided financial support for support of crop protection activities and IPM research since 1975 as part of the response to the major Sahel drought of 1973-1974. A major evaluation carried out in 1981 reconfirmed the importance of IPM-oriented crop protection for the Sahel, and AID's continuing role in it.

Host Country: The CILSS and participating national governments are contributing counterpart staff, land and physical facilities on an in-kind basis. The Canadian and German Governments are supporting national crop protection services in countries where AID is not (Upper Volta and Niger). Other components of CILSS' global crop protection program are funded by other donors, e.g., the Government of the Netherlands and UNDP.

Beneficiaries: The project benefits an estimated 1,500 Sahelians who are employees of the national crop protection services, extension agencies and research entities through training and material support for their work. An estimated 50,000 small food producers living in the participating countries will benefit from crop protection services and IPM research and extension.

Major Outputs	All Years
Regional Training Centers	2
Pest surveillance network	10 posts
Research/demonstration facilities	27
Information dissemination (regional)	1 office
Technical research packages on priority pests	7
Effective crop protection services	6

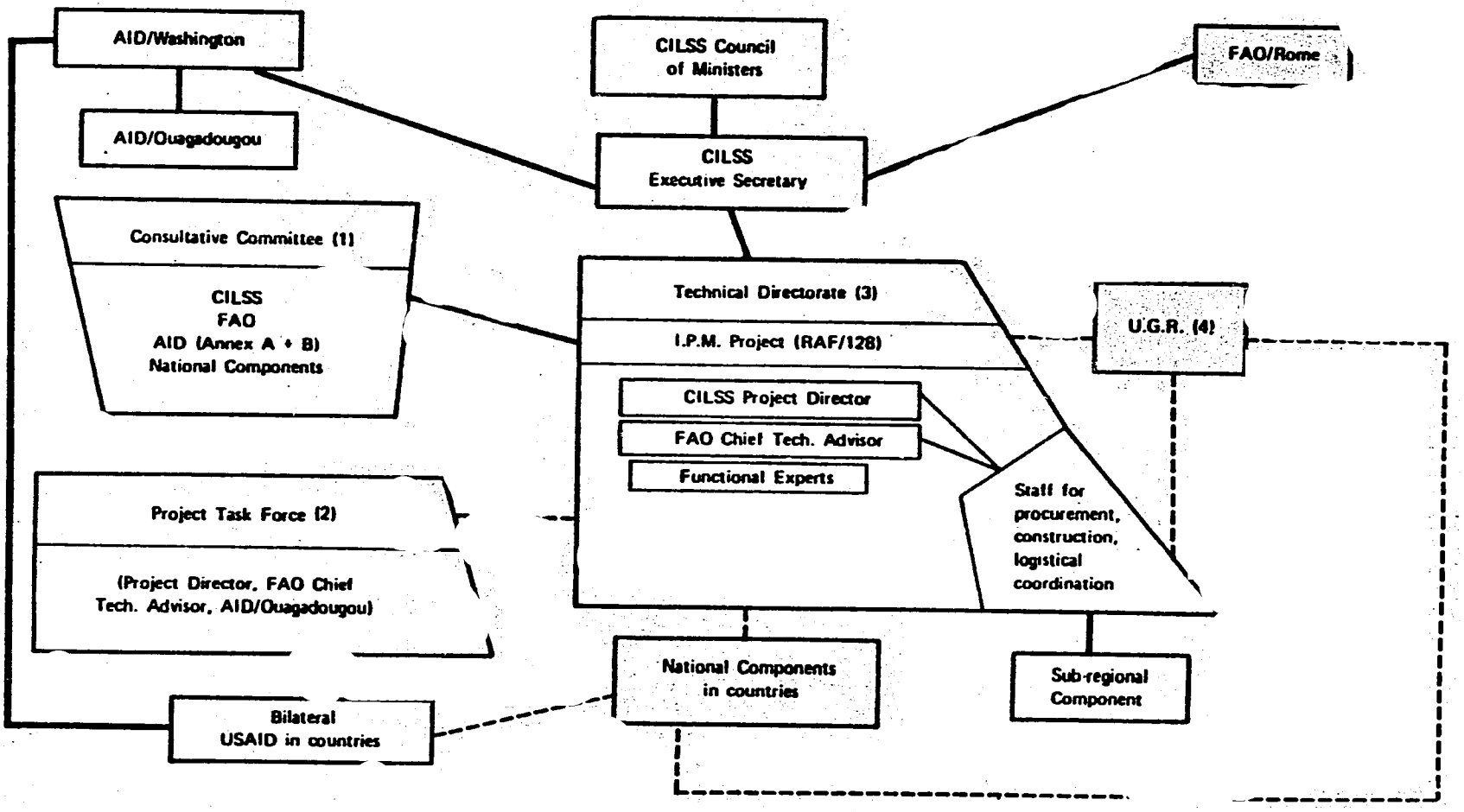
AID-Financed Inputs	($ thousands) Life-of-Project
Technical Assistance:	
30 long-term (1,976 pm)	20,624
9 short-term (58 pm)	617
Training:	
42 long-term US (816 pm)	7,344
48 short-term US (48 pm)	600
64 short-term third country (230 pm)	230
1,500 short-term local (2,600 pm)	1,800
Commodities: Vehicles, lab and field equipment	1,890
Construction: Offices, warehouses, labs, observation posts	4,200
Other Costs: Local operating costs, materials, engineering and audit services	1,745
Total	42,550

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1981	15,318	3,795	11,523
Estimated Fiscal Year 1982	3,050	5,000	9,573
Estimated Through September 30, 1982	18,368	8,795	9,573
		Future Year Obligations	Estimated Total Cost
Proposed Fiscal Year 1983	8,974	15,208	42,550

PRINCIPAL CONTRACTORS OR AGENCIES
(1) USDA PASA (Crop protection)
(2) UN Food and Agriculture Organization (IPM Research)

146

Annex A-3
Organization Chart



1. Meets regularly at least once a year, but more often at the request of any one member. Reviews and approves policies and plans.

2. Meets quarterly for sake of operational coordination.

3. Technical Direction operates under formal delegation with full operational authority for implementation of approved policy and plans

4. Responsible to Executive Secretary for monitoring, reviewing and preparing staff work in support of the execution of his responsibility for or interest in Annexes A, B and others.

Attachments to Annex A-3
FAO-CILSS Terms of Reference
for Regional and National IPM
Managers and FAO Experts

(Unofficial Translation of French Language Original)

Mme Ba
Project Directrix

R. Blouard, FAO

Terms of Reference

Attached are copies of the Terms of Reference referred to the CILSS Executive Secretary and Mr. Furman, USAID Rome.

These TOR should be incorporated as Annex B-5 to the (IPM) Project Paper.

Attached are TOR for
CILSS Director/Directrix
FAO Principal Technical Advisor

Note: Many duties and responsibilities for different positions were defined in the exact, same language. For brevity, cross-referencing has been used without losing any substance.

Terms of Reference

A. CILSS Director/Directrix

Station: Ouagadougou, Upper Volta

1. The project director/directrix will be fully responsible to the CILSS Executive Secretary for the project implmentation. He/she fulfills the mandate in the framework of the CILSS-USAID agreement signed February 7, 1978.

2. The project director/directrix receives the scientific and technical support of the FAO Principal Technical Advisor assigned to the Regional Project Directorate. He/she consults (the advisor) on all matters related to technical and scientific aspects of the project in order to arrive at mutual agreement on decisions to take to direct and coordinate all project activities including related administrative operations, specifically:

a) establish all contacts with national, sub-regional, regional, and international organizations which can and will cooperate and collaborate with the project;

b) supervise--technically--the activities of the project's national components;

c) oversee the complementarity of project activities with those of other existing or planned agencies at all levels: national, sub-regional, and international (USAID's Sahel Food Crop Protection, the AGRHYMET Project, the ICRISAT Project, etc.);

d) convene periodically, once or twice a year, the leaders of each team (research and development) to plan, elaborate, discuss, and revise, as necessary, the programs, plans, and schedules of (project) work;

e) cooperate with all teams working in the members (of CILSS): bilateral, international, national assistance agencies, FAO, etc., and study requests (for assistance) for the national, sub-regional, and regional (project) components;

f) propose and distribute training grants according to project needs;

g) propose and elaborate research contracts with specialized organizations or institutions;

h) oversee proper implementation of research programs, training, surveillance, and extension according to project goals;

X
149

i) prepare reports on the state of project progress.

3. On administrative and financial matters, in consultation with the FAO Principal Technical Advisor, he/she transmits (and assures follow-up) in timely fashion and according to AID format, all requests for supplies, equipment as well as contracts and service requests to meet project needs.

4. The director/directrix fills the function of secretary/reporter to the Consultative Committee and assures the application of directives issued by the Committee.

5. Among other duties, the director/directrix:

a) assures that activities undertaken at national level are linked to IPM goals defined in project documents;

b) organizes the establishment of technical working groups, grouping together technicians working in the same disciplines in the Sahel (plant pathologists, entomologists, etc.);

c) assures that all the experts assigned to national, regional, or sub-regional components receive the means necessary to carry out efficiently and freely the technical responsibilities assigned to them, particularly that of implementing tasks specified in the work plans, approved by the National Committees of Coordination or by the Executive Secretary (of CILSS) for the national or sub-regional levels.

6. The director/directrix assumes all other responsibilities essential to smooth functioning of the project.

B. FAO Principal Technical Advisor

Station: Ouagadougou, Upper Volta

Under the general direction of the Chief of African Service of the Division of Agricultural Operations and the technical supervision of the Chief of Service of Crop Protection of the Crop Protection and Production Division, the Principal Technical Advisor is responsible for the technical support furnished to the Project by FAO and conforms with the September 1, 1978, accord between FAO and CILSS.

Within that context, the FAO advisor:

1. is the representative of all the FAO personnel assigned to the project whether at the project's Center of Coordination or at national or sub-regional levels. In that regard, he supervises and checks the work completed whether by the experts or by consultants in cooperation with the operational and technical services of FAO Headquarters in Rome;

2. is the principal scientific and technical advisor to the CILSS project manager. A permanent and direct collaboration exists between the CILSS Director and the FAO advisor who consult mutually on all questions related to the project's scientific and technical aspects with a view to achieving mutual accord on decisions to take to direct and coordinate all technical activities, including related administrative operations, specifically:

(Note: Points a, b, and c duplicate exactly the same points in the CILSS Director/Directrix TOR; for the remaining points in this paragraph, i.e., d, e, f, g, h, i, the emphasis is on "participating" or "assisting" in the same duties charged to the CILSS manager.)

At the conclusion of the assignment to the project, the Principal Technical Advisor provides a completion of assignment report to FAO Headquarters.

C. National CILSS Director

Station: Each participating country

1. The national director, named by the government, is the responsible (person) in the national component for the project in the country. In that regard, the director assures a permanent liaison with the project directorate in Ouagadougou, keeping it regularly advised of the state of project progress and any potential constraints.

2. More specifically, the national director is charged with supervising the timely delivery in conformity with signed agreements of all the national and international contributions related to activities planned in the country.

In particular, the director

-- applies to the project directorate in Ouagadougou for recruitment of international experts;

-- applies to the appropriate agencies for purchase of supplies and equipment;

-- manages the bank account opened in the project's name from which to cover local purchases (supplies and equipment) and current operating costs.

3. Technically, the national director:

-- assumes the functions of secretary/reporter of the National Committee of Coordination;

-- receives the technical and scientific support of the Principal Technical Advisor assigned to the project in the country and, through that intermediary, the support of other assigned FAO experts;

-- consults the Principal Technical Advisor in the country on all important questions related to scientific and technical aspects of the project in order to arrive at mutual agreement on decisions to take to direct and coordinate all technical activities of the project including related administrative operations, specifically:

(Note: Points a, b, c duplicate those in the Regional Director's TOR, except that the national director receives approval of all plans from the National Coordinating Committee--point c).

d) orients and harmonizes, in conformity with National Coordinating Committee directives, work implemented by all teams regardless of origin: bilateral, international, national, FAO, etc.;

e) proposes to the Onaga Directorate the training needs of the project;

X
152

f) proposes to the Onaga Directorate any research contracts with specialized organizations and institutions;

g) consults the National Coordinating Committee on candidacies for experts or consultants and on research contracts;

h) maintains contact with all national organizations that can and want to cooperate;

i) establishes and convenes periodically the interdisciplinary technical working groups necessary to project operations in the country;

j) prepares reports on project progress.

4. Note: This point coincides with para. 5c in the TOR of the Regional Director.

5. Note: See 4 above.

Terms of Reference

Title: Senior Expert, Specialist in Integrated Pest Control.

Programme: FAO/CILSS, Research and Development of Integrated Pest Management for Basic Food Crops in the Sahel.

Duty Station: Banjul (Gambia) or other participating country.

Under the operational responsibility of the Project Director, assisted by the FAO Principal Technical Advisor and in cooperation with the FAO experts, the experts from bilateral agencies and the national personnel working for the project, the expert, within the overall framework of the project, will be the leader of the multi- and inter-disciplinary team working at the national level of which all the activities are aimed at the same objective, i.e., the integrated control of pests of the major food crops.

For this, he will assist the director of the national project component to carry out the following activities:

1. to review, analyze, and synthesize the studies, work reports, and all other information available concerning research and control of pests of basic food crops in the country;

2. to provide assistance to the national research and extension programmes for the protection of food crops that fall under the present project, i.e., millet, sorghum, maize, wheat, rice, groundnuts, and cowpea;

3. to apply the general guidelines for the research and development of integrated control of pests of major crops in the Sahel countries;

4. to coordinate the activities of the national programme with those of the regional programme;

5. to establish and to organize a national network of surveillance of crop pests in conformity with the arrangements made with the Agrhymet Regional Project. The aims of this network are:

   a) to follow the population fluctuations of all pests, diseases, and weeds;

   b) to study the bio-ecology of the major pest species and their natural enemies;

   c) to define economic damage thresholds; and

X
154

d) to develop a system of pest forecasting and warning.

6. to introduce research results into experimental fields of the agriculture research and plant protection services;

7. to establish demonstration/study plots in farmer's fields in order to show the benefits to be gained from integrated pest control;

8. to organize socio-economic studies for the review and evaluation of traditional plant production and protection practices;

9. to control the pest surveillance network, the field experiments, and demonstrations;

10. to collect and analyse the results obtained by the project;

11. to participate actively in the transmission of information and the local training of personnel working directly or indirectly for the project;

12. to prepare periodically activity reports and documents and brochures for training and extension; and

13. to develop and to apply a true strategy of integrated pest control for each of the major food crops.

At the end of his mandate for the project, the expert will submit to FAO Headquarters a final report.

Annex A-4
Project Checklist

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653(b): Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?	This project is being presented to Congress through the advice of program change process, to show the new total life of project funding of $28.8 million and the research program and implementation changes included in this PP amendment.
2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	The Project Committee determined that FY Section 611(a) was satisfied, in that adequate engineering, financial, and other plans, and reasonably firm cost estimates have been provided.
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	No legislation action required.
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	YES

X
156

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	YES. See Annex C-2(g).
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusions whether assistance will encourage regional development programs.	YES, CILSS is a regional organization.
7. FAA Sec 601(e). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.	The project purpose is to undertake research to improve the technical efficiency of agricultural production in seven Sahelian countries.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	This is a research project for which technical assistance will be provided by the Food and Agriculture Organization.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	CILSS member countries are contributing to extent possible to cover certain local costs.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	U.S. does not own any excess foreign currency.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	YES, competitive selection will be used.
12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?	No such commodities are involved.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and	Participation in research trials and use of research results will involve rural farmers in the economic development process.

X
158

(e) utilize and encourage regional cooperation by developing countries?	
b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source).	N/A
c. (107) Is appropriate effort placed on use of appropriate technology?	Project research will help develop all best appropriate technologies.
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?	The 25% requirement is not applicable because the CILSS member countries are all "relatively least-developed."
e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	N/A
f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.	This project will provide essential cereals research results which will assist the CILSS Member States in meeting their food needs.
g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the	CILSS member countries provide African manpower to complement the FAO researchers.

increase or productive capacities and self-sustaining economic growth?

2. Development Assistance Project Criteria (Loans Only)	N/A
3. Project Criteria Solely for Economic Support Fund	N/A

Standard Item Checklist

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	YES, the individual USAID will see that U.S. small businesses are considered as procurement sources for U.S.-origin equipment.
2. FAA Sec. 601(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	YES
3. FAA Sec. 601(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the United States on commodities financed?	YES
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	N/A
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	YES, this will be assured by the individual USAIDs.
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be trans-	YES

X
161

ported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.

7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? N/A

8. International Air Transport, Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available? YES

9. FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States?

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? N/A

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? YES

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the United States not exceed $100 million? N/A

C. Other Restrictions

1. FAA Sec. 122(e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	N/A
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?	N/A
3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the United States?	YES
4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or guaranty of such transaction?	YES, AID procurement regulations will be applied for purchase of some non-U.S. source origin vehicles.
5. Will arrangements preclude use of financing?	
a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization?	YES
b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?	YES
c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs?	YES
d. FAA Sec. 662. For CIA activities?	YES

X
163

e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel? YES

f. FY 79 App. Act Sec. 106. To pay U.N. assessments? YES

g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.) YES

h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields? YES

i. FY 79 App. Act Sec. 601. To be used for publicity on propaganda purposes within United States not authorized by the Congress? YES

Annex A-5
1981 Evaluation Recommendations and Current Status

A. General Management

1) AID authorize a Regional Integrated Pest Management/Food Crop Protection Office located at USAID/Ouagadougou with a high-level staff of three; (RFCP moves from Dakar);

   A proposal for realization of this recommendation awaits the completion of the RFCP III design.

2) CILSS and AID vest responsibility for technical direction IPM Project implementation in FAO;

3) FAO accepts a technical direction, financial management and procurement responsibility for IPM Project;

   AID with the agreement of CILSS/FAO decided not to alter the existing CILSS-FAO relationship. AID did not concur in the shift of financial management to FAO.

4) CILSS transfers Regional IPM Project Direction Office from Bamako to Ouagadougou. Executive Secretary should have authority to appoint Regional Project Director (CILSS);

   The Regional Directorate function has been transferred; the physical move of the Project Director awaits availability of Ouagadougou real estate to house the entire CILSS Executive Secretariat.

5) Regional IPM Project Director (CILSS) serves as ex officio member CILSS Coordinating Committee for Crop Protection;

   The CILSS Executive Secretariat has not convened a Committee meeting for two years; donors have not received a formal proposal or budget for such a meeting.

6) CILSS-FAO-AID designate Technical/Administrative Advisory Committee to implement Evaluation Team recommendations and to conduct annual evaluations starting June, 1982;

   A committee similar in nature is proposed in the IPM redesign, which also places the responsibility for arranging and funding evaluations in the Regional Directorate.

7) CILSS-FAO-AID designate Regional Management Committee to resolve differences concerning policy directives or procedures;

   A Project Task Force will fulfill this function; a Country Task Force will perform similar duties at national level.

X
165

8) Management analyst review and recommend changes in Management Protocol (Protocole de Gestion) and relationships shown therein.

The redesign addresses the principal relationships, i.e., between the Executive Secretary and the IPM Project Director and the Regional Management Unit Director.

B. Technical Recommendations--Integrated Pest Management Project

1) FAO socio-economist's position should be filled in regional project staff;

This position remains to be filled, but the redesign team placed it in the No. 2 priority standing immediately after the Principal FAO Advisor position which is also vacant.

2) Outstanding young researchers should be recruited by FAO through relaxation of language and experience requirements;

FAO has not exhibited any evidence of pursuing this goal which sought to interest anglophone candidates for IPM positions after requisite language training.

3) Farming systems agronomists should be recruited;

Surveillance and Experimentation posts are proposed for Sahelians (rather than FAO) trained in agronomy from Mali, Mauritania, and Upper Volta.

4) FAO should consider recruitment of an additional crop loss assessment expert;

This recruiting is under way.

5) All research counterparts should be full-time researchers of Sahelian nationality;

Ten researchers are already assigned; other positions will ultimately be occupied by Sahelians after academic training.

6) CILSS, FAO and AID should arrange for adequate counterpart training funds for regional project staff and researchers;

The redesign makes provision for funding for academic training of staff and researchers under FAO administration.

7) National governments should place future plant protection graduates in IPM research programs for half of their internship;

Selection process for academic training includes a commitment by trainees to five years service in IPM work after completion of degree training.

8) Director of Training, Sahel Institute, should chair a newly created CILSS Crop Protection Training Working Group;

9) FAO IPM raining/Liaison Officer should develop teaching packages;

The training position was abolished as a function of consolidation of FAO technical support. A selection committee to choose researchers for academic training includes a Sahel Institute representative as a member.

10) Experiments should be carried out on farmers' fields with proper attention paid to intercropping systems;

This has been provided as a part of the surveillance and monitoring function and in observation post activity.

11) Counterpart researchers should work with non-chemical IPM methods;

Such methods are incorporated into each country work plan.

12) AID should support the WARDA project in rice IPM;

This project comes up for review by AID in the near future and an evaluation will decide future relationships.

13) Project personnel should assist with future pesticide residue monitoring activities;

Some personnel in Mali, Senegal, and The Gambia will assist in activities pending at Wageningen University, The Netherlands, and considerable participation is foreseen under surveillance and (environmental) monitoring requirements.

14) The IPM function of observation posts should be defined and adhered to;

This had been addressed extensively in the re-structuring of technical aspects of IPM Phase I.

15) IPM and RFCP project staffs should cooperate on extension activities;

16) IPM Project National Coordinating Committees and project seminars should ensure liaison between IPM research and the national agricultural and crop protection services;

Liaison at the national level will continue between IPM and RFCP project staffs as well as at the annual meeting of the IPM Tripartite Consultative Committee. Provision for technical coordination at national levels has also been made in the IPM redesign.

X
167

17) Annex G-1 should be funded through contributions to a single fund by all Crop Protection Program donors, including USAID;

AID's Regional Food Crop Protection project will increase contributions to Annex G-1 and in annual meetings encourage other donors to assist in the information dissemination activities supporting crop protection.

18) The following Working Groups should be formed from both RFCP and IPM project staff. They should meet regularly, coordinate activities, publish manuals and other materials.

Crop Loss/Surveillance/Forecasting/Environment
Biological Control
Modification of Cropping Techniques
Integrated Pest Management Systems
Evaluation and Extension

19) Working Groups should procure advice from outside experts;

The Working Group Conference will be assisted by outside consultants recruited annually for contributions on specific topics. Groups are organized by seven priority research topics (pest orientation) and functionally by cropping systems modification; biocontrol; varietal resistance and crop loss assessment/economic thresholds, etc., plus a crop protection policy group to report through the CILSS Executive Secretary to the Council of Ministers.

20) CILSS should sponsor an annual regional plant protection research conference, directed particularly at the West African region;

This idea was dropped by the redesign team in favor of an expanded circle of attendance at the IPM Working Groups Conference.

21) The CILSS Plant Protection Program should employ an international liaison officer;

This function has been included among the revised duties and responsibilities of the CILSS Regional Management Unit.

C. Financial Management Recommendations

1) AID should take action to extend IPM Project until June, 1985 and a revised life of project budget should be jointly prepared by AID, FAO, CILSS;

2) Life of project should become basic project management tool for both financial and administrative planning;

168

A proposal to extend the PACD to September 30, 1987 is now under consideration. The redesign team is preparing a LOP budget for Phase I.

3) USAID Project Officer, CILSS financial manager, CILSS Project Director and senior FAO advisor should meet immediately to finalize IPM 1982 budget;

4) Overall budget should be broken down and each national component advised of their 1982 budget;

These recommendations were provisionally followed, however, final action will be completed in the planning of the FY 1984 budget.

5) Budgeting and financial management should be a responsibility of the Project Director's Office and necessary personnel resources made available.

The Project Director's office is being strengthened with the assignment of a financial manager and an accountant.

D. Financial Administration and Accounting Recommendations

1) Accounting systems should include an encumbrance journal;

2) Period for financial reporting and accounting should be the calendar quarter;

3) Fifteen days before the end of the quarter requests for advance fund replenishments should be received, they should be processed immediately and new advances received by first day of quarter;

These recommendations fall within the general redesign proposals for decentralization of the financial management function.

4) National and sub-regional components should employ full time administrative/accounting officers:

Most components have full time accountants. Those which do not will not receive 1984 funds under the redesign until this recommendation is fulfilled.

5) Internal audits should be conducted by Project Directorate at least annually;

Provision is made for this along with funding in the redesign.

6) Project account should be for entire project. Maintenance of component financial records should be CILSS responsibility;

X
169

7) Close working relationship should be established between CILSS financial officer, FAO financial advisor and USAID controller;

Fulfillment of these recommendations is addressed in the redesign under Financial Management.

E. Construction Recommendations

1) IPM Project construction budget and supporting program should be formally approved;

Most facilities in the Project have been approved for construction, however, a number await request for bids and subsequent action.

2) USAID engineers at local level should be assigned responsiblity for execution of construction program at local level;

These responsibilities will be assumed under the redesign by USAID engineers--either at post or nearby posts or from REDSO/W--as part of decentralization.

3) AID should recognize simple nature and low cost of construction required and seek to simplify its monitoring requirements;

4) Possibility of using Fixed Amount Reimbursement (FAR) method of paying for construction should be examined expecially for simple observation posts;

5) Cost reduction through design simplification and use of local materials should be studied in each case;

Model FAR guidelines are attached to this PP amendment as part of Annex C.

6) The Project Directorate should play more active role in supervision of construction and purchase of commodities to reduce costs on unnecessary expenditures;

While the Project Directorate will play a more significant role, the principal controls on construction and procurement will be in the Country Task Force.

F. Procurement Recommendations

1) Procurement plans, specifying what is procured when, by whom, by what methods, should be drawn up for each category of material and equipment; vehicles, laboratory equipment, equipment for field and offices;

The redesign--Financial Management section--provides that such plans be a first order of business for Country Task Forces.

2) Procurement Plan should be prepared jointly by CILSS Project Director's office, USAID and FAO;

See 1 above.

3) Waivers should be sought for motor vehicles in a timely manner and after objective survey of dealers, other users and facts of FAO maintenance, repair and fuel use records.

See 1 above.

G. Travel Recommendations

1) National, CILSS and FAO regulations, especially as regards per diem should be examined for fairness and adequacy;

This remains the responsibility of national governments for Sahelians and FAO for its personnel.

2) Travel regulations should be very flexible as regards acceptable modes of travel in remote areas;

Properly documented, no problem should be encountered in justifying use of camels.

H. Recommendations on Project Delay

1) CILSS-FAO-AID should consciously adopt parallel action style of management so that other actions continue when one action hits an obstacle;

Decentralization of management and funding should assure a system of parallel action.

2) Some form of PERT, Critical Path or Critical Event programming device should be considered. This should be done in preparation of June, 1982 crop campaign;

A implementation Plan is appended, addressing administrative actions. The Project Director should make this recommendation a first order of business at the March 1983 Working Group Conference to plan the 1983 campaign.

ANNEX B

TECHNICAL BACK-UP

Annex B-1

Updated Initial Environmental Examination

Project Country:	West Africa Regional--Sahel
Project Title:	CILSS--Integrated Pest Management Research
Funding:	FY 1978-82 $28.8 million
Period of Project:	FY 1978-82
IEE Update Prepared by:	Dr. P Matteson, Consortium for International Crop Protection
Environmental Action Recommended:	Negative Determination based on analysis presented in this IEE as supported by additional documentation in full PP amendment
Concurrence:	Emerson Melaven, Director Ouagadougou
	Date
Environmental Officer Decision:	Approved
	Disapproved
	Date 8/8/83

I. Description of Project

This project is a discrete part of a coordinated Sahel-wide effort to provide the member states of CILSS with a capability to implement a program of integrated pest management. A number of factors are involved in the development of such a capability, including evaluation of the economic importance of pests, establishment of a pest surveillance system, performance of research to develop the best integrated control techniques for each of the major food crops of the Sahel, the establishment of field test areas to validate the research, and provision for the transfer of the technology developed to plant protection agencies in the Member States of CILSS.

X
173

The emphasis of this project is upon research which will be performed and validated in all individual Sahelian countries. In order to perform the research it will be necessary to construct, expand, or renovate laboratory, office, and/or residential buildings at 15 locations, each relatively small in size and facilities. Although specific construciton sites within each of these general agriculture research facilities have not been selected, due consideration will be given, in the development of detailed plans and cost estimates for purposes of 611(a) determination to assure tht all environmental requirements are met. The respective AID Mission will prepare an IEE for each building in country and an environmental Threshold Decision will be made prior to proceeding with construction. The Decisions will be documented in writing with a copy forwarded to USAID/Ouagadougou for control project files.

A second component necessary for research is the provision of FAO technical assistance to perform research and train counterpart personnel and strengthen or redirect local research capability along the lines of integrated pest management. Research will be directed toward determining which pests are most destructive from an economic point of view and what techniques are most effective on a least cost basis, with due consideration being given to environmental consequences. The development of a tested integrated pest management system may include many diverse control methods, from exclusive reliance on cultural practices, natural control agents, and improved seed, etc., to partial or substantial reliance on pesticides found in advanced commercial agriculture practiced in developed countries (a practice from which Sahelian states have thus far been largely spared, at least as far as food crops are concerned). Training of the counterpart researchers who will ultimately replace foreign experts will consist of a mix of on-the-job training, U.S. academic training, and third country training in Africa as well as Europe; and will emphasize protection of the environment through selection of least damaging alternative biotechnologies.

Validation of research and field surveillance are critical components in the development of integrated pest management techniques. To do this, the project will establish observation posts and experimental plots on nearby farms across the Sahel to assure coverage of a range of soil and climatic conditions. Each field trial area will be under the research supervision of one of the laboratories, where work will be conducted on food crops grown in the area. Adequate research supervision will be available to assure that these field trial areas will pose no threat to the environment.

As noted above, an integral aspect of integrated pest management research is the use of pesticides under laboratory or field conditions to determine crop losses, economic thresholds, and means of using pesticides selectively. Such actions will be limited in time and space and the extremely small quantities used will not pose an environmental problem. Pesticides chosen will include microbial pesticides, hormones, growth regulators, etc., which are generally quite specific and do not affect organisms other than insects, and are relatively nonpersistent

174

synthetic compounds. No chemicals will be used which have been cancelled in the U.S. or pose a significant hazard to Sahelian applicators or the environment.

All pesticide application will be for research purposes, by or under the supervision of project personnel. This category of project is technically exempt from AID pesticide procedures. However, since the applied research will lead directly to the proposal of control measures, including use of certain pesticides by Sahelian small farmers and crop protection service personnel, the environmental impact of the techniques proposed must be considered at the research stage. Moreover, in many of the countries involved, AID will be funding pest management extension activities and pesticides proposed will have to be allowable under AID regulations.

Project researchers agreed at the December 1982 Dakar technical meeting that no experimentation with U.S.-cancelled pesticides will be done under project auspices. It shall be the responsibility of the Country Task Force (consisting of the national IPM representative, the chief FAO expert, and the AID Liaison Officer) to clear pesticides in proposed technical packages with AID/ST/AGR (Washington). Pesticide clearance will be routinely sought as a part of the decision process regarding the IPM systems to be proposed for regional priority pests by the end of Phase I. USAIDs will assist IPM national representatives and FAO researchers to channel inquiries to ST/AGR (Washington) at an early stage on the chemicals being considered for field use, to avoid wasting time working with unacceptable compounds. At minimum, this will be done on a routine annual basis, starting in 1984.

Project staff are to ensure that the manufacturers of the pesticides provide toxicological and environmental data necessary to safeguard the health of research personnel and the quality of the local environment in which the pesticides will be used. Treated crops will not be used for human or animal consumption unless appropriate tolerances have been established by EPA or recommended by FAO/WHO, and the rates and frequency of application, together with the prescribed preharvest intervals, do not result in residues exceeding such tolerances.

II. Identification and Evaluation of Environmental Impacts

The attached check list reflects the conclusion that none of the activities in this project described in Para I above has the potential for having a significant effect on the environment. Project-financed integrated pest management research will identify to the maximum extent possible non-chemical methods for pest control, which can be extended to and readily adopted by small producers. These by their nature are environmentally much more acceptable than chemicals and should provide alternatives to the spread of chemical controls which threatens the environment of Latin America, Asia, and other parts of the world.

The projects will, however, also carry out research with chemicals. Such research will be on relatively small plots and will be closely

X
175

monitored to observe all the consequences that result from the use of the chemicals being tested. A major purpose of these trials will be to study the more specific use of pesticides that are effective with the minimum possible secondary effects on the environment. As such, none of these tests, because of their small size and limited scope, are expected to impact significantly on the environment. The project will make available to national extension institutions those results of its research which are found to satisfy the two requirements of efficacity and environmental acceptability.

The project will establish a system of monitoring the environmental consequences of the extension of IPM crop protection measures proposed. Preliminary environmental surveys have already begun, and will be supplemented by regular pesticide residue sampling. Full details are given in the "Environmental Monitoring" section of the PP amendment's Technical Analysis.

III. Recommendation for Action

In view of the foregoing, a Negative Determination is considered in order.

Impact Identification and Evaluation Form

Impact Areas and Sub-areas

A. Land Use

1	Changing the character of the land through:	
	a. Increasing the population	N
	b. Extracting natural resources	N
	c. Land clearing	N
	d. Changing soil character	L
2.	Altering natural defenses	N
3.	Foreclosing important uses	N
4.	Jeopardizing man or his work	N
5.	Other factors	
	_____	____
	_____	____

B. Water Quality

1.	Physical state of water	L
2.	Chemical and biological states	L
3.	Ecological balance	L
4.	Other factors	
	_____	____
	_____	____

X
177

C. Atmospheric

1. Air additives N
2. Air pollution N
3. Noise pollution N
4. Other factors

_____ ____

_____ ____

D. Natural Resources

1. Diversion, altered use of water N
2. Irreversible, inefficient commitments N
3. Other factors

_____ ____

_____ ____

E. Cultural

1. Altering physical symbols N
2. Dilution of cultural traditions N
3. Other factors

_____ ____

_____ ____

178

F. Socioeconomic

1.	Changes in economic/employment patterns	L
2.	Changes in population	N
3.	Changes in cultural patterns	L
4.	Other factors	
	_____	___
	_____	___

G. Health

1.	Changing a natural environment	L
2.	Eliminating an ecosystem element	L
3.	Other factors	
	_____	___
	_____	___

H. General

1.	International impacts	N
2.	Controversial impacts	N
3.	Larger program impacts	N
4.	Other factors	
	_____	___
	_____	___

X
179

I. Other Possible Impacts (not listed above)

Replicated, small plot evaluation of pesticides for research purposes during preliminary phases of project L

Annex B-2

Economic Analysis

Original Economic Analysis and Background

(N.B. A review and update of this original analysis appears at II.C, in the basic document.)

In an economic analysis of research on development of integrated pest management, the key word is research. The output of this project will be a certain amount of knowledge, some trained manpower, and a special institutional capacity. The program is designed to produce an intermediate output which will be a critical input into a second process, the widespread application of pest control measures. In this economic evaluation it is essential to recognize that the output of the project will not directly reduce food grain losses; the project will increase the capacity and the efficiency of ensuing efforts to reduce food grain losses.

It is not feasible to conduct a quantitiative evaluation of this project because the requisite data do not exist, although quantitative analysis is possible in a purely technical sense. The core of the analytic methodology, financial and economic, involves determination of all project outputs, calculation of the net present value of the stream of savings caused by the outputs, and comparison of the discounted benefit stream to the discounted cost stream. The technical procedures for this type of analysis are well known and routinely incorporated in project evaluations when the data are available. Thus, a quantitative evaluation such as the calculation of an internal rate of return is not provided. To acquire the necessary data would require initiation of a relatively large scale program of experimentation. Indeed, generation of economic data on integrated pest management techniques is one of the major objectives of the project. Information and data will be generated and collected in a systematic manner so there can be methodical evaluation of plant protection measures in the Sahel.

Whereas the absence of data does not allow a quantitative analysis, it is possible to consider some of the qualitative aspects of plant protection. Some of the more general economic aspects are discussed in Annex B-1.

The fundamental point to be made is that food grain production is a major and a vital economic activity in the Sahel. Thus even small relative changes in the rate of output will exert a significant overall impact. Two examples serve to illustrate this fact. First, in terms of the research project itself, the annual cost of the project is equal to slightly more than 2 percent of the total value of Sahelian food grain production in 1975. Experimental results have shown that the technology already exists to increase yields by at least 10 percent through pest

control--and frequently by much more than this. It would appear that an increase of approximately 2 percent is quite plausible given adequate implementation efforts. To illustrate the degree of importance of crop protection in a Sahel-wide sense, it is noted that an increase in food grain savings equal to a 10 percent increase in the projected 1990 output level is worth $184 million or 2.4 times the value of United States food grain assistance to the Sahel in the major drought year of 1974 and 1.4 times the total value of United States food assistance in 1973, 1974, and 1975.

It is also necessary to view plant protection vis-a-vis plans for the overall development of agricultural production in the Sahel. Parallel efforts are now in progress to increase agricultural productivity by introducing greater use of fertilizer, more specialized, productive plants, and improved cultivation techniques. But as more modern techniques replace traditional methods there is a proportionate increase in the susceptibility of plants to diseases and pests. Thus plant protection is critical if gains produced by other efforts are to be realized. It is also noted that the historical record clearly demonstrates the economic efficacy of pest control programs in more developed economies where protection is a fundamental element in high-productivity agriculture.

The particular design of the research project has its own economically significant elements. The first element concerns the development of economic threshold criteria to be used in directing pest control operations. The second element is the use of an integrated approach to plant protection. The development and application of an economic threshold system has appreciable significance for the economic efficiency of a plant protection program. Very briefly stated, use of an economic threshold criterion involves comparison of the cost of a specific protection operation to the expected value of savings. Thus, for example, in some areas where yields or prices are low, protection may not be warranted. Application of such a system, however, requires the development of data on pests, losses, natural conditions, and other information necessary to make well-informed decisions. Without such a guidance system, it would be necessary to apply plant protection measures without specific knowledge of their cost effectiveness. The significance of this method is that the allocation of plant protection measures will be constantly directed by economic-technical criteria, giving the program an internal economic rationality and allowing it to reflect the diverse conditions which exist across the Sahel.

The second element is that an integrated approach to plant protection will be used. This fact has economic implications which have long-term significance for the Sahelian economies. Integrated plant protection minimizes the use of pesticides and maximizes the use of indigenous resources, particularly labor. Thus, the research project will establish a system which will maximize economic linkages. Minimization of the use of pesticides also minimizes the expenditure of foreign exchange or the use of foreign assistance funds which can be allocated to other, more critical purposes.

As a final point, it is noted that the economic cost of a protection measure may be near zero if it utilizes labor at a time when farmers would otherwise be idle or engaged in very marginal activity. Whereas a quantitative analysis of the project is desirable it is not feasible, nevertheless, the basic scheme of an integrated program, guided by an economic threshold system, constitutes a sound approach to achieving the primary goal in a manner which makes efficient and maximum use of Sahelian economic resources.

Economic Background

A. Introduction

The Sahel represents one of the more economically disadvantaged areas of the world. Five of its eight states are classified among the world's twenty-five poorest countries. Table B-1 provides some key indicators of the level of economic development in their eight states. Agriculture, including livestock and fishing, and largely at a subsistence level, represents the main activity in these countries, which have few known exploitable mineral deposits and a narrow base for industrial growth.

Food crop production is mainly concentrated in cereal grains. Production estimates of the major cereal crops are shown in Table B-2 for the Sahelian states, excluding Cape Verde, for which data were not available.

Cereal food demands by 1990 are projected to be as shown in Table B-3.

B. Economic Aspects

1. Crop Losses

The present chronic shortages of food in the Sahel can be attributed in part to the heavy food crop losses caused by pests. A number of factors intensified by the recent drought have, moreover, aggravated the threat of pest damage. These are:

- The extended and intensified growing of rainfed crops, which have eliminated extensive areas of natural grasses where pests also fed; moreover, intensification of agricultural practices generally leads to heavier pest attacks

- The overgrazing and deforestation which has denuded the soil over large areas, particularly in the Northern Sahel, and left a contorted vegetation favorable to the reproduction of grasshoppers

- The spread of off-season crops in the river basins which creates favorable conditions for pests at the height of the dry season, and has thus provided them with a facility for carrying over from one main season crop to the next.

TABLE B-1
SELECTED INDICATORS OF ECONOMIC DEVELOPMENT

	1	2	3	4	5
	Pop. (millions)	GNP per Capita (US$ 1975)	% Labor Force in Agriculture (1976)	Literacy (% 1976)	Life Expectancy (1976)
Chad	4.0	88	91	5-10	38
Cape Verde	0.5	163	84	5-10	40
Mali	5.6	73	91	5	38
Mauritania	1.2	196	85	1-5	38
Niger	4.6	125	91	5	38
Senegal	4.4	252	76	5-10	40
Upper Volta	6.0	79	89	5-10	29

184

TABLE B-2
CEREAL PRODUCTION IN VARIOUS YEARS (1972-1975)

	Corn		Sorghum & Millet		Rice		Wheat		Sorghum & Millet Area
	000 MT	%	000 MT	%	000 MT	%	000 MT	%	000 Ha
Chad	--	--	450*	89	51	10	5	1	1050
The Gambia	10	14	42	57	21	29	--	--	42
Mali	110	10	800	72	200	18	--	--	1300
Mauritania	5	10	40	83	3	6	--	--	100
Niger	3	**	1134	97	28	2	1	**	2000
Senegal	42	5	680	81	114	14	--	--	1050
Upper Volta	54	5	1000	92	32	3	--	-	1889
Total	214		4146		449		6		

* Questionable estimate

**Less than 1%

TABLE B-3
ESTIMATED FOOD GRAIN CONSUMPTION REQUIREMENTS, 1990

	Wheat	Rice	Sorghum, Millet, and Corn	
	000 tons	000 tons	%	000 Ha
Chad	41	81	1	026
The Gambia	8	84		58
Mali	41	232	1	405
Mauritania	37	64		208
Niger	15	65	1	202
Senegal	202	603		738
Upper Volta	50	71	1	265
Total	394	1200	5	902

186

Virtually no statistically reliable information on the losses caused by insects, diseases, weeds, or vertebrate pests exists in the Sahelian region. A small number of projects conducted at research stations have attempted to measure the losses caused by individual pests, but these are normally conducted as small-scale experiments and the results obtained from them cannot easily be multiplied to provide data on a national or regional scale.

2. Inherent Difficulties in the Evaluation of Plant Protection Projects

The preliminary report of the Government Consultation on Crop and Post-harvest Protection Needs in the Sahel proposes that crop loss estimates should be undertaken as a means of evaluating the impact of proposed actions.

For a first analysis, an economic approach of this kind poses serious difficulties in the present circumstances and is based on ambiguity which should be removed. It is accepted that every development project should be based on objective data and on measurable anticipated results.

But even in countries where agriculture is well advanced, such approaches remain imperfect in the case of pest control. In view of our imperfect knowledge of food crops in the Sahel, and lack of statistics (those that do exist represent no more than orders of magnitude), it would be unwise to take too rigourous an approach to project appraisal, particularly as crop protection is only one of several possible crop production improvements (labor, planting, dates, fertilizer, etc.), and cannot be dissociated from them.

a. It is worth bearing in mind that the ambiguity mentioned above arises from the fact that the losses caused by pests and their economic impact becomes known only when research on the pest is well advanced. Anticipation is dangerous as is any attempt to extrapolate from data on losses in other parts of the world or caused by other pests, or from experiments undertaken in the Sahel in much earlier periods, e.g., by IRAT. Reference to these is made below only by way of illustration since ecological conditions are diverse and non-comparable.

In practice the insects and diseases observed as a permanent feature of traditional crops are seen as one element or parameter among other agricultural constraints. This is why their economic impact has scarcely been analyzed and remains imprecise.

There has been unanimous implicit agreement on the need for plant protection in the Sahel. The recent drought has had the catalytic effect of making this appreciation explicit. But an appreciation of this kind, however based, remains subjective. Various attempts--in themselves subjective--to estimate the impact of plant protection projects can however be made.

b. Their impact can be estimated by the extent to which the producers' basic socio-economic activity increases when the farmers are fully absorbed into the project. The producers' demand for the services of pest control agents and specialists can serve as another indicator. A demand of this kind will assure the continuation and take-off of the project--it represents participation by those most directly involved.

c. A contrast between improved and traditional methods of cultivation can be provided. For example, cowpea, a protein-rich legume, which can be used for both human and animal consumption, is subject to pest attack, both in the field and in storage. Yields vary between 300 and 600 kg/ha in traditional cultivation. At research stations, the yield is frequently between 1,800 and 4,000 kg/ha, but the contribution of plant protection to this difference in yield has not been determined.

In years of good rainfall, it is the weather conditions which have a more important bearing on yields than do crop protection measures. On the other hand, in years of unfavorable weather, plant protection prevents a serious decline in production and ensures a certain food supply. There is, therefore, a need for more research into varieties which guarantee a certain minimum of production than into those that are high yielding but susceptible to drought and pest attack.

d. At the same time, it should be emphasized that the benefits of the project's activities cannot be measured in terms of an overall short-term increase in the amount of food products coming onto the market. There are two reasons for this: first, home consumption will rise until each family's food intake requirement has been satisfied and carry-over stocks have been built up. The Canadian report on development in Kara district (Mali) suggests that the consumption of traditional cereals will rise from 175 kg per head p.a., to approximately 185 kg per head p.a. Second, the profit motive is not a primary consideration among those producing food crops at this stage of development. It should be added that the volume of sales of surpluses is also dependent on the price level.

e. For pests which tend to occur unexpectedly and in large numbers, such as locusts, birds, and occasionally rodents, the evaluation of the activities of regional control organizations is even more difficult. Their primary task is prevention via the surveillance of gregarization areas and control in laying sites. In periods of recession or of moderate locust activity, pesticide application made at the right time can keep losses to a negligible level. While this situation continues, support of the states involved tends to diminish and there is a risk that the necessary financial effort will not be made. The running costs of the regional control organizations are not negligible. They are inevitable and constitute an insurance premium paid by individual countries against possible catastrophes.

3. Economic Aspects

The difficulty of using classical methods of economic appraisal of projects does not mean that all attempt at economic analysis should be rejected. In fact, a deeper investigation of the impact of pest control measures can be subject to a certain degree of economic analysis.

A number of studies have been carried out, principally on cash crops such as cotton, sugar cane, groundnuts, and irrigated rice. The FAO, for example, has compiled a list of methods of measuring crop losses pre-and post-harvest. It remains to be seen how they can be adapted and applied in the field.

Until such times as more reliable data become available and can be incorporated into project proposals, it is necessary to rely on estimates of the impact of certain hypothetical loss levels on national food production. For the purposes of this exercise, the physical and financial losses that would be caused if pests kep actual production 10 percent and, secondly, 25 below potential production are estimated. It should be noted that if pests have consumed one quarter of potential production, this amounts, statistically, to one-third of actual (remaining) production. This exercise is performed for the countries presented in Table B-2, and the results are given in Table B-4.

It should be noted that the financial values presented are extremely approximate. Several factors militate against greater financial precision:

1. It is thought invalid to use world market prices for these crops, since they are not on the whole, exported. It is recognized, however, that they are import substitutes and a more detailed analysis would make allowance for this fact.

2. Lack of data prevents the calculation of precise weighted average grain prices.

3. Prices in all countries are subject to severe seasonal fluctuations.

4. In all countries there are at least two levels of pricing in the main market area--the "official" and "traditional" market prices.

5. Geographical isolation means that prices may vary widely even within countries.

Since the CILSS plan a rapid expansion of agricultural output by 1990, much of which is to be produced on irrigation schemes, it was thought appropriate to repeat the hypothetical loss estimation exercise above for the estimated 1990 crop outputs. Data from this exercise were taken from the FAO perspective study. Prices used were those prevailing in 1976, but these may represent an underestimation of the true value of

TABLE B-4

TOTAL ANNUAL PHYSICAL (000 MT) AND FINANCIAL (000$) LOSSES IN FOOD PRODUCTION FOR 7 CILSS COUNTRIES CAUSED BY HYPOTHETICAL 10% AND 25% LOSSES FROM POTENTIAL PRODUCTION

	Maize	Millet/ Sorghum	Pulses	Rice	Wheat	Total
Actual production	214	4,146	387	449	6	5,202
Actual value	32,100	579,440	50,130	89,800	1,020	752,670
10% loss:						
Physical	23.8	460.7	43.0	49.9	0.7	578.1
Financial	3,570	64,498	5,690	9,980	119	83,857
25% loss:						
Physical	71.3	1,382.0	129.0	149.7	2.0	1,734.0
Financial	10,695	193,480	16,770	29,940	340	251,225

Notes: Actual production taken from Table B-2. Prices based on estimated means of local prices over all CILSS countries. Prices used are as follows:

Maize	$150 per MT
Millet/Sorghum	$140 per MT
Paddy Rice	$200 per MT
Wheat	$170 per MT
Pulses	$130 per MT

losses insofar as there could be increases in the real unit value of the crops by 1990. Furthermore, the development of large irrigated areas will increase the potential for pest damage, so that the real damage will be higher in 1990 per unit area than currently if no controls were undertaken. The results of applying 10 percent and 25 percent hypothetical losses from potential output in 1990 are presented in Table B-5.

C. Relationship of Crop Losses to Proposed Investment in Crop Protection

From these data in Tables B-4 and B-5, we can see that at current 1975 prices, a 10 percent loss would be worth over $84m at current production levels, and worth over $140m at projected 1990 production, while for a 25 percent loss of potential production, the value of loss would be $251m and $413m, respectively on a per annum basis.

By comparison with these figures, the total anticipated disbursement of the proposed program over the five years of Phase I is about $68.5m--i.e., $13.7m per annum approximately.

In order to cover the annual costs of the proposed Phase I, the program would have to generate an increase in output, over the 1975 base of some 2.0 percent and maintain this increased level for each of the first five project years. It must be emphasized that this does not imply a cumulative annual increase (i.e., 2.0 percent being added each year) but the achievement of a 2.0 percent increase and the maintaining of this higher absolute level of output. For later phases of the program, assuming that annual disbursements of a similar order were envisaged, the required higher level of annual output in absolute terms would remin approximately the same, but the rising base of agricultural production achieved through measures other than pest control would translate this same absolute level into a lower percentage increase.

None of the estimated annual disbursements include the proposed expenditures of national plant protection organizations (estimated elsewhere in this submission at approximately $1.5m p.a., of which a portion may be allocated to cash crops, with which we are not concerned here), nor do they include proposed increases in expenditures on pesticides, for which no value-estimate is available. If these annual expenditures were to be included in the annual disbursement figures presented above, the annual increase in output would have to be slightly larger to cover them.

D. Effects of Plant Protection on Production, Prices, and Farmer Income

Because the elasticity of demand for millet and sorghum tends to be less than one, there arises the ironic possibility of farmers' incomes actually declining because the greater output resulting from plant protection would tend to cause an even greater proportional decrease in prices. The demand elasticity for millet and sorghum is estimated in the FAO Perspective Study on Agricultural Development in the Sahelian

TABLE B-5

RESULTS OF APPLYING 10% AND 25% HYPOTHETICAL LOSSES FROM POTENTIAL OUTPUT IN 1990

		Millet/ Sorghum Maize	Pulses	Rice	Wheat	Total
Total projected 1990 output	Physical	6.556	781	1.148	124	8,609
	Value	912,840	101,530	229,600	21,080	1,220,050
10% loss	Physical	729.4	86.8	127.5	13.8	956.5
	Value	101,976	11,284	24,300	2,346	139,906
25% loss	Physical	2,183.3	260.3	382.2	41.3	2,867.6
	Value	295,662	33,839	76,540	7,021	413,062

Notes: In the source document, 1990 output of maize was combined with millet and sorghum. This convention, therefore, has to be repeated here. Since little maize is produced, the millet and sorghum price was applied to the combination.

Countries: 1975-1990 to be about .2 in most Sahelian countries. Thus a 1 percent increase in the quantity of grain going to market would result in a 5 percent drop in prices and a corresponding, although not necessarily equal, fall in farmer income. Inelasticity of demand presents a problem in efforts to increase agricultural production and farmers' incomes, but there are mitigating factors which combine to reduce the problem, and because of the particular relationship of plant protection to other productivity-increasing interventions and to increasing output, the role of plant protection as a causal agent is secondary relative to other types of interventions. Before proceeding further, it is noted that the demand elasticity for rice and wheat is estimated to be one or greater; therefore, the following discussion is mainly applicable to millet and sorghum. Millet is used in the discussion because it comprises the greatest proportion of total grain production.

1. The Technical-Economic Relationship

First consider the technical-economic function of plant protection within the general scheme to increase agricultural productivity in the Sahel. The central point is that the primary purpose and effect of plant protection is to ensure that excessive losses do not occur, including losses of gains brought about by improvements in plant nutrient levels, plant selections, and so on. That is, the main effect of protection is to reduce the magnitude of downward changes in output. In this respect, and to the extent there is a relationship between plant protection measures and farmer income, protection would keep farmer income from experiencing drastic reductions. This is particularly significant in a context in which the output constitutes the major food source for the farmer, because the marginal value of output increases substantially as its supply dips below the subsistence level. Besides helping insulate the farmer against calamity, the passive nature of protection suggests that the inelasticity issue is misdirected. This issue is more appropriately directed to the basic policy of increasing agricultural productivity as constituted by the collections of measures to increase and insure greater yields.

2. The Macroeconomic Relationship Between Plant Protection and Farmer Income

Examination of the relationship between plant protection and farmer income indicates that there are a number of variables which are much more significant in affecting income and which, when considered in a dynamic context, support the argument that plant protection facilitates increasing farmer income. The diagram below depicts the main non-natural variables which interact to influence the supply and demand for millet and which ultimately combine to influence farmer income. Rainfall is the major natural variable, and government agricultural policy may be seen as a variable which both influences and is influenced by many of the variables in the diagram. Similar diagrams could be provided to represent the supply and demand situations of other grains which influence farmer income. In the context of the discussion, it would also be appropriate to include sorghum; but such inclusion does not change the argument.

Although it is not possible to make a definitive statement without specific knowledge of the relationships among the variables, logic, our general knowledge of economic relationships, and experience with plant protection, suggest plant protection is a minor factor in influencing farmer income. Another way of expressing this relationship is to trace backward through the diagram from farmer income to plant protection. Farmer income is based on the price and volume of marketed millet, and its importance as an income source will vary with the degree of diversification of the farmer. (It is understood that diversification tends to be relativel low.) The price the farmer receives is determined by the interaction of the major variables of supply and demand. The major determinants of total supply are stock adjustments, acreage planted, and yield per acre. Plant protection is one of several variables influencing yield per acre.

Combining this overview of plant protection with its technical nature suggests that it is not a significant factor in increasing total supply because of the number of other important variables involved and the technical character of plant protection. On the other hand, it is significant in preventing a fall in output (the other half of the price-volume income determinant) because it is the only input variable specifically designed to prevent losses due to pests. In the overall scheme, it may plausibly be argued that the main effect of plant protection is to dampen downward fluctuations in farmer income.

3. Microeconomic Aspects of Plant Protection

One of the principles of economic logic is that the producer will, to the maximum extent possible, adjust his output level so that his marginal production cost will approximate his marginal revenue. Without elaborating on the underlying theoretical conditions, it can be stated that, to the extent and therefore, marginal--costs must decrease. The farmer will then increase his output in the first instance, and as prices fall he will decrease output to keep his marginal costs on a par with marginal revenue. This implies that productivity increases will tend to counteract a price decline and that the farmer will adjust his output level in a way which maximizes his profitability from grain production. It is possible that his income will increase as a result.

It is also reasonable to expect that farmer income may increase as a result of increased productivity in grain production, because he can devote less land and labor to grow a certain quantity of grain. He then has more land and labor available to devote to other crops such as groundnuts. Grain production may not increase substantially, grain prices may not decline substantially, and farmer income may rise appreciably from increased production of cash crops.

The central point which emerges from a discussion of the relationship between plant protection and farmer income is that the relationship is multifaceted and extremely complex. It is also evident that, while it is not possible to make a definitive statement, it is entirely reasonable to posit that the positive effects will tend to cancel the nega-

194

tive effects and that there are several indications that the farmer will experience a net gain. The second major point is that if there is a question of the overall economic viability of plant protection based on the price inelasticity of certain key food grains, the question can be addressed only in the larger context of agricultural goals, overall price policy, and development strategy.

Determination of Farmer Income

E. Impact on GDP (Gross Domestic Product)

It is impossible to forecast with any degree of accuracy the impact that plant protection measures will have on GDP, since, as was indicated above, the precise scope for preventing crop losses is not known. However, it is evident that plant protection measures should be able to achieve a substantial increase in food crop production which, as can be seen from previous tables, constitutes an important element in total agricultural production. It is also envisaged that the employment of local staff and the local expenditures planned for the projects will generate increases in GDP through multiplier effects.

In all CILSS countries, agriculture accounts for a high but declining proportion of GDP. The rate of decline in its relative importance is so slow as to be insignificant over the project's life. Table B-6 gives details of the national importance of agriculture in each country. The impact of a project designed to increase agricultural production will have a strong impact on GDP because of the major role of agriculture, but the degree of impact remains as a function of the particular measure.

If more precise data were available, it would be possible to estimate the contribution of food crops to the value of agricultural production in each country, and from this, to estimate more precisely the impact of, say, a 1 percent increase in food crop production through pest control measures on the value of total agricultural production and on GDP. Since, however, both the estimation of the total value of food crops and of GDP are subject to wide margins of error, no attempt was made to undertake this exercise.

F. Income Distribution

Several reports, particularly the FAO Perspective Study, 1975-1990, have drawn attention to the growing disparity between urban and rural sectors in all CILSS countries. The recent rise in agricultural input prices with stagnating product prices have exacerbated this situation. The focus of the proposed projects is on food crop producers, who tend to be the most disadvantaged among the rural poor. It is, therefore, expected that the implementation of the proposals will both improve the relative position of food crop producers in the agricultural community, and raise the living standards of the rural vis-a-vis the urban sector. Realization of this expectation is dependent on a number of other vari-

TABLE B-6
IMPORTANCE OF AGRICULTURE IN GDP IN CILSS COUNTRIES

	Value ($000) 1970		Agriculture as % of GDP	Annual Linear Growth (1960-70)	
	Agriculture	GDP		Agric.	GDP
Gambia	14,762	23,788	62.1	4.4	4.8
Upper Volta	103,460	165,764	62.4	2.5	5.9
Mali	127,678	227,347	56.2	-2.5	0.2
Mauritania	49,764	83,290	59.7	1.8	7.0
Niger	162,520	245,373	57.1	2.0	3.4
Senegal	243,573	685,640	35.5	-0.8	0.8
Chad	135,084	250,407	53.9	-1.1	-0.5

Note: Values are given at constant 1970 prices. Table is adapted from FAO Perspective Study on Agricultural Development in the Sahelian Countries 1978-1990. Value of agricultural output represents Gross Agricultural product. GDP is given at factor cost.

ables, including the demand for various food grains and price policies which relate to inputs and outputs.

G. Foreign Trade Effects

The CILSS countries have, over recent years, been spending approximately one-third of their foreign exchange earnings for imports of foodstuffs. Between 9 and 36 percent of imports by value were accounted for by food imports on average over 1969-71. Whilst it is impossible to predict the precise impact of the proposals on foreign trade, it is likely that the main impact will be in the area of saving foreign exchange and substituting for imports. While certain specific imports (e.g., wheat flour for bread) are non-substitutable without taste-changes among consumers there remains, nonetheless, a high potential for absorbing more food at household level and for replacing part of the existing import requirement.

Annex B-3

History of the CILSS Plant Protection Program

The economies of the Sahelian states are primarily agriculturally based with some 85 percent of their population of approximately 26 million engaged in agriculture. This 85 percent consists mainly of small, subsistence farmers producing sorghum and millet. Historically, little attention has been paid by governmental authorities to production and protection of domestic food crops. Agricultural development efforts have tended to concentrate on production of export crops, notably peanuts and cotton. As a consequence, in the face of rising populations, the Sahel has become chronically dependent on imported food to meet the requirments of its urban populations while its rural populations have become increasingly vulnerable to climatic vagaries or other natural afflictions in their struggle for survival.

In the 1960s, a number of regional and international organizations addressed the problem of increased food production. This research has primarily concentrated on maise, sorghum, and millet and involved research and limited field trials to determine local adaptability to existing varieties and to develop new varieties and agronomic practices to best utilize the genetic capabilities of the new varieties. The extension link between this research and the farmer, however, requires further attention before research results find their way into agricultural production practices.

Comparable progress was not achieved in the area of plant protection. Two regionl organizations, OCLALAV (Joint Organization of Locust and Bird Pest Control) and OICMA (Inter-State Organization for the African Migratory Locust), established in the 1960s, succeeded in controlling locust outbreaks and ongoing research efforts enabled them to greatly increase the effectiveness of aerial and ground spraying. The Center for Overseas Pest Research (COPR), sponsored by the British Overseas Development Ministry, and the French-sponsored Groupement d'Etudes et de Recherches pour le Developpement de l'Agriculture Tropicale (GERDAT) have done valuable research on grasshoppers. Beyond this progress, limited entomological and plant pathological research was undertaken at the various research stations in the Sahel. No comprehensive and reliable information is available on the character and extent of crop losses caused by pest damage, with informed estimates ranging from 25 percent to 40 percent of potential production.

In the agriculturally advanced countries during these years, awareness grew that heavy reliance on chemical pest controls carried serious environmental, ecological, and economic consequences. In response, the FAO/UNEP mounted in 1974 a Cooperative Global Program for the Development and Application of Integrated Pest Control in Agriculture advocating a careful choice of control measures. This approach avoids many problems normally encountered in wide-scale pesticide applications:

X
198

development of pest strains resistant to pesticides, decimation of natural enemies leading to the appearance of new and often more dangerous pests, escalating treatment costs, environmental contamination and public health problems, and disturbance of ecological balances.

A U.S.-funded multidisciplinary study conducted in 1972 suggested a long-range goal of practical programs of total pest management integrated completely with improved production systems.

The human suffering and deprivation of the protracted drought of 1968-1973 in the Sahel brought into sharp focus, both in the countries directly concerned and in the world donor community, the fragility of the ecosystem of the area, its basic and unresolved development problems and its total inability, in the face of such situations, to deal with the food needs of its populations. In order to better cope with these problems, Chad, Mali, Mauritania, Niger, Senegal, and Upper Volta joined in March 1973 to form the Permanent Interstate Committee for Drought Control in the Sahel (CILSS, Comite Permanent Inter-etats de Lutte contre la Secheresse dans le Sahel). Cape Verde became a member following its 1975 independence and The Gambia also joined. The CILSS has fixed as its objectives to:

- Reduce the consequences of emergency situations in the future
- Insure self-sufficiency in staple foods
- Accelerate economic and social development, particularly in the least developed countries of the region

The CILSS attempted from the beginning to present needs of the member states for donor financing of specific project proposals and, with the international donor community, to search out additional ways to bring about a basic transformation of the region. These efforts to secure donor support led to the creation by donors of the Club du Sahel, which held its inaugural meeting in March 1976 at Dakar. The Club provides a forum for the CILSS members and interested donor and funding organizations to discuss the goals of Sahelian development and the strategy for achieving them.

The easing of the drought in 1974 brought with it massive outbreaks of pests which highlighted both the inadequacy of the existing capability to deal with pest problems and the magnitude of the threat which pest attacks posed to food production and availability. There was realization also that planned agricultural development efforts (e.g., expansion of acreage under irrigation, expansion of recession agriculture, reduction of mixed or intercropping) would favor the growth of pest populations and greatly increase the risk of crop losses.

Recognizing that the benefits of investment in agricultural production schemes could be largely negated without a parallel development of plant and crop proteciton capabilities, the CILSS, at its meeting in Banjul, The Gambia, in December 1974 adopted a resolution which recom-

mended the reinforcement of national plant protection services and regional plant protection organizations, as well as related research and training. Following this meeting, subsequent meetings, both regional and international, were held to examine Sahelian plant protection problems in depth.

Subsequently, the FAO convened in Rome from December 13 to 17, 1976, a Government Consultation on Crop and Post-Harvest Protection Needs in the Sahel. The consultation, in addition to reviewing the status of needs and existing, planned and proposed assistance, devised a common strategy outline for strengthening plant protection in the region. This strategy reflected recognition of the need to:

- Strengthen national plant protectio services
- Strengthen regional coordination of research, surveillance, training, and information within the framework of CILSS
- Maintain the capability of regional migratory pest control organizations to respond to outbreaks of locusts and grain-eating birds
- Coordinate planning and implementation on both a national and regional basis

Also in December 1976, at the N'Djamena meeting of the CILSS Council of Ministers, the Sahel Institute was formally established and specifically charged with coordination of CILSS member state activities in the field of plant and crop protection. For a variety of reasons, among them lack of financing, the Institute has not fulfilled this mandate.

Pursuant to a proposal made at the Rome Consultations, a design team was assembled in Dakar in February-March 1977 to complete the formulation of a comprehensive program embodying the strategy decisions reached in Rome. Under the leadership of the FAO and with the active participation of AID, this team developed a series of action proposals for plant protection in CILSS member countries. This program was adopted by the CILSS at its meeting in May 1977 and forwarded to the Club du Sahel for consideration by the donor community.

The document, entitled "Plant Protection in the CILSS Member Countries," described a program planned over a 15-year period with funding proposals covering the medium term first 5-year phase. In accordance with the goal of the CILSS to insure self-sufficiency of the Sahelian countries in staple foods, and recognizing that crop protection should be considered as a vital element in agricultural production equal in importance to plant improvement and soil fertilization, this medium and long-term program has the following objectives:

- To establish in the countries concerned a national capability to develop and implement effective pest management programs for the protection of food crops in field and storage

200

- To promote the expansion of extension activities at the required scale for effective pest control at the small farmer level

- To promote regional collaboration in plant protection, particularly through research, information exchange, and contacts and support effective regional organization

The comprehensive program, costed at approximately $70 million for its first 5-year phase, is composed of seven annexes:

A Strengthening of National Plant Protection Services

B Research on and Development of Integrated Pest Management for Basic Food Crops in the Sahel

C Regional Locust Control

D Grain-Eating Bird Control

E Improved Post-Harvest Crop Protection

F Improved Rodent Control

G Plant Protection Information/Documentation (G1), and Training (G2)

The program addresses what continue to be seen as the major constraints to crop production in the Sahel, through the regional and national institutional structures responsible for crop protection efforts. Each of the components is somewhat distinctive in character, calling for its own approach to the problems under consideration. However, to the extent applicable, the principles of integrated pest management are embodied in each. The major emphasis centered on the Integrated Pest Management project for which AID provided first phase financing as proposed in the original project paper approved in 1977. The knowledge and technology developed within the IPM Project will benefit work under the other annexes; for example, it is planned under one of the three phases of the IPM Project to develop an effective pest surveillance and forecasting system for the whole of the Sahelian zone.

The overall CILSS program was to be operational at three levels: national, sub-regional, and regional. The establishment of plant protection policies, programs, and priorities in each country was the responsibility of the national authorities. The implementation of these policies and programs are also primarily a national responsibility. Strong national plant protection services were considered to be the fundamental basis of any sustained progress in the reduction of crop losses from predators and disease. At the same time, it was recognized that pests and diseases are not respectors of national boundaries, that many aspects of research can best be dealt with at broader ecological levels, and that the most economic use of scarce manpower and financial

resources requires the avoidance of duplicative national efforts. These considerations dictate a subregional or regional approach to many of the problems of crop protection. This does not suggest, however, that functions be tightly compartmentalized within these levels, thus some functions can find appropriate expression at all levels.

Annex A--Strengthening of National Plant Protection Services concerns primarily the national level. This annex has been funded in Upper Volta by CIDA (Canadian International Development Agency), in Niger by CIDA and GTZ (West German Technical Assistance Agency), and in the rest of the Sahel (except Mali) by USAID, which funds companion projects in Guinea-Bissau and Cameroon. Infrastructure development, training, and pesticide management support have been given to the national services and limited applied pest control research has been conducted, while awaiting IPM research results. These programs are to undertake extension and training activities meant to bring IPM annex research results into use by farmers and crop protection agents. Under the third and final phase (of the U.S.-funded portion) to be designed and approved in 1983.

Annex B--Integrated Pest Management Research. The research activities are to be implemented through national institutions in the CILSS member countries, each of which will undertake certain elements of the regional research program (activity in Chad was initiated, but has been suspended because of adverse internal conditions). Although this research will be conducted at the national level, it will address the problems in the context of the Sahelian ecological zone. Similarly, a concentrated approach on pest surveillance and forecasting and the development of crop loss profiles are to be undertaken through the national services in the CILSS member countries. Assistance in development of a base for the introduction of integrated pest management into country programs will also be provided to national services in all the Sahelian countries. This approach is consistent with the overall program aim of strengthening national services, but it is expected that the research results and outreach activities will have sub-regional and regional applicability. CILSS will facilitate regional coordination with technical assistance from FAO. This coordination will serve to assure that work at the national level is efficient and applied as widely as possible.

Annexes C and D--Migratory Pest Control. Pests such as locusts and birds range over wide areas within the Sahel region and even beyond. Moreover, the breeding areas where controls can be most effectively applied are not necessarily coincident with the areas (or states) which are potentially subject to attack. A regional approach to research, surveillance, forecasting, and control of these pests is, therefore, necessary. The program envisages that these activities will be continued within the structure of the existing regional organizations, OCLALAV and OICMA, both of which include member states outside of the geographic confines of the Sahel, and/or such other arrangements as the participating groups of states may agree upon. Parts of this undertaking will involve research at the sub-regional or ecological zone

x
202

level. In accordance with established practice, national services will be involved in activities within their countries. Current funding for OICMA and OCLALAV, however, falls far short of that needed to conduct effective programs.

Annex E--Post-Harvest Crop Protection. This is an inter-country project involving the establishment of an adequate infrastructure for effective control operations and the development of a forecasting system through bio-ecological research, as well as applied research to adapt known technology to the conditions of the countries concerned. Specific elements of the study and survey program will be conducted in each of the participating countries with the information gathered in each country providing a basis for improvements in grain storage in all. At this writing, Annex E is unfunded.

Annex F--Rodent Control. This project is foreseen for implementation through the national crop protection services in Senegal and Niger where rodent problems have been most serious and where there is immediate interest on the part of the governments. The studies and research will have regional implications, however, and should lead to better techniques for evaluating the real extent of rodent damage in other countries and provide a sound research base for control programs which could be replicated elsewhere as required. Annex F is likewise unfunded.

Annex G--Plant Protection Information Documentation/Training. This annex will function at the regional level in close cooperation with the Sahel Institute, which will ultimately subsume its functions. G1, Regional Information Unit for Crop and Post-Harvest Protection (Cellule d'Information Regionale pour la Protection des Cultures et des Recoltes) may be partially funded by USAID at the Communications Department of the Sahel Institute. It will serve as a data collection center, a documentation center, a coordinating unit to facilitate a continual flow of knowledge and technology into outreach programs, and an evaluation mechanism to assess the effectiveness of training or information and communication techniques at the farmer level. Among its activities will be a monthly newsletter for researchers and crop protection personnel and the production of audiovisual aids--radio and slide programs, handout sheets, flipcharts--for use in Sahelian crop protection extension programs. G2, Training, is being funded in part by the Netherlands. Laboratory technicians are being trained at the Institut Universitaire de Technologie (IUT), Dakar, and field technicians at Ahmadu Bello University, Nigeria (anglophones) and the Institut Polytechnique de Developpement Rurale, (IIPDR) Kolo, Niger (francophones). Higher level (researcher) training under the Annex is unfunded at this writing, but is in part incorporated into the redesign of Annex B activities.

The CILSS counsiders the Crop and Post-Harvest Protection Program to represent a cohesive whole, all elements of which should proceed within a compatible time frame. If the program has been presented as a series of discrete components, this is more to accommodate expressions of donor interest than to emphasize the distinction between the activi-

ties to be carried out. The CILSS is actively seeking donors for the unfunded parts of the plant protection program. All the Annexes should be operational in order to secure full potential benefits. For example, success under AID-financed Annexes A, B, and G1 should reduce field losses to insect, disease, and weed pests, but the yield gains will be partly erased if birds, rodents, and post-harvest pests continue to consume large proportions of the harvest.

Two CILSS organs monitor and coordinate the overall plant protection program. The Regional Management Unit in Ouagadougou assists in arranging the execution of the various annexes in conformity with CILSS policy, following and reporting on their progress, arranging for donor funding, and serving as liaison between the CILSS Program and other regional and international crop protection and IPM programs. The Regional IPM Directorate, also in Ouagadougou, supervises regional, subregional, and national programs within the scope of the AID-funded project under Annex B.

Annex B-4

Guidelines for the Development and Application of IPM Programs

Integrated pest management (IPM) is not a new approach to pest control. It is simply the common-sense, economically and environmentally sound use of a variety of effective crop protection techniques. It avoids overdependence on chemical pesticides and the accompanying economic, environmental, and public health problems.

Pest outbreaks are prevented as far as possible through nonchemical measures such as cropping practices that suppress pest populations, the use of resistant crop varieties, and importation and augmentation of natural enemies. Surveillance and forecasting systems signal the appearance of potentially harmful pest populations, and immediate control measures (including pesticides) are applied selectively and only when the benefits outweigh the costs. After decades of worldwide pesticide abuse, successful IPM systems are being developed and implemented for an increasing number of crops in both the developed and the developing countries.

Because development of a specific integrated pest management program depends on many variables, including the kinds of pests involved, resources to be protected, economic values, and availability of personnel, it is difficult to establish absolute guidelines. But the following guidelines generally apply in developing IPM programs, regardless of the kinds of crops and pest categories involved:

Crop Loss Assessment and Analysis of the Status of Each Reputed Pest

A given crop may be infested with dozens of potentially harmful species at any one time. For each situation, however, there are rarely more then a few pest species in sufficient density to cause significant damage. These often recur at regular (and often fairly predictable) intervals.

Pests that generally recur regularly and cause economic losses if not controlled are the focal point for integrated pest management programs; they are known as "key" pests.

In contrast, "occasional" or "secondary" pests are those which attain injurious levels only irregularly, when conditions of the natural environment (e.g., optimal weather or low incidence of natural biological control) are particularly favorable for their increase.

Another category of pests, "potential" pests, includes potentially harmful species that reside at sub-economic levels unless aggravated by human manipulations of the cropping system (e.g., introduction of a new crop variety or use of an insecticide that disrupts biological balance) which favor their increase.

X
205

A final category of pests, "migratory" pests, includes migratory species (e.g., migratory armyworms or locusts) that do not reside in a given area, but occasionally enter it, sometimes causing severe damage.

When developing an integrated pest management strategy, it is particularly important that actions taken to manage the key pests do not aggravate the potential pests. The improper use of insecticides directed at key insect pests has frequently resulted in the outbreak of potential pest species. The total fauna of key and potential insect pests in a given crop may be likened to an iceberg in a body of water. The real pests (the key pests), those which usually lack effective natural enemies, are readily recognized above the surface. The potential pests, which may represent 80-90 percent of all the pest species present, are not readily recognized and will remain innocuous if their natural enemies are not destroyed.

A ship navigator views the visible portion of an iceberg as a danger signal of a potentially more serious problem and, therefore, approaches it cautiously. The IPM specialist, similarly, should approach the management of the key pests cautiously in order to avoid the creation of potentially more serious problems.

The population level that determines whether a reputedly harmful species has attained pest status is the "economic threshold." The economic threshold is defined as the density of a pest population below which the cost of applying control measures exceeds the losses caused by the pest. Establishment of economic thresholds for each real pest is requisite to any IPM Program.

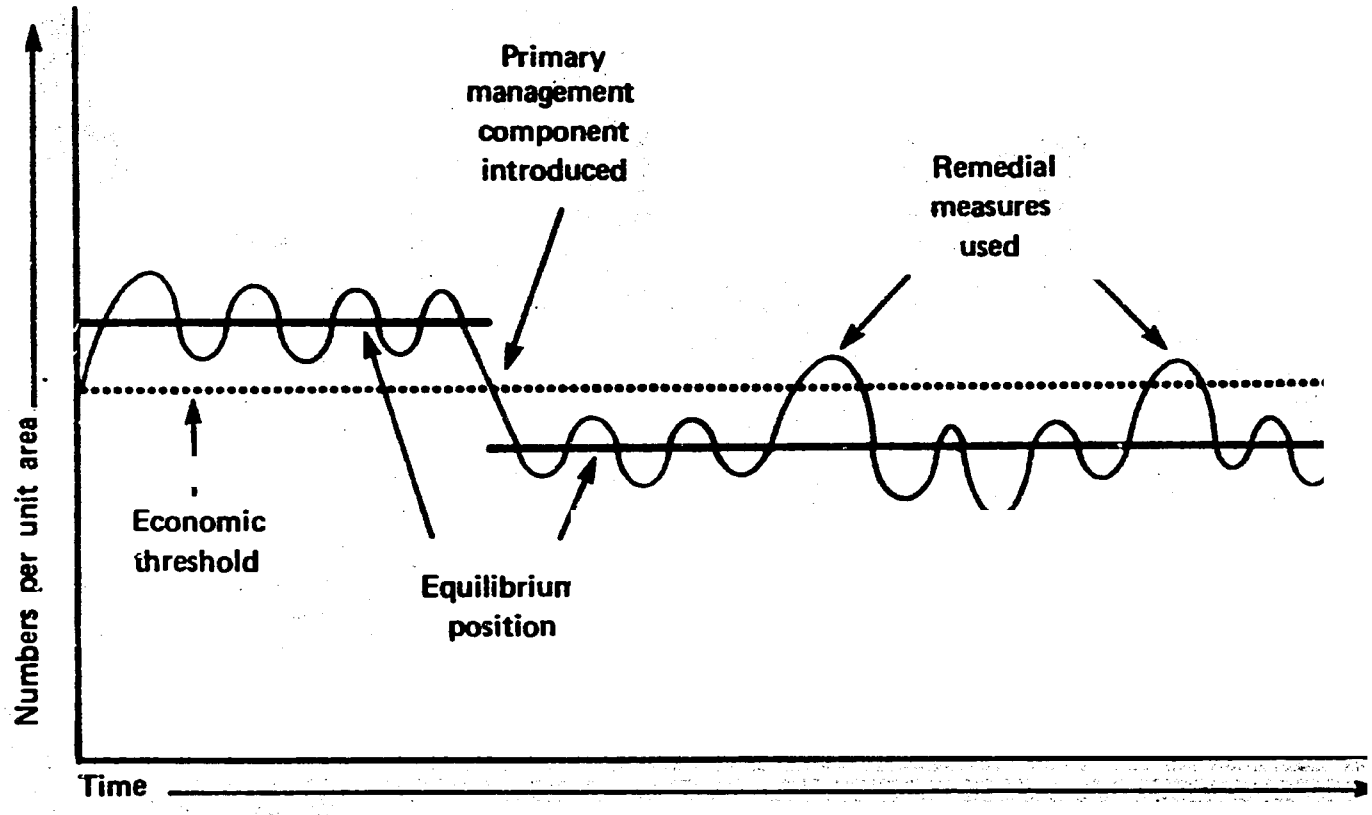
Establishment of IPM Research Capability and Devising Study of Traditional Systems and Crop Protection Schemes for Lowering Equilibrium Positions of Key Pests

A key pest problem varies in severity from year to year, but average pest density usually exceeds the economic threshold. This characteristic abundance is known as the pest's "equilibrium position."

Integrated pest management efforts strive to manipulate the environment in order to permanently reduce the key pest's equilibrium position to a level lower than the economic threshold, as illustrated in Figure B-1. This reduction may be accomplished using three primary management components singly or in combination:

- Deliberate introduction and establishment of natural enemies (parasites, predators, or diseases of pests) in areas where they did not previously occur
- Utilization of pest-resistant varieties of crop plants which cause a reduction in the pest's equilibrium position or which simply tolerate the pest at equilibrium position

Figure B-1
Lowering the Equilibrium Position of a Pest



- Modification of the pest environment in such a way as to increase the effectiveness of the pest's biological control agents, to destroy its breeding, feeding, or shelter habitat, or otherwise to render it harmless. Examples include many well-known agronomic practices such as crop rotation, destruction of crop harvest residues, and soil tillage.

Pest management practices can also raise the equilibrium position of a pest. For example, repeated applications of insecticides may destroy natural enemies, thus creating a higher equilibrium position than when an insect pest was regulated by its enemies. A basic feature of IPM programs is to devise ways to lower the equilibrium positions of major pests while avoiding practices that create environments favorable to pests of secondary importance.

Surveillance Metnodology and Decision Making About Pesticide Use

Utilization of the best combination of natural enemies, resistant varieties, and environmental modification may eliminate the need for further action against many key pests except under unusual circumstances. Nearly permanent control of key insect and disease pests of some agricultural crops, for example, has been achieved by integrating such cultural practices as plowing and timing of irrigation with pest-resistant crop varieties and conservation of natural enemy populations.

When key pests or secondary pests are out of control, remedial measures must be taken (see Figure B-1). Mechanical or biological control tactics can be used. Sometimes pesticides are the only recourse.

Pest control measures should be applied only when inspection of the fields shows that pest populations will exceed the economic threshold. Pesticides should never be applied blindly, i.e., according to the calendar or the stage of the crop. Always check to see whether a problem actually exists.

The economic threshold will vary according to the cost of pest control treatments. If pesticides are subsidized, farmers can afford to keep field pests at a relatively low level, increasing yield. In order to decide whether pesticides should be subsidized, and to set a rational policy, national governments must know the yield returns they can expect from any given subsidy. Crop loss assessment and threshold determination, which analyze the relationship between treatment costs, pest populations, and yields are necessary.

Monitoring and surveillance are essential to integrated pest management. Pest populations are dynamic, sometimes more than doubling in a few days or decreasing at a comparable rate. Weather, crop growth, natural enemies, and other factors that affect pest populations are also changing constantly. Thus, fields must be inspected often in order to decide when to apply or relax various control measures.

How monitoring and surveillance are conducted depends upon the type of pests involved, environmental conditions, and economic resources. Light traps and traps baited with natural or synthetic lures have been used to monitor a wide variety of insects. Some soil-borne fungal and bacterial pathogens and nematodes are detected by soil sampling techniques. Other monitoring procedures involve even less sophisticated procedures and very little expense. Scouting the crop fields and recording information on pest abundance and pest damage to the plants are the most commonly used procedures.

Sampling procedures for field surveillance must be accurate, efficient, and simple enough for use by farmers and crop protection personnel. Developing sound and practical sampling methods is a very important part of any integrated pest management program.

All monitoring methods must be designed to predict economically harmful pest infestations, so that control measures can be taken before unacceptable losses occur. Computer models for predicting pest occurrency can alert farmers and field agents to danger periods in specific areas, which can then be monitored intensively. It is very important to monitor natural enemies as well as pests, and to have studied their impact. Where natural enemies are active and multiplying rapidly, pesticide treatments may not be necessary.

In IPM programs, careful selection of the pesticide dosage and time and method of treatment avoids ecological disruptions and other problems associated with the improper use of pesticides. Pesticides should be as selective as possible--an example is the use of Bacillus thuringiensis, an insect pathogen which kills lepidopterous pests but leaves other organisms, including natural enemies, unharmed. Pesticides should also be used selectively. For example, treatments can be applied to specific parts of plants that harbor pests, or timed to avoid periods of natural enemy activity. Effective dosages should not be exceeded for economic reasons and to avoid unnecessary mortality of natural enemies and the development of resistance to pesticides.

Extension to Farmers, Training Programs, and Coordinative Mechanisms

The ultimate test of integrated pest management is whether or not the farmers use it. New IPM technology offers no real utility to anyone unless it is adopted successfuly by the farmers. Therefore, crop protection specialists must develop educational materials and guidelines for IPM implementation which can be understood and utilized by farmers with no great difficulties. Many of the farmers in west Africa are illiterate or barely literate. The requirements of these persons differ substantially from requirements of the literate farmers.

Integrated pest management schemes, closely synchronized and integrated into optimal crop production systems that are essential for long-term profitable farming, will necessitate good communication and cooperation among all the persons involved in the crop production systems. It is especially important to develop feed-back mechanisms from the farmers

X
209

and extension workers in the field to the research workers in order to properly guide the evolution of IPM programs.

Training for persons at all levels--extension workers at the farm and village level, research technicians, scientific experts, supervisory staff, crop protection officials, and the farmers themselves--is essential to the development and implementation of integrated pest management. It is essential that the crop protection officials understand the principles of IPM and that expertise in its application is developed appropriate to the level of their activities. To get integrated pest management established on the farms, field workers must explain and demonstrate the advantages of the approach. In turn, they must have the support and understanding of their senior officers. To provide continuing improvement and development of specialist services, particularly identification of pests and natural enemy species, additional training is required for the research participants.

Coordination and cooperation among personnel of research, educational, and operational agencies are critical to the success of integrated pest management. Without effective mechanisms for coordination, unnecessary duplication of effort may result, and the research, educational, and operational activities may lack the coherence essential for developing and implementing a cohesive IPM strategy.

Annex B-5

An Overview of Worldwide IPM Activities by FAO and Others

Note: This annex, reproduced from an article by Lucas Brader in the Annual Review of Entomology, uses the acronym IPC where the Project Paper Amendment uses IPM; they are synonymous.

Integrated pest control (IPC) has attracted the greatest interest in North America, Europe, and Australia. Its development in these regions has occurred mainly under the active leadership of the scientific community. Starting in the early 1950s, it was realized that single-method approaches would not provide a permanent answer to most crop protection problems. This origin occasionally created a somewhat academic impression for the noninitiated.

In the developing world, however, IPC evolved much more as a direct result of failing chemical control. Almost all the programs developed provided a direct answer to a worsening pest situation. Therefore, they have a much more pragmatic character in general.

Different aspects of IPC are elaborated in the following paragraphs where programs are discussed for Latin America, Africa, Asia, and the South Pacific. This is followed by a description of the FAO/UNEP Cooperative Global Program for the Development and Application of Integrated Pest Control in Agriculture. This program constitutes a framework through which IPC in developing countries is receiving further support.

The discussion in this review is limited mostly to what has been called "the insect mangement area." IPC, however, applies equally well to other crop-protection disciplines.

Latin America

Development of IPC in Latin America has been strongly related to cotton growing. Here we find typical examples of IPC development and application in response to crisis situations created in cotton production by the overuse of chemical insecticides.

Cotton growing in the Canete Valley, Peru, is a well-documented case that has become a classic example of IPC.

1943-1949

The tobacco bud worm *Heliothis virescens* appeared for the first time in the Valley in 1939, and the use of chemical insecticides resulted in a rapid buildup of cotton aphid (*Aphis Gossypii*). The *Heliothis* problem worsened every year, notwithstanding an increased number of chemical insecticide applications. The elimination of the

natural enemy complex by the insecticides proved to be the reason for the serious pest outbreaks. Crop failures occurred in 1949; and cotton production declined from about 500 kg/ha to 365. As a consequence, a new program for growing cotton was proposed, which included the following elements: prohibition of ratoon cotton, use of early maturing varieties, control of insects only when necessary, the proper use of chemical insecticides, good agricultural techniques with emphasis on irrigation, crop rotation, and legislative measures fixing sowing dates and cleanup campaigns.

1949-1956

The above-mentioned recommendations were only partly implemented. Moreoever, synthetic organic insecticides became available and were used extensively. An increase in the number of pests occurred, and decreased effectiveness of certain chemical insecticides was noted after 3 years. The cotton aphid became resistant to BHC, *Anomis texana* became resistant to toxaphene, and *Heliothis virescens* developed resistance to DDT and mixtures of BHC and DDT. In 1956, when all available chemicals failed to control pests, production was at the lowest level ever recorded in the Canete Valley. It dropped to 332kg/ha, whereas it had reached a peak of 728 kg/ha in 1954. The average number of insecticide applications had increased to 16. The same situation occurred in the Chincha and Paco valleys, the total area affected being more than 40,000 ha.

The proposals of 1949 were now implemented with particular emphasis on the following points: prohibition of the use of synthetic organic pesticides; a return to arsenical insecticides and nicotine sulfate; utilization of biological control methods, including collection and release of *Tacho gramma*, lady beetles, and a carabid beetle (*Calosoma abreviatum*), and interplanting of corn and wheat for natural enemy buildup.

After 1956

The IPC program was closely adhered to and the cotton pest situation returned to normal within one to two seasons. Cotton production reached a level of about 800 kg/ha in 1959, and the average number of pesticide applications in 1958 was reduced to 2.35.

The speedy recovery was attributed to the rapid reestablishment of a beneficial fauna in the cotton fields. At least 72 different parasites were frequently found in cotton fields in all the Peruvian valleys and several of these have been studied in great detail. They were also encountered on the rich flora of wild host plants, Malvaceae in particular.

As a result of the failures in pest control and cotton production, IPC was readily accepted by the farmers with excellent results. However, following changes in the agricultural tenant system, the situation has recently deteriorated to a certain extent, as the recommendations are applied less scrupulously. This situation should be viewed with

212

some apprehension, since it could easily revert to a pesticide-dependent scheme.

A situation similar to that described above for cotton has occurred with other crops in Peru: potatoes, citrus, and olives. In all cases, the reasons were the same: the elimination of natural enemies because of overuse of chemical pesticides, and the subsequent reestablishment of the beneficial fauna through use of selective IPC measures.

Cotton growing in Central Americ suffered a full crisis situation similar to the one in Peru, beginning in the mid-1960s. IPC systems were subsequently developed in Guatemala, Nicaragua, and El Salvador.

Based on the experience gained in cotton, IPC programs were recently developed for basic grains in Nicaragua. They include local experience as well as information gained elsewhere. Recommendations are given for maize, sorghum, and beans concerning cultural control practices, correct choice of pesticides, and economic damage thresholds. Thus an excellent tool is provided to improve protection of the basic food crops of the small farmers. The practical experience to be gained from these programs will also be of great use elsewhere, particularly in those situations where IPC will be applied without first going through a phase of unilateral insecticide control.

Africa

IPC in Egypt was developed as a consequence of the recognition that chemical insecticides are not the ultimate solution for control of most pests attacking major crops. The problems encountered were insecticide resistance, development of new pests, relatively high costs of chemical pest control, and environmental pollution in the densely populated Nile Valley. These drawbacks were especially apparent in cotton, where resistance often led to insufficient control of the leafworm *Spodoptera littoralis*. Heavy infestations by *Heliothis armigera* occurred in 1974. Population increases were already noticed in the two preceding years, whereas the insect was virtually absent in earlier periods.

Maize

The major pests of maise include the corn borers, *Sesamia cretica*, *Chilo agamemnon*, and *Ostrinia nubilalis*, the cotton leafworm, *Spodoptera littoralis*, and the corn aphid *Rhopalosiphum maidis*. Until 1965 as much as four insecticide applications were carried out during the growing season, but losses were still considerable.

Studies on the relationship between sowing dates and borer infestation showed that maize sown between mid-May and mid-June escaped most of the attck. Further experimentation confirmed this and sowing dates were fixed accordingly. This was completed by the establishment of economic damage thresholds, which are 3-4 egg masses per 100 plants for *S. cretica*, 320 egg masses per 100 plants at pretassel stage, and 50 egg masses per 100 plants after tasseling for *C. agamemnon*, and 50 and

75 egg masses per 100 pre- and post-tasseling plants, respectively for O. nubilalis.

Implementation of the above findings has led to the following results: the area of maize treated with insecticides against borers decreased from 692,000 acres in 1964 to an average of 22,000 acres in the last 5 years; losses were reduced over the same periods from 10.7 percent to about 3 percent; overall yields increased from 1.12 ton per acre to 1.64 ton per acre (factors other than crop protection alone also played a role in this aspect); infestations by mites, Tetranychus spp., which often occurred when pesticides were regularly used, have almost disappeared; losses caused by the cotton leafworm have become less important, as plants are well developed at the period of heaviest attack and suffer less; and aphid infestations have also become less frequent.

Rice

A number of studies were carried out to determine the most appropriate control strategies for the three major pests in rice growing: the bloodworm Chironomus sp., the rice stem borer Chilo agamemnon, and maggots of the tabanid Atylotus agrestis.

The bloodworm attacks rice planted under conditions of high salinity. The larvae cut and destroy the rootlings of rice seedlings as soon as these develop, but they do not survive in sweet water and can be controlled by a variety of measures: use of fresh canal water instead of drainage water in rice nurseries; the sowing of already germinated seed immediately after flooding to ensure that plants are well established before the larvae can cause damage; and draining water from the nurseries for 24 hours, which kills most of the larvae.

Rice stem borer damage varies greatly on different varieties, and as a result, those varieties combining good production characteristics and a high degree of borer resistance were promoted. Proper sowing dates further reduced stem borer attack, and the pest has stayed below the economic injury threshold during recent years.

Factors increasing attack by A. agrestis are now better understood. They are late plantings, heavy manure applications, and varietal susceptibility. Application of this knowledge will eventually lead to better control.

Sugarcane

In sugarcane the key pest is Chilo agamemnon. Its range increased further south after year-round irrigation became possible through the construction of the Assuan dam. In normal practice, sugarcane rows are planted 80 cm apart, but it was demonstrated that the damage by Chilo could be considerably reduced by wider spacing. Production was not reduced until spacing was 145 cm between rows, where the infestation was almost 80 percent less. It is concluded that high air humidity favors Chilo, and this information will be further used to develop an effective IPC program for sugarcane.

Cotto

The major pests of cotton are the leafworm, Spodoptera littoralis, and the pink bollworm, Pectinophora gossypiella. Over the years a very effective IPC program has been developed and put into practice in Egypt. It is based on several elements, which are a combination of cultural, biological, chemical, and legislative measures.

1. The sowing date is fixed around 15 March. As the peak of emergence of the pink bollworm mostly occurs in the first half of May, the cotton plants are still too small to suffer severe attack.

2. Fuel oil is to be added to the last irrigation water of berseem clover at 30 liters/acre to reduce the number of leafworm larvae. Clover Verseem, Trifolium alexandrinum is grown as a winter crop in Egypt and is an effective host for Spodoptera, which migrates from clover to cotton.

3. Irrigation of clover fields after 10 May is prohibited, again to reduce the leafworm population. The law fixing this date was established in 1913.

4. Egg masses of Spodoptera are handpicked during the first part of the growing season. This practice, in use since 1905, has proved to be effective in reducing pest populations.

5. Pesticide applications are avoided until early July to protect natural enemies, which reach their maximum populations during this period. It should be noted that parasites and predators were abundant in cotton fields before generalized use of synthetic organic insecticides.

6. The economic threshold for Heliothis armigera was raised to 20 larve/100 plants. Parasites and predators proved to be effective in controlling the bollworm.

7. Recently the picking and burning of infested and dry bolls at the end of the growing season was introduced. This reduces the carry-over of the pink billworm to the next season. To kill diapausing larvae, heat treatment of seeds is also applied.

The whole system has been implemented with increasing success. With the experience gained, it was decided to try to avoid completely the use of insecticides in cotton growing in the Fayoum Province during the 1975 season. This concerned about 70,000 acres. The experiment started in 1974 with an intensive cleanup campaign, involving the handpicking of dry cotton bolls, and was very successful as the average number of sprays in 1975 was less than one. Since then pesticide applications have not been needed at all in the Fayoum. In 1976, the estimated loss in yield due to pest attack for the whole country was 6.4 percent and in

Fayoum it was 5.9 percent. The yield in Fayoum was 5.6 kantar/feddan, which was nearly equal to the general average of prevous seasons. These positive results led to the decision to try to apply the same system to the whole country in 1978.

The scheme relies heavily on the abundance of relatively cheap labor to carry out the handpicking of egg masses and the collection of dry cotton bolls at the end of the season. It seems very important to develop alternative techniques to replace these procedures, which might become uneconomical in the not too distant future.

Asia

The dominant crop in Asia is rice, and the pests are generally recognized as important production-limiting factors when uncontrolled. With the introduction of high-yielding varieties, the need for effective pest control is becoming even more important: first, to safeguard the benefits to be drawn from the higher production potential; and second, to counterbalance the increased risks of pest outbreaks created by multiple cropping, improved production techniques, and the erosion of the varietal diversity.

India

In India an IPC program has been put into practice near Cuttack, Orissa. The major pests of rice in this area are stemborers (Tryporyza incertulas, Chilo suppressalis, Chilo polychrysa, and Sesamia inferens), gall midge (Pachydiplosis oryzae), brown planthopper (Nilaparvata lugens), green leafhopper (Nephotettix virescens), and rice leaffolder (Cnaphalocrocis medinalis). Indian research workers have established the following economic thresholds for these pests: stem borer, 5 percent of dead hearts or two moths or egg masses per m^2 at vegative stage; leaf-and planthoppers, five nymphs or adults per hill at vegetative stage, and 10 nymphs or adults in the post-flowering stage; and leaf-folder, 10 percent of leaves showing damage.

Gall midge infestation is forecast on the basis of the rainfall pattern during April to June. Application of insecticide granules is recommended when the gall midge is likely to become abundant.

The main components of the IPC program are (a) avoidance of peak incidence of pests by sowing of early maturing, short-duration varieties; (b) use of varieties resistant to gall midge during the June-to-December period and a stemborer-tolerant variety during the January-to-May season; (c) destruction of rice stubbles by ploughing soon after harvest to avoid carry over of gall midge and stemborer populations; (d) avoidance of insecticide applications during the period when parasites and predators are dominant (larval parasites of gall midge are abundant towards the end of September, whereas egg parasites of stemborers are important during April and May, and predators of brown plant-

hoppers, mainly spiders, become numerous at a late stage of infestation); (e) monitoring of pest and disease incidence--the first field checks are done by the farmers, who request the assistance of the local agricultural extension officers as soon as pests are noted, and a standardized pest recording procedure is worked out.

The program at Cuttack was implemented for the first time in 1975. It included 10 villages with a total cultivated area of 2500 acres. Before the program started, an average of three to four insecticide sprays was given during the crop's growing cycle. In 1975/76 this was limited to one spray in the nursery and approximately one spray during the rest of the growing cycle, which clearly shows that practical successes can be obtained in a relatively short time. The knowledge gained over the years has been put into the form of a very practical model, and it is evident that such a model can be quite simple and yet still give excellent results. Another strong point is the active involvement of the farmers, who were instructed during special evening sessions.

China

China has made extensive use of IPC in the last decade. The two principal approaches followed by the Chinese are a highly effective pest forecasting system and a very elaborate system of cultural control practices. Biological control elements are also extensively used but are generally rated second after cultural control. Less emphasis has been placed on the development of insect-resistant varieties.

The forecasting system is used for all crop protection programs in China. For example, the Kirin Province has 186 forecasting stations; they all report to the provincial forecasting center, which in turn transmits the information to approximately 500 agricultural production units. The system, which has been functioning for over 20 years, gives trends for the major pests for the entire year and notes shifts in populations over 10-day periods.

The example of wheat typifies the kind of information collected in the forecasting stations. The major pest problem in wheat is barley yellow dwarf virus disease, and its vector is the aphid *Toxoptera* (*Schizaphis*) *graminum*. In spring, the following factors are monitored: population density of the aphid; percentage of virus infection; rate of propagation and dispersal of the aphids; weather conditions (temperatures below 30°C favor virus infection); abundance of natural enemies, e.g., coccinellids and braconids; wheat variety (resistant varieties have been developed).

Cultural control practices are considered of overall importance to suppress pest populations and are particularly aimed at reducing survival of insects in the period between two crops. The approach is based on detailed knowledge of the biology and ecology of the pests concerned. In part, the same techniques are used as elsewhere and include crop rotation, field sanitation, regulation of planting dates, use of a trap crop by early planting of a small section, hand collecting of pests when feasible, etc.

China is a country that makes use of black light traps with the specific aim of mass trapping of pests; they also play a very important part in the forecasting networks. In Hunan Province, traps are dispensed at the rate of one trap for every 3-4 ha, Kiangsu Province uses one trap for every 1-2 ha, and in Kwangtung Province the trap density is one for every 2-3 ha. Specialists in certain provinces doubt the value of catching by light traps and indicate that the traps also kill large quantitites of natural enemies. Bait pails are also commonly used; in most places a 6:3:1 mixture of sugar:vinegar:wine, mixed in nine parts of water, is used.

Although biological control is generally ranked after cultural control, it nevertheless should be emphasized that the progress made and the techniques developed in China appear to have great value for other rice-producing countries in Asia. In particular, the success in popularizing the use of natural enemies at the farm level, through mass breeding and release, is outstanding. Extensive use is made of Trichogramma and strains of the bacterium Bacillus thuringiensis and the fungus Beauveria spp. Ducks are used in rice fields for insect (planthoppers) and weed control.

Twelve species of Trichogramma are reported, four of which are mass produced in special institute laboratories and at the commune level: T. dendrolimi, T. australicum, T. ostrineae, and T. japonicum. The host eggs used are those of the giant silk worm moths Samia cynthia and Antheraea perniyi and are readily available the whole year around, with one egg producing an average of 60 Trichogramma. Eggs of the rice grain moth Corcyra cephalonica are also used. In Kirin Province the host eggs are produced at the county level, they are parasitized in the commune centers, and the releases are organized by brigades.

Considerable research efforts have been made to identify and produce the most effective strains of Bacillus thuringiensis. These formulations are widely used in a number of provinces as selective insecticides for control of various pests, which include the pine caterpillar (Dendrolimus punctatus), the diamondback moth (Plutella maculipennis), the cabbage armyworm (Barathra brassicae), and the European corn borer (Ostrinia nubilalis).

The fungus Beauveria bassiana is produced by the commune pest control specialists under the guidance of a plant protection institute. The basic culture is produced at the county level; then at the commune level it is increased to the amounts needed. In Kirin Province, a simple practical production method has been developed, which uses raw material produced on farms, such as wheat bran, rice powder, cornstalk powder, and compost humus. Cultures may be developed in large flat trays or in glass flasks or jars, in a culture room or on the ground in shallow, sheltered outdoor pits. The final granular or powdered product is stored in plastic bags.

To control pest outbreaks insecticides are still considered effective tools in crop protection in China, but their use is limited as

much as possible because of the various shortcomings. Spraying is generally carried out as spot treatments of heavily infested areas. The use of chlorinated hydrocarbons has been greatly limited.

The various elements discussed above are combined in IPC programs that have been successfully implemented for rice, cotton, corn, and other crops.

Malaysia

That IPC also can be applied under quite different production systems becomes clear from examples in Malaysia, where IPC has been used effectively in so-called estate crops, cocoa and oilpalm.

Cocoa in Sabah, East Malaysia, originally was attacked by a small number of pests, a ring bark borer, Endoclita hosei, and two branch borers, Zeuzera spp. In 1959 spraying with dieldrin or DDT was undertaken, immediately after which other pests became noticeable, including leaf-eating caterpillars, aphids, and mealybugs. Prophylactic spraying was applied with different chemicals. New outbreaks occurred, including two leaf-eating caterpillars, Hyposidra talaca (a geometrid) and Setora nitens (a limacodid), and a planthopper, Colabesthes falcata. The most important were heavy outbreaks of bagworms (Psychidae), Clania spp., and Mahasena spp. The latter showed almost complete resistance to the pesticides commonly used due to their particular living habits.

As a result, spraying was completely stopped at the end of 1961; nearly all pesticides used until then were of the broad-spectrum, contact-acting type. The looper H. talaca was almost immediately attacked by an Apanteles sp., causing a population drop. The planthopper C. falcata has declined rapidly from April to May 1962 onwards. Branch borer populations heavily parasitized by Iphiaulax sp. (Braconidae) dropped next, and damage became minimal by the end of the year. However, damage caused by ring bark borer and bagworms continued to be severe.

Selective chemical control of these two latter pests was then developed. For the ring bark borers, 1% dieldrin applied locally gave good results, and moreover it was found that a commonly occurring secondary forest tree (Trema cannabina) was a main host of the borer. These trees were eliminated from the immediate surroundings of the cocoa plantations. Through the combined effect of these measures, the damage dropped below 0.5% compared to 20% and more earlier.

Trichlorphon was found to be an effective, selective insecticide against bagworm. Monthly spraying gave full control towards April 1963, when treatment could be stopped. A number of minor pests could be controlled after that date without again upsetting the newly established equilibrium.

A somewhat similar succession of events occurred in oil palm plantations in West Malaysia. Starting in the late 1950s, several estates

suffered severe outbreaks of bagworms, Crematopsyche pendula and Metisce plana, and other leaf-eating caterpillars. Heavy defoliation could occur, resulting in a crop reduction of up to 40%. An analysis of the history of these outbreaks showed that they first appeared only after treatment with broad-spectrum contact insecticides were initiated.

The use of this type of insecticide was stopped in 1962, at the same time that studies were initiated on the natural enemy complex. Their high efficiency was shown in undisturbed situations, but parasites and predators did not fully control the bagworm outbreaks. The economic injury level was arbitrarily established at 10 larvae or cocoons/frond, and trichlorphon was used as a selective insecticide. Since then the problems have decreased considerably. Occasional outbreaks of red spider mites, Oligonychus sp. and Tetranychus piercei, in oilpalm nurseries were stopped with the acaricide tetradifon.

In both cases the IPC approach was based on the reestablishment of the natural enemy complex and the careful integration of chemical control methods. These examples clearly demonstrate the overall importance of natural mortality factors.

South Pacific Region

Oryctes rhinoceros causes serious losses in coconut plantations all over the world. The beetles attack the heart of the palm, boring at the base of the unopened leaves,so that newly emerging leaves are broken off or distorted. Under the auspices of FAO, a successful IPC program against the coconut beetle was developed in Western Samoa. It is based on the integration of a number of practical control means that can be applied quite readily by the local population. Two major elements exist. (a) Field sanitation consists mainly of destruction of breeding sites through the disposal of dead trees, fallen logs, and stumps and through the elimination of heaps of organic material. (b) The second major element is biological control, for which in particular the combined use of Baculovirus oryctes and the green muscardine fungus Metarhizium anisopliae has given significant results. Infested beetles transmit the virus to healthy adults and grubs; the principal channel of virus transmission takes place between adults in feeding and mating sites. Beetles can be artificially contaminated in a rather simple manner and consequently they carry the virus to the most remote places.

The use of insecticides has proven to be uneconomical. The only way to include chemical control in this integrated control program is the insecticidal treatment of dust, dung, and compost heaps.

The programs are implemented successfully in a number of countries in the South Pacific. In all cases the rhinoceros beetle damage has fallen below the economic damage threshold.

The strength of the above program is its simplicity of application once the major control elements were identified and its extremely low costs. Consequently, it could be applied readily under the low-capital, intensive growing conditions of coconut palms.

FAO/UNEP Cooperative Global Program

Ever since its establishment in 1966, the FAO Panel of Experts on Integrated Pest Control has urged the establishment of IPC field projects in developing countries. The Panel emphasized the need for IPC in different crop situations such as cotton, rice, citrus, cereal growing, potatoes, deciduous fruits, olives, sugar cane, beans, cacao, vineyards, coconut, coffee, and maize. Specific pest problems mentioned include fruit flies, stored product pests, and cattle ticks. The original ideas were further developed in later sessions of the Panel and were crystallized in the proposal for the FAO/UNEP Cooperative Global Program for the Development and Application of Integrated Pest Control in Agriculture. This proposal was formulated by an ad hoc session of the Panel in October 1974. UNEP, the United Nations Environment Program, first provided the financial support for the program, allowing for its further elaboration.

The following two quotations from the original program proposals describe its objectives. "By providing guidance and training in research, this program will contribute to the development of sufficient expertise in the application of the integrated pest control concept, so that developing countries will be able to develop and carry out integrated control programs for pests of major importance. Long standing support by FAO for such programs will be expanded by direct assistance to national research and advisory bodies and, in particular, by continuing to help coordinate regional programs."

"The Cooperative Global Program aims at promoting the development and application of safer, more effective and more permanent plant protection procedures and techniques, through the combined use of all compatible methods. The goal is to ensure the required production of essential foods and fibres in ways which maintain environmental quality and yet are economically feasible."

The program is coordinated by FAO, which appointed a program coordinator in 1975, and the Panel of Experts serves as the technical advisory body. It reviews project proposals, analyzes results achieved by regularly evaluating the activities, and advises on program changes.

In the initial phase, it is proposed to set up intercountry programs for three major crops--cotton, rice, and sorghum/millet. Each of these programs will be implemented in a certain region and will cover those countries in which the crop concerned is of major economic importance. The research activities in each of the participating countries in the same region will complement each other, with the aim of developing comprehensive results in the shortest possible time. The intercountry programs so far planned are Near East intercountry program for cotton, including Pakistan, Iraq, Syria, and Turkey; Africa intercountry program for cotton, with major emphasis on Egypt and Sudan; Latin America intercountry program for cotton, including Mexico, El Salvador, Guatemala, Colombia, Peru, Bolivia, and Brazil; Southeast Asia intercountry program for rice, comprising Indonesia, Malaysia,

X
221

Philippines, Thailand, Bangladesh, Sri Lanka, and India; and Sahel intercountry program for basic food crops covering Cape Verde, Mauritania, Senegal, Gambia, Mali, Upper Volta, Niger, and Chad.

The activities to be undertaken include the following: (a) setting up of demonstration study areas to evaluate the applicability of available knowledge and at the same time to allow for the identification of major shortcomings; (b) organization of training at all levels; (c) coordination and execution of problem-oriented research; and (d) assistance to the implementation of results at farmers' level. To the extent possible, close collaboration will be established with research teams in developed countries.

Conclusion

The examples given clearly demonstrate that IPC has been applied successfully in developing countries under different conditions. It is used in both annual and perennial crops and under both small farmer and estate crop conditions, and in all these cases it provides an effective answer to crop protection problems. Economically, IPC proves very advantageous, as it stabilizes the pest situation and environment problems are greatly reduced.

Emphasis in all the programs is on three elements: utilization of workable economic damage thresholds and effective pest sampling, in some cases coupled with reliable pest forecasting methods; maximum use of cultural control practices; and optimum exploitation of natural occurring parasites and predators, supplemented by mass breeding and release. The availability of selective crop protection measures is essential for the optimum use of natural enemies. Knowledge is gradually becoming available on pesticide selectivity and this could considerably benefit the IPC program after its validity in various situations has been proven.

The practical economic damage thresholds and the pest sampling methods are comparable from one place to another. Thus direct benefit can be drawn from experience gained elsewhere, and the first step in the development of an IPC program can be made quite readily. However, the establishment of an effective forecasting system requires specific local input on the ecology of major pest species before it can become operational.

Cultural control practices are based mainly on the maximum reduction of the carry-over of pests from one crop to the next. Ways to achieve this are well known and can be used readily. It includes practices such as crop rotation, destruction of stubbles or other plant debris, shortening of the growing season by homogeneous planting dates and early harvesting, and the sowing of trap crops.

Many of these growing techniques are still an integrated part of agriculture in the developing world. They have evolved as the best answer to the crop protection problems under local conditions. In

222

modern agriculture, however, the relative importance of crop protection in the total package of production factors is diminishing gradually. This was acceptable as long as synthetic organic pesticides maintained their status of cheap, effective, and environmentally relatively safe tools. This is often not the case any more and through IPC new solutions are put forward. It again places crop protection within the total production framework.

It is now evident that effective crop protection will only be achieved by giving full consideration to the specific characteristics of the agro-ecosystem. The unrestricted application of generally alien means of control does not provide a satisfactory and lasting answer to crop production needs of the developing world. In addition, a detailed analysis of traditional crop production and protection practices will certainly reveal a wealth of valuable and unexplored knowledge.

Apart from rice growing, host-plant resistance has so far received relatively little attention in IPC programs in the developing world. This is mainly due to the fact that the development of new varieties is a time-consuming process, and in the various crisis situations, answers were needed immediately. In the currently planned IPC programs, host-plant resistance is given considerable attention. Resistant varieties are considered one of the best control means available. They can be easily introduced into agriculture in the developing world as almost no additional costs are involved for the farmer. Apart from the renewal of his seed supply, no specific actions are needed.

The development of pest-resistant varieties requires a close collaboration between plant breeders and plant protection specialists. The role of the latter is to develop simple and reliable screening methods that can be readily used by the breeders. This will not only help the development of resistant plant material, but it can also be used to screen new varieties on a routine basis. All too often selection has been done under conditions of maximum pest control, a practice that might result in the release of varieties that are susceptible to various pests. This could be very detrimental, especially in the developing world where local varieties have acquired a certain degree of resistance to the major pest species.

Through its maximum reliance on natural regulating mechanisms, IPC reduces the need for external input to the minimum. Therefore, it is also economically the best approach to be followed in the developing world, as it will provide a crop protection system based on the local needs and possibilities.

When not fully understood, IPC is viewed as being rather complex. The given examples clearly demonstrate the contrary. It can be introduced step by step, following the development of new information and control techniques and the necessary training of various personnel involved. Consequently, IPC with its variety of crop protection components is extremely well suited to agriculture in the developing world. Close collaboration of all concerned--administrators, researchers, extension workers, and farmers--will permit full benefit to be derived from it.

ANNEX C

PROGRAM BACK-UP

1. Program Component Work Plans

   a. Regional Directorate
   b. Cape Verde
   c. The Gambia
   d. Mali
   e. Mauritania
   f. Niger
   g. Senegal
   h. Upper Volta

2. Program Component Budgets/Schedules

   a. 1984-1986 Budget - All Components
   b. 1984-1986 Budget - FAO
   c. Determination of 121(d) Requirements
   d. Construction Schedules 1984-1986 and Summary
   e. Vehicle Procurement Waivers
   f. 611(e) Certification
   g. General Procurement Schedule

X
225

Annex C-1
Program Component Work Plans

a. Regional Directorate

(1) Recruitment of Experts (FAO)

During 1983 the Principal Technical Advisor was recruited and the Socio-economist will be recruited. In October 1985 a weed scientist will be assigned to headquarters. The bioclimatologist is already in place. These posts will be maintained until 1986.

(2) Training

None at present.

b. Cape Verde

(1) Recruitment of Experts

An expert in integrated pest management will be recruited during 1983, to work through 1986. One of the main tasks will be Crop Loss Assessment.

(2) Training

(a) Once a year a training course will be organized for the benefit of technicians and observers. The training will cover the plant protection and climatology.

(b) Technicians and observers will also participate in training courses organized by regional and international institutions.

(3) Country Work Program

I. Cabbage

Plutella xylostella--Cabbage Leaf Worm

1983-1986:
1. Thuricide field trials
2. Damage thresholds
3. Sequential sampling plan
4. Pest management program

Chrysodeixes calcites
Hellula undalis

1983-1986:
1. Improve damage assessments
2. Damage thresholds
3. Thuricide trials
4. Sampling plan
5. Importation of natural enemies
6. Study of natural enemy impact

II. Cabbage-tomatoes-pigeon pea

Heliothis sp Bollworm

1983-1986:
1. Further trials with Elcar
2. Pest identification
3. Use of pheromone traps
4. Sequential sampling plan
5. Release of parasites, (Apanteles kazak, among others) and follow-up studies

X
227

III. Pigeon Pea

Etiella zinckenella
Lampides sp.
(Heliothis sp.)
(Maruca testulalis)

1983-1986:

1. Crop loss assessment
2. Evaluate crop yield
3. Biological studies
4. Natural enemies
5. Introduction of parasites
6. Documentation of work (key for species and damage symptoms, slides, etc.)

IV. Corn

Sesamia botanephaga

1983-1986:

1. Crop loss assessment
2. If necessary, introduction of parasites and follow up studies

V. Corn and Other Crops

Locusts/Grasshoppers

1983-1986:

1. Continuation of field investigations with GERDAT program

VI. Potatoes

Millipede (unidentified)

1983-1986:

1. Identification to species
2. Study of biology
3. Damage assessment
4. Development of an IPM program (Insecticides? Biological control?)

228

VII. Coffee

Coccus viridis Coffee Scale
(and other pests)

1983-1986:

1. Biology/ecology
2. Natural enemies
3. Eventually introductions of parasites and predators, depending on survey results
4. Survey for other pests and diseases

VIII. Cassava

Aonidomytilus albus

1983-1986:

1. Search for natural enemies
2. Possible introduction of natural enemies
3. Insecticide trials
4. Planting method trials

IX. Beans

Bean pest complex
(Thrips, Pod Borers, etc.)

1983-1986:

1. Survey of pests and diseases
2. Assessment of their pest status
3. Loss assessments
4. Insecticide trials

X. Pumpkins-Squash

Dacus frontalis Fruit Fly

1983-1986:

1. Effect on populatic
   sterile males
2. Further ecological studies
3. Further insecticide trials
4. Introduction of biocontrol agents

XI. Sweet potatoes

Cylas puncticollis

1983-1986: (If sufficient staff available)

1. Cultural control trials
2. Loss assessments

X
229

c. The Gambia

(1) Recruitment of Expert:

The Gambia will have the services of 2 experts: an IPM expert was recruited in 1983 for assignment to Yundum until 1986; a weed scientist will be recruited in 1983 and assigned to Sapu until 1985.

(2) Training

(a) A yearly training course will be conducted to upgrade expertise of the personnel in plant protection and climatology.

(b) One scholarship each in entomology and plant pathology will be provided. Candidates must be high school graduates. B.S.-level training should begin in October 1983 and end in 1987. Subjects of theses should relate to Sahelian pest problems, and fieldwork will be done in The Gambia.

(3) Country Work Program

Entomology

I. Millet

Acigona ignefusalis Shoot fly

1983-1986:
1. Varietal resistance
2. Assessment of cultural control methods (1984-1986 only)
3. Natural enemy inventory

Meloidae Blister beetle complex

1983-1986:
1. Evaluation of the economic importance/pest status of the various species
2. Bioecological studies (1984-1986 only)
3. Test various control methods and their acceptability to farmers (1984-1986 only)

II. Early millet

Rhaguva albipunctella Spike Head Borer

1983-1986:
1. Varietal resistance
2. Ecological and population dynamics
3. Cultural control methods
4. Crop Loss assessment

III. Groundnuts

Millipedes (Diplpoda)

1. Species inventory 1983-84
2. Population dynamics 1984-85
3. Ecology 1984-85
4. Nonchemical controls 1985-86

IV. Rice

Heteropteran complex:
Diploxys souleri
Aspavia armigera
Agonoscelis harddi
Nezara viridula
Stenocoris sp., etc.

1983-1986:
1. Species inventory
2. Assessment of the economic importance of the various species (1984-86 only)
3. Bioecological studies on most damaging species and study of appropriate controls (1985-86 only)

Plant Pathology

I. Millet

Sclerospora graminicola Mildew

1983-1986:
1. Varietal resistance (1984-86 only)
2. Seed treatments (1983-84 only)
3. Crop loss assessment
4. Demonstrations (1985-86 only)

II. Groundnuts

Cercospora arachidicola Groundnut leaf spot

1984-1986:
1. Epidemiology and control
2. Disease forecasting (1985-86 only)

X 231

III. Rice

Pyricularia oryzae (blast)

1984-86:

1. Varietal resistance
2. Loss assessment
3. Demonstrations (1985-86 only)

Weed Science

Note: Program is subject to change after arrival of weed science expert.

I. Sorghum

Striga hermonthica Witchweed

1984-86:

1. Effects of improved soil fertility
2. Rotation with non-host plants and use of trap crops
3. Uprooting and its applicability and acceptability by farmers (1985-86 only)
4. Varietal resistance

II. Rice (swamp and irrigated)

Echinochloa colona Sedge

1984-1986:

1. Evaluation of improved cultivation and irrigation practices
2. Loss assessments

Cyperus difformis Nutgrass

1984-1986:

1. Integration of improved cultivation, hand weeding and selective use of herbicides in comparison with single approaches to the control of the weed

d. Mali

(1) Recruitment of Experts (FAO)

An expert in Plant Pathology will be recruited during 1983 and assigned to Sotuba until 1986, to work with an integrated pest management expert already in place.

(2) Training

(A) Yearly training will be given to improve the expertise of the technicians and observers in entomology, weed science, plant pathology, and climatology.

(b) Three scholarships in entomology (one in taxonomy) two in plant pathology, one in bacteriology/virology and one in weed science are being provided in October 1983 for 3 years, including one year in the field. Candidates should have a diplome des sciences appliquees or a licence in sciences naturelles. Thesis fieldwork will be done in the Sahel, working with the national IPM research team.

(3) Country Work Program

Entomology

I. Millet- Sorghum

Blister beetle complex (Cantharides)

A. 1983-1984:
1. Population dynamics
2. Study of natural enemies and determination of principal mortality factors
3. Study of insect biology
4. Study of geographical distribution by ecological zones
5. Research on resistant varieties
6. Study of traditional control methods

B. 1984-1985:
1. Continued foregoing studies
2. Importance of principal parasite and predators
3. Establish a surveillance capability

C. 1985-1986:
1. Investigation of traditional control methods
2. Continuation of studies underway
3. Pesticides

X
233

II. Millet

Blister beetles (Cantharides). See above.
Raghuva-albipunctella

1. Biology/ecology
2. Diapause studies starting 1983

III. Sorghum

Sorghum head pests
Certain species have been identified

Contarinia sorghicola

A. 1983-1984:
1. Species identification
2. Population dynamics
3. Biological studies
4. Research on principal factors of natural mortality
5. Research on resistant varieties
6. Research on traditional control methods

B. 1984-1985:
1. Continue studies underway
2. Pesticides

C. 1985-1986:
1. Continue studies underway
2. Mapping and geographic distribution of the different species
3. Investigations of traditional methods of control

IV. Rice

Maliarpha separatella

1983-1986:
1. Population dynamics
2. Study of principal factors of natural mortality
3. Study of adult activity
4. Research on resting places

Chilo sp Stem Borer

A. 1983-1984:
1. Population dynamics
2. Study of principal factors of natural mortality
3. Study of adult activity
4. Research on host plants and resting places

B. 1985-1986:

1. Continue prior year's studies
2. Study of resistant varieties under conditions of controlled infestation

Plant Pathology

I. Millet

Sclerospora graminicola Mildew

A. 1983-1985:

1. Identification of biological races
2. Study of the biology
3. Chemical control (seed treatment)
4. Selection in field of tolerant varieties

B. 1985-1986:

1. Continue prior studies
2. Crop loss estimates
3. Mapping
4. Farmer's field demonstrations

II. Sorghum

Sphalocetheca sorghi Smut

1983-1986:

1. Chemical control (seed treatment)
2. Field selection of tolerant varieties
3. Crop loss selection assessment

Weed Science

General inventory and identification of principal weeds of food crops already underway are to be continued.

I. Sorghum- Millet

Striga hermonthica

A. 1983-1984:

1. Identification
2. Study of damage
3. Study of influence of fertilizer
4. Study of traditional control methods

B. 1984-1986:

1. Continue studies underway
2. Chemical controls
3. Research on resistant varieties
4. Biological studies
5. Research on cultural practices

X
235

e. Mauritania

(1) Recruitment of Experts

An expert in entomology (Kankossa) and one in plant pathology (Kaedi) will be recruited in 1983. They will work until 1986 with the integrated pest management expert already in place. An extension expert will be recruited in 1983 to coordinate preparation of IPM materials for extension to farmers.

(2) Training

(a) An annual training course will be organized to improve the knowledge of technicians and observers in entomology, plant pathology, weed science and climatology.

(b) Fifteen technicians and observers will train at regional and international institutions for periods of from 4 to 6 months.

(c) Scholarships will include four in entomology, two in plant pathology, one in bacteriology/virology, and one in weed science, for a diplome d'Ingenieur des Travaux Agricoles or B.S. Training will begin in October, 1983 and will continue for four years. Memoire and thesis fieldwork will be done in the Sahel for the IPM Project.

(3) Country Work Program

Entomology

I. Millet- Sorghum

Acigona- ignefusalis Shoot fly

1983:1986:

1. Population dynamics and biology deriving from climate
2. Research on chemical methods, varietal resistance and cultural methods (collection of diseased stalks)
3. Use of Bacillus thuringiensis
4. Inventory and efficiency trials of parasitoides

II. Millet

Raghuva albipunctella

1983-1986:

1. Population denamics and biology
2. Inventory of secondary alternate host plants
3. Inventory and efficiency of parasitoids
4. Development of chemical and cultural controls and practices
5. Use of Bacillus thuringiensis
6. Resistant varieties

236

III. Cow peas

Pseudoprotaetia stolata

1983-1986:
1. Inventory of secondary, alternate host plants
2. Population dynamics
3. Refinement of control methods
4. Resistant varieties

Heliothis armigera

1983-1986:
1. Population dynamics
2. Research on natural enemies
3. Resistant varieties
4. Determination of action thresholds

IV. Rice

Chilo zaeconius

1983-1986:
1. Population dynamics
2. Resistant varieties
3. Inventory and efficiency trials on parasitoids

Plant Pathology

I. Sorghum

Sphalocetheca sorghi Smut

1983-1986:
1. Resistant varieties
2. Economic importance
3. Refinement of control methods (chemical and traditional)

Sphalocetheca cruenta Smut

1983-1986:
1. Resistant varieties
2. Control methods (traditional and chemical)
3. Evaluation of losses

II. Millet

Tolyposporium penicillanae Smut

1983-1986:
1. Resistant varieties
2. Refinement of control methods
3. Evaluation of losses

III. All cereals:
Inventory and assessment of importance of cryptogamic and other diseases

IV. Cow peas

Maladie des gales des gousses Shell scab

1983-1986:
1. Economic importance and geographic distribution
2. Resistant varieties
3. Control methods

Cercoporiose Leaf Spot

1983-1986:

1. Economic importance and geographic distribution
2. Control methods
3. Resistant varieties

Weed Science

I. Sorghum and millet

Striga hermonthica Witch weed

1983-1986:
1. Economic impact
2. Refinement of control methods:
   - o resistant varieties
   - o mechanical controls
   - o cultural practices

II. Rice

Economic impact of Striga on rice production

f. Niger

(1) Recruitment of Experts (FAO)

During 1983 an expert in IPM and a weed scientist will be recruited, the former to be based in Niamey and the latter at Tarna. A crop loss assessment specialist and entomologist are already in place. These positions will remain until 1986 with the exception of the weed scientist, who will leave in 1985.

(2) Training

(a) Each year, seminars will be organized for the training of technicians and observers. The training will be in plant protection and climatology.

(b) There will be three scholarships in entomology (one in taxonomy), two in plant pathology, and two in weed science. Candidates will have degrees from agronomy schools and will be in scholarship training for a period of two years. Thesis work will be done in the Sahel.

(3) Country Work Program

Entomology

I. Millet- Sorghum

Raghuva albipunctella Spike Head Borer

A. 1983-1986:
1. Biological Cycle
2. Adult emergence curve
3. Study of parasites and predators
4. Evaluation of losses
5. Research on resistant varieties
6. Pheromones
7. Chemical control

Acigona ignefusalis Shoot Fly

A. 1983-1986:
1. Biological cycle
2. Research on resistant varieties
3. Evaluation of losses

Rhynyptia infuscata

A. 1983-1986:
1. Biological cycle
2. Conditions conducive to outbreaks
3. Study of control methods
4. Evaluation of losses

X
239

II. Sorghum

Contarinia sorghicola	Shoot Fly
Atherigona soccta	Shoot Fly
Sesamia spp	Shoot Fly Sorghum Borer

A. 1983-1986:

1. Biological cycle
2. Biological control studies
3. Crop loss assessment
4. Research on resistant varieties
5. Distribution

III. Cowpeas (Niebe)

Taenothrips sjostedi Thrips

A. 1983-1986:

1. Evaluation of losses
2. Biological cycle
3. Insecticides
4. Research on resistant varieties

Maruca testulalis	Legume Pod Borer
Acanthomia spp	Pod Sucking Bug
Anoplocnemis curvipes	Pod Sucking Bug

A. 1983-1986:

1. Population dynamics
2. Biological studies
3. Insecticides
4. Research on resistant varieties

IV. Ground Nuts

Aphis craccivora Aphids

A. 1983-1986:

1. Geographical distribution
2. Study of natural parasites
3. Biological studies

Heliothis armigera Bollworm
Amsacta-moloneyi Leaf Caterpiller

A. 1984-1986:

1. Biological cycle
2. Research on resistant varieties

Rhopalosiphum maidis Corn leaf aphid

A. 1983-1986:
1. Biological cycle
2. Research on resistant varieties

Plant Pathology and Virology

I. Millet

Sclerospora graminicola Mildew

A. 1983-1986:
1. Evaluation of losses
2. Research on resistant varieties
3. Research on cultural control methods
4. Chemical controls (seed treatment)
5. Specificity

II. Sorghum

Sphacelotheca sorghi Smuts
Sphacelotheca reiliana
Sphecelotheca- cruenta
Tolyposporina- ehrenberghii

A. 1983-1986:
1. Same program as for S. graminicola (above)

III. Cowpea

Mosaic virus, common and golden

A. 1983-1986:
1. Identification
2. Evaluation of losses
3. Research on resistant varieties
4. Seed treatment

Weed Science

I. Millet-Sorghum-Corn

Striga hermontheca-

A. 1983-1986:
1. Evaluation of losses
2. Physiological specificity
3. Research on resistant varieties
4. Mechanical control
5. Study of other control methods

g. Senegal

(1) Recruitment of Experts (FAO)

An IPM expert will be recruited in 1983 to remain through 1986 at Bambey. The experts in entomology, biological controls, and crop loss assessment will remain at Nioro du Rip through 1986.

(2) Training

(a) Each year a training course will be organized to upgrade the knowledge of the technicians and observers in plant protection and climatology.

(b) One scholarship in IPM technology, one in plant pathology, and one in weed science will be offerred for completion during 1983-1986.

(c) Three courses of three months each will be given each year for refresher training in regional and international research institutions.

(3) Country Work Program

Entomology

I. Millet-Sorghum

Acigona ignefusalis Stem borer

1983-1986:
1. Follow population dynamics
2. Study of natural enemies
3. Biological and ecological studies
4. Research on resistant varieties
5. Research on traditional control methods

II. Millet

Geromyia penniseti

1983-1986:
1. Biological and ecological studies
2. Biological controls

Rhaguva albipunctella

1983-1986:
1. Population dynamics
2. Crop loss assessment
3. Natural enemies
4. Ecobiology
5. Diapause locations
6. Cultural methods
7. Resistant varieties

242

Cantharides Blister beetles
Cantharis spp.
Psolydolyttae spp.

1983-1986:
1. General studies to refine data on their importance, considering the variability of attacks
2. Loss estimate profiles

III. Sorghum

Contarinia sorghicola

1983-1986:
1. Population dynamics
2. Biological studies
3. Natural enemies

IV. Rice

Chilo zacconius Rice Borer (associated program)

Note: Associated program means that another agency is responsible for the program in which the IPM component cooperates.

1983-1986:
1. Population dynamics
2. Alternate hosts
3. Research on resistant varieties
4. Natural enemies

Cecidomyie-Orseolia oryzae Gall Midge (associated program)

1983-1986:
Studies to determine the importance of attacks (could be the second most destructive pest in the Casamance).

Diopsis thoracica (associated program)

1983-1984:
1. Population dynamics
2. Studies of diapause

X
243

V. Cowpeas

Amsacta moloneyi

A. 1983-1984:
1. Population dynamics
2. Influence of intercropping population development and natural enemies
3. General biological studies with accent on the influence of rainfall on development of the first generation population
4. Movements of first adult generation
5. Chemical control

B. 1984-1985:
Study of seed treatment to reduce pest damage at the beginning of the season

C. 1985-1986:
Practical influence of intercropping on the development of pest populations and their natural enemies

Frankliniella spp.

1983-1986:
1. Population dynamics
2. Biology
3. Loss estimate profiles

Plant Pathology

I. Millet

Sclerospora graminicola Mildew

1983-1986:
1. Biological and ecological studies
2. Resistant varieties
3. Crop losses
4. Variability of races

Tolyposporium penicillariae Smut

A. 1983-1985:
Damage thresholds

B. 1985-1986:
Same as A above plus study of resistant varieties

II. Rice

Pyricularia oryzae Blast

1983-1986:

1. Biological study (variability of virulence)
2. Study of resistant varieties
3. Cultural control
4. Crop loss assessment
5. Variability of races
6. Chemical control
7. Study of other control methods

Rhinchospora spp.

1983-1986:

1. Identification
2. Distribution

helminthosporium oryzae

1983-1986:

Crop loss assessment

Weed Science (associated program)

Rice

Cyperus spp.
Oryza longistaminata

1983-1984:

Biological and ecological studies

X
245

h. Upper Volta

(1) Recruitment of Experts (FAO)

During 1983, an IPM expert and a plant pathologist will be recruited, the latter to be assigned to Saria. The IPM assignment, like that of the entomologist at Kamboinse, runs from 1983-86; the plant pathologist serves only through 1985.

(2) Training

(a) A yearly seminar will be conducted in Upper Volta to upgrade expertise of the personnel in plant protection and climatology.

(b) Two scholarships in entomology, one in plant pathology, one in weed science, and one in integrated pest management will be available for the Upper Volta component. The level requested is the diplome d'ingenieur d'agriculture or the license en science naturelles. The training will be for three years, with the last year spent in the field. The training will begin in 1983. Memoire and thesis topics will be related to the program of the national component, and fieldwork will be done in the Sahel.

(3) Country Work Program

Entomology

I. Millet

Rhaguva SV

1983-1986:
1. Biology-ecology
2. Population dynamics
3. Study of natural enemies

Dysdercus spp. Pyrrhocorid Bug

1983-1986:
1. Methodology for rearing
2. Biological cycle
3. Importance of attacks

II. Sorghum

Contarinia sorghicola

1983-1986:
1. Biology-ecology
2. Study of parasites
3. Rearing of parasites and hosts
4. Pesticides
5. Crop loss assessment
6. Varietal resistance
7. Study of oviposition behavior
8. Chemical control

Aphids (pucerons)

1983-1986:
1. Population dynamics
2. Distribution and economic importance
3. Study of aphid behavior during propagation under diverse laboratory conditions, for rearing the parasite
4. Research on host plants
5. Study of causes of natural mortality

III. Rice (associated program)

Rice midge (cecidomyie)

A. 1983-1984:
1. Biological and ecological studies
2. Chemical control
3. Varietal resistance

B. 1984-1985:
Same as A above

C. 1985-1986:
1. Biological/ecological studies
2. Chemical control
3. Varietal resistance
4. Cultural methods

Note: Associated program means that another agency is responsible for the particular program in which the IPM component cooperates.

IV. Cowpea

Callosobruchus- Bruchidius
Bruchidina atroslineatus

A. 1983-1986:
1. Distribution
2. Study of natural causes of mortality
3. Mass rearing of larval parasites in the laboratory
4. Field releases of parasites

Plant Pathology and Virology

In all of the crops, work is in progress to inventory and determine economic losses caused by the principal diseases of food crops (millet, sorghum, corn, rice, and cowpeas).

I. Millet

Sclerospora graminicola Mildew

A. 1983-1984:
Biological studies

B. 1984-1985:
Same as A above

C. 1985-1986:
1. Biological studies (epidemiology)
2. Chemical control
3. Research on varietal resistance
4. Crop loss assessment
5. Variability of races
6. Cultural control

II. Sorghum

Sphacelotheca sorghi
Spacelotheca- reiliana
Spacelotheca cruenta
Tolplyposporium ehrenberghii

A. 1983-1984:
Biological studies

B. 1984-1985:
Same as A above

248

C. 1985-1986:

1. Chemical control
2. Research of varietal resistance
3. Crop loss assessment
4. Epidemiology
5. Variability of races
6. Cultural controls

III. Corn (mais)

Streak- (virose du mais) (associated program)

1983-1984:
Epidemiology (consultant assistance)

IV. Rice

Pyricularia oryzae Blast

1983-1986:

1. Identification of races
2. Varietal resistance
3. Levels of resistance in varieties available extension
4. Chemical control

Xanthomonas oryzae Bacterial Blight

1983-1986:
Distribution

Weed Science

General and continuation of studies in progress on:

1. Identification of the principal weeds in food crops
2. Economic importance
3. Study of varietal resistance
4. Chemical control
5. Mechanical control
6. Crop rotation and cultural controls will be specifically studied for millet, sorghum, and cowpeas
7. Cover crops
8. Striga in millet and sorghum
9. Striga in cowpea

Annex C-2

Program Component Budgets/Schedules

INTEGRATED PEST MANAGEMENT PROJECT (IPM)
PROJECT NO. 625-0928

SUMMARY OF ESTIMATED LOCAL COMPONENT COSTS
NATIONAL COMPONENT BUDGETS
YEARS - FYs 1984 - 1986

Country Component	Fiscal Year 1984	1985	1986	TOTAL
Regional	579,103	469,209	723,554	$ 1,701,866
Cape Verde	269,900	158,800	155,400	584,100
The Gambia	262,861	231,636	229,806	724,303
Mali	534,892	368,508	369,880	1,273,280
Mauritania	626,890	376,360	318,080	1,321,330
Niger	525,400	406,700	369,840	1,301,940
Senegal	427,644	425,743	352,223	1,205,610
Upper Volta	567,184	388,213	406,681	1,362,078
GRAND TOTAL	$3,793,874	2,825,169	2,925,464	$ 9,544,507

NOTES:

(1) The budgets submitted by country components contained a line item allocating funds for the payment of incentives, indemnities or allowances to researchers and trainees (Line Item J, Contingencies). These costs are legitimate in the local environment and essential in encouraging participating countries to attract and nominate personnel to the project, thereby developing a cadre of trained research and support personnel for continuation of IPM activities beyond Phase I. The decision with respect to paying these personnel costs rests with each individual USAID; it is assumed that such decisions will be taken with consideration to the potentially important human resource development aspect of these incentives.

(2) The participating USAIDs, the CTFs and CILSS should seek financial contributions from host governments in support of the fixed or recurrent project costs appearing in the component budgets. Such contributions should be reflected in revised CILSS/FAO Country Operational Plans due to be completed in October-November 1983.

230

REGIONAL DIRECTORATE
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	Total
A.	Local Personnel				
	Director	28,087	29,492	30,967	88,546
	UGR Director	19,000	19,950	20,948	59,898
	Administrative Officer	25,200	26,460	27,783	79,443
	Accountant	6,946	7,294	7,659	21,899
	Bilingual Secretary	7,200	7,560	7,938	22,698
	Secretary	6,946	7,294	7,659	21,899
	3 Drivers	6,240	6,552	6,880	19,672
	Orderly	1,680	1,764	1,853	5,297
	Work Uniforms	450	473	497	1,420
	Overtime Costs	7,200	7,560	7,938	22,698
	Social Security	15,225	15,987	16,787	47,999
	Medical Costs	5,652	5,935	6,232	17,819
	Other - Local Consultants	20,000	--	--	20,000
	Total Personnel Costs	$149,826	136,321	143,141	429,288
B.	Travel Costs				
	Sahel - Technical Staff	43,600	47,960	62,490	154,050
	- Administrative Staff	19,534	20,987	21,664	62,185
	Seminars Outside Region	23,500	25,850	28,436	77,786
		$86,634	94,797	112,590	$294,021
C.	Contract Services				
	Project Evaluations	--	50,000	200,000	250,000
	Independent Audits	18,000	10,000	7,000	35,000
	Engineering Services	25,000	--	--	25,000
		43,000	60,000	207,000	310,000
D.	General Operating Expenses	59,203	59,762	60,328	179,293
E.	Supplies and Materials	30,440	10,529	10,615	51,584
F.	Equipment	--	--	--	--
G.	Construction	--	--	--	--
H.	Training - (Regional)				
	Working Groups	98,000	107,800	118,580	324,380
	Seminars	62,000	--	71,300	133,300
		160,000	107,800	189,880	457,680
I.	USAID Administrative Support	25,000	--	--	25,000
J.	Contingencies	25,000	--	--	25,000
	GRAND TOTAL	579,103	469,209	723,554	$1,771,866

251

CAPE VERDE
THREE YEARS - FY 1984 - 1986

		Fiscal Year 1984	1985	1986	TOTAL
A.	Local Personnel				
	Accountant	$ 5,000	5,500	6,000	16,500
	Laboratory Assistant	2,400	2,600	2,800	7,800
		7,400	8,100	8,800	24,300
B.	Travel Costs (In-Country)				
	Local & FAO Personnel	5,000	7,000	9,000	21,000
C.	Contract Services				
	Local Labor	4,000	4,500	5,000	13,500
	Transport Services	2,000	2,300	2,600	6,900
		6,000	6,800	7,600	20,400
D.	General Operating Expenses				
	Vehicle Operation & Maint. (2 all terrain 4 motos)	15,200	16,000	18,000	49,200
	Miscellaneous administrative	4,400	4,600	4,800	13,800
		19,600	20,600	22,800	63,000
E.	Supplies & Materials				
	Office Materials & Supplies	8,200	8,400	8,600	25,200
F.	Equipment & Materials				
	4 Motorcyles	5,000	-	-	5,000
	Laboratory & Field Equipment	7,000	6,500	6,000	19,500
	Office Furnishings	1,500	1,000	1,000	3,500
	Furniture: Lodgings/Laboratory	15,000	15,000	1,000	31,000
	Dormitory & Dining Hall	25,000	-	-	25,000
		53,500	22,500	8,000	84,000
G.	Construction				
	Sao Jorge-Lodging for Researchers	90,000	-	-	90,000
H.	Training				
	Short-term Courses, seminars	5,200	5,400	5,600	16,200
I.	USAID Administrative Support				
	Personal Services Contract	70,000	75,000	80,000	225,000
J.	Contingencies				
	Miscellaneous	5,000	5,000	5,000	15,000
	GRAND TOTAL	$269,900	158,800	155,400	$584,100

252

GAMBIA
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
A. Local Personnel				
5 Observers	$ 8,200	8,400	8,600	25,200
1 Secretary/Typist	1,300	1,300	1,400	4,000
1 Administrative Assistant	2,835	2,970	2,105	7,910
2 Drivers	3,992	4,182	4,576	12,750
1 Accountant	6,200	6,400	6,800	19,400
3 Research Assistants	17,500	17,700	17,900	53,100
2 Laboratory Technicians	3,800	4,000	4,200	12,000
5 Permanent Watchmen	4,600	4,700	4,800	14,100
15 Casual Laborers	4,500	4,500	4,500	13,500
(1 at Yundum, 2 at Sapu)	2,750	2,800	2,850	8,400
Subtotal	55,677	56,952	57,731	170,360
B. Travel Cost (In-Country)				
FAO & Local Personnel	26,284	26,284	20,175	72,743
C. Contract Services	3,000	3,000	3,000	9,000
D. General Operating Expenses				
- Operation of Vehicles and Motorcycles	17,600	18,600	20,600	56,800
- Maintenance, other Equipment and Furniture	5,000	5,100	5,200	15,300
- Buildings and Sites	10,000	10,000	10,000	30,000
- Housing (Rents) for Field Personnel	1,800	1,800	1,800	5,400
Subtotal	34,400	35,500	37,600	107,500
E. Supplies & Materials				
Reports, papers	3,000	4,000	5,000	12,000
Films, Slides	2,500	3,000	3,500	9,000
Subtotal	5,500	7,000	8,500	21,000
F. Equipment				
1 Generator	2,000	--	--	2,000
5 Motorcycles	--	6,000	--	6,000
	2,000	6,000	--	8,000
G. Construction				
2 Screenhouses	30,000	--	--	30,000
1 Greenhouse	15,000	--	--	15,000
	45,000	--	--	45,000

GAMBIA (cont'd)
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
H. Training				
Observers	1,200	1,400	1,600	4,200
Assistants	1,000	1,200	1,400	3,600
Accomodations and Transportation	2,000	2,500	3,000	7,500
Total Training	4,200	5,100	6,000	15,300
I. USAID Administrative Support				
Personal Services Contract	70,000	75,000	80,000	225,000
J. Contingencies[1]				
Research & Training Incentives/ Indemnities/Allowances	16,800	16,800	16,800	50,400
GRAND TOTAL	$262,861	231,636	229,806	$724,303

[1]See commentary in summary table C-2(a), page 1.

X
254

MALI
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	TOTAL
A.	Local Personnel				
	2 Secretaries	2,880	3,312	3,809	10,001
	3 Drivers	4,320	4,968	5,714	15,002
	1 Generator Mechanic	1,200	1,380	1,587	4,167
	2 Watchmen	2,400	2,760	3,174	8,334
	20 Field Laborers	24,000	27,600	31,730	83,330
	3 Laborers - Office & Lab.	3,600	4,140	4,760	12,500
	1 Handyman	1,200	1,280	1,586	4,066
	1 Accountant	6,000	6,900	6,934	19,834
	Sub Total	45,600	52,340	59,294	157,234
B.	Travel Cost (In-Country)				
	Researchers (6)	6,400	6,400	6,400	19,200
	Assistants (9)	9,720	9,720	9,720	29,160
	Lab Aids (9)	9,720	9,720	9,720	29,160
	Drivers (5)	5,400	5,400	5,400	16,200
	Experts FAO (2)	8,280	8,280	8,280	24,840
		39,520	39,520	39,520	118,560
C.	Contract Services				
	Reports, Publications, etc.	8,000	8,000	8,000	24,000
D.	General Operating Expenses				
	Vehicle & Equipment Maintenance	40,720	46,828	53,852	141,400
	Communications Expenses	4,000	4,600	5,290	13,890
	Miscellaneous	16,000	16,900	7,934	40,834
		60,720	68,328	67,076	196,124
E.	Supplies & Materials				
	Office Supplies	11,068	6,000	7,934	25,002
F.	Equipment				
	Office Equipment	20,000	13,442	-	33,442
	Field Equipment	10,000	-	-	10,000
	Lab Equipment	20,000	-	-	20,000
	6 Vehicles	90,000	-	-	90,000
	1 Generator	30,000	-	-	30,000
		170,000	13,442	-	183,442

255

MALI (cont')
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
G. Construction Costs				
Garage	5,000	-	-	5,000
Fence	15,000	-	-	15,000
Warehouse	6,000	-	-	6,000
	26,000			26,000
H. Training				
In-Service Training Courses	4,000	4,000	4,000	12,000
I. USAID Administrative Support				
Personal Services Contract	70,000	75,000	80,000	225,000
J. Contingencies[1]				
Research and Training Incentives/ indemnities/allowances	99,984	101,878	104,056	305,918
TOTAL	$534,892	368,508	369,880	$1,273,280

[1]See commentary in summary table C-2(a), page 1.

X
256

MAURITANIA
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
A. Local Personnel				
1 Laboratory Aid	3,600	3,600	3,600	10,800
7 Post Observers	25,200	25,200	25,200	75,600
2 Watchmen	5,760	5,760	5,760	17,280
2 Secretaries	5,760	5,760	5,760	17,280
1 Boatman (Piroquer)	2,880	2,880	2,880	8,640
2 Drivers	5,760	5,760	5,760	17,280
1 Accountant	7,920	8,640	9,360	25,920
Sub Total	56,880	57,600	58,320	172,800
Kaedi Station:				
1 Assistant	1,860	3,360	3,360	8,580
1 Secretary/Bookkeeper	945	1,890	1,890	4,725
1 Driver	945	1,890	1,890	4,725
2 Laborers	760	1,520	1,520	3,800
	4,510	8,660	8,660	21,830
Total Personnel	61,390	66,260	66,980	194,630
B. Travel Costs (In-Country)				
FAO & Local Personnel	55,000	55,000	55,000	165,000
C. Contract Services				
Local Labor	20,000	20,000	20,000	60,000
Freight & Transport	31,000	31,000	31,000	93,000
	51,000	51,000	51,000	153,000
D. General Operating Expenses				
Vehicle Operation & Maintenance	45,000	50,000	40,000	135,000
Utilities & Telecom	2,000	2,500	2,000	6,500
Miscellaneous	9,600	9,600	9,600	28,800
	56,600	62,100	51,600	170,300
E. Supplies & Materials				
Scientific Books, Journals, & Materials	2,500	2,000	1,500	6,000
Office Supplies & Materials	28,000	17,000	17,000	62,000
	30,500	19,000	18,500	68,000

257

MAURITANIA (Cont'd)
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	TOTAL
F.	Equipment & Materials				
	7 Vehicles, All terrain	64,000	48,000	-	112,000
	6 Motorcycles	8,400	-	-	8,400
	Laboratory Materials - Kaedi	50,000	-	-	50,000
	Office Furniture & Materials - Kaedi	15,000	-	-	15,000
		137,400	48,000	-	185,400
G.	Construction				
	6 Observation Posts	60,000	-	-	60,000
	Kaedi Lab and Greenhouse	85,000	-	-	85,000
	Restoration of Kiffa	15,000	-	-	15,000
		160,000	-	-	160,000
H.	Training				
	Group Training Courses/Seminars	12,000	12,000	12,000	36,000
I.	USAID Administrative Support	-	-	-	-
J.	Contingencies[1]				
	Research and Training Incentives/ indemnities/allowances	63,000	63,000	63,000	189,000
	GRAND TOTAL [2]	$626,890	376,360	318,080	$1,321,330

[1]See commentary in summary table C-2(a), page 1.

[2]Line Item totals include support costs for the operation of the Kaedi Laboratory.

X
258

NIGER
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	TOTAL
A.	Local Personnel				
	10 Observer Aides	12,000	12,000	12,000	36,000
	6 Assistants	14,000	14,000	18,000	46,000
	8 Drivers	14,000	14,000	16,000	44,000
	2 Secretaries	3,600	3,600	4,200	11,400
	1 Accountant	5,900	6,300	7,600	19,800
		49,500	49,900	57,800	157,200
B.	Travel Costs (In-Country)				
	FAO & Local Personnel	32,000	43,300	45,200	120,500
C.	Contract Services				
	Local Labor	15,000	16,000	20,000	51,000
D.	General Operating Expenses				
	Vehicle Operation & Maintenance	84,000	88,400	95,840	268,240
	Miscellaneous	5,700	6,900	7,200	19,800
		89,700	95,300	103,040	288,040
E.	Supplies & Materials				
	Office Supplies & Materials	9,000	9,000	9,000	27,000
F.	Equipment				
	Field Equipment	61,400	3,900	2,100	67,400
	Office Equipment & Supplies	14,000	2,000	-	16,000
	Laboratory Equipment	7,800	1,300	700	9,800
	9 Field Vehicles, all terrain	80,000	64,000	-	144,000
		163,200	71,200	2,800	237,200
G.	Construction				
	Garage-Tarna	25,000	-	-	25,000
	Greenhouse-Tarna	15,000	-	-	15,000
	1 Observation Post	10,000	-	-	10,000
		50,000			50,000
H.	Training				
	In-Service Training Courses	10,000	10,000	10,000	30,000
I.	USAID Administrative Support				
	Personal Services Contract	70,000	75,000	80,000	225,000

259

NIGER (Cont'd)
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
J. Contingencies[1]				
Research and Training Incentives/ indemnities/allowances	37,000	37,000	42,000	116,000
GRAND TOTAL	525,400	406,700	369,840	$1,301,940

[1]See commentary in summary table C-2(a), page 1.

SENEGAL
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	TOTAL
A.	Local Personnel				
	8 Technicians - ITA	15,960	17,555	19,312	52,827
	9 Technicians - ATA	12,152	13,367	14,704	40,223
	4 Secretaries	11,200	12,320	13,552	37,072
	1 Accountant	5,095	5,606	6,166	16,867
	6 Drivers	13,003	14,304	15,734	43,041
	4 Laborers	7,559	8,315	9,146	25,020
		64,969	71,467	78,614	215,050
B.	Travel Costs (In-Country)				
	FAO & Local Personnel	35,277	38,804	42,685	116,766
C.	Contract Services				
	Reports, Publications, etc.	8,000	8,000	8,000	24,000
	Local Labor	30,000	30,000	30,000	90,000
		38,000	38,000	38,000	114,000
D.	General Operating Expenses				
	Fuel & Oil	66,000	66,000	66,000	198,900
	Utilities	23,333	25,667	28,233	77,233
	Experimental Supplies	6,667	3,333	3,333	13,333
	Vehicle Insurance & Spare Parts	9,000	9,900	10,890	29,790
	Maintenance of Facilities	3,333	3,333	8,334	15,000
	Miscellaneous Maintenance Costs	3,333	3,333	3,334	10,000
		111,666	111,565	120,125	343,356
E.	Supplies & Materials				
	Office Supplies	3,333	3,333	3,334	10,000
F.	Equipment & Material				
	7 Vehicles, all terrain	36,000	48,000	-	84,000
	17 Mobylettes		18,000	-	18,000
	Laboratory Equipment	33,333	33,333	-	66,667
	Laboratory Maintenance Materials	6,666	6,667	6,667	20,000
	Office Equipment	10,000	3,333	3,334	16,667
		85,999	109,334	10,001	205,334
G.	Construction				
	4 Observation Posts (Kaffine, Gossas, Thysse, Sokone)	40,000	-	-	40,000

261

SENEGAL (Cont'd)
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
H. Training				
Training Programs - Less than 3 months	9,000	9,900	10,890	29,790
In-Service Training Program	10,000	11,000	13,000	34,000
	19,000	20,900	23,890	63,790
I. USAID Administrative Support	-	-	-	-
J. Contingencies[1]				
Research and Training Incentives/ indemnities/allowances	29,400	32,340	35,574	97,314
GRAND TOTAL	$427,644	425,743	352,223	$1,205,610

[1]See commentary in summary table C-2(a), page 1.

262

UPPER VOLTA
THREE YEARS - FY 1984 - 1986

	Line Items	Fiscal Year 1984	1985	1986	TOTAL
A.	Local Personnel				
	3 Secretaries	7,920	8,912	9,585	26,417
	11 Drivers	18,780	23,958	26,354	69,092
	1 Accountant	5,764	6,340	7,641	19,745
	11 Laborers	18,480	20,328	22,340	61,148
	Social Security Costs	9,977	10,978	12,072	33,027
		60,921	70,516	77,992	209,429
B.	Travel Costs (In-Country)				
	Local & FAO Personnel	52,997	52,997	52,997	158,991
C.	Contract Services				
	Reports, Publications, etc.	10,000	10,000	10,000	30,000
	Contract Labor	16,000	17,500	19,000	52,500
	Miscellaneous	5,000	6,000	7,000	18,000
		31,000	33,500	36,000	100,500
D.	General Operating Expenses				
	Communications-Tel. Telex, etc.	2,000	2,000	2,000	6,000
	Vehicle Maintenance & Operation	82,333	90,567	99,623	272,523
	Maintenance of Facilities	38,333	42,000	46,033	126,366
	Agricultural Inputs	2,000	2,000	2,000	6,000
	Compensations for Farm Use	3,000	3,000	3,000	9,000
	Miscellaneous	3,666	4,033	4,437	12,136
		131,332	143,600	157,093	432,025
E.	Supplies & Materials				
	Scientific Materials, Books Journals	3,000	3,000	3,000	9,000
	Office Furnishings	10,000	10,000	10,000	10,000
		13,000	13,000	13,000	39,000

X
263

UPPER VOLTA (Cont'd)
THREE YEARS - FY 1984 - 1986

Line Items	Fiscal Year 1984	1985	1986	TOTAL
F. Equipment				
13 Mobylettes	17,333	-	-	17,333
6 Vehicles	96,000	-	-	96,000
Laboratory Equipment	45,000	-	-	45,000
Office Equipment & Materials	6,000	11,000	6,000	23,000
Meteorology Instruments	2,000	2,000	2,000	6,000
	166,333	13,000	8,000	187,333
G. Construction				
Addition to Laboratory in Saria	50,000	-	-	50,000
	50,000			50,000
H. Training				
In-Service Training Courses	13,334	13,333	13,333	40,000
Seminars	6,667	6,667	6,666	20,000
	20,001	20,000	19,999	60,000
I. USAID Administrative Support	-	-	-	-
J. Contingencies[1]				
Research & Training Incentives/ indemnities/allowances:				
12 Researchers	7,600	7,600	7,600	22,800
34 Observers	34,000	34,000	34,000	102,000
	41,600	41,600	41,600	124,800
GRAND TOTAL	567,184	388,213	406,681	$1,362,078

[1]See commentary in summary table C-2(a), page 1.

264

INTEGRATED PEST MANAGEMENT PROJECT (IPM)
PROJECT NO. 625-0928
ESTIMATED TECHNICAL ASSISTANCE COSTS
FAO
PERIOD: FY 1984 - 1986

Country Components	FAO Experts	Fiscal Year 1984	1985	1986	TOTAL
Regional Directorate	4	514,602	561,384	734,500	1,810,486
Cape Verde	1	124,300	135,600	158,352	418,252
The Gambia	2	278,432	303,744	293,800	875,976
Mali	2	418,891	456,972	376,064	1,251,927
Mauritania	4	673,706	734,952	549,341	1,957,999
Niger	4	540,705	683,424	502,398	1,726,527
Senegal	4	500,308	545,790	560,131	1,606,229
Upper Volta	3	473,583	516,636	380,471	1,370,690
	24	3,524,527	3,938,502	3,555,057	$11,018,086

NOTES:

(1) The FAO Technical Assistance is funded through the AID Letter of Commitment procedure.

(2) FAO's 13% charge is computed on the basis of total FAO direct costs for each country component.

(3) The 10% contingency factor (inflation) shown in the country budgets should be reviewed by the USAID/UV Regional Project Office at the end of each Fiscal Year, and adjustments made in budget allocations when necessary.

X
265

Project No. 625-0928

FAO REGIONAL DIRECTORATE
THREE YEARS - FY - 1984 - 1986

Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A. International Personnel					
*1. Principal IPM Advisor	(36)	$ 87,000	87,000	87,000	$ 261,000
*2. Bioclimatologist	(36)	78,000	78,000	78,000	234,000
3. Socio-Economist	(36)	78,000	78,000	78,000	234,000
4. Weed Scientist	(12)	-	-	78,000	78,000
5. Consultants	(72)	168,000	168,000	168,000	504,000
		411,000	411,000	489,000	1,311,000
B. Contract Services					
Reports/Publications		2,000	2,000	10,000	14,000
C. Supplies & Materials					
Scientific Materials, Books Journals		1,000	1,000	1,000	3,000
D. Training		-	-	-	-
FAO Management Costs (13%)		53,820	53,820	65,000	172,640
Sub-Total		467,820	467,820	565,000	1,500,640
Contingency 10%		46,782	93,564	169,500	309,846
Total		514,602	561,384	734,500	$1,810,486

*On Board; Bioclimatologist posted at AGRHYMET, Niamey

266

FAO - CAPE VERDE
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

	Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A.	International Personnel					
	IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,000
B.	Contract Services					
	Reports, Publications etc.		2,000	2,000	10,000	14,000
	Research Contracts		10,000	10,000	10,000	30,000
			12,000	12,000	20,000	44,000
C.	Suppl & Materials					
	Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D.	Training		-0-	-0-	-0-	-0-
	FAO Management Costs (13%)		13,000	13,000	14,040	40,040
	Sub-Total		113,000	113,000	122,040	348,040
	Contingency 10% p.a.		11,300	22,600	36,312	70,212
	Total		124,300	135,600	158,352	$418,252

267

FAO - GAMBIA
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A. International Personnel					
*IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,000
Weed Scientist	(24)	78,000	78,000	-	156,000
		165,000	165,000	87,000	417,000
B. Contract Services					
Reports, Publications etc.		2,000	2,000	10,000	14,000
Research Contracts		10,000	10,000	10,000	30,000
		12,000	12,000	20,000	44,000
C. Supplies & Materials					
Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D. Training**					
2 Fellowships (4 yrs. ea.):					
Entomology (1)		23,000	23,000	46,000	92,000
Plant Pathology (1)		23,000	23,000	46,000	92,000
		46,000	46,000	92,000	184,000
FAO Management Costs 13%		29,120	29,120	26,000	84,240
Sub-Total		253,120	253,120	226,000	732,240
Contingency 10% p.a.		25,312	50,624	67,800	143,736
Total		$ 278,432	303,744	293,800	$875,976

*On Board

**Funding in FY 86 calculated for two years.

FAO - MALI
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A. International Personnel					
*IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,0
Plant Pathologist	(36)	78,000	78,000	78,000	234,0
		165,000	165,000	165,000	495,0
B. Contract Services					
Reports, Publications etc.		-	-	10,000	10,000
Research Contracts		10,000	10,000	10,000	30,000
		10,000	10,000	20,000	40,000
C. Supplies & Materials					
Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D. Training					
7 Scholarships (3 years each)					
Bacterio-Virology (1)		23,000	23,000	10,000	56,000
Plant Pathology (2)		46,000	46,000	20,000	112,000
Entomology (2)		46,000	46,000	20,000	112,000
Weed Science (1)		23 000	23,000	10,000	56,000
Systematic Entomology (1)		23,000	23,000	10,000	56,000
		161,000	161,000	70,000	392,000
FAO Management Costs 13%		43,810	43,810	33,280	120,900
Sub-Total		380,810	380,810	289,280	1,050,900
Contingency 10%		38,081	76,162	86,784	201,027
Total		$ 418,891	456,972	376,064	$1,251,927

*On Board

X
269

FAO - MAURITANIA
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A. International Personnel					
*IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,00
Entomologist	(33)	78,000	78,000	58,500	214,50
Plant Pathologist	(24)	78,000	78,000	-0-	156,00
Extension Specialist	(24)	78,000	78,000	-0-	156,00
		321,000	321,000	145,500	787,50
B. Contract Services					
Reports, Publications etc.		2,000	2,000	10,000	14,00
Research Contracts		14,000	14,000	14,000	42,00
		16,000	16,000	24,000	56,00
C. Supplies & Materials					
Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,00
D. Training					
8 Scholarships (3 years each)					
Plant Pathology (2)		46,000	46,000	46,000	138,000
Entomology (4)		92,000	92,000	92,000	276,000
Weed Science (1)		23,000	23,000	23,000	69,000
Bact.-Virology (1)		23,000	23,000	23,000	69,000
15 Short-term Courses (4-6 Mos.)		20,000	20,000	20,000	60,000
		204,000	204,000	204,000	612,000
FAO Management Costs 13%		70,460	70,460	48,685	189,605
Sub-Total		612,460	612,460	423,185	1,648,105
Contingency 10%		61,246	122,492	126,156	309,894
Total		$ 673,706	734,952	549,341	$1,957,999

*On Board

270

FAO - NIGER
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

	Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A.	International Personnel					
	IPM Specialist	(36)	87,000	87,000	87,000	261,000
	*Entomologist	(36)	87,000	87,000	87,000	261,000
	*Crop Loss Assessment	(36)	78,000	78,000	78,000	234,000
	Weed Scientist	(24)	78,000	78,000	-	156,000
			330,000	330,000	252,000	912,000
B.	Contract Services					
	Reports, Publications etc.		2,000	2,000	10,000	14,000
	Research Contracts		10,000	10,000	10,000	30,000
			12,000	12,000	20,000	44,000
C.	Supplies & Materials					
	Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D.	Training					
	7 Scholarships (2 years each)					
	Plant Pathology (2)		23,000	46,000	23,000	92,000
	Entomology (2)		23,000	46,000	23,000	92,000
	Taxonomy (1)		23,000	23,000	-	46,000
	Weed Science (2)		23,000	46,000	23,000	92,000
			92,000	161,000	69,000	322,000
	FAO Management Costs 13%		56,550	65,520	44,460	166,530
	Sub-Total		491,550	569,520	386,460	1,447,530
	Contingency 10%		49,155	113,904	115,938	278,997
	Total		$ 540,705	683,424	502,398	$1,726,527

*On Board

271

FAO - SENEGAL
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A. International Personnel					
IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,000
*Entomologist	(36)	78,000	78,000	78,000	234,000
*Bio-Control Expert	(36)	78,000	78,000	78,000	234,000
*Crop Loss Assessment	(36)	78,000	78,000	78,000	234,000
		321,000	321,000	321,000	963,000
B. Contract Services					
Reports, Publications, etc.		1,500	1,500	11,000	14,000
Research Contracts		10,000	10,000	10,000	30,000
		11,500	11,500	21,000	44,000
C. Supplies & Materials					
Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D. Training					
3 Scholarships (3 years each):					
Entomology (1)		23,000	23,000	10,000	56,000
Weed Science (1)		23,000	23,000	10,000	56,000
IPM (1)		23,000	23,000	10,000	56,000
		69,000	69,000	30,000	168,000
FAO Management Costs - 13%		52,325	52,325	51,870	156,520
Sub-Total		454,825	454,825	424,870	1,334,520
Contingency 10%		45,483	90,965	135,261	271,709
Total		$ 500,308	545,790	560,131	$1,606,229

On Board

FAO - UPPER VOLTA
Project No. 625-0928
THREE YEARS - FY 1984 - 1986

	Line Items	(PM)	Fiscal Year 1984	1985	1986	Total
A.	International Personnel					
	IPM Specialist	(36)	$ 87,000	87,000	87,000	$ 261,000
	*Plant Pathologist - Saria	(24)	78,000	78,000	-	156,000
	*Entomologist - Kamboinse	(36)	78,000	78,000	78,000	234,000
			243,000	243,000	165,000	651,000
B.	Contract Services					
	Reports, Publications etc.		2,000	2,000	10,000	14,000
	Research Contracts		20,000	20,000	20,000	60,000
			22,000	22,000	30,000	74,000
C.	Supplies & Materials					
	Scientific Materials, Books Journals, etc.		1,000	1,000	1,000	3,000
D.	Training					
	5 Scholarships (3 years ea.)					
	IPM (1)		23,000	23,000	23,000	69,000
	Entomology (2)		46,000	46,000	20,000	112,000
	Plant Pathology (1)		23,000	23,000	10,000	56,000
	Weed Science (1)		23,000	23,000	10,000	56,000
			115,000	115,000	63,000	293,000
	FAO Management Costs - 13%		49,530	49,530	33,670	132,730
	Sub-Total		430,530	430,530	292,670	1,153,730
	Contingency 10%		43,053	86,106	87,801	216,960
	Total		$ 473,583	516,636	380,471	$1,370,690

*On Board

273

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR FOR AFRICA

FROM : John H. Bierke, AFR/SWA (Acting)

SUBJECT: Integrated Pest Management Component of the Regional Food Crop Protection Project (625-0928)

RE : Africa Bureau Delegation of Authority No. 144

Problem: Section 121(d) of the Foreign Assistance Act of 1961, as amended, (the "FAA") precludes any new obligation of Sahel Development Program funds for disbursement by a foreign government until the Administrator has determined "that the foreign government will maintain a system of accounts with respect to those funds which provide adequate identification of and the control over the receipt and expenditure of those funds". On January 6, 1982, the Administrator delegated the authority to make this determination to you in Africa Bureau Delegation of Authority No. 144.

Discussion: In anticipation of this requirement, the Africa Bureau, at the beginning of FY 1982, initiated a process of "Certification Review" and "Certification" by Mission Directors and Office Heads. This review is designed to establish the adequacy of host country accounting systems. Certification criteria were prepared by the Office of Financial Management and established for the Missions the minimum standards for host country accounting systems which must be met prior to certification.

On July 1, 1983, you determined that, except for Niger, the systems of accounts with respect to the Integrated Pest Management (IPM) portion of subject project funds met the requirements of Section 121(d) of the FAA (Attachment A).

In accordance with this process, USAID/Upper Volta has now recertified (Ouagadougou 3896, dated 5 July 1983, attachment B) that the Niger accounting systems of IPM component of the Regional Food Crop Protection Project meet the criteria established by OFM.

Recommendation: That the AA/AFR make a determination that the IPM component of subject project for Niger has a system of accounts with respect to these funds which meets the requirements of Section 121(d) of the FAA and funds may now be released to that accounting station.

Attachment: a/s

Approved _____

Disapproved _____

Date _____

274.

Clearances:

AFR/SWA:JProcopis _____ date 7/12/83
AFR/SWA:JShampain _____ date _____
AFR/SWA:DMaxwell _____ date 7/12/83
AFR/PD/SWAP:GSlocum _____ date _____
GC/AFR:LDeSoto _____ date _____
DAA/AFR:JJohnson _____ date 7/15/83

AFR/SWA:FEgi:dh:7/12/83:687U

275

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR FOR AFRICA

FROM : Frederick E. Gilbert, AFR/SWA

SUBJECT: Integrated Pest Management Component of the Regional Food Crop Protection Project (625-0928)

RE : Africa Bureau Delegation of Authority No. 144

Problem: Section 121(d) of the Foreign Assistance Act of 1961, as amended, (the "FAA") precludes any new obligation of Sahel Development Program funds for disbursement by a foreign government until the Administrator has determined "that the foreign government will maintain a system of accounts with respect to those funds which provide adequate identification of and the control over the receipt and expenditure of those funds". On January 6, 1982, the Administrator delegated the authority to make this determination to you in Africa Bureau Delegation of Authority No. 144.

Discussion: In anticipation of this requirement, the Africa Bureau, at the beginning of FY 1982, initiated a process of "Certification Review" and "Certification" by Mission Directors and Office Heads. This review is designed to establish the adequacy of host country accounting systems. Certification criteria were prepared by the Office of Financial Management and established for the Missions the minimum standards for host country accounting systems which must be met prior to certification.

On 14 June 1982 you determined that the systems of accounts with respect to subject project funds met the requirements of Section 121(d) of the FAA (attachment A).

In accordance with this process, a new review was undertaken by USAID/Ouagadougou of the Comite Inter-Etats de Lutte Contre la Secheresse dans le Sahel (C.I.L.S.S.)'s accounting system for use in accounting for A.I.D. funds under the Integrated Pest Management (IPM) Component of the Regional Food Crop Protection Project (625-0928) for each of the Sahelian countries participating in this activity. The review related to the accounting and administrative procedures which the C.I.L.S.S. proposed to follow upon receipt of A.I.D. local currency releases and included sampling tests of compliance with such procedures for each of these components. The USAID/Ouagadougou Mission Director affirms his belief that the internal accounting controls to be utilized provide reasonable, but not absolute, assurance as to the safeguarding of A.I.D. financed assets from misuse, waste and non-compliance with previously agreed project purposes.

Conditions vis-a-vis USAID/Niamey and the Government of Niger have precluded completion of the certification review and re-certification of that country's accounting system for this project at this time. No funds will be released to that country under this process. However, as soon as Niger's systems meet the

X
276

criteria established by the OFM, an additional certification will be made, and determination requested with respect to FAA 121(d).

Accordingly, USAID/Upper Volta has certified (Ouagadougou 3794, dated 29 June 1983, attachment B) that:

(A) The subject project's accounting systems, handling any USAID Sahel Development Program funds, which meet the criteria established by OFM, as detailed in the attached cable, are as follows:

Country	Project Component	Station/Location
Upper Volta	Integrated Pest Management	Ouagadougou
Senegal	" " "	Dakar
Mali	" " "	Bamako
Mauritania	" " "	Nouakchott
The Gambia	" " "	Banjul
Cape Verde	" " "	Praia

(B) Those accounting systems not meeting the OFM-established criteria are as follows:

Country	Project Component	Station/Location
Niger	Integrated Pest Management	Niamey

Recommendation: That the AA/AFR make a determination that the Integrated Pest Management component of subject project has systems of accounts enumerated above as item A with respect to these funds which meet the requirements of Section 121(d) of the FAA and funds may be released to those accounting stations. No funds may be released to the project components/ accounting station locations enumerated above as item B.

Attachment: a/s

Approved _____

Disapproved _____

Date _____

277

Clearances:

AFR/SWA:WCSaulters		date
AFR/SWA:NMariani		date
AFR/SWA:LWerlin		date 6/
AFR/SWA:HWoods		date
AFR/SWA:MSMeares		date
AFR/SWA:FEgi		date
AFR/SWA:JShampain		date
AFR/SWA:JHBierke		date 6/30/83
AFR/PD/SWAP:DDawson		date
AFR/PD/SWAP:RMDepp	Rmd	date 6/30/83
AFR/PD/SWAP:DRobertson	Rmd for	date 6/30/83
AFR/PD/SWAP:ASisson	Rmd for	date 6/30/83 *
GC/AFR:LDeSoto		date
DAA/AFR:JJohnson		date

AFR/SWA:JHBierke:dh:6/30/83:667U

* (Clearance based upon statement of Policy and Judicial of Tiger Team beginning July 1 and future as applied to other activities until the Tiger Team is phased out)
(Clearance each country program is phased)

278

PROPOSED CONSTRUCTION SCHEDULE: 1984-86

	COUNTRY	FACILITY	WHERE	SURFACE (M2)	COST/m2	TOTAL COST
1/	Cape Verde	Researcher House	San Jorge	300	$300	90,000
1/	Gambia	Greenhouse	Sapu	75	$200	15,000
		Greenhouse	Sapu	75	$200	15,000
		Screenhouse	Yundum	53	$150	8,000
2/	Mali	Shed/Garage (open)	Sotuba	100	$ 50	5,000
		Fence	Sotuba	750 meter	$ 20	15,000
		Warehouse	Sotuba	28	$210	6,000
1/	Mauritania	6 Observ.Post		100	$100	60,000
		1 Greenhouse	Kaedi	80	$250	20,000
		Lab/Office remodeling	Kiffa	Existing Structure		15,000
		1 Lab/Office	Kaedi	212	$400	85,000
3/	Niger	Garage	Tarna (Maradi)	100	$250	25,000
		Greenhouse	Tarna (Maradi)	116	$300	35,000
		1 Observ.Post		75	$200	15,000
1/	Senegal	4 Observ.Post	Sokhou Jossas Koungheul Fatick	100	$125	60,000
4/	Upper Volta	Addition to lab	Saria	110	$450	50,000

1/ Cost/m^2 Estimated by Engineering Office, USAID/Dakar (Mosely)
2/ Cost/m^2 Estimated by Engineering Office, USAID/Mali (Hafterson)
3/ Cost/m^2 Estimated by Engineering Office, USAID/Niger (Collins)
4/ Cost/m^2 Estimated by Engineering Office, USAID/Upper Volta (Strom)

X
270

IPM (625-0928

OTHER CONSTRUCTION

COUNTRY	FACILITY	WHERE	COST ($U.S.)	APPROVED BY	STATUS
Cape Verde	Lab/Office	Fogo	65,000	USAID/U.V. (Strom)	A
	Lab/Office	Santo Antao	195,000		U
	Dormitory/ Dining Hall	Santiago	195,000		A
Gambia	Lab	Sapu	50,000	USAID/Dakar (Mosely)	A
	Research Housing	Sapu	55,000		A
	5 Ob Post	Silbanor Kerewan Kuntaur Jenoi Basse	50,000		A
	1 Screenhouse	Sapu	8,000		A
	3 Generator Sheds	Sapu Kerewan Kuntaur	35,000		A
Mali	Lab	Sotuba	50,000	USAID/Mali (Haftorson)	C
	1 Greenhouse	Sotuba	50,000		A
	1 Screenhouse	Sotuba	50,000		A
	1 H20 Tower	Sotuba	10,000		A
	1 Generator Shed	Sotuba	10,000		A
Mauritania	Lab/Office	Nouakchott	50,000	USAID/U.V. (Strom)	A
	6 Observ. Posts	Rosso, Vorghe, Kaedi, Selibaby, Kiffa, Nema	60,000		A
Niger	Lab/Office	Maradi	55,000	USAID/Niger (Collins)	C
Senegal	Lab	Djibilor	50,000		C
	Lab	Nioro du Rip	80,000		C
	1 Storehouse	Nioro du Rip	16,000		A
	1 Screenhouse	Nioro du Rip	35,000		A
	1 Greenhouse	Nioro du Rip	35,000		A

Status:

C = construction completed
U = construction underway
A = construction approved by AID engineers

280

COUNTRY	FACILITY	WHERE	COST ($U.S.)	APPROVED BY	STATUS
Upper Volta	Lab/Office	Farako-Ba	61,000	USAID/U.V.	U
	Lab/Office	Saria	28,600	(Strom)	U
	9 Observ. Posts	Fada	110,000		A
		Koupela			A
		Kaya			A
		Dori			A
		Ouahigouya			A
		Dedougou			A
		Hounde			A
		Banfora			
		Diebougou			
	Lab/Office	Kamboinse	78,000		A
	3 Insectarium	Kamboinse, Saria Farako-ba	24,000		A
	2 Hot Houses	Saria Faroko-ba	20,000		A

Note: Local construction to be paid through FARs account is attributed to Other Costs in the project budget, as it is considered a local operating expense. This includes:

Observation Posts	$ 355,000
Generator Sheds	80,000
Cape Verde	455,000
Warehouses/garage	46,000
Fence	15,000
Storehouse	16,000
Lab Addition (Saria)	50,000
Total FARs Construction	$1,017,000

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

SUBJECT: Integrated Pest Management Project (625-0928)
Vehicle Procurement Waivers

Problem: During the four year extension phase of the subject project, procurement of vehicles of non- U.S. sources and origin is required.

FACTS:

A.	Cooperating Entity:	CILSS
B.	Cooperating Countries:	The Gambia, Mali, Mauritania, Niger, Senegal, Upper Volta
C.	Authorized Document:	Project Paper for Grant 625-0928
D.	Project:	Integrated Pest Management
E.	Nature of Funding:	Grant
F.	Description of Goods:	6 Liaison-type passenger automobiles 32 Pick-up/4-wheel drive vehicles
G.	Approximate Value:	$545,000
H.	Probable Sources:	Dakar, Niamey, Ouagadougou, Nouakchott, Bamako, Banjul
I.	Probable Origin:	Western Europe or Japan

Discussion: The $25.3 million Integrated Pest Management (IPM) project was authorized in December 1977, and the Grant Agreement between AID and the Sahelian Committee for the Campaign Against the Drought (CILSS) was signed in February, 1978. The purpose of this project is to conduct research leading to identification of the most effective methods for integrated pest management and control for food crops in the Sahel. The CILSS represents seven participating Sahelian nations. Project implementation was delayed approximately two years by difficulties in negotiations between AID and the FAO on technical execution of the project on behalf of the CILSS Executive Secretariat in Ouagadougou. These problems were resolved on 1979 after which a major project evaluation was undertaken in 1981. Some administrative consolidation allowed the continuation of the project, however, a major redesign, (in 1983) conducted in 1982-83 to improve the administrative and technical structures of the project, calls for a three-year extension of completion of Project Phase 1. At this time, many of the FAO technical advisors have arrived in the participating Sahelian countries, and are working with local counterparts to carry out research aimed at providing baseline data on the primary pests of food crops in the Sahel. A major facet of this

X
282

research is field observation, which requires placement of extension agents and/or other field observers in small villages throughout the participating countries to collect samples of insect pests and plant disease. 4X4 vehicles are required as basic transport to move FAO technicians and counterparts and samples from field to laboratory and to supervise collection and research. Passenger vehicles to be used by the IPM Project Director are for intown liaison purposes.

The number of vehicles requested in this waiver should cover life-of-project requirements, including necessary replacements. Specific country requirements are:

Gambia	1 passenger-type 1 4 X 4-type	X	$12,000/each $17,000/each	=	$ 29,000
Mali	1 passenger-type 5 4 X 4-type	X	$10,000/each $16,000/each	=	$ 90,000
Mauritania	6 4 X 4-type	X	$15,000/each	=	$ 90,000
Niger	9 4 X 4-type	X	$16,000/each	=	$144,000
Senegal	7 4 X 4-type	X	$12,000/each	=	$ 84,000
Upper Volta	2 passenger-type 4 4 X 4-type	X X	$12,000/each $15,000/each	=	$ 84,000
Regional Director	2 passenger-type	X	$12,000/each	=	$ 24,000
TOTAL:	6 passenger-type 32 4 X 4-type			=	$545,000

(No waiver needed for Cape Verde vehicles)

Section 636(i) of the Foreign Service Assistance Act of 1961, as amended, requires that all motor vehicles, to be eligible for AID-financed procurement, must be manufactured in the United States, unless special circumstances permit a waiver. Under Hnadbook 1B, Section 4C2d(1)(a), special circumstances exist if there is an inability of a U.S. manufacturer to provide a particular type of need vehicle. The authority to find such circumstances and grant a waiver has been delegated to you by AID Delegation of Authority No. 40.

In accordance with AID Handbook 1B, procurement of commodities from non-U.S. sources and origins under a grant-financed project requires a waiver. Under Handbook 1B, Section 5B4b(2), a waiver may be granted if "the commodity is not available from countries included in the authorized Geographic Code." At present U.S.-manufactured vehicles are available in only three of the seven participating countries; e.g.,

183

Senegal-Chevrolet, Mali-Jeep, Upper Volta-Jeep. The major problem, however, is the lack of spare parts and service for each vehicle even in those countries. Hence, no reliable spare parts supply, repairs, and maintenance exists. This lack of a viable dealer for essential services and parts support would greatly shorten the useful vehicle life, given the use to which they will be applied; this would not be a cost-effective use of project funds. Given that dealerships with spare parts and maintenance service for U.S. vehicles are not available, the rationale for this source-origin waiver is non-availability of parts and services from the project authorized source for those countries where U.S.-manufactured vehicles are available. For those countries where U.S.-manufactured vehicles are not available, the rationale is non-availability of commodity.

Conclusion: The waiver authorizing procurement of passenger and 4 X 4-type vehicles from Code 935 countries is justified, because such vehicles are not manufactured in countries included in the authorized Geographic Code; nor are they readily available, along with parts and services, from Code 941 countries. They are, however, available from countries included in Code 935.

Recommendations: For the above reasons, it is recommended that you:

1) Approve a vehicle source/origin waiver from Geographic Code 000 to Code 935 for the procurement of vehicles.

2) Conclude that special circumstances exist which merit a waiver of the provisions of Section 636(i) of the Foreign Service Assistance Act of 1961, as amended; and

3) Certify that exclusions of procurement from Free World Countries other than cooperating countries and countries included in Code 941 would seriously impede the attainment of U.S. foreign policy objectives and the objectives of the Foreign Assistance Program.

Clearance:

GC/AFR: L Desoto DRAFT

SER/COM: Peter Hagan DRAFT

G. Fuller Phone

Approved [signature]

Disapproved

Date Aug 11, 1983

284

611(e) CERTIFICATION OF CAPACITY TO MAINTAIN AND UTILIZE

I - Project Data:

A. Region	SAHEL
B. Project	Integrated Pest Management (625-0928)
C. Funding	$ 28.6 million
D. Life of Project	9 Years

II - Project Description:

This project is designed to help establish Sahelian institutional capacity to carry out integrated pest management research for the protection of food crops within the CILSS Member States* and to produce technical packages of IPM control methods suitable for extension to small farmers. Integrated pest management, which involves the maximization of non-chemical control methods such as adjusted planting schedules, post harvest stalk destruction, crop rotation, animal traction for weeding, plant breeding and seed soaking, has been tested elsewhere in the world and proven effective; and it is the best alternative to increased use of chemical pest control, which may be too costly, ineffective and environmentally damaging.

Although this is a discrete, self-contained project, with AID funding totaling $ 28.6 million from 1978-1986 subject to the availability of funds, it fits into a comprehensive CILSS program for protection of crops in the Sahel. Called Annex B of that program, this project will use AID funding to help accomplish the first phase of creation of a Sahelian IPM research system. Other elements of the global CILSS program which are being financed primarily by other donors include strengthening national plant protection services, delivery systems, rodent control, control of grain-eating birds and information/training capabilities related to the plant protection program. The Project is aimed at development through research of technically, economically and environmentally sound production practices which will enable the small farmers of the Sahel to reduce food crop losses caused by insect, weed and plant disease pests.

A Regional Project Directorate located in Ouagadougou will be headed by a Sahelian and will be responsible for overall project technical and administrative management. Research coordination is the responsibility of the Regional Project Directorate through the use of regional cooperative research programs, and regular meetings of Technical Working Groups which are charged with producing manuals on pest management methods for priority pests in the Sahel.

AID funding will be provided for FAO technical advisors; equipment (principally laboratory, field, and vehicles); construction, e.g. small laboratories and observation posts; training, local personnel; and some country operational costs

---

* Mauritania, Cape Verde, Senegal, Mali, Upper Volta, Niger, Chad, The Gambia

285

such as vehicle maintenance, fuel and per-diems. These inputs will be coordinated by the Regional Project Directorate and by Country Task Forces (chaired by the national IPM Project Director and consisting of the senior FAO technical advisor and USAID IPM Liaison Officer) in each country under the overall surveillance and policy guidance of a high-level CILSS-AID-FAO Tripartite Consultative Committee.

By the end-of-project, effective pest management techniques should be locally available in the Sahel to control crop losses, and trained Sahelian counterparts should be in place able to continue the research and refinement of results. FAO was confirmed by CILSS as coordinator of technical advisory services because of the experience that FAO brings to the project as a result of its role in establishing the global FAO-UNEP Program on Integrated Pest Control, which has been effective in coordinating IPM research on several crops in various locations around the world.

With respect to project implementation, the Regional Project Director is appointed by and responsible to, the CILSS Executive Secretary, and will take charge of the project with technical assistance from FAO and administrative support from USAID/Upper Volta. AID will assign a Project Manager to Ouagadougou who will be responsible for project implementation and liaison with CILSS and FAO. Day-to-day procurement, construction supervision and financial management implementation responsibility will be decentralized to the AID Missions in the participating countries which will also monitor the project at the national level and maintain close liaison with the national components through a Country Task Force arrangement.

In order to achieve these outputs, inputs in terms of technical assistance, commodities, training, construction and other elements will be required to be provided on a timely basis from AID and the host governments involved.

III - Certification:

As Acting Principal Officer of the Agency for International Development in Upper Volta, I affirm that, in my judgement, CILSS and its participating Member Countries have both the financial capability and the human resources to effectively maintain and utilize the goods and services being provided by the extended Integrated Pest Management Project (625-0928).

J.C. Stanford
Acting Director
USAID/Upper Volta

Signature: [signature]

Date: 7/27/83

286

GENERAL PROCUREMENT SCHEDULE

1. Responsibilities

The CILSS Executive Secretariat will be the implementing agency for this project. Under the new decentralized management structure, each country task force (CTF) has prepared a detailed list of commodities and equipment (See Section 2 below, i.e., commodity lists by country) to be purchased locally in the Sahel or in the U.S. The lists provide total cost of items and has been reviewed and approved by the IPM Regional Project Task Force. The project will have three major commodity elements; i.e., vehicles, laboratory equipment, and equipment for field offices and observation posts.

(a) Stateside Procurement

The remaining U.S. procurement (mostly vehicles and laboratory equipment) will continue to be procured through a Procurement Services Agent (PSA); i.e., the Afro-American Purchasing Center (AAPC), New York, under an existing contract with CILSS. Each National IPM Project Director will prepare and submit to their respective participating USAID's all standard AID procurement documentation such as PIO/C's. (Each USAID will use a Memorandum of Understanding to advise the CTF of AID regulations concerning procurements which should include specific guidance contained in the AID-CILSS Project Grant Agreement and/or PIL's issued by USAID/Upper Volta. Additionally, the designated USAID IPM Project Liaison Officer and the Administrative Officer of the IPM Regional Directorate will be available to provide assistance in the preparation of PIO/C's or interpretation of AID procurement regulations.

(b) Local Procurement

Local procurement will be in accordance with the shelf-item rule; if the amounts exceed the authorized figures, by solicitation of offers to obtain the best possible price (see Section 5 below - Shelf-Item Procurement).

2. Commodity Lists

(a) Cape Verde

Quantity	Item	Unit Price ($U.S.)	Total Price ($U.S.
	Motorcycles	1,250	5,000
	Laboratory and Field Equipment	2/	1[illegible],500

287

Office Furnishings

4	desks	250		1,000
10	chairs	50		500
5	File Cabinets	250		1,250
5	Supply Cabinets	150		750
			Subtotal	3,500

Furniture

(1) Lodgings/Laboratory

Laboratory (2 sites)

2	desks	250	500
10	chairs	100	1,000
2	manual typewriters	700	1,400
4	file cabinets	250	1,000
4	supply cabinets	150	600
4	shelving-steel	100	400
4	fans, ceiling	250	1,000
	Misc.	5,000	5,000

Lodging (2 sites)

4	chairs w/armrest	1000	400
2	sofas	800	1,600
4	floor lamps	100	400
4	coffee tables	100	400
2	tables (dining)	250	500
12	chairs	50	600
4	fans-ceiling	250	1,000
2	refrigerators	700	1,400
2	gas ranges	600	1,200
4	beds w/frames	500	2,000
	Misc.	10,600	10,600
		Subtotal	31,000

(2) Dormitory/Dinings Hall

(Library)

9	shelving- steel, Adj.	93	848
4	folding tables, fedestal type	93	372
32	chairs	16	512
4	fans, ceiling	220	880
2	card catalog	150	300

1	typewriter-Manual	150		150
1	rack, magazine, 8 shelves	200		200
1	book rack, portable w/carters	140		140
1	circulation desk	700		700
1	chair, swivel, adj.	75		75
1	desk (see classroom)	230		230
1	chair " "	105		105
			Subtotal	4,512

(Lounge)

4	fans, ceiling	220		880
15	chairs w/armrest	35		525
2	sofas - business lounge type	800		1,600
4	floor lamps	100		400
4	coffee tables	100		400
			Subtotal	3,805

(Dining Hall)

12	Tables, Pedestal type, folding	93		1,116
100	chairs	16		1,600
6	fans, ceiling	200		1,220
	Mis. furnishings	747		747
			Sub-Total	5,036

(Kitchen Hall

2	freezer chest type litres (18 cuft) 220v	500		1,000
1	air conditioner, 23000 BTU 220V	1,000		1,000
2	gas range with extra wide oven, 2 oven rocks 4 burners, self cleaning oven	600		1,200
	pots pans knives utensils plates cups	1 lot 800		800

289

	bowls silverware	1 lot	1,000	1,000
			Subtotal	5,000
(Dormitory)				
20	Bunk beds hardwood/metal construction with matresses lader		200	4,000
20	wardrobes with shelves		150	3,000
			Subtotal	7,000
			Total	$84,000

b. The Gambia

1	generator		2,000	2,000
5	motorcycles		1,200	6,000
			Total	$8,000

c. Mali

	Lab/field equipment		2/	30,000
6	vehicles (4x4) 1/		1,500	90,000
Office Equipment Supplies				
3	manual typewriter		700	2,100
10	file cabinets		200	2,000
4	supply cabinets		200	800
1	conference table		1,000	1,000
10	desk		250	2,500
10	chairs		100	1,000
20	chairs		200	2,000
3	typing desks		250	250
10	desk lamps		100	1,000
1	xerox photocopy		5,000	5,000
	Misc.		14,792	14,792
	supplies		2,000	2,000
			Subtotal	33,442
15	air conditioning equip.		1,300	19,500
	misc.		500	500
			Subtotal	20,000

290

1	generator	30,000		30,000
			Total	$183,442

d. Mauritania

6	vehicles (4x4) 1/	16,000		96,000
4	motorcycles	1,400		5,600
			Total	$101.600

e. Niger

9	Vehicles (4x4) 1/	16,000		144,000
-	Laboratory and field equipment 2/	77,200		77,200

Office Equipment and Supplies

2	manual typewriters	750		1,500
2	file cabinets	300		600
4	supply cabinets	150		600
2	desk	250		500
2	chairs, desk	100		200
5	chairs, writing	150		750
4	fans; ceiling	200		800
6	rolling 2 tier tables	175		1,050
	supplies	10,000		10,000
			Subtotal	16,000
			Total	$237,200

F. Senegal

7	vehicles (4x4) 1/	12,000		84,000
17	motorcycles	1,060		18,000
	laboratory equipment 2/	66,667		66,667
	laboratory maintenance	20,000		20,000

Office Equipment and Supplies

3	manual typewriters	750		2,250
2	supply cabinets	200		400
3	file cabinets	300		900

5	chairs waiting	250		1,250
5	chairs, desk	100		500
3	fans, ceiling	200		600
4	desk lamps	100		400
	supplies	10,300		10,300
			Subtotal	16,600
			Total	$205,267

G. Upper Volta

13	motorcycles	1,333		17,333
6	vehicles 1/	16,000		96,000
-	laboratory equipment 2/	45,000		45,000

Office Equipment and Material

11	desks	250		2,750
10	chairs, desk	100		1,000
20	chairs, waiting	150		3,000
10	filing cabinets	300		3,000
10	supply cabinets	150		1,500
5	manual typewriters	750		3,750
2	xerox photocopy	4,000		8,000
			Subtotal	23,000
				6,000
			Total	$187,333

H. Regional Director

2	vehicles 1/	14,000		28,000
			Total	$28,000

3. Commodity Eligibility

All commodities listed are eligible for AID financing, and will be procured from Code 941 countries, except for items for local procurement

4. Source/Origin

Except as indicated in the equipment list, all commodities are from AID Geographic Code 941 Source/Origin.

5. Shelf-Item Procurement - Local Cost Financing

Procurement under the shelf-item rule will be in accordance with rules outlined below. Local procurement of commodities can provide the following items:

---Indigenous commodities - those mined, grown or produced in the cooperating country. Non-free worl componentry is disallowed.

---Shelf items - those items imported and stocked to meet a general public demand in the cooperating country or any other Code 941 Country. They are not goods imported solely to support an AID-financed project.

Both indigenous goods and shelf items must meet eligibility criteria - they are subject to the statutory and policy restrictions found in Handbook 1, Supplement B, Chapter 4.

Financing Support

---indigenous good can be financed by AID project fundswithout limitations, other than the total local currency limit of the Project.

---Imported shelf items from Code 000 (U.S.) sources can be financed in unlimited quantities. Commodities from Code 941 sources (U.S. and Less Developed Countries) can also be financed in unlimited quantities; the eligible source(s) must be identified in the Project Agreement. Shelf items coming from Code 899 (Free World) sources, but not from Code 941 (Selected Free World) sources, i.e., Code 935 sources, can be procured if the price per unit does not exceed 5,000; the total amount of these Project purchases cannot exceed $25,000 or 10% of the total Project local cost financing, whichever is higher, but in no case will they exceed $250,000 without a source/origin procurement waiver. Prices to be paid for locally procured commodities will be no more than the lowest available competitive prices, and purchases will be in accordance with good commercial practices. Commodities on the local market that are imported from non-Free World countries are not eligible for AID financing. Vehicles are not eligible items under the "shelf item rule" but cement, sand, gravel, POL, and construction materials are obtainable with local cost financing. Some locally-procured items may be ineligible as a result of being shipped aboard non-Free World vessels, high

293

visibility commodities (tractors, farm equipment, fertilizers, etc.) may fall under this heading. Invoices for payment should state the source and origin of locally purchased materials, if such a requirement is practical.

6. Title of Commodities

Title to commodities procured through AID financing normally rests in the cooperating country.

7. Waivers

The procurement of vehicles requires a source/origin waiver (see PP Amendment: Annex C-2E). A separate source/origin and proprietary waiver has been requested for $350,000 worth of meteorological equipment. AA/AFR approval is pending.

General Footnotes

1/ Waiver requested

2/ The definitive list of remaining commodities is to be determined in FY 1984. As a member of the Country Task Force, the principal FAO technical export (or the senior FAO technical advisor in Ouagadougou) will review all proposed procurements to assure that appropriate equipment is required.