PD-ABN-515

A.I.D. EVALUATION SUMMARY - PART I

1. BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS.
2. USE LETTER QUALITY TYPE, NOT "DOT MATRIX" TYPE.

IDENTIFICATION DATA

A. Reporting A.I.D. Unit:

Mission or AID/W Office USAID/SENEGAL
(ES# _____)

B. Was Evaluation Scheduled In Current FY Annual Evaluation Plan?

Yes ☐ Slipped ☐ Ad Hoc ☐

Evaluation Plan Submission Date: FY ____ Q ____

C. Evaluation Timing

Interim ☒ Final ☐ Ex Post ☐ Other ☐

D. Activity or Activities Evaluated (List the following information for project(s) or program(s) evaluated; if not applicable, list title and date of the evaluation report.)

Project No.	Project /Program Title	First PROAG or Equivalent (FY)	Most Recent PACD (Mo/Yr)	Planned LOP Cost (000)	Amount Obligated to Date (000)
685-0295	Southern Zone Water Management (SZWM)	FY 88	6/97	18,000	15,700

ACTIONS

E. Action Decisions Approved By Mission or AID/W Office Director

Action(s) Required	Name of Officer Responsible for Action	Date Action to be Completed
- Redesign the project;	USAID/GOS	July 1995
- Extend the project PACD for one year	USAID/GOS	Sept. 1995
- Extend LBII contract for six months	USAID	June 1995
- Reduce the number of valleys to develop to 25 and reclaim/improve 10,000 ha of land	USAID/GOS	July 1995
- Build small retention dikes (30cm at crest, 60 to 70 cm high) rather than big antisalt and retention dikes (3 meter at crest)	LBII/PMU	June 1997
- Hire a Rural Sociologist to assist in Village and Water Management Committee organizations and to manage the data collection and dissemination	LBII	Oct. 1994

(Attach extra sheet if necessary)

APPROVALS

F. Date Of Mission Or AID/W Office Review Of Evaluation: (Month) (Day) (Year)

G. Approvals of Evaluation Summary And Action Decisions:

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Name (Typed)	Abdoulaye BARRO	N.A.	Sounka NDiaye	Anne M. Williams
Signature	Abdoulaye Barro		[signature]	[signature]
Date	11/18/96		12/10/96	

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ABSTRACT

H. Evaluation Abstract (Do not exceed the space provided)

The project aims at improving farmer utilisation of water and recovery of fertile valley lands for agricultural purposes in the Senegal southern regions of Ziguinchor and Kolda. The major GOS agencies implementing the project are the "Direction du Génie Rural et de l'Hydraulique" (DGRH) and the "Direction de l'Agriculture" (DA). Louis Berger International, Inc. (LBII) was the primary US technical assistance contractor with Louisiana State University (LSU) and Tech International as subcontractors.

This mid-term evaluation (11/1/93-2/15/94) was conducted by the International Resources Group, Ltd (IRG) on the basis of meetings in Washington DC, reviews of project documents, site visits, farmer interviews, and discussions with Southern Zone Water Management project (SZWM) and USAID staff.

The purpose of the evaluation was to provide guidance to USAID and GOS for making decisions concerning more effective implementation of SZWM activities through the PACD, and provide guidance for the design of future improvement activities beyond the PACD.

The major findings and conclusions are:

- the project, after a lag phase, is starting to achieve satisfactorily many of its purposes and objectives, although not necessarily the project paper's ambitious level of goal and outputs as planned;
- without a substantial agricultural component and credit facilities, the project will never be economically viable;
- careful selection of valleys based on topography can reduce the construction cost per hectare;
- villagers should be aware of their responsibilities within their village organizations in order to make them sustainable;

The evaluation team noted the following "lessons"

1. The goal was blatantly overestimated because of an unjustified assumption that water control management alone will promote farmers' interest, who will then automatically use agricultural inputs to increase rice production.
2. It is extremely difficult for this project to depend solely on agricultural returns to be justified, in economic terms, without a substantial agricultural component.
3. Careful study should be made in costing infrastructures and in assessing the availability of necessary construction capabilities.
4. Because the IRR of a project depends essentially on costs and benefits, a great deal of attention should be given to these two factors in project preparation documents.
5. In the attempt to reduce project costs, expectations were set too high in populations' contribution and ability to render exhausting construction services.
6. Unforeseen problems emerged especially in the early implementation phase of the project.

COSTS

I. Evaluation Costs

1. Evaluation Team

Name	Affiliation	Contract Number OR TDY Person Days	Contract Cost OR TDY Cost (U.S. $)	Source of Funds
J. Cyril Mongelard	IRG	50	28,170	DFA (project)
Millie Gadbois	IRG	44	18,876	DFA (project)
Philippe De Casse		3	779	"
Omar Diakité	IRG (local consultant)	10	750	DFA (project)

2. Mission/Office Professional Staff Person-Days (Estimate) _____

3. Borrower/Grantee Professional Staff Person-Days (Estimate) _____

A.I.D. EVALUATION SUMMARY - PART II

SUMMARY

J. Summary of Evaluation Findings, Conclusions and Recommendations (Try not to exceed the three (3) pages provided)
Address the following items:

- Purpose of evaluation and methodology used
- Purpose of activity(ies) evaluated
- Findings and conclusions (relate to questions)
- Principal recommendations
- Lessons learned

Mission or Office:	Date This Summary Prepared:	Title And Date Of Full Evaluation Report:

I. Background:

The southern zone of Senegal offers a high agricultural potential, with generally higher average yields and lower variations in yields than other regions in Senegal. The decline in average annual rainfall over the past 20 years has resulted in significant losses of productive farmland in the valleys due to salinization, and in decreased yields of major crops. The project responds to the urgent need to increase agricultural production by assisting farmers to reclaim productive valley lands and improve the utilization of water.

II. Purpose of the Evaluation

The purpose of the evaluation was to provide guidance to USAID and the GOS for making decisions concerning more effective implementation of SZWMP activities through the PACD, and provide guidance for the design of future improvement activities beyond the PACD. This resulted in scaling down the PP's overly ambitious goal, purpose and objectives to a more reasonable and attainable level.

III. Methodology of the Evaluation

The team spent one day in Washington D.C. for briefing, studying documents supplied by the TA team and USAID, and for the initial planning of the evaluation. Upon arrival in Dakar, the team was briefed by the USAID staff in charge of the SZWMP. The team gathered further documents and obtained information for planning site visits and interviews.

The team reviewed in detail the Project Paper, the PIO/T's, various reports and construction design documents prepared by LBII consultants and project staff reports prepared by the National Steering Committee, the Mission's strategic objectives, training documents, annual work plans, and applicable AID evaluation guidance.

Site visits by the whole team, in sub-groups or individually, were made to several valleys in the regions of Sedhiou, Bignona and Kolda. In addition, over 100 farmers were interviewed by the team's Agro-Economist and Sociologist, and the whole team discussed with field project staff and USAID personnel.

IV. Findings and conclusions:

1) Concerning the project Assumption:

The following assumptions proved invalid:

- Secure political situation,
- favorable conditions for cereal marketing;
- Financial incentives exist for increasing cereal production;
- extension services are available;
- easy access to and use of improved inputs;
- no labor constraints;
- availability of skilled civil servants;
- construction materials procured in a timely manner;
- local expertise build up rapidly.

2) Concerning the project Objectives:

The project will not be able to achieve its goal and purpose with water resources management alone by 1996. There is a need to add an agricultural

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component comprising extension and credit.
Other constraints to successfull implementation of the project are:
- an overly optimistic village labor participation in dike construction which did not materialize;
- In addition to start-up delays, political insecurity led to numerous disruptions and delays in project implementation;
- The low staffing and slow development of local private sector entreprises; their inability to build dikes and the underestimation of the number of topographers needed from the GOS;
- Construction cost reduction per-hectare is greatly influenced by the topography of the selected valleys; therefore by careful selection of valleys based on topography, the costs per hectare can be substantially reduced.
- The lack of baseline data precludes reliable assessment of the project constructive impact with regard to areas of land reclaimed and increase in rice production.
- Three-meter crest dikes were constructed in lieu of one meter crest dikes due to engineering requirements;
- Villagers did not seem to have a clear idea of the roles, responsibilities and functions of the Village and Inter-Village Water Management Commitees (VWMC and IVWMC). In addition, there is no trained rural sociologist to oversee village organizations and to supervise project sociology team and NGO personnel working in village organizations.

V. RECOMMENDATIONS

Alternative 1. Extend the PACD of this project and the LBII contract by one year. The reasons for this extension are that, without this extension, only 10,000 ha would have been reclaimed or improved in contrast to 16,000 ha with the extension. Also, without the extension, the monitoring of the environmental issues, the training courses, and the operational and applied research would be incomplete. However, under this scenario the internal rate of return remains a feeble 5.8%

Alternative 2. Add an agricultural component to this Project and provide additional funding of about $ 3 million for this component alone. Extend the PACD of this project by one year from June 1996 to June 1997, and extend also the LBII contract to end in June 1996 at an estimated additional cost of $ 3.97 million. Under this scenario, the IRR increases to an acceptable 10.9%, inasmuch as the social benefits were not included in the analysis because of lack of baseline data.

Alternative 3: add to this project an agricultural component with an additional funding of $3.00 million , and an endowment fund of $1.00 million for credit facilities to farmers, but entirely managed by private banks. Extend the PACD of this project by 1 year from June 1996 to June 1997, and extend also the LBII contract to end in June 1996 at an estimated additional cost of $3.97 million. Under this scenario, the IRR increases to 15.7%.

The Evaluation Team highly recommended Alternative 3.

VI. LESSONS LEARNED

The principal lessons learned from the evaluation were:

1. The goal was grossly overestimated because of an unjustified assumption that water control management alone will promote farmers' interest, who will then automatically use agricultural inputs to increase rice production. This did not happen and was not likely to happen without some supportive action.

2. Careful study should be made of costing infrastructures and of the necessary construction capabilities. In this project, small dikes were recommended and these could not easily be built. The building of larger dikes increased the estimated cost by over 200%.

3. Because the IRR of a project depends essentially on costs and benefits, a great deal of attention should be given to these two factors in project preparation documents.

4. In an attempt to reduce the project costs, expectations were set too high on the populations' contribution and their ability to render exhausting construction services.

5. Unforeseen problems usually emerge especially in the early implementation phase of a project. More attention should have been given to these areas in the PP document with due allowance for contingencies.

6. It is extremely difficult for a project with a major infrastructure building component to depend solely on agricultural returns to justify it in economic terms without a substantial agricultural component.

ATTACHMENTS

K. Attachments (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier; attach studies, surveys, etc., from "on-going" evaluation, if relevant to the evaluation report.)

Evaluation report, May 1994

COMMENTS

L. Comments By Mission, AID/W Office and Borrower/Grantee On Full Report

In the evaluation report, IRG raised several key issues and recommended changes to facilitate the achievement of project objectives.

The Evaluation Team was well balanced in its expertise and executed the scope of work in a professional manner. IRG encouraged the participation of a Government of Senegal observer, a USAID intern and a USAID Sociologist in a collaborative multidisciplinary undertaking. As a result, in analyzing the issues of concern to the Mission, the Team was able to integrate the divergent views on strategies and means for achieving the project goals.

The evaluation team concluded that, as currently structured, the Project would not be able to achieve its goals. In order to recover 15,000 hectares and achieve the other project targets, the Evaluation Team recommended that: (1) the Technical Assistance Contract and PACD be extended by one year; (2) additional TA in the form of a local Social Science/Monitoring Specialist and an NGO Coordinator be added to the TA team, (3) a credit component be added to the project, (4) additional agricultural activities be undertaken under the current project or in a follow-on project.

IRG had delays in fulfilling contract requirements due to late delivery of the French version and a last minute change in team composition (one team member lacked language capacity). This delay has hindered the Mission's ability to discuss redesign activities with the Government of Senegal in a timely manner.

USAID, the GOS, NGOs and populations have extensively reviewed the findings and recommendations of the mid-term evaluation. They concurred with the following recommendations: (1) the Louis Berger Technical Assistance Contract be amended in September 1994 to permit the hiring of the local Social Science /Monitoring and Evaluation Specialist and the NGO Services Coordinator; (2) the Louis Berger Technical Assistance Contract be extended for six months, from June 15, 1995 to December 14, 1995; (3) The PACD be extended by one year from July 1, 1996 to June 30, 1997. The major reasons for retaining these three recommendations were that the credit experience in Senegal has so far failed, and that USAID is not planning for a follow-on project. USAID was rather interested in being able to reliably assess the SZWM activities impact at the PACD and assuring sustainability by involving NGOs in providing technical support and training to farmers.

XD-ABN-515-A

MID-TERM EVALUATION REPORT

SOUTHERN ZONE WATER MANAGEMENT PROJECT (SZWMP) SENEGAL

Submitted to:

U.S. Agency for International Development/Dakar
Senegal

Under
USAID Contract No.:
PDC-5517-I-00-0104-00
Delivery Order No. 17

Submitted by:

International Resources Group, Ltd.
1400 I Street, N.W., Suite 700
Washington, D.C. 20005

May 1994

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MID-TERM EVALUATION REPORT

SOUTHERN ZONE WATER MANAGEMENT PROJECT (SZWMP)

SENEGAL

ACTIVITY TO BE EVALUATED

Project Title	*Southern Zone Water Management*
Project Number	*685-0295*
Authorization Date	*August 22, 1988*
Date Project Agreement Signed	*August 22, 1988*
Life of Project Funding	*$ 18,000,000*
Project Assistance Completion Date	*June 30, 1996*

Under USAID Contract No.:
PDC-5517-I-00-0104-00
Delivery Order No. 17

Mid-Term Evaluation Team

J. Cyril Mongelard	Civil Engineering Specialists
Millie Gadbois	Economist
Philip J. DeCosse	Economist

International Resources Group, Ltd.
1400 I Street, N.W., Suite 700
Washington, D.C. 20005

May 1994

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LIST OF ACRONYMS

ADECOR	Appui à l'Auto-Développement des Collectivités Rurales (NGO)
ADIF	Action pour le Développement Intégré et la Formation
AJAC	Association des Jeunes Agriculteurs de Casamance
ANRO	Agriculture and Natural Resources Office
CERP	Centre d'Expansion Rurale Polyvalent
CBNRM	Community-Based Natural Resources Management Project (USAID)
CNS	Comité National du Suivi
CR	Communauté Rurale
CVGES	Comité Villageois de Gestion de l'eau
DERBAC	Project de développement Rural en Basse Casamance
DGRH	Direction du Génie Rural et de l'Hydraulique
FONGS	Féderation des ONG du Sénégal - Action Paysanne
FORAGE	Fondation des Organisations Rurales pour l'Agriculture et la Gestion Écologique
GIE	Groupement d'Intérêt Économique
GOS	Government of Senegal
IRA	Inspection Regionale de l'Agriculture (Regional Inspectorate of Agriculture)
ISRA	Institute Sénégalais de Recherche Agricole (Senegalese Agricultural Research Institute)
IVWMC	Inter-Village Water Management Committee
LBII	Louis Berger International Inc.
LSU	Louisianna State University
MFR	Maisons Familiales Rurales (NGO)
MRD	Ministry of Rural Development
NGO	Non-Governmental Organization
NPC	National Project Committee
PACD	Project Assistance Completion Date
PIDAC	Projet Intégré de Développement Agricole en Basse Casamance
PMU	Project Management Unit
PNVA	Projet National de Vulgarisation Agricole
PP	Project Paper
PRIMOCA	Projet Intégré de la Moyenne Casamance (Italian Project)
PROGES	Projet de Gestion De l'Eau dans la Zone Sud
PRS	Projet Rizicole de Sedhiou
RDC	Regional Development Committee
RTC	Regional Technical Committee
SENECI	Sénégalaise d'étdue de conseils et d'Intervention
SOMIVAC	Société de Mise en Valeur
SOW	Scope of Work
SZWMP	Southern Zone Water Management Projet
TSNGO	Technical Support NGO
USAID	United States Agency for International Development
VSU	Village Support Unit
WUA	Water-User Association
VWMC	Village Water Management Committee

TABLE OF CONTENTS

EXECUTIVE SUMMARY i
INTRODUCTION i
OVERVIEW iii
MAJOR FINDINGS, CONSTRAINTS AND CONCLUSIONS iv
RECOMMENDATIONS ix
LESSONS LEARNED xii

1. INTRODUCTION 1
1.1 Background of the SZWM Project 1
1.2 Project Goal, Purpose and Objectives 1
1.3 Purpose of the Evaluation 2
1.4 Methodology of the Evaluation 3
1.5 Overview 3

2. PLANNED PROJECT OUTPUTS v/s CURRENT ACHIEVEMENTS 5
2.1 Water Management Plans and Designs 5
2.2 Anti-Salt and Water Retention Dike Installations 5
2.3 Institutional Building and Strengthening 5
2.4 Training of PVOs and PCVs 8
2.5 Environmental Studies 8

3. PROJECT DESIGN 9
3.1 Analysis of Project Assumptions in LogFrame 9
3.2 Project Objectives 13
3.3 Revision of Goal and Objectives 14
3.4 New Objectives and Approaches of Project 16
3.5 GOS Strategy and Private Sector Involvement in Design, Construction and Management 17
3.6 GOS Financial Contribution and Technical Support and Their Impact on Progress 18

4. WATER CONTROL AND MANAGEMENT 20
4.1 On Achievement of Purpose and Outputs 20
4.2 Planned Outputs v/s Current Achievements 22
4.3 Procedural Selection of Valleys and Sites Selection 31
4.4 Construction Plans for Program II and III 35
4.5 Private Sector Involvement 37
4.6 Project Budget and Resources 38

5

5. INSTITUTIONAL STRENGTHENING 40
5.1 Introduction 40
5.2 LBII Progress 40
5.3 The Scope and Framework of GOS, Private Sector, NGO and Village Involvement 47
5.4 The Role of PROGES, Private Sector, GOS, NGO and Villages in Sustainability 49

6. OPERATIONAL AND APPLIED RESEARCH 54
6.1 Agronomy 54
6.2 Agro-Economy 59

7. PROJECT MONITORING 63
7.1 Evaluation of Project Monitoring Activities 63
7.2 Assessment of Project Personnel Needs for Project Monitoring 64
7.3 Summary of Findings, Constraints and Conclusions 65
7.4 Recommendations 65

8. PROJECT MANAGEMENT AND IMPLEMENTATION 66
8.1 Assessment of the Effectiveness of Project Management and the Nature of Collaboration by Project Parties 66
8.2 Impact of the Political Unrest in Casamance on Project Implementation . . 70

9. SOCIOLOGY ASPECTS 72
9.1 Participation of Beneficiaries in Construction, Operations and Maintenance (C, O & M) of Watershed Control Systems 72
9.2 Exploitation of Valleys Developed 80
9.3 Project's Impacts on Village and Household Economies 85
9.4 Special Issues: Gender Considerations 86
9.5 The Project Sociology staff 88
9.6 Involvement of NGOs 89

10. ECONOMIC ANALYSIS 92
10.1 Revised Analysis of Project Benefits and Costs 92

K

LIST OF TABLES

TABLE		PAGE
1	Planned Achievements	6
2	Planned Outputs vs Achievements of the Training Program	7
3	Construction of Dikes: Cost and Hectares To Be Improved	23
4	Program I - Cost Per Dike and Per Valley	24
5	Program II - Cost Per Dike and Per Valley Sédhiou	25
6	Program II - Cost Per Dike and Per Valley Bignona	26
7	Program III - Cost Per Dike and Per Valley Sédhiou	27
8	Program I, II, III - Hectares Controlled	28
9	Area Cultivated in Rice for the 5 PROGES Valleys - 1993	30
10	Project Costs in $US with 12 Month Extension (Pre-devaluation)	95
11	Revised Project Costs in $US with 12 Month Extension (Post-devaluation)	96
12	Estimated Proportion of Land Areas and Rice Yields Without a PACD Extension and Without and Agricultural Component	99
13	Calculation of Land Areas, Rice Yields, Costs, Benefits and IRR as Affected by SZWMP Without a PACD Extension and Without an Agricultural Component	100
14	Estimated Proportion of Land Areas and Rice Yields With A PACD Extension and Without an Agricultural Component	101
15	Calculation of Land Areas, Rice Yields, Costs, Benefits and IRR as Affected by SZWMP With a PACD Extension and Without an Agricultural Component	102
16	Estimated Proportion of Land Areas and Rice Yields With A PACD Extension and Without Credit Facilities	103
17	Calculation of Land Areas, Rice Yields, Costs, Benefits and IRR as Affected by SZWMP With a PACD Extension, With an Agricultural Component, and Without Credit Facilities	104
18	Estimated Proportion of Land Areas and Rice Yields With A PACD Extension, With an Agricultural Component and With Credit Facilities	105
19	Calculation of Land Areas, Rice Yields, Costs, Benefits and IRR as Affected by SZWMP With a PACD Extension, with an Agricultural Component and With Credit Facilities	106

ANNEXES

I List of References

II List of People Contacted and Places Visited

III Scope and Statement of Work

IV Logframe Annex

V A.I.D. Evaluation Summary Form

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EXECUTIVE SUMMARY

INTRODUCTION

A. Background of the SZWM Project

The Southern Zone Water Management Project (SZWMP) was authorized by USAID/Dakar on August 19, 1988. The purpose of the eight-year $18 million Project is to improve farmer utilization of water and recovery of fertile valley lands for agricultural purposes in the southern regions of Kolda and Ziguinchor. The major government agencies implementing the Project are the *"Direction du Génie Rural et de l'Hydraulique"* (DGRH) and the *"Direction de l'Agriculture".* Louis Berger International, Inc. (LBII) is the primary U.S. contractor to the Project, with Louisiana State University (LSU) and Tech International as sub-contractors. The LBII contract was signed in June 1990 and will expire in June 1995. The Project's PACD is June 30, 1996.

The decline in average annual rainfall over the past 20 years and salinization have resulted in significant losses of productive farmland in the valleys of Casamance. The Project responds to the urgent need to assist farmers to reclaim/improve productive valley lands, and improve the utilization of water and crop productivity.

The SZWMP supports the Country Program Strategic Plan for Senegal developed by USAID/Dakar for the 1992-1997 period. Specifically, it contributes to the achievement of the strategic objective of increasing crop productivity in zones of reliable rainfall.

B. Project Goal, Purpose and Objectives

1. Project Goal

The Project goal is to increase cereal (mainly rice) production by 50% by 1999 on 15,000 hectares (ha); from 54,000 tons in 1987/88 to 81,000 tons of paddy rice in 1999 in the region of Ziguinchor and Kolda. Overall production of cereals in the Project area would increase by 25% from 106,000 tons in 1987/88 to 132,000 tons by 1999.

2. Project Purpose

The Project purpose is to improve land and utilization of water for agricultural production purposes.

3. Project Outputs

Seven Project outputs are expected. They are:

- Water Management Plans and Designs for 60 valleys
- Anti-Salt and Water Retention Dike Installations to reclaim 10,000 ha and improve 5,000 ha of land
- Institutional Building
- Implementation of Operational and Applied Research
- Private Sector Involvement in infrastructure development
- Training of PVOs and PCVs in operation and maintenance
- Environmental Studies

C. Purpose of the Evaluation

The purpose of this mid-term evaluation of the SZWMP is to :

1. Assess progress towards meeting the objectives of the SZWMP and evaluate the effectiveness of U.S. and GOS funded activities in contributing to Project objectives.

2. Identify constraints to effective implementation, and provide recommendations on how to address those constraints.

3. Evaluate efforts aimed at improving sustainability of Project activities and make recommendations for further improvement.

4. Assess Project cost effectiveness and implementation efficiencies.

5. Determine planned versus actual accomplishments, review the Project design and implementation technology, and make recommendations regarding modifications required to Project goal, purpose and strategy.

6. Appraise Project institutional arrangements, watershed management, operational and applied research and environmental and Project monitoring to identify early corrections needed.

7. Assess the extent to which the Project contributes to achievement of the Mission's strategic objectives.

The ultimate purpose of the evaluation is to provide guidance to USAID and GOS for making decisions concerning more effective implementation of SZWMP activities through the PACD, and provide guidance for the design of future improvement activities beyond the PACD. This entails a revision of the PP's overly ambitious goal, purpose and objectives to a more reasonable and attainable level.

OVERVIEW

In the Project Paper (PP) the overall purpose was to reclaim lands damaged from the intrusion of salt water in 60 valleys by building anti-salt dikes, and to improve water management by constructing water retention dikes higher up in these valleys, in a rough proportion of 2:1 for reclaimed versus improved lands, with a view to increasing agricultural production. Thus, by 1999, 10,000 ha of land would have been reclaimed and 5,000 ha would have been improved. The Project represents a multi-disciplinary approach to assist in meeting part of the basic food requirements of Senegal. This would be achieved by increasing cereal production (mainly rice) by 50% from the perceived 54,000 tons of paddy at the time the PP was written in 1986/87 to 81,000 tons in 1999 with concomitant increases in other cereal production.

Evidence gathered thus far in the valleys where dikes have been or are being constructed shows that the ratio of reclaimed to improved lands is 1:2, the reverse of the ratio of 2:1 as perceived in the PP. This reverse ratio has a serious implication on the already ambitious purpose of increasing average yields through water control management activities alone, as explained in this evaluation report. The expected benefits that the PP envisaged are not materializing, and the grossly underestimated costs in the PP of dike construction have put the economic and financial viability of the Project in question.

Nonetheless, the Project has been designed to develop a replicable and sustainable methodology applicable in the Casamance to improve the livelihood of the local population that relies mainly on rice production for subsistence. Achievement of this objective would come about by reclaiming salinized soils and improving water management that encourages rice and cereal production. Thus, the Project was designed to give guidance in the development of a process of water control management specially applicable in the Casamance area. It includes construction, training, capacity building, formation of Village Water Management Committees (VWMCs), upgrading of Non Government Organizations (NGOs), and other institutional and policy changes. It field tests new application technologies in water control management in the valleys, and new Water Users' Associations (WUAs) formed across government and indigenous institutions in a cross section of the Casamance environment.

The Project, after a lag phase partially beyond its control, is starting to achieve satisfactorily many of its purpose and objectives, although not necessarily the PP's ambitious level of goal and outputs as planned. These need to be and will be revised in this evaluation.

MAJOR FINDINGS, CONSTRAINTS AND CONCLUSIONS

A. Goal

The goal of increasing rice production by 50% by 1999 on 15,000 ha, from 54,000 tons in 1987/88 to 81,000 tons of paddy rice in 1999 is not attainable by this Project in its present form.

The Project will not be able to reclaim and improve 15,000 ha of land in 60 valleys for full production activities by 1999. However, it can reclaim/improve 15,000 to 16,000 ha in about 35 valleys with an additional year of implementation. On the negative side, an increase in rice production by 50% is not achievable with water control management alone.

The goal of the PP cannot be achieved with a PACD of 1996. The **goal** of the Project which was to increase rice production by 50% on 15,000 ha, and **by** 27,000 tons in 1999, should be amended if an agricultural component is not included.

B. Purpose

The purpose of increasing rice yields by 1.8 tons/ha is not possible without the use of agricultural inputs. The PP assumed that by improving water control management alone, farmers would automatically have access to, and use those inputs in optimal amounts. ISRA reports that their recommended dosages are reduced to 50%, 25% and often to nil because of limited cash resources and restricted credit. There is evidence that an average yield/ha increase with water management alone will not be more than 700 kg.

The main constraints to achieving an increase in yields of 1.8 tons/ha are the dearth of agricultural extension services and of agricultural inputs, coupled with the fact that the soil has been extremely impoverished through lack of fertilizer inputs during the last two decades. The assumption that rice growers will automatically utilize optimal agricultural inputs to increase productivity/ha is not likely to materialize. The lack of agricultural extension services and credit facilities to farmers is an impediment.

Soil improvement through the use of organic and inorganic fertilizers, and the use of substantial amounts of lime needed for pH correction is imperative. A substantial agricultural component with extension services must be considered. Without this, the purpose of the PP, as well as the revised goal and purpose of this evaluation, will never be achieved.

C. Objective

The objective to improve 60 valleys, reclaiming 10,000 ha and improving 5,000 ha by 1999 is overly ambitious in terms of valleys. However, reclaiming 7,500 ha and improving 8,500 ha in about 35 valleys is more realistic.

In addition, the current low staffing at PROGES, the slow development of local, private-sector enterprises' ability to build dikes and the under-estimation of topographers needed from the GOS, are constraints to Project implementation.

The objectives and ouputs of the PP need be to revised.

1. For the current Project

As the Project stands, the number of valleys to be improved should be reduced from 60 to 25. Expected reclaimed lands should be reduced from 10,000 ha to 3,500 ha while improved lands should be increased from 5,000 to 6,500 ha by 1999 for a total of 10,000 ha.

2. With an extension of one year in LBII contract

With an extended PACD of one year and provision for agricultural inputs, the number of valleys to be improved should be reduced from 60 to 35 to control at least 16,000 ha (it is not possible to predict accurately the actual number of ha per valley). Reclaimed lands would drop from 10,000 to 7,500 ha, while improved lands would increase from 5,000 to 8,500 ha by the year 2000; thus exceeding the PP's expected output of 15,000 ha.

D. Construction Costs

Infrastructure costs have increased from $1.944 million for 28 to 30 valleys to $5.6 million projected to June 1995 for 25 to 27 valleys, and revised to $4.1 million in January 1994 as a result of the devaluation. If only the number of valleys is considered, construction cost estimates of the PP ($3.8 million for 60 valleys) have increased by about 240% per valley. The Project's overall anticipated costs for 1994 amount to $ 5.19 million (pre-devaluation), reduced to $4.46 million as a result of the 100% FCFA devaluation.

However, it is the number of hectares reclaimed or improved, and not the number of valleys, that will permit increased agricultural production, although from a social point of view the number of valleys reclaimed retains its importance. Cost reduction on a per hectare basis is greatly influenced by the topography of the selected valleys. Therefore, by careful selection of valleys according to topography, the cost/ha can be substantially reduced.

R

E. Cost Comparison

Comparison of cost/valley and cost/ha in the 3 Programs				
Program	No. of Valleys	Hectares Controlled	Cost/Valley 000 FCFA	Cost/ha FCFA
I	2	1087	157,609	144,995
II (Sedhiou)	3	1470	276,050	187,789
II (Bignona)	2	1623	131,497*	81,021
III	3	2222	200,128*	90,066

* It has been calculated that 1994 construction costs will decrease by 29% of the dollar value because of the devaluation.

The figures for Program II (Bignona) and Program III represent the current situation. Thus, it is safe to assume that future construction costs/ha would be in the neighborhood of 85,000 FCFA (in pre-devaluation figures). In giving greater weight to topography in the future selection of valleys, the anticipated cost/ha would be about 160,000 FCFA (post-devaluation), a figure which the evaluation team has retained. It is not possible to build 1-meter crest dikes as envisioned in the PP in an attempt to reduce costs by about 30%.

PROGES has considerably improved its implementation programs, and there is evidence that 25 to 27 valleys covering about 3,500 ha can be reclaimed and 6,500 ha improved by the current PACD. The Project currently has an Internal Rate of Return (IRR) of 2.5% and is not justifiable on purely economic grounds. However, there are unquantifiable sociological benefits that could increase the IRR. Unfortunately, without that baseline data, these cannot be estimated.

F. Size of dikes

All the anti-salt dikes and the water retention dikes that have been constructed, and will be constructed in Program III, have a crest of 3 meters, except for one dike in Mayor that has a crest of 1 meter.

Lack of compaction and extreme difficulties in the construction of 1-meter crest dikes preclude this option, until an alternative design can be proposed. Instead, smaller dikes (diguettes) with 30-cm crests and 60-70 cm high are being considered, together with contour berms.

Because heavy machinery must be used to construct the dikes, PROGES has standardized the designs with 3-meter crest dikes.

G. Delays in implementation

It is recognized that there have been substantial delays in Project implementation beyond the normal lag phase. Due to problems of political insecurity in the Project zone, the Project has suffered numerous disruptions and delays beyond its control. Indeed, the Project office has had to move four times during the calendar year September 1992-1993.

PROGES has made substantial progress and is on the exponential phase of project implementation. A one-year extension of the LBII contract would result in more value per dollar spent, both in economic and social terms. A "*sine qua non*" condition for this extension would be the addition of an agricultural component, or preferably the implementation of a follow-on agricultural project, because without this component the average potential increase of only 700 kg/ha cannot justify this Project's continuance.

H. The insurgence problem

The political situation has been calm for the past few months, and the outlook for continued tranquility looks favorable. These constraints on the project have been temporarily relieved. Provided the lull in the insurgence continues and the PROGES staff's movement is not restricted by the U.S. Embassy, progress in implementation is likely to improve.

I. Village organizations

Villagers do not seem to have a clear idea of the roles, responsibilities, and functions of the Village and Inter-Village Water Management Committees (VWMCs and IVWMCs). Some of the villagers interviewed indicated that they see membership in the VWMCs and IVWMCs predominantly as a means of obtaining access to wage employment from the construction contracting firms, or as a means of obtaining free or highly subsidized inputs. However, the small sample of this evaluation's survey (because of time limitations) carries with it a significant margin of error.

There is no trained (local) rural sociologist to oversee village organization, and to supervise project sociology-team and NGO personnel working in village organizations.

The village organizations, (VWMCs and IVWMCs) are not viable entities at the present time. Because they have a crucial role in the maintenance of dike structures and in the management of the revolving funds, more time needs to be spent in village organization. If not, this will have negative implications for the sustainability of these structures after the end of the Project.

J. Water control management

Water control management alone will not result an average increase in rice yield of more than 700 kg/ha. The soil has been degraded for the past two decades by lack or inadequacy of inputs, and salinization. However, with an agricultural component and credit facilities, the average increase in yield could attain 1.85 tons/ha or more by 1999, as assumed in the PP.

Without the agricultural component the IRR is -2.5%, whereas with a full agricultural component the IRR jumps to 15.7%.

The Project needs a follow-on agricultural component to be viable on economic terms alone.

RECOMMENDATIONS

A. The New Goal

Under the present PACD, the new project goal should be to increase rice production by 6,700 tons on 10,000 ha, instead of 27,000 tons on 15,000 ha by 1999. Without an agricultural component, the Project may be allowed to continue through the PACD of 1996 as scheduled for the main reasons of reclaiming land from salt intrusion, and for social and political benefits. It should be pointed out that the IRR at 2.5% in this case is negligible, and unjustifiable on purely economic terms.

B. Alternative Proposals

The *status quo* on this Project is not acceptable to this evaluation team. Therefore, three alternatives are presented :

Alternative 1. Extend the PACD of this Project and the LBII contract by one year. The reasons for this extension are that, without this extension, only 10,000 ha can be reclaimed or improved in contrast to 16,000 ha with the extension. Also, without the extension, the monitoring of the environmental issues, the training courses, and the operational and applied research would be incomplete. However, under this scenario the IRR remains a feeble 5.8%.

Alternative 2. Add an agricultural component to this Project and provide additional funding of about $3 million for this component alone[1]. Extend the PACD of this Project by one year from June 1996 to June 1997, and extend also the LBII contract to end in June 1996 at an estimated additional cost of $3.97 million. Under this scenario, the IRR increases to an acceptable 10.9%, inasmuch as the social benefits were not included in the analysis because of lack of baseline data.

Alternative 3. Add to this Project an agricultural component with an additional funding of $3 million, and an endowment fund of $1 million for credit facilities to farmers, but entirely managed by **PRIVATE BANKS** and not by GOS controlled banks due to their poor records. Extend the PACD of this Project by one year from June 1996 to June 1997, and extend also the LBII contract to end in June 1996 at an estimated additional cost of $3.97 million. Under this scenario, the IRR increases to 15.7%. It should be stressed here that the IRR calculations did not include the substantial, but as yet unquantifiable social benefits.

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[1]*Note.* This evaluation team deplores the fact that USAID does not provide direct aid for credit facilities. As a second best, USAID should help in the provision of credit facilities through other donors and through private banks. The use of PL 480 funds might be envisaged. Another possibility could involve the establishment of decentralized, non-governmental credit facilities, as under the USAID-funded ACEP project. A third approach could involve an OPG with an American PVO, such as VITA or CLUSA, which have had considerable success in extending rural credit in other West African countries.

If either alternative 2 or 3 is selected, there might be a need to redesign the present Project or design a follow-on agricultural project under a new contract with normal bidding procedures and with a target starting date of January 1996. The agricultural project would take maximum advantage of the reclaimed and improved lands realized in this Project. The new project should dove-tail with the present Project to assure smooth transition. If USAID concurs with either of these two recommendations, work on a new PP should start as soon as possible. The estimated costs of a follow-on, but new project, cannot be quantified within the time limits of this evaluation. The minimum expertise needed to design a new follow-on project should consist of (i) an agricultural economist, (ii) an agronomist in multiple cropping systems, (iii) a sociologist and (iv) a financial/ marketing analyst for a period of at least two months each. This team should receive back-up support from USAID/Dakar PDO and ANRO, but USAID employees should not be included as consultants on the team itself.

The evaluation team strongly suggests that USAID chooses alternative 3, although alternative 2 would be acceptable.

C. New Objectives and Outputs

1. Under the current PACD

The new objectives and outputs under the current PACD of June 1966 should reduce the number of valleys from 60 to 25. Expected reclaimed lands should be reduced from 10,000 ha to 3,500 ha, while improved lands would increase from 5,000 to 6,500 ha. The maximum increase in rice production cannot be expected to be more than 6,750 tons.

2. With a PACD extension of one year

- The new objectives and outputs, with an extension of the LBII contract by one year, will reduce the number of valleys from 60 to 35, with 7,500 ha to be reclaimed and 8,500 ha to be improved by the year 2000.

- To reduce cost/ha, more attention and weight should be given to the topographical conditions in the selection of valleys and siting the dikes.

- Because the cost/ha is of greater importance than the cost per valley, an effort should be made to obtain the maximum number of ha per unit construction cost in any one valley.

- Large expensive dikes (3-meter crest) should only be anti-salt dikes, unless the valley topography dictates otherwise. Water retention dikes should be multiple smaller dikes (30 cm crest, 60-70 cm high) up the valleys if the cost/ha is substantially lower, and this has not been proven yet. Such a strategy would increase sustainability since these small dikes can be constructed by local contractors using the services of the population.

PROGES is already considering the implementation of this strategy. However, the longevity of these small dikes, *"diguettes de rétention,"* remains in question and should be thoroughly studied before implementation.

- A one-year extension in the LBII contract, and the LBII/ISRA contract, is therefore recommended with the condition that 35 valleys and at least 16,000 ha (possibly 17,000 ha) will be reclaimed and improved, thus achieving the **purpose** as outlined in the PP. The implementation of an agricultural component will help attain 100% of the **goal** of the PP, instead of the 25% expected under the present conditions without this component, and without an extension.

- In the interest of establishing viable VWMCs and IVWMCs to ensure the sustainability of water management and other Project activities, the Project should hire a rural sociologist locally to assist the PROGES staff and NGOs in village and VWMC/IVWMC organization.

- A follow-on agricultural project should be designed to dove-tail with this Project to augment the benefits in 35 valleys. This scenario will result in 16,000 ha or more of reclaimed or improved lands after an extension of one year of the current LBII contract. Without this one-year extension, only 25 to 27 valleys and about 10,000 ha would have been reclaimed or improved.

Special Remarks. Both LBII and local Project personnel are to be commended for their good will, patience and steadfastness to continue water resource development under such a difficult situation. Any evaluation of this Project must take into account the extremely difficult conditions, both logistical and personal, under which the Project personnel had to work.

LESSONS LEARNED

In the preparation of the PP, there were several overly optimistic and unjustified assumptions.

1. The goal was grossly overestimated because of an unjustified assumption that water control management alone will promote farmers' interest, who will then automatically use agricultural inputs to increase rice production. This did not happen and is not likely to happen without some supportive action.

2. Careful study should be made in costing infrastructures and of the necessary construction capabilities. In this Project, small dikes were recommended which can not easily be built. The building of larger dikes increased the estimated cost by about 240%.

3. Because the IRR of a Project depends essentially on costs and benefits, a great deal of attention should be given to these two factors in project preparation documents.

4. In an attempt to reduce Project's costs, the PP's expectations of the population's contribution to the project and their ability to render exhausting construction services were too high.

5. Unforeseen problems usually emerge in the early implementation phase of a project. More attention should be given to these areas in the PP document with due allowance for contingencies.

6. It is extremely difficult for an infrastructure building project to depend solely on agricultural returns to justify it in economic terms without a substantial agricultural component.

1. INTRODUCTION

1.1 Background of the SZWM Project

The Southern Zone Water Management Project (SZWMP) was authorized by USAID/Dakar on August 19, 1988. The purpose of the eight-year $18 million project is to improve farmers' utilization of water and recovery of fertile valley lands for agricultural purposes in the southern regions of Kolda and Ziguinchor. The major government agencies implementing the Project are the *"Direction du Génie Rural et de l'Hydraulique"* (DGRH) and the *"Direction de l'Agriculture"*. Louis Berger International, Inc. (LBII) is the primary U.S contractor to the Project, with Louisiana State University (LSU) and Tech International as sub-contractors. The LBII contract was signed in June 1990 and will expire in June 30, 1995. The Project's PACD is June 30, 1996.

The southern zones of Senegal offer a high agricultural potential, with generally higher average yields and lower variations in yields than other regions in Senegal. The decline in average annual rainfall over the past 20 years has resulted in significant losses of productive farmland in the valleys due to salinization, and in decreased yields of major crops. The Project responds to the urgent need to assist farmers to reclaim productive valley lands and improve the utilization of water.

The SZWMP is, in some sense, a follow-on project to the AID-funded Casamance Rural Development Project (1978-1986), which, in addition to many other agricultural and research activities with SOMIVAC, PIDAC, and ISRA, constructed 31 anti-salt dikes using village participation. One of the main, but erroneous, assumptions of the SZWMP was that the lack of water resource development was the only major constraint to developing agriculture in the region.

The Project supports the Country Program Strategic Plan for Senegal developed by USAID/Dakar for the 1992-1997 period. Specifically, it contributes to the achievement of the strategic objective of increasing crop productivity in zones of reliable rainfall.

1.2 Project Goal, Purpose and Objectives

Project Goal

The Project goal is to increase cereal (mainly rice) production by 50% by 1999 on 15,000 hectares; from 54,000 tons in 1987/88 to 81,000 tons of paddy rice in 1999 in the region of Ziguinchor and Kolda.

Overall production of cereals in the Project area would increase by 25% from 106,000 tons in 1987/88 to 132,000 tons by 1999.

Project Purpose

The Project purpose is to improve land and the utilization of water for agricultural production purposes.

Project Outputs

Seven Project outputs were expected. They are:

a. Water Management Plans and Designs for 60 valleys leading to dike construction;

b. Anti-Salt and Water Retention Dike Installations to reclaim 10,000 hectares and improve 5,000 hectares of land;

c. Institutional Building and Strengthening;

d. Implementation of Operational and Applied Research;

e. Private Sector Involvement in infrastructure development of 60%;

f. Training of PVOs and PCVs to form 60 local organizations in O & M;

g. Environmental Studies.

1.3 Purpose of the Evaluation

The purpose of this mid-term evaluation of the SZWMP is to :

- Assess progress towards meeting the objectives of the SZWMP and evaluate the effectiveness of U.S. and Government of Senegal (GOS) funded activities in contributing to Project objectives;
- Identify constraints to effective implementation, and provide recommendations on how to address those constraints;
- Evaluate efforts aimed at improving sustainability of Project activities and make recommendations for further improvement;
- Assess Project cost effectiveness and implementation efficiencies;
- Determine planned versus actual accomplishments, review the Project design and implementation technology, and make recommendations regarding modifications required to Project goal, purpose and strategy;
- Appraise Project institutional arrangements, watershed management, operational and applied research and environmental and Project monitoring to identify early corrections needed;
- Assess the extent to which the Project contributes to achievement of the Mission's strategic objectives.

The ultimate purpose of the evaluation is to provide guidance to USAID and the GOS for making decisions concerning more effective implementation of SZWMP activities through the PACD, and provide guidance for the design of future improvement activities beyond the PACD. This entails a revision of the PP's overly ambitious goal, purpose and objectives to a more reasonable and attainable level.

1.4 Methodology of the Evaluation

The team spent one day in Washington D.C. for briefing, studying documents supplied by the TA team and USAID, and for the initial planning of the evaluation. The team determined that the scope of work (SOW) was too extensive given the team's composition and the time allocated to complete the assignment. Upon arrival in Dakar, the team was briefed by the USAID staff in charge of the SZWMP. Discussions were held on the SOW, and the USAID personnel felt that most, if not all the questions of the SOW, needed to be answered. The team gathered further documents and obtained information for planning site visits and interviews.

The team studied in detail the Project Paper, the PIO/Ts, various reports and designs prepared by LBII consultants and PROGES staff (Projet Gestion de l'eau dans la zone sud), reports of the Comité National du Suivi (CNS), the Mission's strategic objectives, training documents, annual work plans, and applicable AID evaluation guidance. Further documents studied are detailed in Annex 1 "List of References".

Several site visits by the whole team, in sub-groups or individually, were made in several valleys in the regions of Sédhiou, Bignona and Kolda. Details of places visited and people contacted are in Annex 2. In addition, over 100 farmers were interviewed by the team's agro-economist and sociologist, and the whole team had lengthy discussions with the PROGES and USAID staff.

1.5 Overview

In the PP, the overall purpose was to reclaim lands damaged from the intrusion of salt water in 60 valleys by building anti-salt dikes, and to improve water management by constructing water retention dikes higher up in the valleys, in rough proportion 2:1 of reclaimed versus improved lands to increase agricultural production. Thus, by 1999, 10,000 hectares (ha) of land would have been reclaimed and 5,000 hectares would have been improved. The Project represented a multi-disciplinary approach to meeting part of Senegal's the basic food requirements from the higher agricultural potential of the southern zone (Casamance). This would be achieved by increasing cereal production (mainly rice) by 50% from the perceived 54,000 tons of paddy at the time the PP was written in 1986/87 to 81,000 tons in 1999 with concomitant increases in other cereal production.

Evidence gathered thus far in the valleys where dikes have been or are being constructed, shows that the ratio reclaimed versus improved lands is 1:2, which is the reverse of the ratio stated in the PP. This reverse ratio has a serious implication on the already ambitious purpose of increasing average yields by 1.8 tons/ha through water control management which is explained later in this report. The expected benefits that the PP envisaged are not materializing, and the

grossly underestimated costs in the PP of dike construction have put the economic and financial viability of the Project in question.

Nonetheless, the Project has been designed to develop a replicable and sustainable methodology applicable in the Casamance to improve the livelihood of the local population that largely relies on rice production for subsistence. Achievement of this objective would come about by reclaiming salinized soils and improving water management that would encourage rice and cereal production. Thus, the Project was designed to give guidance in the development of a process of water control management specially applicable in the Casamance area. It includes construction, training, capacity building, formation of Inter- and Village Water Management Committees (IVWMCs and VWMCs), upgrading of Non Government Organizations (NGOs), and other institutional and policy changes. It field tests new application technologies in water control management in the valleys, and new water users associations (WUAs) formed across government and indigenous institutions throughout the Casamance environment.

The Project must accomplish this at a time when the Senegalese economy is in transition from a State-controlled to a private-sector economy. The Government of Senegal (GOS) has been trying to stimulate the economy for the past decade and many of the needed agricultural policy reforms are not yet in place to enable Senegalese farmers to benefit from the recent currency devaluation. In this context, the recent devaluation could be a mixed blessing. In addition, the Project is under considerable constraint in its construction program from the project requirement of building up local expertise and private-sector capabilities in construction. Given this, the Project is not to be evaluated strictly in terms of the total area and the number of valleys brought under the new water control methods, but rather the extent to which various project outputs, i.e., training, institutional change, and the irrigation system improvements in selected valleys have and are creating a basis for expanding the Project activities across the entire Casamance area. From this angle, the Project is starting to satisfactorily achieve many of its goals and objectives, although not necessarily at the PP's ambitious level. These need to be and will be revised in this evaluation.

The team was asked to evaluate the SZWM Project using a framework of a series of over ninety questions from an ambitious scope of work which it will attempt to answer.

2. PLANNED PROJECT OUTPUTS v/s CURRENT ACHIEVEMENTS

2.1 Water Management Plans and Designs

Water management plans for 60 sites on a small watershed basis are to be produced by the Project. According to the logframe, the Project is to develop 60 plans for 60 valleys before the completion date of 1999. The Project was designed to improve seven to ten new valleys each year, or approximately 2,300 hectares.

As of December 1993, the Project had developed plans for 14 valleys. The number of hectares protected by the Project is 2,217 of which 747 are for Program I and 1,470 for Program II.[1]

2.2 Anti-Salt and Water Retention Dike Installations

The PP does not specify the number of different water control structures to be built. The number of dikes either constructed or in the process of construction to date by the Project are 24. Construction of 8 dikes for Program I has been completed. The 16 sites of Program II (Sédhiou) are nearing completion and none of the Program II structures has been received by the Project.

Tenders for the construction of 9 additional dikes for 3 valleys in Program II (Bignona), and 7 dikes in 6 valleys in Sédhiou have been let out for bids in December 1993, and these will be built in 1994. PROGES proposes to build dikes in about 9 valleys per year during the LOP.

2.3 Institutional Building and Strengthening

The Project is designed to support and ameliorate existing government institutions, the private sector and to create village water management organizations. The PP does not specify a plan for achieving each of these three components; it merely outlines general activities for this component of the Project.

[1]Source - CNS PROGES report, October 1993

TABLE 1
PLANNED V/S ACHIEVEMENTS
Construction of Dikes and hectares (to be) controlled (Through Dec. 18, 1993)

	Planned		Achieved	
	Number of Dikes	Hectares Improved	Number of Dikes	Hectares Improved
Completed				
Water retention	?		6	
Anti-salt	?		2	
Area		2300		747
Total	?		8	
Under Construction				
Water retention				
Anti-salt	?		13	
Area	?		3	
Total		2300		1470
	?		16	
Contracted for 1994				
Water retention				
Anti-salt	?		7	
Area	?		9	
Total Contracted		2300		5323*
			16	
Total Area		6900		7540
Total Dikes			40	

*This figure of 5323 hectares is misleading. To improve/reclaim that number of hectares, one additional large dike needs to be constructed in one of the valleys (Segafoula) and a series of small water retention dikes and/or contour berms must be constructed. These are still in the planning stage.

2.3.1 Government Institutions

The GOS' capacity to help with water control management subsequent to the PACD will be improved through a training program. The training portion of the Project is one of the crucial elements for its sustainability beyond the PACD.

TABLE 2 PLANNED OUTPUTS V/S ACHIEVEMENTS OF THE TRAINING PROGRAM	
Planned Project Outputs	***Achievements by December 1993***
Long-term training for 4 participants	Master's degree programs in soil science and agro extension for 2 participants
2 short workshops	n/a
Short-term observations tours for 14 participants	National Dir. and Dirs. of Hydrology & Agriculture tour to U.S.
Training in Burkina Faso	Course on Land Conservation for 2 Reg. Inspectors for Agriculture
Short study trips for 12 participants	Courses taken by 3 participants
Financial and management systems for GOS accounting staff	n/a
Internships for 12 participants	n/a
Training in Morocco for 16 participants	n/a

To date, two members of the PMU have begun long term training at LSU for M.S. degrees in soil science and agricultural extension. They are expected to return in 1995. Two more members are scheduled to start advanced degree studies in engineering at LSU in the Spring and Fall semesters of 1994. Three members of the PMU have undergone short-term training in Burkina Faso. Also provided by the Project are short-term in-house training in computer software packages for Project staff and members of the regional technical assistance (TA) teams. English courses have also been provided. Members of the GOS regional inspectorates have participated in training programs offered by the Project.

2.3.2 Operational and Applied Research

Various studies concerning environmental impact of water control structures, and ground water studies are required as outputs of the Project, including a minimal monitoring of the effects of the Affiniam dam. The PP stipulates five areas of environmental research to be performed by short-term consultancies. The reports to be produced are (i) anti-salt dike round-table discussions, (ii) ground water studies, (iii) regional water control modeling, (iv) water-born disease assessment, and (v) terrestrial ecosystem.

In addition to these five areas, a specific paired-watersheds study is required. The PP underlined the importance of this component and stated that the Project will work with a local research institution for operational and applied research, which also includes monitoring and evaluation. A belated contract between LBII and ISRA has been signed and came into effect in December 1993.

2.3.3 Private Sector Involvement

The PP states that the Project TA will contract with the private sector whenever possible for construction work, surveying and other services in order to increase their capacity to build water control structures. Overall 60% of the value of construction is to be performed by the private sector.

In addition to directly working with the private sector, the Project is to develop procedures for the GOS to increase its involvement with the private sector. PROGES has made a substantial amount of progress in accomplishing this objective. Several small local firms have been involved in dike construction in the last two years, although a couple of them have defaulted on their contract. A growing number of small construction firms have been qualified by PROGES and have submitted their bids for the 1994 construction program.

2.4 Training of PVOs and PCVs

2.4.1 Village Committees

The Project recognizes the importance of involving the local population in all aspects of implementation. To accomplish this goal, VWMCs are to be organized by the Project in order to provide the necessary labor and maintenance for the structures. IVWMCs are required for the proper management of water resources at the valley level.

To date, 47 VWMCs and 6 IVWMCs have been created for Programs I and II valleys. For Program III, 33 CVGEs have been formed in six valleys.

2.4.2 Non-Governmental Organizations

A new component of the Project has been visualized in an effort to promote village participation. Non-governmental organizations (NGOs) will assist the Project by working with the VWMCs and IVWMCs to perform specific tasks.

The NGO component began in earnest in March of 1993 and six NGOs have become involved in the Project. This will be discussed in more details in later sections.

2.5 Environmental Studies

These include soil and water quality analysis, geographic studies to determine the nature of the terrain, soil compaction studies, aquatic life, agricultural activities of the population, ecological studies, and public health. These studies will be performed by ISRA as defined in the SOPS. (See Section 6.1.2 for detailed discussion).

3. PROJECT DESIGN

This section will compare assumptions in the PP with the facts as they currently are.

3.1 Analysis of Project Assumptions in LogFrame

3.1.1 Assumptions in goal achievement

The goal is to increase cereal production by 25% and rice by 50% 1999 in the southern zone of Senegal.

assumption No severe and prolonged drought affects the Casamance during Project years. Political stability continues.

fact There has been no severe or prolonged drought since the writing of the PP. However, political stability has not continued and was not the case in the initial stages of Project implementation. This faulty assumption seriously hampered Project implementation and dictated the Project area of intervention. Security in the area remains a concern to the American Embassy and the USAID Mission. Travel restrictions imposed upon PROGES's personnel remain an incumbrance to planned Project implementation.

assumption Cereals can be exported or consumed locally. Marketing would not be a problem.

fact The cereal of primary importance is Casamance rice. Given its high production costs relative to world prices for long grain rice, there might be some potential for exportation for specialty markets which is not yet evident given the lack of sufficient rice production to satisfy local consumption needs. Cheap, illegally imported broken grain rice from Gambia is about 50% less expensive than locally produced rice. Locally produced rice does not reach the market except for that produced by entrepreneurial farmers with large acreage, and that amount is minimal. There was no marketing of the local varieties of rice at the time the PP was written, and there has not been any change. Farmers were, and are, still producing below their own subsistence level. There are virtually no net buyers of imported rice, and there is practically no marketing of the local varieties. For other cereals such as corn, millet, sorghum and Niebe, only a very small market exists. Farmers are generally at subsistence levels of production for these crops as well.

assumption Both financial and cultural incentives exist to increase production of cereals.

fact There are cultural incentives to increase production of cereals. There are political incentives as well reflected by the GOS policy of food self-sufficiency. Financial incentives are another matter. Even at the time of the production of the PP, it was known that farmers could grow peanuts and purchase their rice because one hectare of peanuts was as financially rewarding as four hectares of rice. Peanut prices decreased temporarily and have recently increased, but rice and cereal are still commodities that are not normally marketed. The recent devaluation could render locally grown rice competitive with imported rice. This would depend on deflationary measures taken by the GOS with respect to demand in elastic imported goods, e.g., Asian broken grain rice.

assumption Applied research findings for particular crops/areas will be produced and extended to farmers.

fact This assumption basically implies agricultural extension services are available in the Project area of intervention. Given the lack of resources in the GOS's traditional services, this is highly unlikely to happen within this Project's lifetime, (as it was in 1986), because the PP's conception excluded support for an agricultural component. When interviewed, farmers indicated that they have very little contact with or access to any agricultural extension workers, either from the GOS or elsewhere. At the time of the PP, it was not foreseen that the extension services of the SOMIVAC (PIDAC and PRS) would cease to operate. The SOMIVAC is the only regional development organization in Senegal to be closed by the GOS.

assumption Farmers will have access to and use fertilizer and improved seeds.

fact Farmers have access to improved inputs, although if imported, they are now at higher prices. Improved seeds and chemical fertilizers are not readily available in all areas, as well as animal traction and organic fertilizers. Whether farmers use improved inputs or not is another issue. Although their exposure to agricultural extension is very limited, farmers are aware of the level of benefits that can be derived from the use of fertilizers and improved seeds. These inputs are expensive, and judicious use is imperative for benefits to exceed costs. Farmers have been using inputs sparingly or not at all for the last two decades. This decision was rightly based on the fact that to use inputs in the absence of agricultural support services was not economic, given the risks of poor rains, possible disease outbreaks and locusts' invasion. Good water control management, as planned in this Project, may induce them to take some risks, but will take several years and will require adequate agricultural extension services as support. These services are now close to non-existent.

3.1.2 Assumptions for Project Purpose

Improve farmer recovery of land and utilization of water for agricultural production purposes.

assumption No labor constraints in using new fields or new techniques

fact This assumption is erroneous as far as new fields are concerned. A Ziguinchor regional inspectorate of Agriculture study of Programs I and II rice lands found that, on average, farmers are planting about 78% of all land available for rice cultivation. This may indicate a labor shortage. Other possibilities may be a lack of inputs such as seeds, constraints to reallocation of resources from other activities, or a lack of confidence in water control capabilities of the newly constructed dikes.

assumption Demand for improved water management is high. Farmers want to follow through, seeing that it is to their advantage.

fact The demand for improved water management, especially for the anti-salt structures, exists ostensibly. For farmers in the Project zone of intervention, the structures are virtually free.

Initially, uncompensated village labor was required as an input. At present, some laborers are paid a wage higher than the SMIG by the contractors and this can create instability on the job market place.

No cost recovery program is envisaged in the Project for two main reasons (i) farmers cannot afford the high costs of dike construction and (ii) a cost recovery program is politically unpalatable. Therefore, replicability without an additional source of funding is a non-issue. The Director of the Ministry of Public Works and Hydraulics has informed the evaluation team that the GOS has already approached international financial institutions regarding funding.

It is only sustainability that remains in question. This involves mainly the continued operation and maintenance of the dikes built by the Project, and the existence of credit facilities to stimulate use of agricultural inputs without which yields will remain low. A revolving fund equivalent to 2% of construction costs for O & M purposes was mandated in the PP. The CNS of 1993[2] reports that sufficient funds have been collected only for the valleys of Kandion Mangana and of Mayor to cover the *purchase of inputs*. This is a digression from the PP's intention on the use of the revolving funds for O & M purposes, which may negatively affect sustainability. At the same time, PROGES may have reached the conclusion (and rightly so) that, without agricultural inputs, the goal of the Project would not be achievable, hence the diversion of funds.

3.1.3 Assumptions of Project Outputs

assumption Availability of GOS fonctionnaires able and willing to do water management plans and designs at the request of farmers.

fact There are fonctionnaires capable of doing the required work. However, the availability of appropriate personnel has been a constraint in some cases.

assumption Support of administrative officials at all levels and cooperation from NGO to protect high-risk valleys against salt intrusion.

fact This has not always been the case, especially since 1991. Over the past six months, the Ministries of Finance and of Modernization have been apathetic with respect to the approval of requests from USAID and PROGES regarding long-term training for GOS personnel. The approvals to continue salary payments for two participants have not been forthcoming (a condition of the contract agreement between GOS and USAID). Their training, essential for Project sustainability, has been postponed pending GOS consent. GOS counterpart salaries have also not been paid since August 1993 and replacements for participants who have left for long-term training have not been identified promptly.

assumption Coordination and good working relationships among all organizations and Ministries involved in carrying out water management planning, development, follow-up and evaluating/monitoring.

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[2]Rapport d'activités au 31 octobre 1993 de la gestion 1992/1993

fact During the first few years of Project implementation, good coordination did not exist and the Ministry was not involved. There was substantial disagreement among USAID, the first two Chiefs of Party, and the first National Director. This had a deleterious effect on Project implementation. However, with the nomination of another National Director and a third Chief of Party, Project implementation has gathered steam and is proceeding on course. Friction between USAID's ANRO and PDO has been perceived and remains a problem.

assumption Land tenure and land distribution are not constraints to infrastructure development, and improved water management and water utilization through research could be completed by ISRA.

fact The first assumption seems to hold at present for the valleys located in Sédhiou, and the Project has selected sites where problems regarding land tenure and distribution are unlikely to arise. However, the land tenure situation in the lower Casamance is far more complicated. There is a need for the Project to undertake a sociological baseline study to identify any problems regarding land tenure and distribution in that region.

With respect to the second assumption, a cooperative agreement signed in June 1993 between PROGES and ISRA came into force only in December 1993. This contract involves research to be conducted by ISRA on various components as detailed in the "Standards of Operating Procedures" (SOPS).

assumption Local population provides labor for infrastructure development.

fact This assumption is incorrect. A dike would take about two years to build if the Project had to rely on village labor to do the compacting. The late start of construction induced a desire on the part of LBII to speed up the completion of the Program I and II dikes. Machine compactors were brought in to do the work, after which village laborers were no longer willing to do the compacting manually. In addition, manual compacting is an exhausting physical exercise which the PP underestimated. The villagers do provide unpaid labor, but only for the minor tasks.

assumption Private contractor and/or GOS can procure materials for construction in a timely manner.

fact This is not necessarily true. There is a paucity in the local supply of construction equipment. The system that has evolved has been that large national firms use small local firms as partners. The majority of small local firms are not sufficiently capitalized to complete the structures alone and in a timely manner.

assumption Available private contractors and PVOs willing to provide required services at acceptable quality, standards, and costs.

fact This assumption proved to be correct. Using private firms, NGOs and PVOs, the Project has been able to produce many of its required outputs. PROGES is continually trying to build up local expertise, and this takes time. This activity, which is geared towards satisfying one of the Project's objectives, sometimes delays Project implementation.

Many objectives as described above have not been met and are difficult, if not impossible, to achieve. The reasons are varied. These, as well as the constraints, conclusions and recommendations will be presented in Sections 4, 5, 6 and 7 below, where the four main components of the Project will be discussed:

Section 4 Water Control and Management

Section 5 Institutional Strengthening

Section 6 Operational and Applied Research

Section 7 Project Management and Implementation

3.2 Project Objectives

To achieve the Project goal and purpose, seven objectives are listed in the PP logframe. They are :

(1) Water management plans, including designs, for small watershed areas completed and implemented at request and through assistance of local farmers;

(2) Protection of high-risk valleys against salt-intrusion;

(3) A defined set of institutional relationships between MRD and MH, and capacity for supervising and carrying out water management planning, development, follow-up, and evaluation/monitoring;

(4) Research completed by ISRA or other research organizations on topics related to water management concerning social/cultural problems, infrastructures/ technical questions, soil and topography, and best mix of water management techniques;

(5) Private sector involved in infrastructure development;

(6) PVOs and possibly PCVs working closely with village organizations in developing and supporting water management activities and improved water utilization; and

(7) Environmental studies completed on impacts of water control structures on soils, water, flora and fauna in the Project area.

3.3 Revision of Goal and Objectives

3.3.1 Analysis of the PP's conception

a. Goal

The goal of the Project is to increase cereal production (mainly rice) in Casamance. Achievement of this goal must be measured by multiplying yield increment by area under cultivation.

Verifiable Indicators

The PP determined that 100% of the goal would be achieved if, by 1999, 10,000 hectares (ha) of land have been reclaimed and protected from salt intrusion by anti-salt dike structures, plus improved water availability on 5,000 hectares through the use of water retention dikes. The PP assumed that these improvements would, through demonstration plots and sociological extension services, automatically generate farmers' interest and stimulate increased usage of improved seed varieties, adequate fertilizer inputs and other agronomic packages, the basic ingredients essential for yield improvement. Rice production in the target area would increase by an average 1.8 tons/ha, representing a 50% increase on 15,000 hectares, from 54,000 to 81,000 tons. The water control and management program should improve both components (yields and area) that are factors of the **goal** equation.

A major flaw of the Project's design is the emphasis on two different fields of intervention. The Project's goal and purpose encompassed agricultural motivations for the Project's viability, while the objectives underscored building infrastructure. The outputs of the Project emphasized primarily the building of dikes. It is difficult, if not impossible, to increase agricultural production as outlined in the *PP's stated goal and purpose* regarding water control management in the absence of an agricultural component in the Project.

The Project has been implemented as a dike building project, and this mid-term evaluation focusses also on achievement of agricultural goals, an essential factor in the IRR analysis. The nature of the USAID intervention must be clearly identified before any Project redesign, or a new design, is undertaken.

3.3.2 Summary of Findings, Constraints and Conclusions

It is evident that the goal of increasing rice production by 50% by 1999 on 15,000 hectares, from 54,000 tons in 1987/88 to 81,000 tons in 1999 is not attainable. The purpose of increasing rice yields by 1.8 tons/ha during years of normal rainfall is also not possible without the use of adequate agricultural inputs. The evidence gathered indicates that average yields in fields receiving sufficient water do not exceed 1 ton/ha. Therefore, in reclaimed lands where no rice is now grown, the increase in yield would evidently be a maximum of 1 ton/ha; and the increase in yield in improved lands where current yields are 500 to 600 kg per hectares would only reach a maximum of 500 to 400 kg/ha.

The main constraints to achieving of increasing yield by 1.8 tons/ha is the dearth of agricultural extension services and of agricultural inputs. After at least two decades of rice

growing with minimal nitrogen, phosphorus and potassium (NPK) inputs, and also other major and micro elements, the soil is extremely impoverished. Unless the soil is improved through the use of organic and inorganic fertilizers, and the use of substantial amounts of lime needed for pH correction, the purpose of the PP will never be achieved. Farmers will not utilize inputs, with or without credit facilities, until they are assured of adequate water supply to their crops. Evidence of adequate water supply and the effects of desalinization will take a few years to demonstrate.

Therefore, the goal, purpose, objectives and outputs of the PP need to be revised.

The number of valleys and hectares reclaimed or improved to this date are far below the expected percentage. It is obvious that the objective to improve 60 valleys, reclaiming 10,000 hectares and improving 5,000 hectares by 1999 is overly ambitious. The current low staffing at PROGES, the slow development of local private sector enterprises' ability to build dikes which the Project is mandated to encourage, and the minimal support from GOS in providing staff for topographical surveys (all of them are underestimates of the PP) are added constraints to Project implementation.

3.3.3 Recommendations

Given the constraints, goals would be accomplished by working in fewer valleys rather than achieving the maximum percentage of the PP expected outputs. Therefore, the evaluation team recommends a revision of the Project outputs from 60 valleys to 25 valleys, and the number of hectares from 15,000 to 10,000 by 1999. However, if the LBII contract is extended to June 1996 and the PACD is extended to June 1997, then the number of valleys that could be improved would be 35 and the number of hectares increased from 15,000 to 17,000. The outputs of the PP in terms of hectares would therefore be achieved.

Without an extension in the LBII contract, of the 10,000 hectares mentioned above, 40% (i.e., about 4,000) should be reclaimed lands, and 60% should be improved lands maintaining the ratio of reclaimed to improved to 1 in the future to compensate for the low percentage of reclaimed lands in Programs I and II. The PP had recommended that the ratio of reclaimed to improved areas be 2:1. Evidence from the design and construction of Programs I, II and III shows that the actual ratio is more or less reversed to 1:2. Since the benefits to be derived from reclaimed lands are greater than those from improved lands, an effort should be made to increase the ratio in favor of reclaimed lands whenever possible in the valley selection process. The long term effects will be more rewarding.

The **goal** and **purpose** of the Project, to increase rice production by 50% on 15,000 hectares, by 27,000 tons in 1999 should be revised.

Without any extension of the LBII contract, the new goal of this Project should be to increase rice production by 15,000 tons on 10,000 hectares. The purpose regarding land area to reclaimed would be 4,000 hectares and improve water management on 6,000.

With a one year extension of the LBII contract, the new goal of the Project should be to increase rice production by 27,000 tons on 16,000 hectares. The purpose regarding land area reclaimed would be 7,500 hectares and improve water management on 7,500, with an additional potential of 2,000 hectares on improved lands.

(The figures retained for the IRR analysis are 7,500 of reclaimed lands and 8,500 hectares of improved land.)

3.4 New Objectives and Approaches of Project

3.4.1 Management and institutional approaches

If the Project is one of infrastructure improvement (dike building) then the goal should not be to increase agricultural production by significant amounts. The goal and purpose should be to merely stop environmental degradation and reverse the trend of land deterioration. Because environmental and social benefits are harder to quantify, the Project would be impossible to justify on purely economic and financial terms.

If the nature of USAID intervention in this Project, or a follow-up Project, emphasizes a substantial agricultural component, then the Project could perhaps be justified in economic terms. This will be further discussed in the agro-economic Section 6.2. However, the design of a new Project must reflect the conclusions and recommendations of this evaluation, and should include a component necessary to increase agricultural production which can only come about through agricultural extension services and a credit component. The credit component should be an endowment fund of about $1 million, where only interest on the capital is utilized, due to ill-managed credit in Senegal. The endowment funds should be managed by private banks without any interference from GOS.

Before adding an agricultural extension component, the availability of human resources on the PROGES staff, GOS and NGOs must be considered. It has already been found that the NGOs now working with the Project may be over-burdened with respect to the training of trainers' responsibilities they currently are undertaking. Their funding will come directly from the Project up to the end of LBII's contract, if approved by USAID. Beyond the PACD, the GOS may or may not have the resources to allocate more extension agents to the Project zone. Because there is no cost recovery program in the Project, future funding for NGOs' activities beyond June 1995 is problematic. Unless there are substantial GOS policy changes showing a willingness to support the Project as previously agreed, the PACD date of this Project will signify that all extension and credit allocation activities will cease, and the sustainability and replicability of this and other projects initially funded by USAID and other donors will decline. In the medium term, farmers will find themselves once again in a credit rationing, inefficient environment with reduced access to inputs and capital.

3.4.2 Lessons Learned in Program I

The goal and purpose of the Project need to be revised. Village labor participation in dike construction was overly optimistic. A major lesson learned was that village labor could not be utilized as hypothesized in the PP. Hand tamping to compact each dikes is physically exhausting and time consuming, even more so considering the delays in getting dike construction underway.

Quality control in dike construction was very inefficient. The necessity to have a construction site supervisor manifested itself. Costly mistakes of Program I made it necessary

to hire and then train *conducteurs des travaux* who check and recheck the specifications of the construction works to ensure that contract standards are being met.

3.5 GOS Strategy and Private Sector Involvement in Design, Construction and Management

3.5.1 Background

The PP envisioned developing the regional services of Agriculture and Hydraulics to design and execute water management plans, while including local farmers in planning and construction activities.

The National Director of the PMU is appointed by the Ministry of Hydraulics, even if his salary is paid by USAID. Theoretically, the PMU is responsible for the planning and implementation of Project activities.

The Regional Division Chief of Agriculture and Hydraulics in Ziguinchor and in Kolda are members of the Regional Technical Committees, set in place by the Project in each of their respective Regions.

In each Region, a Regional Water Management Team (RWMT) composed of technicians is provided to the Project by the Ministry of Agriculture and Hydraulics. These Technicians while working with the Project, are under the hierarchical authority of their respective Regional Division chief. The RWMTs, in collaboration with the TA team and short-term specialists are responsible for supervising construction, developing approaches for the transfer of operations and maintenance to villages.

The Ministry of Hydraulics and the Ministry of Agriculture are members of the National Oversight Committee (Comité National de Suivi).

3.5.2 Summary of Findings, Constraints and Conclusions

Engineering design options for concrete works are made unilaterally by the contractor. The full participation of the GOS staff members working with the Project, regional representatives of technical Ministries, local administrative authorities, and leaders of rural communities) in all stages of Project implementation is indispensable for the success of the Project, its sustainability and its replicability. If the Contractor's approach to GOS involvement is not changed, the Project will collapse after the end of the TA contract, because the GOS local staff will not have sufficient financial resources to continue Project activities, unless funded by international banks (BADEA, BAD, etc.) with which the GOS is now negotiating.

The roles of the RWMTs are more visible in the supervision of construction. Regarding design options, the RWMTs' civil engineers seem to be aware of their rationale, but there is no evidence that they can influence these options. No significant assistance to villagers in issues related to Project interventions can be expected from local administrative authorities and from rural committees. Even if the political context of the Casamance is improved, the chances to mobilize rural committees' Fonds de Concours for the maintenance of infrastructures developed by the Project will be limited.

There is no evidence of direct involvement of Regional Division chiefs of Agriculture and Hydraulics in the design, construction and management activities of the Project. Also, representatives of the Ministry of Hydraulics and Agriculture are not involved in Project design, construction and management activities. The GOS administrative authorities and Rural Communities are not associated in the planning and execution of watershed control systems. As long as the GOS continues to be marginalized in the design, construction and management aspects of the Project, sustainability and replicability will remain an unsolvable issue. The role of the National Project Committee is rather to solve administrative problems than technical issues.

3.5.3 Recommendations

- The Contractor should develop an approach to effective involvement of the GOS as stated in the PP.
- USAID should plan for an interim phase between TA team departure and GOS take over. During that phase, all Project management responsibilities will be transferred to the GOS, with the TA team playing only an assistance role.

3.6 GOS Financial Contribution and Technical Support and Their Impact on Progress

3.6.1 Background

In the PP, the GOS financial contribution to the Project was expected in the following areas :

- Salaries and fixed indemnities of the GOS civil servants (fonctionnaires) provided to the Project, or sent by the Project for long-term training;
- Salaries of personnel hired under the planned GOS counterpart budget *(agents contractuels);*
- Starting Year Four of the Project, all per diem of GOS employees and operating costs of vehicles assigned to the RWMTs become the GOS responsibilities;
- Operating expenses for the RWMT headquarters;
- Resources for dike construction through the Rural Communities' Fonds de Concours;
- Village unpaid labor to be used in construction works;
- GOS technical support was mainly anticipated from agents of the Ministries of Agriculture and Hydraulics working within RWMTs, from Regional Division chiefs of Agriculture and Hydraulics, and from ISRA researchers.

3.6.2 Summary of Findings, Constraints and Conclusions

Contrary to what was envisioned in the PP, the National Director of the PMU is paid by USAID. The GOS only pays for his fixed indemnities due to his responsibilities (indemnité de sujétion). Since the National Director represents the interest of GOS in the Project, it would have been more ethically appropriate for GOS to pay his salary so that he would be more accountable to the GOS.

In 1993, the GOS financial contribution to the Project (Civil servants' salaries not included) initially budgeted at 39 million FCFA, was reduced to 33 million in August 1993, while the Project had already committed 34 million FCFA. The personnel working for the Project and those who are paid by the GOS include 9 civil servants and 16 agents. In addition, the GOS continues to pay the salaries of the two civil servants sent to long-term training in the U.S. As a result of budget cuts, the fixed indemnities of the civil servants and the salaries of the personnel hired under the GOS counterpart contracts were not paid from August 1993 until January 1994. During that period, the GOS contractuals relied entirely on the per diem paid by LBII to partially compensate for this loss of earnings. Among the contractuals, many are not supposed to travel for business purposes, and therefore, do not have access to the per diem. In cases where GOS contractuals rely entirely on LBII per diem, there is a risk that they will multiply unjustified field trips. This could increase the pressure on Project resources. LBII now pays per diem to GOS personnel and operating costs for vehicles assigned to RWMTs, despite the fact that these charges should have been transferred to the GOS in June 1991. However, these requirements of GOS responsibilities were waived by a grant agreement amendment.

The RWMT, and in particular the civil engineers, and rural animators *(agro-vulgarisateurs)* have made a valuable contribution to Project activities. The assessment of village requests, the formation of VWMCs, the sensitization of villagers and their mobilization and involvement in construction works are activities entirely - and in some cases with NGO assistance - under the responsibility of the RWMT animation and extension specialists. The RWMT civil engineers are entirely assuming the role of supervision of the construction works. The TA experts are effectively assisted by their Senegalese counterparts, but the GOS technical support through RWMT agents to the Project is less than expected.

3.6.3 Recommendations

- Because there is a serious doubt about the GOS' capacity to take additional financial charges, USAID should continue to pay the per diem for all Project personnel and operating costs for all Project vehicles during the life of the Project to ensure adequate performance. USAID should raise, as a top priority issue, the need to have the GOS assure the regular and timely payment of salaries and fixed indemnities for the contractual personnel the GOS has provided to the Project.

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4. WATER CONTROL AND MANAGEMENT

4.1 On Achievement of Purpose and Outputs

4.1.1 Inconsistencies of the PP.

a. On **average** increase in rice yields.

There are inconsistencies on average yield increase expectations in the PP. On page vii of the executive summary of the PP and page 2 of the PP document itself, it is stated "Estimates are that the average yields of paddy rice will increase from current average levels of .5-.8 tons/ha *to* 1.8-2.3 tons/ha, meaning an increase of about 1.4 tons/ha". (Italics added). On page ix of the executive summary and page 4 of the PP, one reads "the improved water control and utilization will lead...*to average increases* in rice production *of* 1.8 metric tons per hectare..." These inconsistencies reappear in REDSO/WCA/Senegal 89-015 "Statement of Work" on pages 11 and 12. This apparently minor difference of 0.4 ton/ha is not unimportant because it would lead to a difference of 6,000 tons of paddy rice, down from an expected output of 81,000 tons to 75,000 tons by 1999, with an incremental yield of only 21,000 tons. The Internal Rate of Return (IRR) was calculated on an *increase* in yield *OF* 1.8 tons/ha, and this is the figure which has been retained in the Logframe, and also by the evaluation team.

b. On **potential** yield increases

The CNS *(Comité National de Suivi)* document of December 1993 reports an average yield of 2.7-2.8 tons/ha in the demonstration plots of 1992. Figures for 1993 activities report a wide range from 275 kg/ha to 5092 kg/ha. These wide differences are attributable to varieties and, more importantly, to water insufficiency and pedological factors. Taking an average of these yields would not be too meaningful, except to serve as a basis for a reasoned assumption of potential yield increment as discussed later in Section 6. Nonetheless, they show potential in substantial yields under good water management, improved soil conditions, and the use of agricultural inputs. Tom Zalla's 1992 report (from various sources) puts the average yield in the Sédhiou area to 1.2 tons/ha. The evidence collected by this evaluation team puts the baseline yield figure at 900 kg/ha. Throughout the Casamance area, the average figure would more likely be 700 kg/ha when one considers that unreclaimed lands are not productive at all. The PP assumption that an average increase in yield by 1.8 tons/ha would therefore have been achievable, but only if :

(i) The same total agronomic package is adopted over the entire area of 15,000 hectares in 1999;

(ii) All the lands on 10,000 hectares have been reclaimed from salinity and excess acidity has been corrected;

(iii) All the lands on 5,000 hectares have been improved by water retention dikes with good water control management, maintenance and operation.

These three above assumptions do not hold.

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4.1.2 Summary of Findings, Constraints and Conclusions

Scientific data over the years have shown that farmers' average yields are about 70% of relatively small demonstration plot yields, provided the same agronomic package is utilized. It follows that to obtain an average increase in yield of 1.8 tons/ha in the Sédhiou area, the demonstration plot yields should reach 4.2-4.3 tons/ha if the baseline yield data of 1.2 tons/ha as reported by Zalla is correct. But the evaluation team's baseline average yield data is only 700 kg/ha. Thus, the demonstration plot yields would be acceptable to confirm the PP's estimation if they reach an average yield of 3.6 tons/ha, i.e., 70% of 3.6 tons/ha minus 0.7 tons/ha = 1.82 tons/ha.

On the positive side of the equation, if 10,000 hectares represent the area that is uncultivable without reclamation, then any yield obtained on these lands would represent a net increase above zero. If yields in those reclaimed areas average 2 tons/ha, then the increase on the remaining 5,000 hectares need not be higher than 2.3 tons/ha to achieve the goal output of an average increase of 1.8 tons/ha. Thus the demonstration plot yields in reclaimed lands, where no rice is currently grown, 2.6 tons/ha or higher would be considered satisfactory. In lands which are now being cultivated, the demonstration plot yields should be 3.3 - 3.6 tons/ha. This may be achievable as a result of a good agronomic package in three to four years after further soil improvement, which was grossly neglected for the past two decades. The results of demonstration plot yields, without pedological and water shortage problems, averaged 3.3 tons/ha in the 1993 program. This is very encouraging. Assuming that rice yields in farmers' fields attain 70% of those obtained in the demonstration plots, an average increase of 1.8 tons/ha is achievable.

An agricultural component, comprising extension, input availability and credit, is essential before the goal of increased rice production in the Casamance can be attained. The case of Nguindir, which with the assistance of the NGO, ADIF, was successful in obtaining credit from the CNCAS/Sédhiou after qualifying as a GIE, is exceptional given that the local NGO coordinator intervening in the village participation also works as a consultant to PRIMOCA, and was able to obtain access to credit for the village on easy terms. In addition, villager participation in the Projet Bananier has earned them relatively high incomes from the marketing of bananas to the Dakar region. These farmers are far better placed to invest in rice production than the average farmer in the region.

HOWEVER, there is no indication that ALL of the farmers will have automatically adopted the agronomic package of the demonstration plots by 1999. Although farmers might be impressed by yield results of their relatively well-to-do neighbors who might have adopted the agronomic package, they might not be able to emulate because credit facilities do not exist at present. Availability of fertilizers upon demand in the Casamance area is essential, and support from the private sector to provide these services is necessary in the near-term. The Project does not have a component for substantial agricultural and sociological extension services which are needed to achieve these objectives. Without this component, the achievement of the goal of the PP is utopic.

Notwithstanding the above, all farmers will not avail themselves of the opportunities, even if presented to them, for a variety of reasons. A percentage, scaling upwards to an assumed maximum of 90%, will have to be factored in the IRR analyses.

Also, it is intended for the Project to develop an improved system for water management that increases the capacity of the regional governments to implement sound and appropriate water control infrastructures to increase productive areas.

4.1.3 Recommendations

- The Project should make every effort to increase the percentage of reclaimed lands, because this would allow rice planting where none exists. Also, any production in those reclaimed lands would represent a net increase in yields. The Project should recommend the increasing use of optimal agricultural inputs corresponding to the degree of desalinization, and according to the extent water control management is being accomplished.

- Project intervention should result in an improvement in the ability of the GOS Technical ministries to provide water management infrastructures that improve approximately 2,300 hectares per year.

4.2 Planned Outputs v/s Current Achievements

4.2.1 Water Management Plans

Water management plans for 60 sites on a small watershed basis are to be produced by the Project. According to the logframe, the Project is to provide 60 valley plans to be completed by 1999. The Project will work in seven to ten new valleys each year to improve 2,300 hectares per year.

As of December 1993, the Project has recovered a little over 7% of the estimated 15,000 hectares anticipated in the PP by 1999. This assumption made during the Project design, was overly optimistic because it did no take into account that the SOMIVAC projects (PIDAC in Ziguinchor, PRS in Sédhiou) were winding down and both improved inputs and agricultural credit were mostly unavailable.

PROGES has also developed enough plans for 14 valleys[3]. For Program I, eight dikes (4+4) were built in 2 valleys to increase the number of and recoverable hectares to 1087[4] (average of 135 ha/dike). For Program II, 16 dikes (5+5+6) were required to improve 1,470 hectares (average of 92 ha/dike). The plans for 3 valleys of Bignona which were prepared for Program II, but now are part of Program III, require 9 dikes (2+3+4) to control 1,623 hectares (average 180 ha/dike). The more recent plans designed for Program III show only 7 dikes, 1 anti-salt dike for each of the 6 valleys plus 1 water retention dike for Bougnadou. These 7 dikes will have a beneficial effect on an estimated 2,210 hectares (average of 315 ha/dike built), but these 2,210 hectares include 605 hectares of *superficie pluviale à nappe* which were not counted in

[3]Source CNS Report of 12/93.

[4]This figure has been increased from 747 hectares (CNS Report, December 1993) to 1087 hectares as communicated by PROGES in January 1994.

Programs I and II. The addition of a large water retention dike (3-meter crest) in Segafoula valley is now under study.

4.2.2 Cost of Dikes and hectares improved[5]

TABLE 3
CONSTRUCTION OF DIKES: COST AND HECTARES TO BE IMPROVED (Through Dec 18 '93)

	Dikes	Hectares Improved	Cost M CFA	Cost/Ha/[6] 1000 CFA	Cost/dike M CFA
Program I	8	1087	156.6	144.0	19.58
Program II (Sédhiou)	16	1470	264.0	179.6	16.50
Program II (Bignona)	9	1623	145.0	89.3	16.1
Program III	7	2210	194.0	87.8	27.7
Program III[7]	7	1490	194.0	130.2	27.7

Table 3 clearly demonstrates that when one compares like with like, the cost/ha has not decreased from 200,000 CFA in Program I to 100,000 CFA/ha in Program III, as stated on page 13 of the CNS report, but the cost/dike has increased substantially in Program III. This may be due to an increase in the average length of the 7 dikes in Program III compared to Programs I and II, because the dike structure remains almost the same. These costs, however, do not include the cost of several relatively smaller (30 cm wide, 60 cm high) water retention dikes which must be built in the valleys of Program III to obtain the desired hectarage, nor is the number known at this time, especially in the valley of Ségafoula where 1 anti-salt dike is supposed to control 847.7 ha. The topographical information needed to measure the hectarage in Program III also differs from those in Program I, and the percentage of error in the former may well be higher than 10% because of its inaccuracy. The change in technique was attributed to the high costs incurred for accurate topographical information, and the Project has only two topographers at its disposal to do all the valleys.

[5]Source CNS Report of December 1993. Figures differ somewhat from those of Tables 4, 5, 6 and 7 below which show revised figures provided by PROGES in January 1994.

[6]Figures for cost/ha in Table VII of the 1993 CNS report differ from those of the Table above because PROGES used the average of the means, and the evaluation team used the true mean.

[7]In this row, the evaluation team excluded the area under "superficie pluviale à nappe." This permits a true comparison between Programs I and II on the one hand and Program III on the other

The costs per dike and per valley, and the number of hectares controlled in each valley, are of primary importance in this analysis. The recently revised costs per dike and per valley, including small dikes *(diguettes de rétention)*, for Program I, II and III are summarized in Tables 4, 5, 6 and 7. The number of hectares to be reclaimed or to be improved is shown in Table 8.

TABLE 4
PROGRAM I - COST PER DIKE AND PER VALLEY (Cost in 000 FCFA)

Valleys	Number of Large Dikes	Cost of Large Dikes	Cost of Small Dikes	Cost of Contour Berms	Total Cost
Mayor	1	6342		n/a	6342
	1	12927	990	n/a	13917
	1	16030		n/a	16030
	1	12744		n/a	12744
Total	4				49033
Nguindir	1	42463	540	n/a	43003
	1	30299			30299
	1	16198			16198
	1				19076
Total	4				108576
TOTAL: PROGRAM I	8				157609

Cost per dike in Program I		= 17,125,000 FCFA
Cost per dike/valley:	MAYOR	= 12,258,000 FCFA
	NGUINDIR	= 27,144,000 FCFA

TABLE 5
PROGRAM II - COST PER DIKE AND PER VALLEY (Cost in 000 FCFA) Sédhiou

Valleys	Number of Large Dikes	Cost of Large Dikes	Cost of Small Dikes	Cost of Contour Berms	Total Cost
KANDION MANGANA	1	15542	0	360	15902
	1	16530	0	n/a	16530
	1	13752	0	n/a	13752
	1	11379	0	n/a	11379
	1	6896	0	n/a	6896
	1	8404	0	n/a	8404
	6				72863
KANDION DIOE	1	30090	0	450	30540
	1	34274	0	n/a	34274
	1	11197	0	n/a	11197
	1	5741	0	n/a	5741
	1	1755	0	n/a	1755
	5				83507
BADOBAR	1	61284	0	900	62184
	1	11583	0	n/a	11583
	1	21208	0	n/a	21208
	1	17104	0	n/a	17104
	1	7601	0	n/a	7601
	5				119680
TOTAL PROGRAM II Sédhiou	16				**276050**

Cost per dike in Program II (Sédhiou) = 17,129,000 FCFA

Cost per dike/valley:		
	KADION MANGANA	= 12,144,000 FCFA
	KOUMINDING DIOE	= 16,701,000 FCFA
	BADOBAR	= 23,936,000 FCFA

TABLE 6
PROGRAM II - COST PER DIKE AND PER VALLEY (Cost in 000 FCFA) BIGNONA

Valleys	Number of Large Dikes	Cost of Large Dikes	Cost of Small Dikes	Cost of Contour Berms	Total Cost
DJIMANDE	1	16695	15000	0	31695
	1	14504	-	-	14504
Total	2				45749
BALINGOR	1	51666	5250	0	56916
	1	28430	-	-	28430
Total	2				85346
DIATANG	1	19006	7125	0	26131
	1	27981	-	-	27981
	2				54112
TOTAL BIGNONA	6				185207
Cost per dike in Program II (BIGNONA)				= 26,380,000 FCFA	
Cost per dike/valley:		DJIMANDE		= 15,600,000 FCFA	
		BALINGOR		= 40,048,000 FCFA	
		DIATANG		= 23,494,000 FCFA	

TABLE 7
PROGRAM III - COST PER DIKE AND PER VALLEY (Cost in 000 FCFA) Sédhiou

Valleys	Number of Large Dikes	Cost of Large Dikes	Cost of Small Dikes	Cost of Contour Berms	Total Cost
BONA	1	45876	7500	495	53871
MADINA FINDIFETTO	1	30397	2700	666	33763
BOUGNADOU	1 1 2	17372 19798	10725	526	28623 17798
SEGAFOULA[8]	1 ?	38806 ?	49350	544	88700 ?
TONIATABA	1	28041	11100	382	39523
TOTAL Sédhiou	>7				>281870
Cost per dike in Program II (Sédhiou)			= 27,193,000 FCFA		
Cost per dike/valley:	BONA TALITO MADINA F. BOUGNADOU SEGAFOULA TONIATABA		= 45,876,000 FCFA = 30,397,000 FCFA = 10,059,000 FCFA = 18,585,000 FCFA = 38,806,000 FCFA = 28,041,000 FCFA		

[8]Plans for Segafoula are incomplete. There is a strong possibility that an additional large water retention dike will have to be built.

TABLE 8
PROGRAM I, II, III - HECTARES CONTROLLED

Valleys	Hectares Reclaimed	Hectares Improved		
	Anti-salt Large Dike	Flooded by Dikes	Contour Berms	Total
Mayor	9	188	220	417
Nguindir	210	340	120	670
Total Program I	219	528	340	1087
Kandion M.	110	200	80	390
Badobar	300	500	200	1000
K. Dioe	120	240	100	460
Total Program II (Sédhiou)	530	940	380	1850
Balingor	355	215	0	570
Djimande	282	601	0	883
Diatang	20	150	0	170
Total Program II (Bignona)	657	966	0	1623
Bona	139	147	110	396
Talito	37	68	148	253
Madina F.	7	105	24	136
Bougnadou	53	151	117	321
Toniataba	36	139	85	260
Segafoula	38	688	121	847
*Segafoula**	(538)?	688	121	
Total Program III	310	123	1184	1617
Grand Total	1716	2557	1904	6177

* *Potential if anti-salt dike site is moved further down the valley. This is still under study by PROGES, but 500 additional hectares is an overstatement from this evaluation team's viewpoint.*

4.2.3 Proportion of land recovered in the valleys

As mentioned in the "Rapport d'activités au 31 octobre 1993" prepared by the SZWMP for the Comité National de Suivi (Table VII page 14), in the valleys developed (Program I and Program II-Sédhiou), or planned (Program II-Bignona and Program III), the area recoverable is consistently low compared to the area cultivated and in which water management will be improved.

In the PP, it is estimated that of the 15,000 hectares of rice land that will be reclaimed and/or in which water management will be improved, 2/3 of the area (10,000 ha) will be reclaimed. Improvement of water management will concern 1/3 of the developed valley, i.e. 5,000 ha.

If the proportion of reclaimed land is low, the impact projected in terms of increase in rice production will be proportionately lower. To illustrate this, if one assumes for example that the average yields are 600 kg/ha in farmed land before Project intervention and 0 kg/ha in unreclaimed but recoverable land, and 1000 kg/ha in all recovered/improved land after Project intervention, then the increases in rice production attributable to the Project will be 400 kg/ha in areas which were under cultivation before the Project, and 1000 kg/ha in areas that would have been reclaimed. This issue has been taken into account in the IRR Project analysis.

4.2.4 Number of valleys and area control

Citing the *Etat d'exécution des recommandations issues de la première session de la gestion 1992/1993"* of CNS, PROGES estimated that it was possible to improve 15,000 hectares with less than 60 valleys because the total area under control in the six valleys of Program II is 3,400 ha, and that exceeds the expected annual objective of 1,500 ha.

First, the figures show that the sum of the area as shown in the CNS report is 3,093 hectares and not 3,400 ha. This 3,093hectaresrepresent 1,470 hectares of Program II that is almost completed, and 1623 hectares in Program III (3 valleys in Bignona of Program II) for which construction bids were issued in mid-December 1993. Construction of these 9 dikes will be implemented in 1994.

Second, the stated annual objective of 1,500 hectares is not correct. The PP's objective is to improve 15,000 hectares during the LOP of ten years. One cannot divide 15,000 by 10 to come up with an annual figure of 1,500 hectares because it does not make sense. In any project, even if the TA team works diligently and as expected, there is always a lag phase, and the PP recognized that because its annual figure is 2,300 hectares and not 1,500 ha.

Third, the number of hectares that can be improved is directly related to the topography of the valleys. In the six valleys of Sédhiou in Program III for example, the number of hectares is 2,210 when the "superficie pluviale à nappe" is included, and 1,605 hectares if it is excluded.

Fourth, the PROGES program has suffered delays due to staff inadequacies on LBII part, which are separate from the significant delays related to the insurgence. USAID also shares responsibility for the delayed start-up, because it was slow to approve the nominated TA Civil Engineer, who then accepted another position. Also, the first GOS-nominated National Director did not meet USAID's and the Project's performance expectations, and the replacement process was prolonged.

At present, the Project has partially completed work in five valleys, with approximately 1,141 hectares planted in rice, of which 1,044 are irrigated rice. Therefore, with 18 months remaining before the PACD, less than 7% of the 15,000 hectares of irrigated rice envisaged for 1999 have been achieved. (And this may indeed be over-estimated because it assumes that no rice was cultivated in the valleys before the Project. Because no baseline data was collected on

rice cultivated areas before the Project intervention in the Phase I and Phase II valleys, only unsubstantiated assumptions can be made.)

Preliminary estimates from the PROGES-financed survey undertaken by the Inspection Régionale (IR) de L'Agriculture à Ziguinchor of area cultivated and yields in the five Program I and II valleys for the present agricultural season, indicate that on average 78% of the area available for rice production was cultivated, although for some valleys, the area actually cultivated in rice was far less than that available, as presented in Table 9 below.

TABLE 9
AREA CULTIVATED IN RICE FOR THE 5 PROGES VALLEYS-1993

Valley	Area Cultivated Rice - 1993 (ha)	Total Area Available	% of Total
Kandion-Mangana	88	200	44
Mayor	100	188	53
Kounouding	183	340	54
Badobar	593	624	95
TOTAL	1141	1468	78

The reasons for the relatively low percentage of area cultivated in 4 of the 5 valleys are unknown at present, but could be a result of a multitude of factors including lack of seeds, shortage of labor, or an unfamiliarity with appropriate technologies. (Note that all 5 valleys are in Moyenne Casamance, which has far less of a rice-cultivating tradition than the Basse Casamance or Ziguinchor Region).

4.2.5 Summary of Findings, Constraints and Conclusions

The slow start in water management plans, which resulted from LBII and GOS staff changes, USAID's delay in approving the nominated Contractor's Civil Engineer, and the local insurgence, greatly increased the Project's lag phase. However, during the past one and half years, the impetus generated by the new Chief of Party has increased the rate of implementation.

The cost per valley is a function of number and size of dikes, and both are influenced by the topography of the valley. The number of hectares falling under the control of the structures is also dependent on the valley's topography.

The proportion of land reclaimed thus far is only 1/3 of total valley lands compared to 2/3 improved, the inverse of what the PP conceived.

The number of hectares controlled, rather than the number of valleys, is more important to achieve the goal of the Project, which is to increase rice and cereal production.

4.2.6 Recommendations

- Water management plans should not exceed 27 valleys, if the PACD date remains June 1996, because LBII will not be able to complete construction in more valleys. If the LBII contract is extended to June 1996 and the PACD to June 1997, then water management plans for 35 valleys should be the target.

- Greater importance should be given to the valleys' topography prior to selection, which would lead to construction by cost per hectare, since it is the number of hectares and not the number of valleys that are primary to achieve the Project's goal.

- Because the highest "increase" in yield will ultimately occur in reclaimed lands than on improved lands, PROGES should make a greater effort to attain at least a 1:1 ratio. In addition, one of the main objectives of the Project is to reclaim lands and this objective should be achieved to the maximum.

- If a choice has to be made regarding the number of valleys and the number of hectares controlled, PROGES should give priority to the latter.

4.3 Procedural Selection of Valleys and Sites Selection

An assessment of the construction of the 24 dikes already built, or in process of being built, in the 5 valleys of Program I and II has been conducted.

4.3.1 Appropriateness of valleys and sites.

a. Selection of valleys

The selection of valleys is an important process that is guided by agro-pedology, topography, sociological and cost factors. In the PP design, the ratio of reclaimed land to improved land was set at 2:1, since the number of reclaimed hectares by 1999 would reach 10,000 hectares while improved land would be 5,000 hectares. As discussed in this section, this ratio has an important bearing on the goal of the Project in terms of increased rice production. Therefore, keeping this ratio as high as possible should be an additional criterion in the selection process. Whenever possible, and only as a guide, this ratio should preferably be not less than 1:1, although it is recognized that this might be difficult to accomplish in some valleys.

b. Site selection

For the selection of sites to be developed, three criteria were taken into account: (i) sociological factors (ii) agro-pedology, and (iii) criteria relating to rural engineering which were respectively assigned 30, 30 and 40 points to form a maximum of 100 points in the selection procedure. However, in view of the various sites which were selected in Program I, it seems that this approach was not adopted.

Detailed topographical surveys and preparation of contour maps were carried out in Program I valleys (Mayor and Nguindir). Because of the high cost of preparing detailed contour maps, only point line surveys and transects were prepared for Program II valleys.

The PP emphasized that the valleys and sites selection should be made according to the wishes of the valley population. No dike would be constructed in any valley unless prior approval from the population was obtained. Actually, it appears that valley selection was weighted towards the populations wishes, to the point that some dikes built were not technically suitable to the sites.

c. Dike sites

The selection of dike sites in the valleys must be guided primarily by technical considerations and override the desire of the population if those dike constructions are not cost-effective. An example is the anti-salt dike in Mayor Kandialon which was built 220 meters downstream from a water retention dike constructed earlier. This dike is not cost effective as it reclaims a relatively small area. The cost of this work amounted to 12,927,354 FCFA[9]. It is important to note that the technical decisions concerning the construction of the Mayor-Kandialon dike were made by the GOS engineering staff during a period when there was no LBII water resources engineer.

In Barandama, it was not necessary to build the hillside impounding dike since the rectilinear spillway could be directly connected to an existing drain (length 2.01 m, height 1.92 m) under the No.4 National Road, capable of evacuating a decennial flow. Approval from the Ministry of Public Works would have been necessary, however no request was ever made by PROGES because it was assumed that the Ministry would refuse. The construction of this dike might not have been necessary had the Project requested permission from the Ministry of Public Works to use the Route Nationale. This dike cost the Project 6,955,578 FCFA.

4.3.2 Appropriateness of type and size of dikes

These issues have been debated at length between the evaluation team and the staff of PROGES.

The height of the anti-salt dike depends on the maximum height of the tide. Those of the large water retention dikes must necessarily correspond with the quantity of water needed for rice growing (0.4 - 0.5 m). Therefore, this dimension is imposed and cannot vary in any particular site. It follows that only the top width of the dam is the modifiable element.

If the dike must necessarily be used as a passage-way for people and vehicles, a 3-meter crest becomes essential. However, this Project is not supposed to build roads unless dike construction at a particular site led to the destruction of an existing road. If the dike is not used as a passage-way, then a 1-meter crest could reduce the earthworks cost by a margin of about 30%. Unfortunately, this last assumption implies a certain number of problems including :

[9]Source - PROGES 2nd CNS Report, 1991/92.

- Difficulties for medium size equipment to obtain the required compactness rate (95% ± 2% of the modified Proctor optimum);

- Impossibility for heavy vehicles to construct the embankments since the breadth of most of them varies between 2.3 and 3 meters;

- Increased duration of earthworks resulting in construction periods covering two seasons, due to hiatus during the rainy season; and

- Stability of the dike in relation to infiltration problems.

A 1-meter crest dike was effectively built in Mayor. However, because of extreme difficulties during construction, the 1-meter crest dike built in Mayor cannot be repeated. The 3-meter dike has to remain the norm despite its cost until an alternative design is proposed. However, it is strongly suggested that for future construction, those 3-meter dikes be mostly anti-salt dikes. Water retention dikes should be smaller structures (diguettes de retention: 30 cm crest, 60-70 cm high) as already discussed. However, the cost of building those "diguettes de retention" should be much lower than the 3-meter crest dikes because their longevity would be much shorter. The cost of building those "diguettes" was still unknown during this evaluation. In some cases, it would be wiser, although more costly, to build the 3-meter crest structure as water retention dikes. USAID should refrain from opposing the decisions of the Project engineers unless their approach in dike building is found unsuitable by independent and competent civil engineers.

4.3.3 Village groups' participation and capabilities in dike construction

The Village Groups' participation and dike construction capabilities and the implication of their projected and effective roles in Project cost, timing and sustainability is discussed in detail in Section 9, Sociological Aspects.

One major objective of encouraging village groups' participation in dike building is to reduce the construction costs of the water control systems. The other objectives, which are not as explicitly stated in the PP as in Project document are:

- develop among villagers a sense of ownership of infrastructures; and

- familiarize populations with these infrastructures in order to facilitate the transfer of operations and maintenance functions to the beneficiaries.

The areas where the PP anticipated populations' participation in the construction works are the spreading and compacting the fill for the dikes. In addition to these tasks, the Project requires that villagers take charge of clearing dike sites, collecting rocks and placing them on the banks of the dikes, and building small regulation dikes and contour berms.

4.3.4 Summary of Findings, Constraints and Conclusions

As of December 1993, construction of dikes will have improved a little over 15% of the 15,000 hectares anticipated in the PP. Delays were due to a slow start in construction

activities, several changes in the Project staff, including the Chief of Party twice, and more importantly the insecurity caused by the separatist movement that also hampered construction work. LBII did react appropriately to replace its staff despite the difficulty of locating qualified French-speaking professional willing to work in an uncertain environment. The delays caused by the insurgence were unavoidable.

The cost of detailed topographical surveys and dike construction are substantially higher than what was envisaged in the PP. The size of the dikes are larger than planned in the PP. However, the construction of these 1-meter crest dikes is extremely difficult, and any one such dike would take at least two years to build because work cannot be continued during the *hivernage*. Therefore, the construction of the 3-meter crest dikes now being designed and constructed has to be continued, especially for anti-salt dikes.

The average cost per dike has not decreased as indicated in the CNS report of 1992/93, but the cost per hectare has substantially decreased. It is difficult to reduce costs without sacrificing quality. The cost per hectare is also related to the topography of the valleys. Because cost reduction in dike construction can only be minimal (about 10%) and the most important factor is the number of hectares controlled, valley selection that increases the number of hectares to be reclaimed or improved is of primary importance.

The potential for yield increases is higher in reclaimed than in improved lands. The PP estimated that 2/3 of the land would be reclaimed and 1/3 improved. This proportion is currently the reverse, which makes it more difficult to achieve the PP's goal with an agricultural component added, unless the total number of hectares is increased. Also, the proportion of reclaimable land in any valley may be limited by salty and/or acidic conditions of the soil. However, it might be possible to increase the ratio of reclaimed to improved lands from the current 1:2 to 1:1. Efforts should be made in this direction.

In cases where villagers participated in dike building activities, the contribution by women was very significant. The data collected by the Project on this issue are not comprehensive nor well organized to permit a quantitative estimation. A comprehensive study is needed to assess precisely the level of involvement by women in the design, construction and maintenance of infrastructures.

4.3.5 Recommendations

- Give more time to PROGES to catch up on construction activities, now that substantial progress has been made.

- Since the anti-salt dikes must have a 3-meter crest, making them expensive, an effort should be made to construct smaller dikes and contour berms for water retention whenever possible. A greater effort in cost-cutting measures in dike design should be made by LBII.

- More attention should be devoted to the pedological surveys and to the topography in the selection of valleys. Site selection of the anti-salt dikes could also increase this ratio, as would be the case in Segafoula valley, where moving the anti-salt dike farther down the valley is being considered.

4.4 Construction Plans for Program II and III

4.4.1 Site Selection

Site selection for dikes in the second half of Program II and all of Program III was mainly based on technical criteria, such as agro-pedology and topography, to determine the most appropriate location of the dams (minimal length), as well as shallow the areas to be developed for rice growing. Sociological aspects were included in Program I, but have been reduced to improve the cost-effectiveness of construction. An appropriate methodology was carefully studied and adopted for the elaboration of preliminary project summaries in order to correct the weaknesses in Program I and of part of Program II.

4.4.2 Engineering designs

Standard designs were computed to dimension dikes according to decennial floods (Q_{10}). However, they did not take into account the laminar effects which could reduce further construction costs. Unlike Program I and the first half of Program II where 24 dikes were built in 5 valleys, the second half of Program II in Bignona consist of 9 dikes for 3 valleys. In the 6 valleys of Program III, one anti-salt dike will be built in each valley and only one large water retention dike will be constructed in Bougnadou, and possibly another one in Segafoula. It must be stressed that a number (still unknown) of smaller water retention dikes and/or contour berms will have to be built in those valleys to achieve good water control management.

4.4.3 Structure types

The same two types of structures as in Program I were adopted again for Program II and III. They are either rectilinear spillways for anti-salt and water retention dikes which do not easily permit people and animal crossing, or Giraudet spillways combined with nozzled passage ways and these dikes with a 3-meter crest are effectively used as roads, even for heavy trucks.

4.4.4 Quality of designs, construction and O & M

Lessons learned in Program I

a. On cost-effectiveness

In Program I, the 25-year recurrence flood (Q_{25}) was used to establish the dimensions of the dikes. In Program II, a decennial flow of Q_{10} was appropriately used to reduce cost. However, in the design of all dikes, the laminar flow has not been included in the calculation for maximum Q_{10} flow. This would have reduced the size of the spillways and their cost. If a decennial flow (Q_{10}) had been used in Program I, the Project could have saved the cost of 3 lines of nozzles and 34 linear meters of spillway in Nguindir and 2 linear meters of submergible aprons in Mayor.

The selection of dike sites was not always fully studied for cost-effectiveness. The submergible aprons (radier submersible) were built downstream from the rectilinear spillways at the level of Mayor Kandialon anti-salt and water retention dikes to allow people and animal crossing. These constructions were inappropriate and costly. Moreover, the bridge which is on

the water retention dike is being rebuilt for 1 million FCFA due to the excessive incline (16%) of the passage-way from an initial misinterpretation of topographical data or an error in the preparation of those data. It is also obvious that construction site supervision was lacking and such an error should have been detected before the cement was poured.

On almost all civil engineering works carried out in the five valleys of Program I and II, the following observations were made:

- Defective bulkheads because of tightness problems and gate control obstructions caused by the poor quality of building materials;
- The gate control wooden traps already have substantial leaks in most dikes, which are difficult to lift. Plastic or treated iron gate valves that have a crank-hoisting design to provide leverage should be used;
- Rubber seals must be affixed on all slides;
- Spillway walls are not rectilinear and their thickness varies. A good quality casing wood must be used as well as a sufficient number of props.

b. Embankment protection

Initially, both the upstream and downstream embankments of the dikes were to be protected with ashlars (*moëllons*) and grass according to the type of the dike. This rule was applied in certain cases (e.g. Mayor Kandialon anti-salt dike). However, for economical reasons, only the embankment on the downstream side of the other retention dikes are protected with ashlars, although both sides of the anti-salt dikes continue to be covered.

The operation and maintenance of the dikes when they start to deteriorate will be performed by the local population who have formed VWMCs for that purpose. They benefit from training programs financed and carried out by the Project, but their working capital has to be funded by a revolving fund, equivalent to 2% of construction costs, which the village committees themselves would have raised.

4.4.5 Summary of Findings, Constraints, Conclusions

In Program I, there was much hesitation in the selection of sites and types of structure. Thus, many mistakes were made in Mayor :

- Barandama hillside impounding dike where the embankment was not necessary;
- The Mayor-Kandialon anti-salt dike where the number of hectares reclaimed did not justify the investment; and
- The Mayor-Kandialon submergible aprons were not adapted structures.

In Program II, the dike dimensions were improved (Q_{10} instead of Q_{25}) and their sites were more appropriately selected.

In Program III, more significant progress was made :

- Use of aerial photographs associated with topographical data to localize the most favorable sites and
- Computerization of cubature calculations relating to earthworks as well as excavation, and reinforced concrete volumes and quantities of iron needed for civil engineering structures.

4.4.6 Recommendations

In general, dikes are very well constructed even though some technical faults were observed, e.g. leakages in the Kandialon-Sedeck anti-salt dam in Mayor, and in Beila water retention dike in Badobar. Practical measures should be adopted at the time embankments are constructed on former waterways. Connections between dikes and governing structures must be carefully made. The casting of concrete structures must be improved to make them rectilinear with a homogeneous thickness.

4.5 Private Sector Involvement

4.5.1 The policy of PROGES

PROGES' policy consists of training and promoting private businesses in the regions of Ziguinchor and Kolda to enhance their participation in the construction of valley development structures (dikes and civil engineering structures). Generally, local companies do not have much experience in the construction of agricultural structures and lack the financial resources necessary purchase expensive equipment. Most are compelled to rent the heavy equipment, or subcontract with large companies based in Dakar, to carry out the earthworks. This situation does not facilitate the timely execution of the works planned (case of the NCO Bagher Company in Kandian Magana valley). In addition, one company has defaulted and their contracts canceled. PROGES is making a substantial effort to help the local private sector develop construction capabilities, as mandated in the PP. Dike building could have been much quicker if larger firms were involved. There is evidence that private construction firms are making progress, albeit at a slow pace. which is nonetheless encouraging.

4.5.2 Equipment purchase

The question was raised as to whether PROGES could purchase heavy equipment to be rented or made available to local private companies on a lease agreement. It was also suggested that PROGES could establish a credit system which would allow private companies to purchase heavy equipment.

PROGES is not a financial institution. Heavy machines like these are very exp have a depreciation period of ten years, which exceeds the current PACD. In additior companies would not be able to reimburse a large loan before PACD (1996).

4.5.3 Cost reduction

On a per hectares basis, cost reduction would be achievable by selecting valleys, using a weighted criterion during the selection phase, whose topography would permit the building of only one 3-meter crest dike, which would be **the** anti-salt dike. The necessity of building additional water retention dikes with crests of 3 meters should be avoided as much as possible. Instead, water retention control structures such as contour berms or smaller and cheaper dikes with a crest 30-40 cm wide and a height of about 60-70 cm, could be built using the services of local construction firms and the local population. The number of those dikes per valley would depend on the slope of the valleys. The designs would also be carried out by private, local firms, initially with the help of PROGES. In so doing, it must be recognized that the negative side is the shorter life of these small dikes. The cost-effectiveness of these *"diguettes de rétention"* relative to the 3-meter crest dikes should be thoroughly studied by qualified engineers.

In addition, the contour berms would be constructed where necessary by the local population with the help of tractor services initially through PROGES, and subsequently by local firms after they would have built up the necessary capacity to perform. This would help in replicability and sustainability, since external funding would most probably be required for only the anti-salt and large water retention dikes. At the same time, the construction of smaller dikes would stimulate development of the local private sector, and building costs could be at an affordable level for the local population. Credit facilities, whatever its origin but preferably from private banks or donors establishing an imprest account or an endowment fund, would certainly help the process. PL 480 funding should also be considered in this connection.

4.5.4 Summary of Findings, Constraints and Conclusions

PROGES' policy is enhancing the capacity of the private sector in dike construction. Two of these companies have defaulted because of weak financing and inexperience. This is a learning process that the private sector has to go through.

4.5.5 Recommendations

PROGES should neither purchase heavy equipment to rent nor lease them to the private sector. These activities should best be left to financial institutions.

4.6 Project Budget and Resources

The original Project budget of $18 million significantly underestimated certain costs, while entirely overlooking the costs of many activities essential to achieve the Project goal and purpose.

The need to shift some construction activities, particularly spreading and compacting, which had been originally planned as village participation in the PP, resulted in an increase in construction costs by approximately 22% for labor. This increase, together with the number of dikes per valley and their high construction costs in Program I, resulted in the PP's estimate of

$159/ha to rise to more than $640/ha. Overall estimated project costs for 1994 have increased to $5.19 million, as a result of the recent devaluation. (See Tables 10 and 11, Section 10)

It is worth noting that the estimates of actual construction costs in the original PP budget were estimated to be $3.8 million for 60 valleys, (or $4.9 million counting the additional $1.1 million for village labor).

As discussed in previous sections, the PP budget also neglected to incorporate any funds for an agricultural component, which will be necessary to achieve the Project objectives in a cost-effective manner. The PP budget did not include funds to finance such key personnel as a monitoring and evaluation specialist, a training coordinator, and a sociologist (except for the initial years). It is estimated that an additional $4 million is required to extend the PACD by one year, and this does not include the costs of adding an agricultural component. Table 11 presents an estimate of the funds required to extend the PACD by one year, thereby achieving the PP's expected output of 15,000 ha, with the possibility of developing an additional 1,000 to 2,000 hectares.

5. INSTITUTIONAL STRENGTHENING

5.1 Introduction

The institutional strengthening component of the Project has been designed to support and enhance existing GOS institutions, the private sector and village groups. In the PP it was originally envisioned that the Project would work directly with the traditional technical services of the (then) Ministry of Rural Development (MRD), including both the agricultural and hydraulics divisions, to develop their capacity to support water management development in the southern zone.

Villagers were to be organized into VWMCs, which would receive training in watershed planning, construction, and in the operation and maintenance of the dikes. The private sector, essentially locally-based, would benefit from the practical experience of constructing water management structures, and would benefit from the simplified contracting procedures developed by the Project to maximize the use of private, locally-based contractors. It was also envisioned that local NGOs, which were already active in water resource development, could work with the Project, and benefit from the technical expertise of Project staff in the areas of water management planning, construction techniques, and operations and maintenance. The NGOs would then train farmers' groups.

5.2 LBII Progress

5.2.1 Background

On-the-job training of GOS counterparts and the preparatory work necessary to the formation of VWMCs began during the initial period of implementation 1990 to 1992.

There were significant delays in the development of a training plan for short- and long-term training, despite numerous consulting missions from Louisiana State University (LSU). The process was exacerbated by the two changes in chiefs of party (COPs) before 1992. (The first two COPs had been responsible for developing the training plans). Planning for long- and short-term training finally began in 1991, though initial delays and cancellations were encountered because of logistical problems and disagreements between AID and the LBII management team. This has seriously effected the training program. As with the other components of the Project, the training section suffered because of the problems of lack of adequate personnel and problems of political insecurity.

A local training coordinator was recruited in November 1992, 17 months after the staffing of the position was recommended by short-term training advisors (as early as July 1991). The Project Sociologist had been the acting training-coordinator during the period of initial site selection. However, his subsequent involvement in village organization once the construction phase began, did not allow him time for training coordination activities. Therefore, much of the training activity has only recently started. In early 1993, an assessment of training needs for 1994 to 1996 was to have been completed.

5.2.2 Development and training of GOS counterparts

Three types of training for GOS counterparts outlined in the PP are : on-the-job; long-term; and short-term training of personnel from the Ministries of Agriculture and of Hydraulics. The original idea of transferring personnel from the Regional Inspectorates for full-time work on the Project was not feasible due to limited staff at the Inspectorates. The objectives of the training program are to develop the capacity of GOS technicians to undertake their roles as planners and supervisors of water control development and management, to provide services to farmers, and to ensure that the construction and operation of water management structures and improved water resources management will continue after the end of the Project. It is hoped that the GOS and the private sector will be able to continue to reclaim and improve lands suffering from salt intrusion in the southern zone subsequent to this USAID intervention.

a. On-the-Job Training

On the-job training is a very important aspect of the institutional strengthening component. It is through this mechanism that the practical knowledge of managing a water services project is disseminated. Theoretically, with successful on-the-job training, the transfer of the Project to GOS and private sector management, as envisioned in the PP, will be smooth and sustainable.

The PP envisioned the training of GOS counterparts to be an on-going Project activity, with training to be provided by both long-term and short-term LBII personnel. Due to difficulties in recruiting and maintaining long-term LBII personnel, most notably the COP and water resources engineer, the success of on-the-job training has been mixed. (The short-term training provided by consultants or home-office LBII staff has been excellent, and is much appreciated by GOS personnel).

Two of the long-term technical assistants were never assigned true counterparts : the Project Sociologist was assigned two agronomists, while the Project Agronomist was assigned two soil scientists. Although the assigned counterparts worked diligently, the absence of appropriate counterparts negatively affected the sustainability of the Project.

Disagreements among USAID/Dakar officials, the National Project Director and the LBII Chief of Party and also within USAID/Dakar itself, have delayed the initial implementation of Project activities during the 1989-1991 period. Because of these delays, on-the-job training suffered. The need to catch up on planned construction activities necessitated (in LBII's view) expediting construction activities by having the LBII home-office engineering staff become primarily responsible for engineering plans and designs. LBII therefore decided, from a contractual standpoint, to build as many dikes, reach as many valleys as possible, and recover as many hectares as possible during the time remaining in their contract. As a result, the GOS counterparts have not been as involved in the design process as originally intended; and may not receive the intended level of on-the-job training.

b. Long-Term Training

The Project is to fund the long-term training of four participants at the Master's (M.Sc.) level. In the PP, four GOS employees were to be chosen for masters degrees in

engineering, and soil and water management. Training was supposed to begin during the second year of the Project, with two more participants to begin the following year.

After initial delays in implementing Project activities, largely caused by the frequent changes in LBII long-term personnel, the first two participants began their studies in the fourth year of the Project, just two years before the PACD. (Though it was just in the third year of Project activities that the first LBII team was fielded). Efforts are now being made to arrange the training of the remaining two participants. As a result, the bulk of the long-term training will take place during the final two years of the Project. Another problem has been the finalization of the two participants departure, as the Ministry of Modernization has yet to approve the payment of their salaries during their stay in the United States. Without approval, the participants cannot attend, because the university grants are not sufficient to finance both university fees and family needs in Senegal.

c. Short-Term Training

Short-term training, through study tours and short-term technical training courses, is designed to enhance the capability of the GOS to provide water control services. It was originally planned for the Project to provide short-term training in Africa, Asia, and the United States for 14 participants. The Project would also support 12 short workshops and seminars in Senegal. Short-term technical assistants were supposed to hold seminars and/or workshops on the results of their field results, findings and methodologies. The PP outlines some of the institutions and lengths of stay for the training.

At the time of the mid-term evaluation, eight GOS participants had benefitted from short-term training, which has taken place in three separate trips abroad. Two members of the regional Inspectorates have taken a short course in Burkina Faso, three members of the PMU have taken three-week courses in Sierra Leone and Burkina Faso, and the National Project Director, together with the Directors of Agriculture and Rural Engineering and Hydraulics toured universities in the U.S. for a month. Other short-term training has been planned for the first six months of 1994.

Some of the short-term training programs and internships proposed in the PP have proven to be outmoded and are inappropriate. Many of the short-term courses and internships in the US are not feasible, given that lack of English language skills among the GOS candidates will pose a problem. Some of the training called for by the PP should therefore be reconsidered, particularly the internships stipulated in the PP Training Annex. A needs assessment has not yet been undertaken for short-term training and thus presents the possibility that much of the planned training may not be necessary. A needs assessment would have identified the abilities and interests of the participants. This would have allowed a more pro-active approach toward the choosing of courses, rather than what seems to be a reactive approach.

A few pre-identified schools and institutes were contacted and their courses were accepted. Some of these organizations, such as ETSHER in Burkina Faso, are highly esteemed. A needs assessment, however, would have identified other training opportunities and needs. Some GOS participants indicate that the courses which they took were interesting but not particularly relevant to their work.

5.2.3 Identification and training of village groups

Another major element of the institution-building to be undertaken by the Project is the direct assistance to village groups in watershed planning, construction, and operation and maintenance of the dike structures. Both VWMCs and IVWMCs were to be established by the Project and be trained by Project personnel. Subsequently, these committees were to train other villagers subsequently. Original plans called for villagers to participate fully in dike construction, but due to both time and technical constraints, village participation was greatly reduced

Village organization and training was initially undertaken by the Project Sociologist and his assistants. The VWMCs and IVWMCs were established in the Program I and II valleys. Introduction of the Project's NGO training sub-component has involved local NGOs in village organization and training.

Farmers interviewed during the mid-term evaluation are very positive about the Project's dike construction, and indicate that they had been consulted about the construction before the Project. Some of the farmers interviewed indicate a willingness to freely contribute to construction activities, while others would not. A sample of farmers interviewed during "*Reconnaissance Rapide*" informal surveys undertaken by the evaluation team indicated a general lack of understanding on the part of the farmers of the role and functions of the VWMCs. While some respondents had no idea concerning the intended functions of the committees, the majority thought that the committees were established to organize the recruitment of village labor for paying jobs with the contracting firms. A LBII consultant had a similar impression in discussions with Project farmers, as he found that "It is only a matter of time before farmers in all valleys begin demanding dikes, not so much because of the water control benefits they bring, but because of the employment opportunities they provide." (Zalla, 1993).

5.2.4 Training of NGOs and their involvement (see Section 9)

A new NGO component has been proposed for the Project, and is awaiting final approval from USAID/Dakar. In the proposal, it is planned that NGOs will support the Project in final valley selection, in the supervision and execution of construction activities, and by facilitating the transfer of maintenance, extension and input supply functions to VWMCs. It is hoped that when the Project ends, NGOs will continue to provide support to VWMCs. After several years, it is anticipated that the VWMCs will be sustainable entities, providing extension services to farmers, organizing farmers for infrastructure operation and maintenance, and supplying farmers with necessary inputs.

Until the NGO component is approved, the Project is currently undertaking a training program for six NGOs. Project personnel is training the NGOs and supervising their village level activities. These activities include VWMC organization, organization of village labor for dike construction and infrastructure operation and maintenance, providing extension services, data collection and input delivery (for pilot plots).

Given their almost total dependence on Project financial support, NGO local staff appears to be Project employees ready to execute all Project directives.

Discussions with NGO personnel and questionnaire responses reveal that only recently many have been established in response to the opportunities presented by the Project. Many of the NGOs were founded in 1992, and in some cases, just months before the Project NGO training component began. It is not clear whether their members have the proper background and training to perform the duties required. Field visits indicated that at some of the sites the water control structures were not being maintained properly (fallen moëllons were not put back on the dike slopes), and villagers expressed dismay concerning the capabilities and perseverance of some NGOs. During a meeting for NGO and Project personnel attended by the evaluation team concerning Program III valleys, the main concern of the NGOs seemed to be the management of credit funds. They did not discuss their basic tasks, namely the management of the water control structures and the provision of extension services.

5.2.5 Private Sector Involvement in contracting procedures

The PP envisions that part of on the-job-training consists of technology transfer from the TA team to the private sector, comprised mainly of construction firms. The day-to-day experience during the construction season of working with the TA team is expected to prepare the firms to continue the construction of water control structures after the Project's PACD. Other members of the private sector may include local consultants hired to assist in implementation.

The Project has worked with four private construction firms during Program I. Of these, two were able to honor their contracts and were also awarded Program II contracts. For Program II, an additional five new enterprises were awarded contracts, only one of which defaulted. Of the twenty-one responses to the call for bids for Program II contracts, 15 were from private sector construction enterprises and are new to the Project. In Program I structures, there have been no problems in terms of the quality of the workmanship. There is, however, one site where the construction firm made a egregious error, which is currently being corrected. Analysis and discussion of Program II sites would be premature, until they are officially accepted by the Project. It is noted that under Program II, the Project has hired *"conducteurs des Travaux"* to oversee the construction, and to ensure that Project designs and standards are being met.

5.2.6 Summary of Findings, Constraints and Conclusions

The delay in formulating a training plan, despite numerous short-term consultancies for training activities, and the lack of a training coordinator during the initial years of the project, caused delays in all aspects of the training program, including on-the-job, and both short- and long- term training. Despite initial delays, both the short- and long-term training components are generally working well, except for the delay in sending the next two long-term participant for Master's programs. The participants wait for the Ministry of Modernization to approve continuing payment of their salaries during their absence. Presently, two long-term training participants are pursuing Master's programs at LSU.

The on-the-job training component of the Project has met with mixed results, due in part to the heavy turnover in LBII personnel and, in some cases, the lack of appropriately qualified TA personnel. Attention and emphasis should be placed on training on-the-job. This could reduce the number of valleys to be developed before the PACD, but the gains made in developing a cadre of personnel trained in water management planning and construction, will assure

sustainability and replication of the Project activities. Using engineering plans from East Orange, New Jersey may achieve quicker results, but will not ensure the Project directives.

Short-term technical assistance generally has been excellent, although seminars and workshops on findings and field results have not been given on a regular basis to GOS counterparts. Also, there is a need for a trained (local) rural sociologist to oversee village organization, and to supervise the Project sociology-team and NGO personnel working in village organization. Many of the short-term training study tours and internships are no longer appropriate or feasible.

Due to initial delays in Project start-up activities and the need to make up for lost time by developing as many valleys as possible, on-the-job training has often been sacrificed. This is evident in the amount of engineering design work undertaken by the LBII home office for implementation in the field. The input of the LBII home office engineering division occurred during the absence of an expatriate water resources engineer in Casamance. It must be noted that the home office was instrumental in developing more cost-effective engineering designs.

There is a lack of sufficient GOS personnel to staff the Project and furnish appropriate counterparts in some cases. The Project has not effectively used the extensive water resource development and management experience of the Senegalese National Project Director. In the interest of the Project's goal of sustainability, the National Director should be given a greater role in both Project administrative and technical decisions.

Within the Project, there is a shortage of staff with expertise in agricultural extension, credit, technology transfer, and input supply and distribution to train farmers, VWMCs and NGOs. Given the crucial role of both the VWMCs and IVWMCs in the maintenance of the dike structures and regarding the use of revolving funds, more time needs to be spent in village organization. It is essential that Project beneficiaries clearly understand what is being asked of them during the construction phase and in the operation and maintenance of the dike structures. If not, this could have negative implications for the sustainability of these structures after the end of the project.

The Project's agronomist and the (recently departed) sociologist never had appropriate counterparts. At present, locally-based NGOs with expertise in water resource infrastructure management/operation/maintenance, financial management, agricultural extension and technology transfer do not exist. Given the lack of expertise of both the local NGOs and the Project vis-à-vis agricultural extension and technology transfer, it seems highly doubtful that PROGES can successfully undertake the training of NGOs in that area. A closer collaboration with the Ziguinchor *Inspection Régionale de l'Agriculture* is recommended in both the training and supervising NGO extension activities.

Villagers do not seem to have a clear idea, (or often, no idea whatsoever), of the roles, responsibilities, and functions of the VWMCs and IVWMCs. In individual and group interviews undertaken in the evaluation's Rapid Reconnaissance survey, villagers indicated that they see membership in the VWMCs and IVWMCs predominantly as a means of obtaining access to wage employment from the construction contracting firms, or as a means of obtaining free or highly subsidized inputs.

It is not apparent that any of the NGOs will be sustainable or viable after the Project. The question remains whether they will be more viable than the existing GOS extension services, which, admittedly are understaffed and under-funded but will still be in existence after the Project. Six NGOs are currently working with the Project under the NGO training program. The NGOs currently working with the Project are of an uneven quality. It is doubtful that they all of them can successfully undertake the activities proposed for them. This lack of expertise is particularly acute in the area of agricultural extension and technology transfer, though some of the NGOs, most notably ADIF and ADEGOR, have some personnel experienced in agricultural extension.

The Project is not providing sufficient management and supervision of NGO activities. Their progress, (or lack thereof), is not being tracked properly as they seem to be neglecting the more fundamental tasks assigned to them such as the training of villagers in the operation of the structures. PROGES personnel does not have the required expertise in village organization, agricultural extension, credit (revolving funds), or input supply and distribution to adequately train the NGOs. Once the NGO component is signed, it is planned to involve qualified Technical Support NGOs (TSNGOs) to undertake the training of village-level NGOs.

The lack of Project staff to adequately supervise the work of the private contractors is often cited as an impediment to Project implementation, particularly the absence of the TA Water Resources Engineer. However, the gravity of some of the mistakes made by the contractors can only be attributed to their lack of experience and quality control by the responsible firms. The recent hiring of conducteurs de travaux will help to reduce the number mistakes made in the past.

5.2.7 Recommendations

- Each short-term consultant funded by the Project should give a workshop or seminar of field results, findings, and methodologies to Project staff.

- All Project personnel who attend short-term training courses or study tours should be required to hold a short seminar on their findings for Project staff.

- A training needs assessment should be undertaken to establish all short-term training requirements.

- In the interests of Project sustainability and in developing a trained cadre of engineers qualified to plan and design water resource infrastructure, LBII should involve appropriate GOS personnel in technical decisions regarding the Project, especially with respect to the planning and construction of the infrastructures. This is recommended for sustainability, although it might reduce the number of valleys developed or hectares reclaimed.

- The Project should hire a local rural sociologist to assist the Proges staff and NGOs in village and VWMC/IVWMC organization.

- The capacities, capabilities, interest, and future viability of the NGOs needs to be further studied before assuming it will help achieve Project sustainability.

- The Project should work closely with the traditional agricultural extension sector, especially the training and supervision of NGO activities.

5.3 The Scope and Framework of GOS, Private Sector, NGO and Village Involvement

5.3.1 GOS capability to provide needed Project services

GOS technical personnel has considerable experience in water resources development, including the construction of anti-salt dams in the Casamance. Even before the present SZWMP, GOS personnel gained considerable experience during the construction of 31 anti-salt dikes, using villager participation, under the former USAID-funded Casamance Integrated Development Project. The training and experience received under the present Project ensures the existence of a cadre of GOS technicians experienced in the design, planning, and implementation of water resources development activities.

Also, there are several development projects constructing irrigation structures with anti-salt dikes currently underway, including the Baila, Kamobeul, DERBAC, and PRIMOCA projects. These projects are of varying quality and are located in the Ziguinchor, Bignona, and Sédhiou Departments.

As far as agricultural extension and technology transfer are concerned, significant technical capabilities exist within the traditional services, but are not available to the Project.

The Regional Inspectorates of Agriculture and of Hydraulics in both the Ziguinchor and Kolda regions are both understaffed and underfinanced. Although the agricultural inspectorates are participating in the World Bank-funded agricultural extension project *[Projet National de Vulgarisation Agricole (PNVA)]*, there are currently only 19 extension agents in the Ziguinchor Region. As a result, PNVA and the BAD-financed DERBAC project extension agents have divided the region, with DERBAC in some zones and PNVA agents in other zones.

5.3.2 Comparative analysis of NGO and GOS technical staff capability and experience

There is no comparison between the technical capabilities of the GOS technical services and local NGOs in the Casamance at the present time. The GOS traditional services have vastly more experience and expertise than do the newly-formed NGOs. The Regional Inspectorates of both Agriculture and Hydraulics have experienced and qualified personnel in the areas in agricultural extension, technology transfer, input delivery, water resources development and irrigation.

The NGOs currently working with the Project are of an uneven quality, and it is doubtful that they can successfully undertake the activities proposed for them. This lack of expertise is particularly acute in the area of agricultural extension and technology transfer, although some of the NGOs, most notably ADIF and ADEGOR, have some personnel experienced in agricultural extension. NGO agents would appear to have a greater experience in village organization, and have perhaps a comparative advantage in working with village-based organizations such as VWMCs and IVWMCs, given their close proximity to the villagers.

5.3.3 Local NGO capability, expertise and prior experience to undertake needed Project services

The majority of the NGO's local staff members, particularly the supervisors, have a long experience in agricultural extension activities in the Casamance, and have worked for many years in former local rural development projects such as PRS and PIDAC.

The NGOs initially collaborating with the Project while awaiting USAID approval of the NGO component underscore serious organizational weaknesses : the so-called NGO agents often act individually without the approval of their organizations. In many instances, these organizations are newly formed and emerging in the Project intervention zones only when the NGO component was first proposed.

Before the approval of any NGO partner, the Project needs to be more selective and redefine its approach to NGO collaboration.

5.3.4 NGOs' capability to manage Project funds

Currently, the Project collaborates with individuals rather than with NGOs even if these individuals profess to act on behalf of their NGOs. The NGO head offices generally prefer to ignore that their local representatives are collaborating with the Project and are being paid indemnities.

These issues are major constraints to establishing contracts between the Project and NGOs, particularly if the planned collaboration will imply equipment supply and provision of financial support.

5.3.5 Village involvement and support capabilities

Members of the IVWMCs participate during "walk-through" sessions which take place during the design of infrastructure when decisions are made concerning the width of the dikes, types of water control systems, and the selection of the dike sites.

The role of the IVWMCs and their ability to have their views taken into account has decreased steadily, from Program I to Programs II and III, while the Project has moved towards a tendency to impose its technical choices in the design of infrastructures. This tendency can be explained by the fact that the Project is increasingly giving its top priority to the need to reduce construction costs, and to accelerate dike construction.

The role of villagers during the construction phase is essentially limited to providing the needed labor. The IVWMCs and the VWMCs are responsible for mobilizing and organizing the village labor. The management and maintenance functions are not yet formally transferred to populations. Regarding the maintenance of infrastructures, the Project is helping populations set in place revolving funds in each of the target valleys, but these funds are sometimes used to purchase agricultural inputs with the approval of the Project.

5.3.6 Summary of Findings, Constraints, and Conclusions

GOS services have the technical capability to provide needed Project services, although they are under-staffed and under-financed. They are better qualified to provide agricultural extension, technology transfer, input supply, and training in the operation and maintenance of irrigation structures than do the newly established NGOs. However, NGOs have a comparative advantage in providing assistance in village organization.

In Program I, the Project made significant efforts to involve farmers, through their committees, in the design of water control systems and in the site selection for the dikes. In Programs II and III, the Project gives priority to technical and cost considerations rather than the populations' expressed preferences.

In its efforts to involve populations in all stages of valley development, the Project is facing numerous constraints. Effective involvement of populations hinders the Project's growing concerns regarding the need to reduce construction costs, while increasing the rate of implementation. The risk associated with the marginalization of populations is that the transfer of the management and maintenance roles to villagers will be difficult to undertake successfully.

5.3.7 Recommendations

- The GOS technical services, particularly the Ziguinchor Regional Inspectorate of Agriculture should be involved to a greater extent in the training and supervision of NGO activities under the Project.

- USAID should increase the construction works budget line items in order to compensate for cost increases from the transfer of tasks from populations to sub-contractors.

- The evaluation team's conclusions are that cost reduction is of primary concern. Without emphasis on cost reduction and on purely economic terms, the Project would be closed, at a loss to everyone involved. Therefore, the evaluation team fully supports the Project and their decision-making process. This is not to say that the local populations' concerns are not important. It is just a question of priority.

5.4 The Role of PROGES, Private Sector, GOS, NGO and Villages in Sustainability

5.4.1 Background

The sustainability of Project activities is predicated upon the continued viability or active participation of the major actors in the process: the GOS technical services; the local private sector; NGOs; and the villagers themselves. In large part, the extent to which the Project can successfully develop a trained cadre of GOS personnel to undertake and supervise future water management planning, development, follow-up, and monitoring and evaluation will be a major determinant in the sustainability of Project activities. Future sustainability also depends on the extent to which the Project can assist in developing viable private sector contracting firms, NGOs, and village organizations. These village organizations (VWMCs and IVWMCs) are indeed

the key element in the process. The Project cannot be sustainable without dynamic village organizations trained and participating in the operation and maintenance of irrigation structures and input supply.

5.4.2 The capacity of GOS technical services to continue activities after the PACD

As far as agricultural extension and technology transfer are concerned, significant technical capabilities exist within the traditional services.

While the technical capability of GOS traditional services is not in question, it is rather their financial capability to continue services after the Project which is in doubt. The Regional Inspectorates of Agriculture and of Hydraulics, in both the Ziguinchor and Kolda regions, are both understaffed and underfinanced. Although the agricultural inspectorates are participating in the World Bank-funded agricultural extension project (Projet National de Vulgarisation Agricole {PNVA}), there are currently only 19 extension agents in the Ziguinchor Region.

Indeed, the GOS has had difficulties providing the resources promised during the Project. The Project's regional office (ERGES) in Sédhiou, which was part of GOS's contribution to the Project, has had its water, electricity and telephone cut off for long periods.

5.4.3 The capacity of local NGOs to provide, and for village groups to finance maintenance and repair

Although some of the NGO staff members have a long experience in rural development activities, this experience generally does not include management and maintenance of water control systems similar to those built by the Project.

An adequate training of NGOs in water control systems will take as much time as training villagers who have the same level of education as NGOs' animateurs. This begs the question "Why not directly train the farmers instead of the NGOs, who will most probably not remain in the area once the Project's financial support ends?" If the NGOs leave the area, the investments made in training NGOs will have no impact on villages. Villagers' ability to finance maintenance and repair should be addressed through the revolving funds. The Project should assist in managing these funds, as envisioned in the PP.

5.4.4 Village capacity to absorb additional labor from increased rice production

The capacity of village labor to absorb the additional workload from increased rice production on lands where previously saline soils are recovered or improved is indeed an important issue which has yet to be adequately addressed by the Project. The PP merely assumed that labor availability would not pose a constraint to the cultivation of the recovered lands. Given that farmers consider the valley land as the most productive, it was assumed that farmers would inevitably shift back to the valley floor. (This is probably a safer assumption in the Bignona Department than in the Sédhiou Department, where the tradition of aquatic rice production is less strong).

No baseline study of the Program I and II valleys has been undertaken, so the issue of labor availability has not been analyzed. A socio-economic and agricultural baseline study was

undertaken in three of the Program III valleys in late 1993 by the SENECI, (SENECI, 1993). All three valleys, Segafoula, Talito, and Tognataba are located in the Sédhiou Department. Although the study did not directly address the issue of labor availability, preliminary results indicate that women perform the majority of rice production activities, with men assisting in land clearing and plowing. Labor shortages at the peak periods, which include weeding, harvesting, and threshing, necessitate the hiring of additional labor. This labor is usually provided by women's groups, (*associations féminines de travail*), who are remunerated at rates ranging from 2,000 to 5,000 FCFA per day depending on the activity and the number of workers in the group.

The political insecurity of the past several years in the Ziguinchor Region has resulted in many of the farmers leaving their villages for neighboring towns and cities. Many farmers in the Tendouck, Tenghory, and lower Diouloulou areas of Bignona never harvested their crops after the 1992/93 agricultural season. While it is said that most of the population has returned, the impact of this rural exodus on available labor in the Project's Bignona valleys in unknown.

Farmers in Project valleys were interviewed during a Rapid Reconnaissance survey undertaken by the mid-term evaluation team in both Bignona and Sédhiou; responses concerning labor differed between the two departments.

Farmers in Bignona felt that sufficient labor existed for aquatic rice production. Indeed, they indicated that they would be happy to leave most of their upland peanut production, saying that they were cultivating peanuts in large part only because of salinization problems in their rice fields. (Low producer prices for peanuts were another factor in the desire to return to rice production).

In Sédhiou, however, more than half of the respondents indicated that sufficient labor existed for aquatic rice production **only with animal traction or mechanized production.** (The use of animal traction for rice production was widespread since the beginning of the first World Bank financed PRS Project (Projet Rizicole de Sédhiou), but nearly all of the machinery is no longer in usable condition). Male farmers indicated that they would leave their upland peanut and cereal crops to work in aquatic rice only if animal traction or tractors were available. (Animal traction and/or tractor use is not readily adaptable or appropriate for rice cultivation in the Lower Casamance, due to small field sizes and existing cultural practices, such as the *culture en billons*).

Bignona and Sédhiou farmers indicated that wage labor for rice cultivation existed if one had sufficient funds to purchase it. Rates for groups ranged from 1500 to 15,000 FCFA per day, depending on the size and origin of the groups. Lower fees were for workers from the same concession. Most of the additional labor for rice cultivation is provided by groups, although a farmer in Mayor paid daily rates of 500 FCFA for individual labor.

5.4.5 The strategy for post-Project sustainability at the village level

Post-Project sustainability at the village levels necessitates viable, functioning village organizations to oversee water management, revolving or other credit funds, and the supply and distribution of needed agricultural inputs. Without improved inputs, cost-effective increases in rice production are not feasible or sustainable.

Because the IVWMCs and the VWMCs are created to function as intermediaries between the Project and villagers, they will not probably survive the end of the Project. More formal and viable organizations should be set in place in Project intervention zones.

5.4.6 Summary of Findings, Constraints and Conclusions

GOS services have the technical capability to provide needed project services, although they are understaffed and under-financed. Indeed, in the on-going Project, the GOS has not been able to pay staff salaries in a timely manner, and has not provided some of the promised resources to the Project. It would seem that GOS resources are not sufficient at the present time to continue all Project services under the current environment.

Locally-based NGOs lack experience and technical expertise in most areas, and they suffer to some degree from financial insecurity. It is doubtful that the NGOs currently working with the Project under the NGO training program can remain viable entities after the end of Project financing (or financing by another project). The question remains whether they will be more viable than the existing GOS extension services, which, admittedly are understaffed and under-funded but will still be in existence after the Project. The dire economic situation in Senegal will, at least in the short-run, be exacerbated by the recent devaluation of the FCFA.

The village organizations (VWMCs and IVWMCs) so crucial to the sustainability of Project activities at the village level are not viable entities at the present time. Villagers do not seem to have a clear idea of the roles, responsibilities, and functions of these committees. In some cases, villagers indicate that they see membership in the VWMCs and IVWMCs predominantly as a means of obtaining access to wage employment from the construction contracting firms, or as a means of obtaining free or highly subsidized inputs.

A base-line study in the Project area would have, among other things, given LBII personnel a much needed understanding of exiting farming systems. Project farmers interviewed in Sédhiou, indicated that sufficient labor existed for aquatic rice production **only with animal traction or mechanized production.** Male farmers in Sédhiou are extremely reticent to participate fully in rice production without animal traction or tractors. Daily wage labor exists for providing labor at peak periods in rice cultivation, if sufficient funds are available to purchase it. The situation regarding the availability of labor for aquatic rice production is not clear, and needs to be further studied, as does the need for animal traction in Sédhiou.

Without an agricultural component, comprising extension, input availability, and credit facilities, the Project is not sustainable at the village level.

5.4.7 Recommendations

- The GOS technical services, particularly the Ziguinchor Regional Inspectorate of Agriculture, should be involved to a greater extent in the training and supervision of NGO activities in the Project.

- In the interests of establishing viable VWMCs and IVWMCs to ensure the sustainability of water management and other Project activities, the Project should

locally hire a rural sociologist to assist the Proges staff and NGOs in village and VWMC/IVWMC organization.

- Base-line and other monitoring and evaluation studies need to be undertaken by the Project.

- A study needs to be conducted to evaluate the availability of labor for increased rice production, the cost-effectiveness of using wage labor, and the possible necessity to introduce labor-saving technological change.

- A follow-on project, comprising an agricultural component should be designed as quickly as possible.

6. OPERATIONAL AND APPLIED RESEARCH

6.1 Agronomy

6.1.1 ISRA's potential contribution

PROGES signed a contract with ISRA in June 1993 to conduct a research series pertaining to the Project. Some initial work was completed at that date, but the core activities began in December 1993, with a retainer at 15%. ISRA has a long record of accomplishments in research activities in various agricultural disciplines. In Djibelor, from which the research activities relating to this Project will be conducted, the existing facilities were meager at the time of this evaluation team's visit. Some of the qualified personnel, identified to do the research work, are on a long leave of absence undergoing further training overseas. It was stated that directives would be given by the qualified personnel from abroad to technical assistants who will carry out the work locally. The technicians would then report back to them for further instructions. Obviously, this is not a manageable or ideal situation.

The impression of the evaluation team, after interviewing some of the staff assigned to conduct the Standard Operating Procedures (SOPS) research under the LBII and ISRA contract, is that under staffing will create a major problem, unless corrected. In addition, the amount of work described in the SOPS is monumental and is intended to be performed through a series of activities, some for which ISRA is not qualified. For example, they have little background experience in agricultural production surveys, and they will have to subcontract for the research component in the health discipline. Any research institute in the world, with the same staffing problem that ISRA now has, would find it impossible to carry out the SOPS to terms within the time frame allocated to ISRA. LBII and ISRA's contract ends in June 1995 when the Project concludes. ISRA's contribution to Project objectives under these conditions will be rather limited. It should be stressed that this evaluation team is not questioning the ability of research scientists at ISRA to perform the activities they were asked to undertake, nor the quality of the research that they will accomplish. What is in question is the present inadequate staffing, the uncertainty of correction regarding the staffing, and the existing time frame in which to accomplish these research activities.

There was also an uneasiness on the part of the ISRA personnel at Djibelor regarding the funds generated by the above mentioned contract, which will only partially be made available to the research activities in Mayor, Nguindir, Badobar, and a fourth yet unspecified valley, where a large proportion of work has to be accomplished. One point that the evaluation team is trying to stress is that funds earmarked for the SOPS' research should not be diverted by ISRA in Dakar to fund other activities elsewhere.

Under the prevailing conditions, the evaluation team has strong reservations on ISRA's capacity to carry out the adaptive research for the Project within the time allocated. Their willingness and their capability are not in question. It is hoped that part of the funding provided by the Project will be used to increase staffing to the level required to achieve the objectives, taking into consideration that the evaluation team is recommending an extension of Project activities by one year, which should also apply to the LBII and ISRA contract with commensurate

additional funding to be provided by USAID. If this does not happen, the scope of work in the SOPS should be reduced because it is overly ambitious. (See Section 6.2.2).

Provided that the above reservations are addressed, this evaluation team believes that ISRA at Djibelor will have the capacity, willingness and capability to carry out the adaptive research for the Project, and has the potential to contribute to the achievement of Project objectives. ISRA/Djibelor has requested that funds for one of two vehicles be redirected to purchase instead ten motorcycles, and PROGES and USAID have approved their request. A third vehicle will be provided later in 1994, when the time remaining to do the work will be almost negligible. The wisdom of delaying approval of this third vehicle's purchase is questionable. Laboratory equipment for their research activities are finally on their way, after a delay of six weeks in the US awaiting release.

6.1.2 Suitability of the applied research themes

The applied research themes being promoted by ISRA would be suitable without any staff and time restrictions on their activities. Given the above constraints (Section 6.1.1), the amplitude of the advocated research should be reduced to size. This evaluation team is fully aware of the need for monitoring and evaluating the effects of the Project's intervention as mandated in any USAID project. A sequence of priorities on ecological effects that could be brought about by dike construction in this Project should be established. An example of low priority would be the study on the effects created by dike construction in this Project on the pedological characteristics of the Affiniam valley. Another means of reducing the research workload would be to give the agricultural production and farm-level socio-economic surveys to the Regional Inspectorate of Agriculture (IRA) or to qualified local consulting firms. ISRA really has not had considerable experience in these types of surveys.

6.1.3 Constraints on agricultural production

There are several constraints affecting agricultural production in the Project area, and the scope of work did not make it clear whether the evaluation should address agricultural production in general, or rice production in particular.

a. General agricultural production

General agricultural production is limited to a number of crops grown mainly for local consumption and limited trade, except for peanuts which commanded a remunerative price. The price of peanuts has been dwindling recently, but are now going up again by 43% since the devaluation, while the price of cotton rose by 30% and rice by only 6%. Other commodities which are mostly perishable are traded locally and a very small amount finds its way to Dakar and other areas of the country with the possible exception of bananas, fruits and root crops, and some vegetables. The dikes that the Project is constructing are now improved roads also, and this will have a positive effect on transportation of goods in and out of previously enclaved valleys. The water control management, that is made possible with dike and contour berm construction, will also have a positive effect on the availability of water that will move up the valley sides by capillary and lateral action, and this will permit a more extensive planting of deep-rooted and productive fruit trees. These improvements in transportation and water availability in the soil might stimulate general agricultural production by themselves, but more so with the establishment

of a good agricultural extension service, post-harvest technology, a marketing infrastructure and the provision of credit facilities.

b. Rice Production

The situation is totally different with regards to rice. Rice in Casamance has not been marketed in recent years, due to decreased production as a result of reduced rainfall and increased salinization of soils. For the past two decades, consumption has increasingly exceeded production. Some farmers do produce more than their extended family can consume. Nonetheless, the excess is usually stored or used for gifts or ceremonial occasions; it is rarely sold. It is only in cases of over-abundance that farmers become traders.

There are several constraints in rice production in the Project area. First and foremost was the inadequacy of rainfall amount and distribution for the past two decades. During this long period, inorganic fertilizers have been used sparingly or none at all in many rice fields because the lack of precipitation, or uncertainty of it, will not permit the crop to utilize the chemicals, and any positive effect therefrom would be negligible or nil. There has been some addition of organic fertilizers in the form of manure, but the amount added was barely sufficient to replace the elements that the rice plants extract from the soil. As a result, the soil has been impoverished and it would take several years to improve its fertility.

In some saline areas, the soil has been subjected to increasingly saline conditions that reach in some cases a reading >10 mmhos, the limit of tolerance beyond which there is no possibility of rice growing. Because the addition of expensive fertilizers will not increase rice yields under these conditions, the normal reaction of farmers, and rightly so, is to either reduce substantially or eliminate altogether the use of fertilizers.

Although excellent rice varieties have been identified and recommended by ISRA, they are not readily available to most farmers. Farmers also hesitate to switch varieties and prefer the "status quo" unless there is persistence in demonstrating to them the advisability of using improved varieties. These varieties usually fare better under good water control management and adequacy of agricultural inputs, in contrast to "old" varieties with low yield potential but which produce nonetheless an acceptable yield (from the growers' point of view) without any inputs.

6.1.4 Effectiveness of on-farm demonstration trials

Whereas the demonstration plots that PROGES undertakes is a step in the right direction, it is simply not enough. Because most rice farmers have utilized inputs sparingly or not at all, agricultural extension services are needed to advise on, and promote, a complete agricultural package that will improve yields in the Project area, now that water adequacy is being assured by construction activities. However, these services are scanty in the Project area, and this problem has been addressed several times throughout this evaluation report.

6.1.5 Project's effects on land reclamation and crop production

Any land reclamation process takes time. It is too soon to evaluate quantitatively the Project's effects on land reclamation and crop production. Qualitatively, there is no doubt that the desalinization process, which will take a few years to accomplish, will reclaim some of those

lands that are not irrevocably non recuperable. There will be a trade-off between choices available to villages between the rate of recovery of those salinized lands and the amount of water retained in the upper valleys by water retention dikes to increase rice production/ha there. The more the water is withheld in the upper part of the valleys, the slower will be the rate of desalinization. Obviously, the amount of rainfall in the coming years will be an important factor in the progress towards the attainment of the goal and purpose of the Project.

6.1.6 Effects of construction works on rice production

It is too early to determine quantitatively the effects of construction works on rice production. There is no doubt that the effects will be positive with regards to better water control in the upper part of the valleys, and the desalinization of soils subjected to tidal waves in the lower portion of the valleys. Again, the positive effects of the construction works will be minimal on rice production in the absence of an agricultural component. This is because average increase in yield due to water control alone will be in the neighborhood of half a ton compared to 2 tons with inputs. This has been discussed at length throughout this report.

6.1.7 Evaluation of Programs I and II pilot parcels

The Program II pilot parcels have shown an improvement in terms of average rice yields when compared to the results in the Program I parcels. This indicates improvement in sequential years. However, these increases were obtained in fields that are not subjected to salty conditions or to low water supply. It should be pointed out that the construction of dikes has two main objectives:

- to leach soils in the lower part of the valleys of the salt which currently prevents rice growing and which will take place over the next few years, and
- to hold rain water in the fields of the upper valleys and ensure water supply for rice growing.

Once more, the component that is missing is an agricultural package that farmers could use, provided they can afford the expense. The demonstration plots have shown average yields in the neighborhood of 3 tons/ha and a greater average is achievable with adequate agricultural inputs, once the soils are improved and the water control measures can assure water supply.

6.1.8 Specific research needs

ISRA has decades of multi-disciplinary research activities and their accumulated experience accumulated is substantial. Not only have they conducted research on rice production in the Casamance, at Djibelor, but they have also an abundance of data on rice production in the Senegal river area and elsewhere in this country. They have identified, developed and conducted innumerable trials which form the basis of their recommendations on rice varieties adapted to various ecological and pedological conditions. They have developed an agronomic package for inputs consisting of different amounts of organic and inorganic fertilizer dressings under varying conditions. They have also done extensive work on disease and pest control.

It would be presumptuous on the part of this evaluation team to assess, within this Project evaluation, their decades of work. This would be an evaluation in itself. Specific research needs for this Project, in addition to the ones already proposed in their "*Planning des Activités de Recherche et Budjet*" of November 1993, would be to fine-tune work previously performed, specifically

- The cost-effectiveness of inputs required to obtain optimum rice and cereal yields on reclaimed and improved lands which will keep changing over at least the first five years of Project implementation;

- The effects of water control management on a possible increase in disease incidence;

- The short and long term effects of tractor use in field preparation in Moyenne Casamance (tractor use is not possible in Basse Casamance because of small field sizes);

- The economics of the effects of tractor usage on rice production, including availability, cost, maintenance and operations, and

- The possibility of a double-cropping of rice per year in some areas of Basse Casamance that could be re-established, as was the practice two decades ago and abandoned because of low rainfall, but now made possible again with water control management.

6.1.9 Summary of Findings, Constraints, and Conclusions

ISRA has the potential and capability to contribute enormously to the Project, but its capacity to do so will be negatively affected by the current under-staffing. The applied research themes being promoted by ISRA would be suitable if the present under-staffing is corrected.

Low rainfall, inadequate or lack of agricultural inputs, enclaved valleys that restrict trade, and lack of marketing facilities are several constraints on agricultural production.

The demonstration plots have shown that the Project is having a positive effect on land reclamation and crop production with the *proviso* that improved seeds and agricultural inputs are utilized.

6.1.10 Recommendations

- Additional staff at ISRA Djibelor will be required to carry out all the research described in the SOPS. If increased staffing is not available, the amount of research and survey activities should be reduced.

- Agricultural extension services should be better organized, credit facilities under strict "private bank" control should be made available to the growers, and advice

on increasing and benefitting trade activities should be provided to the farmers, now that the dikes are being utilized for motorized transportation.

6.2 Agro-Economy

6.2.1 Baseline Data and Impact Assessment

a. Types of baseline data required to assess farm level impacts

Baseline data are usually collected early in a project's first year to establish existing conditions before implementation of the project. Impact data collected throughout and after the project can then be compared against these *ex ante* conditions to evaluate project impacts. The absence of baseline data renders extremely difficult any evaluation of project impacts.

Baseline surveys were never conducted during the initial years of SZWMP, although a baseline survey of three Program III valleys was conducted in late 1993 by SENECI. (See Section 7.1). ISRA will be collecting data in the Mayor, Nguindir, Badobar, and a fourth, as yet unknown, valley. These data cannot be considered baseline data since these valleys will have had one or several years of Project intervention before the collection of these agricultural and socio-economic data.

Types of baseline data needed to assess the impact at the farm level include information on:

Farm Population, including both the total and the number of family members active in agricultural activities, their age, sex, and relationship to the head of the farm household (*chef d'exploitation*), and the number of family members on short or long term absences.

General Farm Characteristics, including family access to land, total number of hectares of land in both the valley and upland, and the availability of additional land or land in fallow.

Agricultural Production, area planted, including field measurements of all crops; yields and production for all types of rice. (It is important to collect area planted data for all crops in order to see the relationships over time; for example, an increase in area planted in aquatic rice may not necessarily indicate an aggregate increase in area planted for the farm [*exploitation*], but a reallocation of resources away from upland crops to aquatic rice).

Rice Production Farming Practices, including type of plowing, planting dates, type and dates of replanting, number and dates of weeding, type and date of harvest, and type of threshing. It is also useful to obtain the amount of time spent in each operation (*temps de travaux*), if possible.

Farmers' Previous Experience in Rice Production, including type of rice production (*riz aquatique*, *riz de nappe*, *riz pluvial*), the sexual division of rice production activities by type of activity.

Farmers' Perceptions concerning problems related to aquatic rice production, and general production constraints for all crops.

Input Use by crop, including quantities applied, type, place of purchase and price for all inputs (seeds, fertilizers, insecticides, pesticides, etc.).

Use of Agricultural Equipment, including type of equipment, price, place and means of acquisition.

Access to credit, source, type, conditions, interest rate.

Use of Agricultural Production, amount of production used for various purposes: family consumption, gifts, amount or percentage sold, stored.

Marketing, amount sold, place, price, and date(s) of sale, and type of buyer.

Storage, type of crop stored, length of time, and percentage of spoilage.

Off-farm activities and sources of revenue.

Baseline data, collected one time at the beginning of project activities, is not to be confused with monitoring data which are gathered during the Project activities themselves, although many of the variables cited above continue to be collected in Project monitoring and evaluation.

b. The adequacy of the proposed ISRA system (for the collection and analysis of socio-economic data)

As part of the ISRA sub-contract for applied research and monitoring, recently finalized in December 1993, ISRA will collect data concerning the area planted, yields and production of rice and other crops in four of the Project valleys. Additional information will be collected on existing farming systems, input use, and non-agricultural income.

These agricultural and socio-economic surveys will be conducted in the Mayor, Nguindir, Badobar, and a fourth (as yet unspecified) valley. It is unfortunate that the ISRA sub-contract has not been signed earlier, for that would have allowed the collection of baseline information. These four valleys are among the earliest to be implemented, so the information will not be baseline data for Mayor and Nguindir since these valleys will be experiencing their second agricultural season following the construction of the dikes. There are at present no plans to collect baseline data for future valleys.

The agricultural and socio-economic surveys will be undertaken by the Agronomy and Farming Systems Group at ISRA/Djibelor, under the supervision of the senior agronomist at Djibelor. The surveys involve a series of questionnaires concerning land use and availability, profiles of valley villages, surveys of both village *concessions* and *exploitations*, crop production, livestock, use of agricultural equipment, and non-farm agricultural activities.

The series of questionnaires is ambitious, but with an overabundance of qualitative rather than quantitative questions. Rapid Reconnaissance techniques are to be used in the land-use inventories, assessment of village-level constraints, potentials and proposed solutions; and in the village profiles and surveys of *concessions* and *exploitations*. These surveys will be undertaken by the researchers themselves under the supervision of the Djibelor sociologist. While this approach will gather noteworthy and interesting information that will provide an in-depth understanding of existing farming systems, the information will be mostly qualitative in nature. The usefulness of much of this information, from a quantitative viewpoint, remains questionable.

The size, composition and stratification of the samples of farmers to be assessed are also not specified in the SOPS. It also seems an unnecessary step to survey both *concessions* and *exploitations*; the sample frame in the Casamance has traditionally been the *exploitation*.

The agricultural production surveys are to be conducted by four enumerators under the supervision of the senior agronomist and associate researchers. This study will hopefully gather some of the more quantitative data required to evaluate Project impacts. It is not clear if the agricultural production samples will include the same farmers interviewed in the Rapid Reconnaissance surveys of farm households mentioned above. Although not clearly specified in the questionnaires, it is assumed that the enumerators will measure all fields of farms surveyed. This is absolutely necessary to obtain the much needed area, yield, and production data. (It was noticed that the list of equipment to be purchased for this survey did not include compasses or surveying poles; these will be necessary for field measurements).

The agricultural production surveys should be undertaken annually, and should also include information concerning total and active farm population, input use, and use of the harvest, i.e. whether what is produced is kept for family consumption, stored, or marketed.

Two additional socio-economic studies to be undertaken concern non-farm income generating activities and input use. Instead of undertaking them as separate studies, these two questionnaires could be incorporated in the agricultural production survey. It is interesting to note that off-farm income (including such quasi-agricultural activities as vegetable and fruit production, livestock, together with non-agricultural activities) are studied, but nowhere in this exhaustive series of questionnaires are questions asked concerning on-farm income!

It is the opinion of the evaluation team that ISRA really does not have the needed experience to undertake agricultural production surveys, which involve the very difficult task of undertaking field measurements of all fields in those farm households drawn for the sample. ISRA's experience and expertise is in undertaking adaptive or applied agricultural research. Given the extremely heavy research load demanded of ISRA in the 1.5 years remaining in the Project, it would be preferable to have the agricultural production surveys be undertaken either by IRA or a local consulting firm. There is a local consulting firm in Ziguinchor formed by the former Regional Agricultural Inspector; and there is a recently formed Groupement d'Intérêt Economique (GIE) which specializes in rural agricultural surveys.

c. Specific economic studies and/or data to collect

While it would be interesting to undertake economic studies on various topics, these can only be done when basic data has been collected. The Project needs to concentrate

on collecting basic baseline and monitoring data. The ISRA applied research and monitoring activities are already overly ambitious for the length of their contract; it would therefore not be possible to add additional studies to their heavy research schedule. Possible future studies in a second project phase could include : the impact of labor constraints on increased rice production; the impact of introduction of wage labor for villager participation in Project's construction activities; the cost-effectiveness of input use; and the impact of tractor use in the Project zone, to name just a few.

d. Summary of Findings, Constraints and Conclusions

Baseline surveys were never conducted during the initial years of SZWMP, (although baseline survey of three Program III valleys was conducted in late 1993 by SENECI).

The series of ISRA's socio-economic questionnaires is overly ambitious, and contain an overabundance of qualitative rather than quantitative questions. The usefulness of much of this information for the evaluation of Project impacts is questionable. The size and composition of the samples of farmers to be drawn, nor how they are to be stratified are also not specified in the SOPS.

The agricultural production surveys should be undertaken annually, and should also include information concerning total and active farm population, input use, and use of the harvest (whether the produce is kept for family consumption, stored, or marketed).
Although ISRA has considerable experience and expertise in doing adaptive or applied agricultural research, it is the opinion of the evaluation team that ISRA does not have the requisite experience to undertake agricultural production surveys which involve the very difficult task of undertaking field measurements of all fields in those farm households drawn for the sample.

e. Recommendations

- Baseline and annual production surveys for all valleys should be undertaken using a uniform methodology under the supervision of a full-time Project Monitoring and Evaluation specialist who should be hired by the Project.

- In the interests of obtaining the most useful agricultural production and farm household data, the Project should sub-contract with IRA or should recruit a local consulting firm, which would use a uniform methodology for all valleys.

- Given the extremely heavy research load demanded of ISRA in the 1.5 years remaining in the Project, it would be preferable to have the agricultural production surveys undertaken either by IRA or by a local consulting firm.

7. PROJECT MONITORING

7.1 Evaluation of Project Monitoring Activities

The PP envisioned impact monitoring and evaluation data would come from three sources:

- The Project water management plans;
- Information from the Project's operational research and environmental monitoring plan; and
- Crop area, yield and production data from the annual agricultural production surveys undertaken by the Regional Inspectorates of Agriculture (IRA).

7.1.1 First source of impact data

The water management plans were to include data on population, labor mobilization, land tenure, land use, water control structure designs, estimated economic benefits, construction program and scheduling, and estimates of land recovery. While the Project undertook a series of preliminary engineering, soils and land-use studies, the inclusive water management plans envisioned in the PP were never undertaken. Although the Project Sociologist collected demographic data for all valley villages, baseline data was not collected on land tenure, estimated economic benefits, or other socio-economic data. Indeed, at the time of the mid-term evaluation the total area and cultivable area in Project valleys was often a subject of some debate.

7.1.2 Second source of data

These data were to come from the operational research and environmental monitoring program. They were to provide comparative data to measure the impact of the execution of the watershed plans on soil and water characteristics, flora, and fauna. The operational and environmental monitoring program is just getting underway, as the sub-contract with ISRA was finalized in late 1993. (The ISRA system for data collection is discussed in Section 6.2 above).

7.1.3 Third source of data

These were the annual *Inspection Régionale de l'Agriculture* production statistics, which were expected to track crop production impact. This assumption on the part of the PP is impossible. The sample size of the IRA annual production surveys is quite small and makes extrapolations of area, yield and production down to the *Communauté Rurale* (C.R.)[10] level. The IRA sample is thus too small to capture production impacts at the level of individual valleys, each C.R. is composed of numerous valleys and upland terrain.

[10] N.B. Arrondissements are divided into C.R.

7.1.4 Analysis of available data

At the present time there is a considerable lack of baseline and monitoring data. Indeed, most of the impact information needed to evaluate the Project does not exist. For example, basic information does not exist regarding area planted in rice before dike construction, the additional area planted after construction, or the extent to which rice or other production has reduced due to farmers reallocating resources to return to aquatic rice production.

While the Project has recently initiated the collection of baseline and impact monitoring data (ISRA, SENECI, IRA), the efforts are scattered and diverse, with different institutions or firms responsible for data collection and analysis. Each survey utilizes a different sampling method (some are even using different sample frames), which brings into question the homogeneity and comparability of the data.

The actual Project monitoring situation is quite diverse. The consulting firm, SENECI, recently completed a socio-economic survey of three Program II valleys; the IRA/Ziguinchor has just completed an agricultural production survey of the Program II valleys for the 1993 agricultural season; and ISRA will be undertaking baseline (*ex post facto*) and impact monitoring in four Program I and II valleys.

The results of these surveys are mixed. IRA has done a good job of gathering basic area planted data, (the yield and production data were not ready when the evaluation team was in Ziguinchor). SENECI, however, proved to be inexperienced and not qualified for the job. It was fortuitous that the LBII consultant agricultural economist was in Ziguinchor at the time, and was able to design the sampling scheme, redesign the questionnaires and train the enumerators. The survey was well-executed by experienced enumerators, but problems remain at the tabulation and analysis level.

There is a need for a uniform system of baseline and impact monitoring. This was really a fault of the PP design; although the PP spoke of the need for impact monitoring data, there was no provision for an agricultural economist or monitoring and evaluation specialist to oversee this important component. At present, among LBII personnel, there is no one qualified to evaluate the capacity of local consulting firms to undertake baseline or impact assessment data. A wealth of qualified firms do exist in Senegal, both in Dakar and Ziguinchor.

7.2 Assessment of Project Personnel Needs for Project Monitoring

There is a strong need for a full-time monitoring and evaluation specialist at PROGES. The specialist will require a budget to purchase the material and equipment needed to undertake surveys (motorbikes, compasses, programmable calculators, surveying poles, scales, etc.). Enumerators are also needed; these could be hired directly or through local consulting firms, GIEs[11], or through sub-contracts with traditional services.

[11] A local GIE comprising experienced agricultural surveyors has recently been formed in Ziguinchor.

7.3 Summary of Findings, Constraints and Conclusions

Baseline surveys were never conducted during the initial years of SZWMP, except for the baseline surveys of three Program III valleys conducted in late 1993 by SENECI.

Although the Project undertook a series of preliminary engineering, soils and land-use studies, the inclusive water management plans envisioned in the PP were never undertaken, and written water management plans do not exist.

Certain assumptions made in the PP concerning the ability to use IRA annual production survey data to evaluate Project-level production impacts were erroneous because they are not feasible.

There is a strong need for a monitoring and evaluation specialist at PROGES. The position requires a well-experienced person with a background in rural surveys and methodology (including sampling); and must be someone with the stature to interface with the agricultural researchers at ISRA and with the traditional agricultural services.

7.4 Recommendations

- Baseline and annual production surveys for all valleys should be undertaken using a uniform methodology under the supervision a full-time Project Monitoring and evaluation specialist who should be hired by the Project.

- An organized system should be put in place for the collection and analysis of impact monitoring data.

- Given the extremely heavy research load demanded of ISRA in the 1.5 years remaining in the Project, it would be preferable to have the agricultural production surveys be undertaken either by IRA or a local consulting firm, under the supervision of the Project Monitoring and Evaluation Specialist.

8. PROJECT MANAGEMENT AND IMPLEMENTATION

8.1 Assessment of the Effectiveness of Project Management and the Nature of Collaboration by Project Parties

8.1.1 USAID

The evaluation team noticed an uneasy situation between PDO and ANRO in regards to this Project. The Project Officer (PO) is from PDO and is in charge of supervising implementation. The PO has a "back stopper" from the PDO office. This Project is in fact an infrastructural development project which essentially consists of dike building to reclaim and improve lands. The PP assumed that the water control management alone would bring about higher productivity, and that the agricultural improvement would automatically take place. This was an extremely erroneous assumption made in the PP.

The PDO has therefore a Project, which at its origin, was untenable in pure economic terms. The two main reasons were the large increases in construction costs, highly undervalued in the PP; and the low benefits because rice yields will not substantially increase with water control management alone and without agricultural inputs; and the benefits were grossly overestimated in the PP. The situation was exacerbated by changes in LBII staff and the National Director position, and especially by the problems of the insurgence. Given these unsurmountable problems, the Project Officer managed to continue implementation.

ANRO, on the other hand, had rightly concluded that the PP's assumptions were untenable. It was evident that the goal and purpose of the Project could not be achieved without a strong agricultural component. ANRO believed that this Project should no longer be simply an infrastructural development project because it could never stand alone on purely economic terms. Since the Project needed to be redesigned to include substantial agricultural activities, the ANRO was apparently desired to take charge of the Project. This could not, and did not, evolve because this Project still remained essentially a dike-building project with peripheral activities.

The evaluation team concluded that the collaboration between ANRO and PDO in this Project was mostly superficial, because ANRO avoided interfering with what was a development project and PDO was determined to make the Project successful, against all possible odds.

Assuming there is no reorganization of departments at USAID/Dakar, the Project should remain under PDO's supervision, unless an agricultural component is added. In that case, the responsibility of the project should be transferred to ANRO.

Additionally, the previous Project monitoring officer possibly exceeded his responsibilities, viewed as a "watch-dog" by PROGES, and created a feeling of uneasiness not conducive to collaboration. However, the evaluation team believes that this approach was necessary at the time because project activity had come to a standstill. The present Project monitoring officer began his activities in September 1993, and it is too early to assess his interventions. He did, however, express his opinion that there is a need for decentralization of the Project, with which the evaluation team concurs. Delegation of responsibilities is a necessity for good management.

8.1.2 LBII

LBII has extensive experience in similar projects around the world. However, the work performed by LBII consultants can only be as good as the consultants themselves. It is only with the benefits of hindsight that one can criticize LBII's selection process. It was unfortunate that the selection of the first two Chiefs of Party was not successful, creating some delays in design and construction works. There were also staff changes and under-staffing of the project (e.g., the water resources engineer) which added additional expenses due to faulty construction from lack of supervision, which had to be remedied. USAID was also instrumental in the project's delay the prolonged approval process of an LBII-nominated candidate for a project position.

It cannot be understated that the insurgence problems exacerbated the situation.

The present team of LBII is now on course. There has been considerable progress by the present team compared to the previous teams. Nonetheless, the evaluation team is of the opinion that there is now an urgent need for decentralization at PROGES. The present COP is highly competent, but he should reorganize his management approach to delegate responsibilities to his staff.

8.1.3 GOS

The GOS involvement in Project activities as envisaged in the PP was that the National Director of the Project Management Unit (PMU) would be appointed and paid by the GOS, and that the Ministry of Rural Development (now the Ministry of Agriculture) would advise the Project. A PP Supplement transferred this role to the Ministry of Hydraulics, before the beginning of Project activities. Under this supplement, agents from the Ministry of Agriculture and the Ministry of Hydraulics would be made available to the Project and would be paid by the GOS, while maintaining their hierarchical relations with the regional representatives of the Ministries.

In order to improve collaboration between the Project and the GOS, a Regional Technical Committee (RTC) and a Regional Water Management Team (RWMT) were to be installed in each of the Regions of Ziguinchor and Kolda.

Each RTC would be composed of the National Director of the PMU, the COP, the Regional Inspector of Agriculture, and the Regional Division Chief of Hydraulics. The RTCs have two main functions :

- They are responsible for the execution of the work programs and the plans which are to be developed with the PMU; and
- They serve as a liaison between the Project and the Regional Development Committee (RDC) set in place in each Region, and chaired by the Governor.

The RTCs are not fulfilling their first function (mentioned above) effectively. The Regional Inspectors of Agriculture and the Regional Division Chiefs of Hydraulics are not closely involved in Project activities, particularly in the execution and planning of Project works.

Regarding their second assigned role, the National Director of the PMU, the Regional Inspectors of Agriculture, and the Regional Division Chiefs of Hydraulics attend the RDC meetings. Information on Project activities to the RDCs is provided by the National Director of PMU.

The GOS has taken the initiative to install a National Project Committee to oversee Project activities. This Committee is composed of representatives of the Ministry of Hydraulics, the Ministry of Agriculture, the Ministry of Finance and Planning, USAID, the PMU, and regional representatives of technical ministries. The NPC meets twice a year in Ziguinchor or Kolda. This initiative partly compensates for the ineffectiveness of the collaboration within the RTCs.

The Regional Inspectors of Agriculture and the Regional Division Chiefs of Hydraulics are indirectly involved through the RWMTs which are composed of their agents. These agents are active in Project works, in particular during the supervision of sites works and village organization. While working full time for the Project, RWMT agents remain under the administrative authorities of their the regional representative of their respective ministries.

The political context in the Casamance was not propitious for an effective collaboration between the Project and local administrative and technical authorities. The administrative authorities main concern was to restore a peaceful environment. Security restrictions imposed upon both Project staff and GOS technical authorities did not permit a collaborative atmosphere between the two parties.

The GOS decided to make drastic cuts in the already limited operational budgets of all public agencies, including the Regional Inspectorate of Agriculture and the Regional Division of Hydraulics. The scarcity of their financial and logistical resources limited the capability of these agencies to collaborate effectively under the Project. Thus, the Project should intensify its efforts to create the conditions necessary for a successful transfer, in the near term, of management and implementation responsibilities to the Ministry of Hydraulics.

The GOS and the Project do collaborate through the National Project Committee and the Regional Water Management Committees. However, this collaboration is not constructive enough to the transfer, in the near-term, the responsibilities of the current National Director of the PMU to the Regional Division Chiefs of Hydraulics. The RTCs, which should be the structures through with these regional authorities would be organized to take over the responsibilities, are not functioning effectively.

It is also important to note that the PP envisaged that the National Director of the PMU would depart at the end of the fourth year of the Project, and his responsibilities would be transferred to the Regional Division Chiefs of Hydraulics. The involvement of these regional authorities in the RTCs was to prepare them to take over the duties of the National Director at the end of his assignment.

8.1.4 NGOs

In the prospect of the approval of the NGO component submitted to USAID, the roject has begun working with selected NGOs. Currently, the NGO field staff are trained by the

Project in topics related to their future roles. The NGO component envisages that the NGO will assist villagers and the Project in many the following areas : selection of valleys; formation of village committees; mobilization of farmers for Project construction activities; supervision of Committees' work in operation and maintenance of the infrastructures; assistance of committees to set in place and manage a revolving fund; assistance to farmers for credit accessibility; advising farmers on the use of improved inputs as recommended by the Project; and in the training of farmers' extension agents.

If the NGO component is approved, the NGOs currently working with the Project will be the Valley Support Units (VSU), based at the valley level. The two NGOs which will play the roles of Technical Support NGOs (TSNGOs) are not yet identified and/or selected. There will be one TSNGO based in each of the regions of Kolda and Ziguinchor.

The training services provided to six NGOs combine theoretical courses and field practices. NGO field staff members receive financial and logistical support from the Project. Many of the NGO coordinators have generally have extensive experience with rural development agencies in the Casamance.

8.1.5 Summary of Findings, Constraints and Conclusions

USAID/Senegal should decide which path to choose. The current Project, measured on purely economic terms, is not viable at an IRR of 1%. The social benefits cannot be quantified because baseline data is not available. The political ramifications are substantial indeed, but on what quantitative basis will this Project remain operative? An extension of the Project by one year will improve the IRR, but the maximum benefits cannot be attained without an agricultural component. Should ANRO take over the Project from PDO and add an agricultural component? This evaluation team believes that there is sufficient evidence to support the graduation of this Project from building dike structures, to a multi-disciplinary project encompassing agriculture.

LBII's new team is on an exponential phase of construction activities. An extension of one year in the LBII contract will permit the reclamation and improvement of more than 15,000 hectares.

Some of the NGOs currently working with the Project do not yet have the legal authorization to operate as an NGO. This limits their eligibility to undertake formal sub-contracts with the Project. In some cases, NGOs decided to intervene in a given zone upon expectations that the NGO components would be approved. In these cases their field staff are perceived by villagers as Project personnel. Also, some of the village-based staff members of the NGOs (animateurs) have limited education and experience in rural development activities.

The idea of having NGOs give support to villages in various tasks, such as operation and maintenance of the infrastructures, and the optimal use of water control systems to increase rice production is excellent in principle.

8.1.6 Recommendations

- There is an urgent need for decentralization at PROGES. The present COP is highly competent, and it follows that he should be able to organize his management approach to delegate some of his responsibilities to his staff.

- USAID should extend the LBII contract by one year. allowing the reclamation/improvement of 15,000 hectares as envisioned in the PP. USAID should also approve the addition of an agricultural component within this Project, or preferably design a follow-on project with an agricultural component to take maximum advantage of the land reclamation works of this Project;

- USAID should extend the position of the National Director of the PMU for 12 to 18 months. The Project should reorganize the RTCs, and develop a plan that will create a successful take over by the Regional Division Chief of Hydraulics when the National Director departs. The RTCs should be become fully operative because, without them, the sustainability of the Project beyond the PACD becomes questionable;

- USAID and the Project should seek ways to solve the financial and logistical constraints negatively affecting the involvement of the Regional Inspector of Agriculture and the Regional Division chief of Hydraulics in Project activities. The utilization of the Project financial resources for training activities to pay for their expenses related to their participation in the RTCs should be considered;

- The Project should be more rigorous in the choice of its NGO partners;

- Rather than parachuting NGOs (future VSUs) in selected valleys, the Project should first assess, within the Federations of GIEs to be set in place, the availability of individuals qualified to undertake the tasks of VSU agents.

8.2 Impact of the Political Unrest in Casamance on Project Implementation

The southernmost region of Senegal, (formerly the Casamance Region, but now divided into the Regions of Ziguinchor and Kolda), has suffered from political insecurity over the past ten years. These problems have been particularly acute over the past three years, which has coincided with the early years of the SZWMP. As a result, the Project has suffered numerous disruptions and delays, which have been beyond its control.

The Project office has moved five times since its establishment in Ziguinchor in mid-1990. (Indeed, during the calendar year September 1992-1993, the Project moved four times!) In September 1992, SZWMP moved from their rented offices in Ziguinchor to the former offices of the SOMIVAC on the Guinea Bissau road outside Ziguinchor. The following month, on October 23, 1992, the LBII team was evacuated to Banjul in the Gambia due to serious political unrest in the Lower Casamance. The team set up a Project office in a Banjul hotel restaurant, for one month, until the LBII team and most of the GOS personnel moved to the town of Kolda in the Upper Casamance, where security risks were minor. SZWMP had two offices in Kolda: first, in

a suite at the Hotel Hobi, and then in rented offices in town. Finally in September 1993, the Project was back in Ziguinchor.

These numerous moves and disruptions of field visits also caused considerable delays in construction and other activities. There was also a tremendous social cost for both expatriate and GOS project personnel who had to leave their homes, and children's schooling was disrupted.

Once the Project returned to the Ziguinchor office, considerable delays in Project activities continued as Project staff could not travel to many of the construction sites to supervise on-going activities. (As a result of the unrest, all Program II valleys in Bignona had been canceled and placed in Program III). Even after the security problems subsided, the need for LBII personnel and vehicles to receive security clearances caused significant delays in the Project's supervision of construction and in undertaking Project activities. For example, although Badobar, a Program II valley, is only 2 hours from Ziguinchor on the Tanaff road, due to US Embassy passage restrictions on the Tanaff-Ziguinchor road, Project personnel must pass via Bignona-Sédhiou-Kolda to Badobar, which is a 5-hour car ride (10-hour round trip)! This is just an example of the difficulties SZWMP has experienced in trying to conduct activities.

The political situation has been calm in recent months, and the outlook for continued peace looks favorable.

Both LBII and local Project personnel are to be commended for their patience and steadfastness in continuing to undertake water resources development under difficult conditions. Any evaluation of this Project must take into account the extremely difficult conditions, both logistical and personal, under which the Project staff worked.

9. SOCIOLOGY ASPECTS

9.1 Participation of Beneficiaries in Construction, Operations and Maintenance (C, O & M) of Watershed Control Systems

Assumptions and objectives

9.1.1 The concept of beneficiaries

The identification of the ultimate beneficiaries of the Project and the nature and magnitude of benefits are fundamental factors that determine populations' interest in project intervention, their contribution to the planned work, and their willingness to assure the maintenance of the infrastructures. The beneficiaries of the Project interventions were not precisely identified in the PP, nor during implementation. At both stages, it was implicitly assumed that all populations living in villages where there are farmers who own and/or rent parcels in a valley will "equally" benefit, on relative terms, from interventions that will result in an improvement of water management systems in that valley.

This assumption is questionable. Villages, families and individuals living in target areas have varied access to ownership and use rights over valley lands. Therefore, they are unequally affected by the Project, and their motivation to participate in the C, O & M watershed control systems depend on their expected gains from the construction activities. Villagers who own small areas are less disposed to a massive mobilization of their labor force for dike construction. Villagers whose lands are saline, acidic, and/or sodic; and located below the projected anti-salt dikes are less likely to be motivated to participate in the construction works, compared to those villagers whose lands will be positively affected. Villagers who have only precarious use rights are less amenable to contribute to the realization of long-term investments, as is the case for watershed control systems.

The Project did not collect information that could help clarify the concept of beneficiaries, and the relationships between expected benefits and participation. The rationale as to why some farmers participated, and others did not, in the construction works in Programs I and II programs is not clear. Project records regarding the local populations' participation reveal that all available labor in target villages was not mobilized. The reasons why some adult villagers did not participate are unknown.

- Was participation motivated only by expected water control improvement for rice production?
- Was it motivated by expected improvement of villages' access to markets?
- Was it motivated by short terms revenues such as wage employment?
- Are there other reasons why some villages and some villagers were more active that others?

These questions cannot be answered based on the information available so far.

9.1.2 Areas where beneficiaries' participation were anticipated.

The PP anticipated that during the construction phase, villagers would take responsibility for soil spreading and compacting the dikes. Although it is not explicit in the PP, the Project requires that villagers take charge of clearing the sites of the dikes, collecting quarry stones, placing these stones on the banks of the dikes, and building small regulation dikes and contour berms.

9.1.3 Objectives pursued through beneficiaries' participation

The need to have the local population participate in the construction works has three justifications:

- Reduction of the construction costs;
- Preparation of beneficiaries to assume effectively operations and maintenance (O & M) functions; and
- Development among beneficiaries of a sense of ownership of the investments made by the project.

a. Reduction of construction costs

Village contribution in the construction works was perceived in the PP as a means to reduce significantly the construction costs of the water management infrastructures. The PP estimated that this village contribution would amount to 30% ($73/ha) of the construction costs ($242/ha).

Many unforeseen difficulties arose during Program I (Mayor and Nguindir valleys) in the manual compaction and spreading of the fills.[12] The decision was then made to transfer compaction and spreading operations to sub-contractors. According to Tom Zalla (1992,12)[13], this resulted in an increase of 22% of the costs of the sub-contracts.

The PP's figure on the influence of village participation in the construction costs needs to be nuanced. The construction costs per hectare estimated by the PP, and mentioned above ($242/ha), involve only the infrastructures, i.e. the costs of the contracts between the Project and construction firms. If other related costs such as the TA, GOS personnel, logistic support and equipment are included, the investments costs projected by the PP amounts to $947/ha. Then, the village labor expected by the PP represents only 7% of these investment costs.

At the implementation level, one should be aware that the estimated 22% increase due to the transfer of compacting and spreading activities to sub-contractors only takes into account

[12]Insufficient compaction, and difficulties to mobilize village labor for timely execution of the works.

[13]Zalla Tom. Economic and financial analysis of various aspects of the SZWMP. Consulting Report. LBII, Inc. Ziguinchor. November 1992

the essential program (anti-salt and water-retention dikes). Based on estimates of the Program II, Tom Zalla (1992, op. cit., 14) showed that the development of the global program (including major structures as well as contour berms and small water-retention dikes) will result in average costs of $960/ha. He estimated that if the population did the compaction and spreading, the cost would average $825/ha, i.e., a reduction of 14%.

b. Preparation of beneficiaries to take over O & M

Beneficiaries were not adequately informed. Partly because of the long delays associated with the optimal use of unpaid village labor in the construction works, the surface area annually reclaimed/improved is smaller than expected, whereas the costs of some major components of the investments (salaries of the TA team and the GOS personnel, equipment, etc.) remain unchanged. As far as investments costs are concerned, the massive use of unpaid village labor is hardly justifiable.

c. Sense of ownership

Regarding the need to develop a sense of ownership among beneficiaries, it is clear that the population's labor contribution is one of the best ways to achieve this objective.

Villagers' input in the construction works in Program I helped reduce the construction costs of the infrastructures, but had negative impacts on Project investment costs because of a slow pace of implementation. After the transfer of compacting and spreading activities to sub-contractors, other tasks needed in the construction phase are still done manually by villagers. The gains and losses of this participation at the levels of sub-contracts and the Project are not known.

In order to maximize the Project's physical impact in its zone of intervention (area reclaimed and/or improved), it will be necessary not only to reduce investment costs (construction costs as budgeted in sub-contracts), but also all other related costs supported by the Project. Involvement of the local population in some tasks (cleaning sites, collecting stones) could be a constraint to achieve this objective. The transfer of these tasks to private firms will increase the costs of the sub-contracts, but will permit a faster implementation pace resulting in gains in investments costs, and a significant physical impact by Project end.

If the population's participation in the construction works are minimized, other alternatives need to be considered in order to achieve the other objectives initially targeted through this participation. For example, the Project could require that prior to its intervention, villagers should mobilize sufficient funds to assure the maintenance of the planned infrastructures (revolving funds). This option would identify those populations perceiving themselves as potential beneficiaries. It would also permit the Project to identify willing partners among villagers.

Regarding the need to prepare beneficiaries in assuming the operation and management functions, the initiatives taken by the Project could achieve the same objectives. These initiatives would be to involve the villagers in the design of infrastructures (specifications of dikes), selection of sites ("walk-through"), and training of trainers (village-based NGO personnel). Other indications of beneficiaries' interest to create the conditions for optimal use of the infrastructures would be their willingness or reluctance:

to support entirely or partially the training costs (salaries of village-based NGO representatives); and

to assign some villagers operation tasks and give compensation for their services.

Villagers' labor contribution to the construction works need to be kept at levels compatible with the necessity to reclaim and improve annually the maximum land area. The gains obtained in construction costs are offset by the delays that result from the massive use of unpaid village labor. These delays increase dramatically the investment costs/ha at the Project budget level.

9.1.4 Approaches to the organization and involvement of farmers in C, O & M

a. The village organizations created by the Project

The Village and Inter-Village Water Management Committees (VWMCs and IVWMCs) serve as the main liaison between the Project and the local people[14]. These organizations are formed by the Project sociology staff, once the valleys are selected. The VWMC, at the village level is composed of eight designees of a village assembly. In general, these meetings are held under the auspices of the Project sociology staff who require that at least three out of the eight positions be reserved for women. Once the VWMCs are installed in each of the villages intervening in the target valley, a IVWMC, which is the coordinating body for the valley, is created. The members of the IVWMC are drawn from and elected by the assembly of the members of the VWMCs.

The VWMCs and IVWMCs are normally executive bodies both at the levels of the villages and the community of villages around a given valley. The VWMCs and the IVWMCs are supposed to represent and act on behalf of these entities in all water management issues in the selected valleys. Many questions not addressed by the Project emerge from this situation :

- Are the members of the committees designated on the basis of their interest in rice cultivation?
- Are they designated on the basis of their level of education, their traditional responsibilities, or for other reasons?
- Are there prerogatives limited to water management issues, or do they also include other rice farming aspects, e.g., use of inputs, access to credit, coordination of agricultural tasks, etc?

The informal status of the committees set in place by the Project is another major constraint. The committees do not have a legal status, and therefore the contract agreements they sign with the Project have no judicial validity. They are not eligible to credit opportunity. They have no possibility to sue villagers or committee members, even in cases of mismanagement of funds.

[14]The Project's approach to village organization and participation is described in a document prepared by the sociology section entitled *"Guide d'Animation pour une Action Participative des Populations Rurales dans la Gestion de l'Eau"*, dated october 1993.

If the members of the committees are known, the concept of membership is unclear at the level of the village, and the community of villages. All adult villagers, whatever is their level of interest and involvement in rice cultivation, are implicitly considered as partners of the Project, and are therefore expected to participate in the Project activities under the supervision of the IVWMCs and the VWMCs.

In many intervention zones, the committees create a more complex organizational environment. In all targeted villages, many types of producer organizations existed prior to the Project's intervention: village sections (cooperatives), Economic Interest Groups (GIEs), Women's Groups, Youth's Groups, Village Associations, traditional working networks ("groupes de travail" or "Ikefë" in the Joola zones), etc. As a result, the members of the committees who are also members of executive boards of other associations, are overloaded with organizational and administrative tasks.

For all these reasons, the VWMCs and the IVWMCs are not able to fulfill the designated. Because they are created to function only as intermediaries between the Project and villagers, they will not likely survive the PACD.

In order to create more viable organizations, some of the valley-based NGOs have taken initiatives to set in place formal organizations with an GIE status. In the valley of Nguindir, the local NGO (ADIF) organized villagers into a GIE of rice farmers at the valley level. This initiative helped the villagers to have access to credit from CNCAS for the 1993-1994 agricultural campaign. In the Badobar valley, the local NGO (Form/Action), took a similar initiative, but the GIE which is being created at the inter-village level will be involved in many economic activities, including but not limited to rice cultivation. In both ADIF and Form/Action initiatives, the VWMCs and the IVWMCs continue to exist, but their staff board members are the same as those of the newly created GIEs. In both cases, the creation of GIEs has helped in clarifying membership status among villagers, because those who are interested have to contribute financially to the administrative registration of the GIE.

The major imperfection noticed in these initiatives is that the GIEs are created at the inter-village level and are too large to be easily managed. Villages around a given valley do not generally constitute an homogeneous entity, and in some cases do not traditionally work together. The advantage of a GIE status is that it allows the formation of small groups composed of members who share the same interest in specific economic activities.

b. Design and site selection

Members of the IVWMCs participate during "walk-through" sessions in the design of infrastructures, the width of dikes, types of water control systems, and the selection of the sites where these infrastructures will be installed. In valleys selected in Programs II and III, the members of the IVWMCs had the opportunity to visit one of the valleys developed by the Project. These visits ("visites organisées") helped them to have a clear idea of the planned work. This stimulated them to contribute more effectively to the design and sites selection. After the "walk-through", the Project finalized the design of the planned work, taking into account, whenever possible, the suggestions made by the IVWMCs. If the final plan is accepted by the IVWMC, a contract of agreement between the Project and the IVWMC is signed before any work is initiated.

The role of the IVWMCs and their ability to modify the Project's initial options in the design phase has notably changed between Programs I and II. In Mayor and Nguindir valleys (Program I Sédhiou), the Project changed its initial technical choices several times in order to take into account the suggestions of the populations. For example, the crest of the dike of Kandialon-Mayor and of the anti-salt dike of Kindakam were widened in order to function as roads as well. In Program II, the Project seems to be more concerned, and rightly so, about the necessity to reduce the costs per cubic meter and per hectare reclaimed/improved than to satisfy the population's *ambitions*. In Program II Sédhiou (valleys of Badobar, Kandion Mangana, and Kounounding Dioe), and particularly in Program II Bignona (valleys of Diatang, Balingor and Djimande), the Project tried to persuade the population on the validity of its technical choices on economic grounds, rather than giving them the possibility to suggest modifications. For example, in the valley of Djimande, certain villages such as Etakom, Kaor and Mandegane have decided not to participate because the Project did not accept their suggestion to install the anti-salt dike downstream from their lands. In the valley of Diatang, the village of Diatang has made a suggestion for a new site for the retention dike in order to solve a potential land tenure conflict. The Project has decided not to change the initial site selected for that dike.

It should be mentioned that while the Project moved towards a tendency to impose its technical choices in the design of infrastructures, the role of the sociology section in the process of valley selection has been progressively marginalized. In Programs I and II (Sédhiou), the sociological criteria were the first aspects considered in the process of pre-selection of the valleys. In Program II (Bignona) and in Program III, valleys are pre-selected on the physical criteria (engineering and agro-pedology). The sociology criteria are taken into account only in the final selection process.

c. Construction works

Prior to Project intervention, many meetings are organized in target villages by the sociology section and representatives of the local population. The purpose of these meetings is to explain the nature of the labor contribution expected from villagers, and to sensitize populations on the need of their involvement in the construction phase.

The IVWMCs, in collaboration with the VWMCs and the local NGOs, are responsible for mobilizing and organizing the villagers to participate in the construction works.

The Project has requested that sub-contractors hire part of their manual workers from target villages for construction. Generally these workers are hired from villages next to the construction sites and are normally selected by the VWMCs.

Regarding the population's unpaid participation in the construction phase, several problems arose :

- Unavailability of labor in villages either due to seasonal out-migration (during the dry season) or to villagers' preoccupation with other agricultural tasks (during the rainy season);

- The locals' need to have Project support for meals during the periods of massive mobilization of the villagers (this issue was raised in Mayor and Diatang during interviews);

- Lack of significant logistical support (transport to the stones quarry, lack of equipment for stone excavation or for site clearing);

- Coordination difficulties between the local population and sub-contractors.

d. Maintenance: the role of the revolving funds

The Project chooses to ignore the role of revolving funds as conceived at the PP level. The Project's estimation of the required financial resources in the revolving funds is done based only on farmers' needs for improved seeds and chemical fertilizers (Rapport d'activités., op. cit. Table XV, page 34). It should be pointed out that these revolving funds are indirectly financed from revenues generated by demonstration plots' through the use of project tractors and by a share of salaries paid to villagers by local firms.

The PP stipulated that the revolving funds' function is maintenance activities, with no mention of support for the purchase of agricultural inputs. The PP indicated that a minimum of 2% of the capital costs of the anti-salt systems (or $3.20 per hectares of cultivable land) be set aside by farmers for annual maintenance (PP page 30). Along with farmers' contributions, the PP stated that the GOS should provide additional financial resources to the revolving funds. In the Project covenants (PP page 52), the GOS agreed to make additional financial resources available for dike construction and maintenance through the use of the Fonds de Concours (local tax rebate). Due to the security problems in Casamance, the head taxes are not collected from many villagers. In the arrondissement of Tendouck (Department of Bignona), the Sous-Préfêt mentioned that head taxes have not been collected during the last two years. Thus, the Rural Communities in the Casamance are not currently eligible for the use of the Fonds de Concours, which requires 100% head tax recovery.

e. Summary of Findings, Constraints and Conclusions

i. On Assumptions and objectives

The PP and the Project assume (explicitly or implicitly) that all populations living in target zones are beneficiaries of Project interventions. One of the major constraints to villagers' optimal participation in construction works is that they do not equally benefit from the Project's activities, and some of them are therefore not motivated to participate. The objective of reducing construction costs by using village unpaid labor should be considered at both levels of sub-contracts and the Project.

Most adult villagers are willing to participate in the Project's construction works by providing the required manual labor. However, villagers' participation generally results in long delays in the execution of infrastructures.

ii. On Approaches to the organization and involvement of farmers in C, O & M.

In its zones of intervention, the Project creates a VWMC at the level of each village, and a IVWMC at the level of each valley. Besides the members of the Committees' boards, the status of other villagers vis-à-vis these Committees is not clearly known.
Their chances of survival after the Project are limited. The roles and responsibilities of these organizations are not clearly defined by the Project, nor well understood by populations. Due to their lack of legal status and their unclear areas of competency, the IVWMCs and the VWMCs are not viable organizations. In lieu of, and/or in addition to these Committees, there is a need to create more formal organizations such as GIEs.

In Program I, the Project made a significant effort to involve farmers through their Committees in the design of water control systems and in site selection for the infrastructures. These informal and artificial Committees set in place in villages will probably not survive after the Project. The data collected by the Project on populations' participation are not sufficient and not properly organized.

In Programs II and III, the Project gives higher priority to technical and cost considerations, rather than populations' expressed preferences. The current Project's cost-effective-oriented approach limits populations' involvement in the design and site selection of water control systems. The organizational weakness of the Committees is partly the reason why populations did not participate in construction works, as expected.

In any valley, the functions of management and maintenance of infrastructures have not yet been transferred to the local population. The functions of the revolving funds, which are key elements for guaranteeing a proper maintenance of infrastructures, are not well understood by the Project. A clear strategy has not been outlined by the Project, assuring that the revolving funds will be supplied in a sustainable way with the financial resources required for an effective maintenance of infrastructures.

f. Recommendations

i. On Assumptions and objectives

- In all cases where local labor inputs under the construction phase causes delays in the progress of the planned works, the Project should transfer the tasks to sub-contractors.

- USAID should increase the budget line-item reserved for the construction of water control systems in order to compensate for increases that arose from the transfer of tasks from the local population to sub-contractors.

ii. On Approaches to the organization and involvement of farmers in C, O & M.

- The Project, local NGOs, and villages in intervention zones should work together to harmonize approaches to village organizations;

- In order to create legal and manageable organizations, the Project and local NGOs should help villagers create GIEs (affiliated to regional or national farmer organizations that have the NGO status)[15] at the inter-village level;

- The Project and local NGOs should help villages create a VWMC in each village GIE, and an IVWMC in each Federation of GIEs;

- The Project should organize and analyze the data collected on the local populations' labor contribution, and develop for future valleys, a comprehensive monitoring system of beneficiaries' labor inputs;

- The Project and NGOs should help villagers find support for their food needs during periods of massive mobilization of village labor. Among the potential sources of support are the Food For Work program of the UN World Food Program;

- The Project should not subsidize the revolving funds. Farmers should provide the needed financial resources by individual cash contributions and by sharing revenues generated by rice production;

- The Project should require that farmers mobilize a certain amount of financial resources for the revolving funds prior its intervention. The minimal amount should be based on estimates of financial resources needed to assure the maintenance of the infrastructures; and

- Before transferring maintenance responsibilities to farmers, the Project should make sure that the revolving funds are adequately supplied with financial resources and that a plan for the renewal of these resources is developed by villagers.

9.2 Exploitation of Valleys Developed

The water control systems developed or to be developed by the Project create conditions for paddy rice production in the target valleys.

9.2.1 Increased availability of improved land for rice production

In reclaiming salinized soils, the Project increases the land available for rice cultivation. The effects of Project intervention in target valleys (particularly in Program I) should be assessed in terms of gains due to improved water management. To assess these effects it will be necessary to have information on the baseline and current situations in target valleys as well as in other valleys not developed. The Project has not collected enough information, but there is an attempt to do so in Mayor and Nguindir.

[15] E.g. AJAC (Association des Jeunes Agriculteurs de Casamance) and FONGS (Federation des ONG Paysannes du Senegal)

The survey that the Inspectorate of Agriculture is conducting will partly fill the gaps in the information needed to assess farmers' attitudes and the potential of reclaimed and improved land, and will identify the constraints for optimal land use in developed valleys.

9.2.2 Land tenure issues

The land tenure issues in the improved valleys can be analyzed from two angles:

- The way the Project intervention affect tenure practices; and
- The potential land tenure constraints to the achievement of the Project objectives.

a. Project impact on land tenure and land use practices

i. At the level of administrative entities

The valley selection procedures adopted by the Project exclude the local authorities legally in charge of the management of natural resources. These authorities are the Rural Councils, and to some extent the Sous-Préfêts and the CERPs staff. Currently, villagers can and generally do ask the Project to intervene without the approval of the above mentioned local authorities. This practice is inconsistent with USAID approaches adopted in other projects, particularly in the CB-NRM Project which will be soon implemented. On the one hand (SZWMP), USAID contributes to weaken the role of the decentralized authorities, but on the other hand (CB-NRM), it enforces the decentralized management of local natural resources.

The exclusion of local authorities in valley selection procedures has two potential negative effects:

- The local authorities could be reluctant to help solve potential land tenure conflicts in target valleys; and
- Project interventions are not included in regional development planning which helps to harmonize and coordinate local development activities.

ii. At the inter-village level

Some villages are not comfortable with the names given by the Project to targets valleys. In all cases, the names given by the Project to target valleys (e.g., Mayor, Nguindir, etc,) are those of the villages which made the request for the Project intervention. The fact that a given village takes the initiative to ask for Project intervention does not mean that this village has more authority in the target valley than other surrounding villages.

This is not yet a critical issue, but in order to avoid potential misunderstandings and conflicts, it would be wiser to give to valleys their traditional names (e.g. the traditional name of the valley of Diatang, Program II - Bignona is Boulanab, and Ba Dalla for the valley of Kounounding Dioe, Program II - Sédhiou).

iii. Within villages

Current information in developed valleys is not sufficient to analyze the impacts of the Project on land tenure and land use practices. It is assumed that all villagers have access to rice land, whether through ownership rights or use rights. The interviews conducted in target villages did not reveal new practices such as share cropping or renting.

b. Land tenure/use constraints

In some cases, land tenure and land use practices could constrain the achievement of Project objectives, e.g., increasing yields in areas improved:

- Rice parcels are too small (average of 0.2 hectares in the Sédhiou Department[16]) to facilitate the use of animal traction or tractors in critical tasks such as plowing;
- Deep plowing is generally needed to foster land reclamation or to optimally use fertilizers;
- The exploitation of increased rice land will require additional labor that is not generally available in villages, particularly in cases where rice cultivation is reserved for women;
- In cases where improved water management will allow double cropping, early plowing is essential and this necessitates the use of animal traction or tractor.

The DERBAC and the Kamoubeul Bolong projects consider the small sizes of rice parcels and that they are geographically dispersed within farms as one of the major constraints to the modernization of rice cultivation. These projects suggest land grouping as a required condition for improved and sustained rice farming in the Casamance.

Land grouping is not successful in any Senegalese Region. Therefore, It is not advisable for the Project to get involved in this issue. It will be necessary to track the long term trends in parcel sizes and distribution in target valleys.

The high percentage of parcels cultivated under precarious use rights is a constraint for long term investments such as the construction of contour berms and small retention dikes. A survey conducted by ISRA for the PRIMOCA Project in the Sédhiou Department in 1991[17] showed that 22.4% of the parcels located in the lower parts of the valleys were cultivated by farmers who had use rights that are annually renewed.

In some villages, the need to preserve traditional hierarchies could result in a reluctance to adopt the technical packages recommended by the Project. Because access to financial

[16]PRIMOCA. 1991. Enquête agricole. rapport de synthèse. Sédhiou. September.

[17]SONKO, Mamadou and SALL, Samba. 1991. Analyse socio-économique des vallées de Djendé et de Simandé Balant. Département de Sédhiou. Moyenne Casamance. ISRA - PRIMOCA. Djibélor (Ziguinchor), Sédhiou. December.

In some villages, the need to preserve traditional hierarchies could result in a reluctance to adopt the technical packages recommended by the Project. Because access to financial resources is uneven among households, the use of improved inputs could disturb the traditional hierarchical organization of villages. For example, families which control limited land could, by proper use of improved seeds and fertilizers, produce more rice than families which control wider areas but do not have access to improved seeds.

The above-mentioned issues were not observed by the evaluation team in the Project intervention zones, but they are nonetheless mentioned to demonstrate the need to monitor land tenure issues in target valleys.

9.2.3 Labor strategies

The Project did not collect enough information on labor inputs. During the interviews conducted by the evaluation team, many farmers pointed out the fact that labor shortages in critical periods of the rice production campaign (especially land preparation and harvesting) are the major constraints to the cultivation of all available land. In the Sédhiou Department where rice cultivation is generally reserved for women, men often help in some labor demanding tasks such as land preparation and harvesting.

The possibility of a shift from uplands (peanut and millet cultivation) to the valleys is mentioned as a potential solution to the need to farm all the land that the Project will make available in the valleys. For the time being, a significant shift is not yet observed.

9.2.4 Use of improved inputs and credit accessibility

The achievement of the Project objectives relies heavily on farmers' access to improved seeds and fertilizers. The expected increase of 1.8 metric tons of paddy rice per hectare of improved/reclaimed rice land is not achievable without improved seeds and fertilizers. The PP's logical framework assumed that farmers would have access to and would use credit for fertilizers and improved seeds.

In the current context of the Casamance, this is not generally the case. The only facilities currently offered are by PRIMOCA in the Sédhiou Department and by DERBAC in the Ziguinchor Region. All these projects have made arrangements with the CNCAS in order to create attractive credit conditions for farmers. For example, the PRIMOCA project provides the initial deposits (15% of the value of the loan) required by the bank. To decrease the interest rate (17%) to farmers, that project gives to GIEs and Cooperatives a discount of 3% on loans if they are entirely reimbursed.

The importance of credit access to improve agricultural inputs is clearly demonstrated in the comparison of the Nguindir and Mayor valleys, where water management infrastructures are operating. In Mayor, the local NGO (Maisons Familiales Rurales) did not help rice farmers create an organization eligible for formal credit. As a result, farmers who wanted to use improved seeds and fertilizers had to pay cash for these inputs. Due to this constraint, only 85 farmers used improved seeds and chemical fertilizers. The representatives of local NGOs mentioned that these farmers bought and used far less than the quantities recommended by the Project. In Nguindir,

the farmers formed a GIE eligible to the PRIMOCA/CNCAS credit facilities. Only 400 rice farmers used bank credit for chemical fertilizers, and 125 for improved seeds.

Given that the PRIMOCA and the DERBAC projects will terminate their activities in 1994, and the CNCAS has financial difficulties, there will be a minimal use of fertilizers and improved seeds in the Project intervention zones. As a result, yields will be very low compared to the PP projections, and the economic validity of the project will be negatively affected.

Even in cases where credit is available under attractive conditions, such an opportunity for increasing rice cultivation is constrained by the specificities of this activity in the Casamance. In that region, rice cultivation is essentially for home consumption, i.e., rice production is not marketed. This means that farmers will reimburse the credit they obtain for rice production through other activities such as peanut production and cash revenues generated by forest and orchard products. This specificity clearly shows the tight linkage between rice cultivation and other economic activities in the Casamance. The Project failed to see this linkage when it built dikes wide enough to function also as roads. This considerably increased the cost/ha of water management infrastructures. However, these roads, by improving villages' access to markets, will have a positive impact on rice cultivation.

9.2.5 Summary of Findings, Constraints and Conclusions

No comprehensive data are currently available to discuss the implication of increased availability of improved rice lands in production activities. It will be necessary to collect more information on the use of reclaimed and improved land, on the production performances of each of these types of land, and on the Project impact on village and household economies. The survey being conducted by the *Inspection de l'Agriculture* will give a better understanding of the use of reclaimed land, and of production performances in improved areas.

No study has been undertaken or is planned to monitor land tenure issues in order to determine how they are influenced or are influencing the Project's interventions and objectives. Comprehensive data on land use and land tenure should be collected before and after Project intervention, not only at the valley level but also at the farm level.

In the two valleys where the Project's water control systems are now operating, only Nguindir farmers had access to credit offered by the PRIMOCA project, and they borrowed to purchase inputs for rice production. In Mayor, farmers had to pay cash for their inputs (which they used in much lower amounts), because the credit offered to farmers in Nguindir was not available to them.

Currently, farmers' accessibility to credit is far more limited than projected in the PP, and farmers in the Project's intervention zone have limited resources to pay cash for the recommended inputs. The restriction on the use of improved inputs compromises the achievement of the Project objective to increase paddy rice yields by 1.8 metric tons/ha. The use of credit for rice production is also constrained by the fact that, in the Casamance, this crop is still exclusively cultivated for home consumption. Because of precarious rainfall conditions and water availability, local banks are reluctant to develop a credit component for farmers without guarantees similar to those offered by PRIMOCA and DERBAC, and farmers in the Casamance are not prepared to negotiate credit with local banks without outside support. Therefore, the

Project cannot rely on the current facilities offered by the PRIMOCA and DERBAC projects which will terminate their activities this year. A credit program for farmers should be envisaged as a component of the SZWMP. This has been discussed elsewhere in this report. If farmers' access to credit is not improved in the Project intervention zones, the objective of increasing rice yields by 1.8 metric tons per hectare in developed valleys will not be achieved.

9.2.6 Recommendations

- The Project should monitor the use of rice lands reclaimed and/or improved;
- As the Project goal is to increase crop production, the Project should also track the consequences of valley development in upland cultivation;
- The Project should monitor closely the impacts of the Project on land tenure and land use practices in some of the valleys developed;
- In developed valleys, the Project should collect data on labor inputs, additional labor demand related to the use of new agricultural techniques and technologies;
- USAID should, in coordination with the Ministry of Agriculture and other local development projects, develop a credit program for populations in zones targeted by the SZWMP. This program should be managed by selected NGOs, private banks or private firms in separate contracts, without any SZWMP or GOS involvement. The medium term objective of this program should be to help rice farmers in improved valleys to work together with local banks, without intermediaries; and
- USAID, in collaboration with the Ministry of Agriculture and other rural development projects and NGOs intervening in the Ziguinchor regions, should develop a strategy to provide extension services to farmers in the Casamance.

9.3 Project's Impacts on Village and Household Economies

Besides rice production, the Project already has or could have in the future positive impacts of the Project on village and household economies. Among the most important positive impacts mentioned by villagers during the interviews conducted by the evaluation team are:

9.3.1 Improved access to markets

Forest and orchard production are among important activities that provide cash revenues to villagers in the Casamance. The 3-meter crest dikes are also used as roads, and this has improved villagers' access to main roads, thus reducing transportation costs for trading activities. In some villages it was mentioned that the prices obtained for these forest and orchard products are higher in cases where the trucks have access to the villages.

9.3.2 Improved access to potable water

Some villagers in Program I and II (Sédhiou) located near the water retention dikes mentioned that the quantity and quality of the water of their wells have improved since the retention dikes were built. In villages near the anti-salt dikes, some villagers mentioned that the water of their wells is less salty than before.

There is also improved water accessibility for gardening activities and orchard production. In some villages, farmers have started garden and banana plantations on the banks of the valleys. They have noticed that due to water retention for long periods, the groundwater table is higher than before the dikes were constructed.

There is a positive impact on livestock production. On the banks of the valleys near the retention dikes, there is an impressive green vegetation in November, while the fodder was dry in other areas not influenced by the Project's infrastructures. Besides rice cultivation, the Project has many positive effects on other village activities and contribute to increase villagers' income and welfare.

Thus far, negative impacts are not noticeable, but these need to be documented.

9.3.3 Recommendations

- The Project should collect data, along with the studies on land tenure and labor inputs, and on household revenues.

9.4 Special Issues: Gender Considerations

The level of involvement and access to benefits generated by the use of water control systems is gender-differentiated.

Rice production is an activity in which women are generally more involved than men. This is particularly true in Mandinka areas (Sédhiou Department) where rice cultivation is exclusively the women' responsibilities. Therefore, the PP assumed that women will fully participate in all phases of Project activities and will be the major beneficiaries of the planned interventions.

9.4.1. Summary of Findings, Constraints and Conclusions

Women do participate in the design and sites selection through their representatives in the VWMCs and in the IVWNCs. In Programs I and II, the Project required that at least three out of the eight members of the VWMC be women, and with the *proviso* that a woman be the treasurer. In addition, one of the VWMC advisors is generally a woman. The effectiveness and cultural acceptability of gender-mixed Committees in some villages is questionable. It is not proven that by imposing the involvement of women in these Committees, the Project give to women more voice in the decision-making process.

In cases where villagers participated in dike building activities, women's contribution was very significant. The data collected by the Project on this issue are neither adequate nor well organized to permit a quantitative assessment of this participation.

The use of inputs is mostly evident in parcels farmed by women. The issue which remains unclear is whether these women bought cash or used credit on collateral provided by their husbands. In Nguindir where rice farmers are women, it is mostly men who use the credit opportunity to buy inputs.

In some valleys, villagers reported that some men shifted from uplands farming (millet and peanut) to valleys (rice cultivation). The magnitude of this shift is not known. There is also no indication that this could be the beginning of a long-term trend. The data available to date in Project intervention zones do not permit a good understanding of gender roles and Project impacts on men and women.

Regarding rice cultivation, it will be necessary to have a better understanding of intra-household distribution patterns in the Project intervention zones. The fact that women are rice farmers does not necessarily mean that they have full decision-making privileges regarding the use of revenues from rice production. Almost 90% of rice fields are owned and controlled by men. Women could have more authority if rice were marketed. It is generally assumed that rice is exclusively for home-consumption; however, an increase in rice production could result in men's (not women's) increased access to cash revenues, because once the household food needs are met (through rice production), an increased share of men's millet production could be marketed.

A comprehensive study is needed to assess more precisely the level of involvement of women in the design, construction, maintenance of infrastructures, in rice production activities, and in the use of the revenues generated in rice fields.

9.4.2 Recommendations

The Sociology unit should collect qualitative and quantitative data on gender issues related to Project interventions. Among the most critical issues that need to be clarified are:

- The cultural acceptability and effectiveness of gender-mixed Committees.
- Access to ownership and use rights of various types of rice lands: more productive, less productive lands.
- Constraints on women's access to inputs. Specific attention should be given to land tenure constraints on long term investments and accessibility to credit.
- Changes in sexual division of labor, and gender specialization by production systems.
- Intra-household distribution patterns, regarding in particular rice production. This type of study will clarify the disparity between women's and men's income when rice production is not marketed but home-consumed.
- The indirect impacts of the Project, e.g. improved access to markets, improved access to potable water, positive effects on gardening and livestock production, etc.

9.5 The Project Sociology staff

The task of the sociologist on TA team, as defined by the PP, was to develop effective working relations between villagers and the Project. His position was defined as a Water-User Associations (WUA) Specialist. He had to work with his homologues within the RWMTs to:

- Identify village water needs and analyze village requests for Project intervention;
- Organize village Committees;
- Collect baseline data on land tenure/land use and on labor availability;
- Assist villagers in their participation in Project construction works; and
- Train villagers in the operations and management of construction works.

9.5.1 Summary of Findings, Constraints and Conclusions

The Project never had a Sociology component. The WUA Specialist worked as a village animation specialist rather than a Sociologist. The team composed of the WUA Specialist and his counterparts within the RWMTs undertook satisfactorily the works assigned by the PP, particularly in organizing village Committees and village unpaid labor.

The contract of the TA Sociologist was terminated in mid-1993. Currently, there is no Sociologist on the Project. Rather than sociologists, the two staff members who compose the "sociology unit" are an agronomist and a rural engineer, who define their positions as "agro-vulgarisateurs" (agricultural extension specialists). These individuals are GOS agents working in the RWMTs of Ziguinchor and Kolda.

The need for the WUA division to move at the same speed as the engineering division, prevented its staff from spending time with villagers to organize the Committees, train Committee members in the management of water control systems, collect comprehensive baseline data, and identify organizational and sociological constraints to the achievement of Project objectives. The WUA division did not have field support agents. They have to collect and analyze the needed information without external support.

Because the PP did not envisage the creation of a Sociology component, critical data needed to evaluate the Project from a sociological perspective are not available. Even before the departure of the TA WUA, the sociology section has always been very weak, particularly in tracking sociological and cultural variables in intervention zones. The weaknesses of the WUA section are derived partly from the PP's ambiguities regarding the roles of the TA sociologist/WUA. In fact, the PP did not plan for a formal Sociology component within the Project. The WUA Section created by the Project, in conformity with the PP, did not have the required staffing to fulfill its tasks properly in all Project intervention zones.

As sociological variables need to be collected in order to identify sociological and cultural constraints to the achievement of Project objectives, and to clearly assess the Project' impacts it will be necessary to create and strengthen a Sociology Section within the Project. The current

WUA activities should be part of the responsibilities of this Sociology Section. The training unit recently created within the Project should also be included in the Sociology Section. Along with training and village support activities, the Sociology Section should also be responsible for collecting, analyzing and monitoring sociological and socio-economic information in target zones.

9.5.2 Recommendations

- The Project should develop a strategy to collect comprehensive data on the local populations' involvement on Project activities and on the impacts the Project has on villagers' living conditions.

- The Project should create a Sociology component and hire a Senegalese rural Sociologist.

- The Project should hire field staff for data collection, as needed.

- The Project should provide the proposed Sociology section with the required hardware and software equipment needed to undertake the assigned tasks.

- The Sociology Section staff should be trained in data management.

9.6 Involvement of NGOs

9.6.1 Background

LBII has submitted to USAID a proposal and budget to add a NGO component to the project. The purpose of this proposal is to provide selected NGOs with financial and training support so that they can: (i) assist farmers in organizing the village labor to be mobilized in Project construction sites; (ii) train village committee members in operations and maintenance of water control systems and in the management of the revolving funds; and (iii) provide extension services and help farmers have access and use improved agricultural inputs.

The NGOs currently working with the Project are:

- The NGO MFR (Maisons Familiales Rurales), which was created in 1964 and has been present in Mayor since 1982-83.

- The NGO ADIF (Action pour le Développement Integré et la formation) begun intervention in Nguindir in April 1993. It was "created" in November 1992 and is still waiting for its official recognition by the GOS.

- The NGO ADECOR (Appui à l'Auto-Développement des Collectivités Rurales) is in fact a section of an inter-village association which intervenes in the Communauté Rurale of Bounkiling. It was created in 1988 and has begun intervention in the valley of Kandion Mangana in May 1993.

- The NGO FORAGE (Fondation des Organisations Rurales pour l'Agriculture et la Gestion Ecologique) was created in May 1992, but is not yet legally registered. It began intervention in Kounounding Dioe valley in July 1993.

- The NGO Form/Action was created in 1992 and intervenes in the Senegal river valley and in the Department of Velingara. Its headquarters are in Thies. The NGO started intervening in the valley of Badobar in August 1992.

Anticipating the approval of the proposal, the Project has begun working with NGOs selected for each of the valleys of Program I and Program II (Sédhiou). The collaboration started formally in March 1993, and consists essentially in training NGO representatives (valley-based "animateurs" and their supervisors) in their future realm of intervention. Project experts are the trainers.

Training courses, generally organized in Ziguinchor, are combined with practice in the field. NGO representatives are requested to submit monthly activity reports to the Project.

9.6.2 Summary of Findings, Constraints and Conclusions

Since the beginning of what is called the training phase, the Project pays indemnities to NGO animateurs (6,000 FCFA per day), and their supervisors (FCFA 6,000 per day up to 14 days per month). In some cases the Project provides NGOs with logistical support (motorcycles and fuel, and bikes). The majority of the NGOs' local staff members, particularly the supervisors, have a long experience in agricultural extension activities in the Casamance, and have worked for many years in former local rural development projects such as PRS and PIDAC.

On the basis of the Project's collaborative experience with NGOs, several potential constraints to the achievement of the NGO component's objective have been identified :

(a) The Project currently collaborates with individuals rather than with NGOs, even if these individuals pretend to act on the behalf of their NGOs. This is illustrated by the fact that copies of the monthly reports submitted to the Project are not sent to the Direction of their NGOs. Rather, the Directions of these NGOs generally ignore that their local representatives are collaborating with the Project and are paid indemnities. This is particularly true for NGOs active in the Casamance before and/or independently from the Project intervention, e.g. Form/Action in the valley of Badobar, Maisons Familiales Rurales (MFR) in the valley of Mayor. This problem is a major constraint to establishing contracts between the Project and NGOs, particularly if the planned collaboration will imply equipment and provision of financial support.

(b) In almost all cases but one (the MFR), the NGOs collaborating with the Project are created or have decided to intervene in the targeted valleys only for the financial opportunities expected from the NGO component. The only financial resources available to NGOs' field personnel (animateurs and supervisors) are the indemnities given by the Project. These indemnities are in fact their salaries. In effect, all NGOs' field personnel

are Project's employees. The implications of this situation are that : (a) NGO field agents will execute Project directives and therefore will take minimal initiatives; (b) if the Project stops providing indemnities and/or if the proposal is not funded, NGO agents will leave their assigned zones of intervention, and the investments made to train them will have no impact on villagers; (c) at the end of the project, NGOs will move to other areas even if their assistance to villagers is needed.

(c) Some of the NGO animateurs have very limited experience in agricultural extension and in water management. The time required to train these agents adequately is too long, and there is a need to assist villagers at the early beginning of project intervention.

Before the approval of the NGO component, the Project needs to redefine the Project's approach to NGO collaboration, and be more rigorous in the choice of its NGO partners. Some of the NGOs which have begun collaborating with the Project in the perspective of the approval of the NGO component present a serious organizational weakness. These NGO agents generally act individually without the approval of their organizations. In many cases, these organizations cannot be considered as NGOs because they are still waiting for their legal recognition by the GOS.

9.6.3 Recommendations

- The Project's Training Specialist should undertake a quick institutional diagnosis of the NGOs collaborating with the Project.

- For the future, the Project's Training Specialist should develop a more rigorous procedure in the selection of NGOs, and adopt more formal collaborative relations with NGOs.

- Instead of parachuting NGOs in villages, the Project's Sociology Unit and Training Specialist should help villagers create, at the valley level, Federations of GIEs (affiliated to regional or national farmer organizations with the status of NGO) eligible for support through the NGO component. It is assumed that, at the valley level, villagers with the required level of education will be available to work as animateurs.

10. ECONOMIC ANALYSIS

10.1 Revised Analysis of Project Benefits and Costs

10.1.1 The PP's economic analysis

The economic analysis undertaken during the design phase of the Project had some highly erroneous assumptions which significantly overestimated benefits and underestimated costs. The internal rate of return (IRR) estimated in the PP was 22.4%.

The calculation of future Project benefits in the PP was based on the assumption that improved water management alone would result in average increased yields of 1.8 tons/ha, without any agricultural inputs from the Project. The PP assumed that farmers would automatically utilize improved technology. Currently, this is not happening to any great extent. Yield increments of this magnitude are not achievable in the Casamance without proper applications of improved seeds and other inputs. Without the utilization of improved inputs, average yields of no more than 900 kg/ha can be expected.

The costs assumed in the original PP were also significantly underestimated, especially construction costs, which have raised the cost/ha of constructing the water management structures to about $640/ha, about four times the $159/ha cost originally predicted in the PP. Approximately 20% of this increase can be attributed to shifting from village labor for spreading and compacting activities to contractors.

10.1.2 The economic impact of the Project on local economies

The Project provides direct benefits to the local economy through increased rice production and increased farm incomes. It is more difficult to quantify the benefits accruing from improved access to market and reduced transportation costs, as dikes also serve as roads in many valleys. To quantify the net benefits of this improvement in infrastructure necessitates further study. However, as the Project has yet to collect further data on the use of these structures, it can only be surmised that savings in transportation costs during the rainy season would be significant. Another indirect social benefit of the Project is the opportunity for many young people to remain on the farm instead of migrating to other regions, towns or cities to seek work. This is because the traditional Casamance rice cultivation has gradually declined over the years due to the increased salinization of land and inadequate rainfall, thus causing the exodus.

The Project has also provided benefits to the local economy directly through its hiring of members of the local population and through expenditures for the start-up costs of Project implementation. These are, for example, purchases of Project office equipment and supplies. These expenditures were unrelated to dike construction works. Contracting with local construction firms, NGOs and the hiring of village labor has provided a boost to the local economy. The institutional development of local NGOs and contracting firms will be beneficial to the economy long after the end of the Project.

Assuming good management, one can also expect an increased production of fish and seafood, forest products, fruits and vegetables, in addition to grains (mainly rice) and peanuts. Small ruminant and livestock production will be ameliorated because of the availability of desalinized water and increased land for pasture.

A possible negative factor will be the effect of increased water surface area on the population of disease carrying insects, increasing health care costs in the area over the long term.

10.1.3 Revised economic analyses

In February 1994, a SZWMP (LBII) consultant conducted an economic and financial analysis of various aspects of the Project and found the IRR to be only 1.8% with the revised costs and benefits (Zalla, February 1994). Economic analysis was again undertaken during this mid-term evaluation, and the IRR was recalculated based on reasonable and conservative estimates of costs, land areas and rice prices (to be discussed presently), using four different scenarios.

The four scenarios are :

Scenario 1. The *status quo* in the LBII contract and the PACD which end in June 1995 and June 1996 respectively.

In this first scenario, the IRR was calculated at 2.5%. The sensitivity analysis with a 10% increase in costs and a 10% decrease in benefits gives an IRR of 0.03%, while a 20% increase in costs and 20% decrease in benefits lowers the IRR to a -1.9%. Although the benefits accruing from social benefits were not included, e.g., increased trade made possible by the use of the dikes as roads, increased agricultural production (fruits, nuts, legumes, etc.) as a result of better water control management, the continuance of the Project in its present form is hardly justifiable.

Scenario 2. A 12 month extension of both the LBII contract and the PACD ending in June 1996 and June 1997 respectively. No agricultural component has been added to the Project.

The second scenario increases the IRR to 5.8%. The sensitivity analysis with a 10% increase in costs and a 10% decrease in benefits gives an IRR of 3.4%, while a 20% increase in costs and 20% decrease in benefits lower the IRR to 1.2%. Whether the added social benefits can justify the Project or not is debatable.

Scenario 3. A 12 month extension of both the LBII contract and the PACD ending in June 1996 and June 1997 respectively. An agricultural component, with no credit facilities from USAID, and with an estimated cost of US $3 million has been added to the Project. In view of the costs involved, normal USAID bidding procedures might be applicable. If a firm other than LBII is selected, an integrated approach between the two firms will have to be worked out.

In this third scenario, the IRR becomes acceptable at 10.9%, when one considers the fact that there are as yet unquantifiable social benefits as mentioned in Scenario 1 that have not been included in the calculation. The sensitivity analysis with a 10% increase in costs and a 10% decrease in benefits gives an IRR of 8.3%, while a 20% increase in costs and 20% decrease in benefits lower the IRR to 5.8%. With USAID's reluctance to provide credit facilities to Senegalese farmers, and the history of non or partial repayment of loans by these farmers to CNCA and other GOS controlled banks, this scenario may be acceptable to USAID.

Scenario 4. A 12 month extension of both the LBII contract and the PACD ending in June 1996 and June 1997 respectively. An agricultural component (US $3 million) with credit facilities (US $1 million) for a total estimated cost of US $4 million added to the Project. Again, in view of the costs involved, normal USAID bidding procedures might be applicable.

This fourth scenario includes provision for a revolving agricultural endowment fund of US $1 million (to be strictly controlled by PRIVATE BANKS under USAID supervision) where only the interest income from this fund would finance the credit to farmers who can provide acceptable collateral. It should be stressed that GOS controlled banks should not get involved in these transactions, for the reasons already stated in scenario 3.

Under this scenario, the IRR rises to 15.7%. With a 10% increase in costs and a 10% decrease in benefits, the IRR remains reasonable at 12.7%. With a 20% increase in costs and a 20% decrease in benefits, the IRR still remains at a highly acceptable 9.8%, when potential effects from social benefits (such as increased agricultural diversification and increased trade, unquantifiable at present for lack of base-line data), are factored in.

Tables 10 and 11 present the Project costs in US dollars with a 12 month extension of the contract to June 1996 and of the PACD to June 1997. In both Tables, the last column shows the expenditures in the absence of an extension. In Table 10, the figures are those prior to the 100% devaluation of the FCFA, while in Table 11 the potential effects of the devaluation on future costs are taken into account. The projected expenditures from 1994 onwards are extrapolations of actual expenditures from 1990 to 1993, and therefore can be presumed to be fairly accurate, except for probable cost overruns. Although PROGES estimated a 29% decrease in US dollars in construction costs for 1994 as a result of the FCFA devaluation, the overall Project costs show only a 14% decrease for 1994 because many of the expenses, such as salaries and wages, will barely be affected. The devaluation effects on total costs at the end of the Project show a decrease of 8.1% without a PACD extension, which decreases slightly more to 9.4% with a PACD extension.

The recalculated benefits (Tables 12 to 19) are based on revised estimates of the number of hectares of land to be reclaimed, flooded or improved by contour berms. In all of the four different scenarios, one cannot reasonably expect that 100% of the total cultivable area will be cultivated. Therefore, a maximum of 90% of the total reclaimed and improved cultivable areas has been retained in all the analyses.

TABLE 10
PROJECT COSTS IN $ US WITH 12 MONTH EXTENSION (PRE-DEVALUATION)

COST ELEMENT	CONTRACT BUDGET	ACTUAL EXPEN-DITURE 1990	ACTUAL EXPEN-DITURE 1991	ACTUAL EXPEN-DITURE 1992	EXPECTED EXPEN-DITURE 1993	PROJECTED EXPEN-DITURE 1994	PROJECTED EXPEN-DITURE 1995	PROJECTED EXPEND (JAN-JUN) 1996	TOTAL WITH PACD EXTENSION	TOTAL WITHOUT PACD EXTENSION
SALARIES AND WAGES	$1,237,067	$81,294	$307,746	$377,278	$446,455	$332,333	$332,333	$111,303	$1,988,742	$1,656,409
FRINGE BENEFITS	$300,743	$22,878	$69,756	$95,525	$121,473	$83,684	$83,684	$41,842	$518,842	$435,158
OVERHEAD	$912,781	$76,757	$212,610	$314,154	$392,790	$292,622	$292,622	$146,311	$1,727,866	$1,435,244
TRAVEL & TRANSPORT	$788,504	$50,270	$166,660	$281,218	$227,201	$198,765	$198,765	$99,383	$1,222,262	$1,023,497
ALLOWANCES	$742,333	$42,857	$192,774	$195,201	$232,125	$181,668	$198,765	$99,383	$1,142,773	$944,008
EXPEND SUPPLIES	$177,780	$9,940	$68,253	$147,189	$139,622	$73,200	$73,200	$36,600	$548,004	$474,804
NON-EXPEND SUPPLIES	$457,514	$2,011	$34,503	$69,618	$100,313	$76,727	$60,000	$20,000	$363,172	$303,172
TRAINING	$770,000	$0	$1,802	$10,230	$142,812	$384,398	$97,200	$48,600	$685,042	$587,842
INFRASTRUCTURE	$1,944,000	$0	$2,742	$510,523	$1,654,734	$2,243,569	$2,243,569	$1,987,479	$8,642,616	$6,399,047
NGO COMPONENT	$0	$0	$0	$0	$0	$342,164	$350,490	$181,608	$874,262	$523,772
RES & MONITORING	$935,000	$0	$1,242	$52,456	$129,137	$274,058	$274,058	$137,029	$867,980	$593,922
OTHER DIRECT COSTS	$659,775	$26,140	$130,887	$264,007	$309,571	$200,206	$200,206	$100,103	$1,231,120	$1,030,914
G & A	$145,219	$3,347	$47,848	$36,087	$43,591	$34,873	$43,591	$21,796	$231,132	$187,541
EVACUATION COSTS	$0	$0	$0	$0	$0	$289,281	$0	$0	$289,281	$289,281
TOTAL	$9,070,716	$315,494	$1,236,823	$2,353,486	$3,939,824	$5,007,548	$4,448,483	$3,031,436	$20,333,093	$15,884,610
FIXED FEE	$328,360	$20,000	$25,751	$69,729	$111,465	$181,273	$161,035	$109,738	$736,058	$575,023
TOTAL + FIXED FEE	$9,399,076	$335,494	$1,262,574	$2,423,215	$4,051,289	$5,188,821	$4,609,518	$3,141,173	$21,069,151	$16,459,633

SOURCE: ADAPTED FROM SZWMP COMPUTATION, 1993

REVISED PROJECT COSTS IN $ US WITH 12 MONTH EXTENSION * (POST-DEVALUATION)

COST ELEMENT	CONTRACT BUDGET	ACTUAL EXPEN-DITURE 1990	ACTUAL EXPEN-DITURE 1991	ACTUAL EXPEN-DITURE 1992	EXPECTED EXPEN-DITURE 1993	PROJECTED EXPEN-DITURE 1994	PROJECTED EXPEN-DITURE 1995	PROJECTED EXPEND (JAN-JUN) 1996	TOTAL WITH PACD EXTENSION	TOTAL WITHOUT PACD EXTENSION
SALARIES AND WAGES	$1,237,067	$81,294	$307,746	$377,278	$446,455	$332,333	$332,333	$111,303	$1,988,742	$1,656,409
FRINGE BENEFITS	$300,743	$22,878	$69,756	$95,525	$121,473	$83,684	$83,684	$41,842	$518,842	$435,158
OVERHEAD	$912,781	$76,757	$212,610	$314,154	$392,790	$292,622	$292,622	$146,311	$1,727,866	$1,435,244
TRAVEL & TRANSPORT	$788,504	$50,270	$166,660	$281,218	$227,201	$198,765	$198,765	$99,383	$1,222,262	$1,023,497
ALLOWANCES	$742,333	$42,857	$192,774	$195,201	$232,125	$181,668	$198,765	$99,383	$1,142,773	$944,008
EXPEND SUPPLIES	$177,780	$9,940	$68,253	$147,189	$139,622	$51,972	$54,900	$27,450	$499,326	$444,426
NON-EXPEND SUPPLIES	$457,514	$2,011	$34,503	$69,618	$100,313	$54,476	$45,000	$15,000	$320,921	$275,921
TRAINING	$770,000	$0	$1,802	$10,230	$142,812	$272,923	$72,900	$36,450	$537,117	$464,217
INFRASTRUCTURE	$1,944,000	$0	$2,742	$510,523	$1,654,734	$1,942,047	$1,682,677	$1,490,609	$7,283,332	$5,600,655
NGO COMPONENT	$0	$0	$0	$0	$0	$242,936	$350,490	$175,245	$768,671	$418,181
RES & MONITORING	$935,000	$0	$1,242	$52,456	$129,137	$194,581	$274,058	$137,029	$788,503	$514,445
OTHER DIRECT COSTS	$659,775	$26,140	$130,887	$264,007	$309,571	$142,146	$200,206	$100,103	$1,173,060	$972,854
G & A	$145,219	$3,347	$47,848	$36,087	$43,591	$25,063	$43,591	$21,796	$221,323	$177,732
EVACUATION COSTS	$0	$0	$0	$0	$0	$289,281	$0	$0	$289,281	$289,281
TOTAL	$9,070,716	$315,494	$1,236,824	$2,353,486	$3,939,824	$4,304,498	$3,829,991	$2,501,903	$18,482,019	$14,652,028
FIXED FEE	$328,116	$20,000	$25,751	$69,729	$111,465	$155,823	$138,646	$90,569	$611,982	$473,337
TOTAL + FIXED FEE	$9,398,832	$335,494	$1,262,575	$2,423,215	$4,051,289	$4,460,320	$3,968,636	$2,592,472	$19,094,001	$15,125,365

REVISED COSTS IN US $ BASED ON 100% DEVALUATION OF THE FCFA

SOURCE : MODIFIED FROM PROGES INFORMATION TO THE EVALUATION TEAM, 1994

Thus, the Project will reclaim approximately 4,000 hectares and improve 6,000 hectares, with a maximum cultivated area of 9,000 hectares as from 1997 onwards in scenario 1, without a PACD extension (see Table 13, column 2). With a PACD extension of 12 months, reclaimed and improved lands will amount to about 16,000 hectares of which a maximum of 14,400 hectares are assumed to be cultivated annually from 1997 onwards, in scenarios 2, 3 and 4 (Table 15, 17 and 19, column 2).

There will be a lag between the time the infrastructure construction for each phase is completed and the actual growing of rice. An annual and gradual increase in cultivated land in percentages up to the assumed maximum of 90% of cultivable area has been introduced in the analyses. In addition, yield increases in reclaimed lands will take longer to achieve than in improved lands because of the need to leach the salt from the soil. This increase in the lag phase in reclaimed lands has also been factored in.

The magnitude of the benefits will differ for the three types of land (flooded, contour berms and reclaimed). With the reclaimed land, any production can be attributed to the Project, while on the improved lands, only those production increases due to improvements made by the Project can be counted as a benefit. These differences are reflected in Tables 12, 14, 16 and 18 for each scenario. Columns 1, 3 and 5 in each of these tables show the estimated number of hectares of flooded, contour berms and reclaimed areas where the use of agricultural inputs is anticipated under each scenario, whereas columns 7, 9 and 11 show the areas where no use of inputs is expected. Columns 2, 4, 6, 8, 10 and 12 of each even numbered Table present the expected yield increase under each type of land in each of the previous column respectively.

Without an agricultural component and without a PACD extension, it has been assumed that progressive farmers representing approximately 10% of all farmers will in the end use agricultural inputs. On these improved parcels, the expected mean increase in yields, based on the PROGES demonstration plot yields multiplied by a factor of 0.7, will reach 2.0 tons/ha in improved lands, 1.2 tons/ha in contour berms and 2.5 tons/ha ultimately in reclaimed lands. It must be noted that a gradual increase in yield increment in reclaimed lands (Tables 12, column 6) has been factored when making the comparison to improved lands (column 2). This is necessary because it will take a few years for the soil to return to unsalty conditions. Where agricultural inputs are not added, the mean increase in yields have been calculated at 0.5 ton/ha for improved lands, 0.4 ton/ha on contour berms and 0.9 ton/ha in reclaimed lands.

In scenario 2, with a PACD extension but not an agricultural extension, the same percentages and expected yield increases were applied. In this case, it is only the total cultivable area that increased from 10,000 hectares to 16,000 hectares (Table 14).

In scenario 3, where an agricultural component is added to the Project, it is anticipated that the percentage of farmers using agricultural inputs will gradually increase to 50% by the year 2000 (Table 16).

In scenario 4, where agricultural extension services are provided and credit facilities become available, it is estimated that by the year 1997, close to 85% of all farmers will be using improved seeds and fertilizers at close to optimal amounts, resulting in a slight increase in yields, reflected in Table 18 (columns 2, 4 and 6).

In Tables 13, 15, 17 and 19, column 5 shows the assumed price of paddy in US dollars increasing from 85 FCFA in 1993, to 90 FCFA in 1994, 100 FCFA in 1995, 110 FCFA in 1996 to eventually stabilize at 120 FCFA in 1997. The pre-devaluation conversion rate was US $1 = 270 FCFA, and the post-devaluation exchange rate was estimated at US $1 = 580 FCFA. Considering that the World Bank long-term world market price is forecasted at an approximate 150 FCFA/kg of paddy, the figures retained by the evaluation team may seem very conservative. However, it has been deemed appropriate to retain those lower figures given the GOS historical policy of keeping rice prices artificially low because rice is one of the main staple foods of Senegal. For example, following the devaluation, the GOS revised the price of paddy/kg from 85 FCFA to 90 FCFA (6% increase), whereas the price of peanuts/kg went up from 85 FCFA to 100 FCFA (30% increase), and the price of cotton was increased from 85 FCFA/kg to 110 FCFA (43% increase).

10.2 Summary of Findings, Constraints and Conclusions

The economic analysis undertaken during the design phase of the Project made some highly erroneous assumptions which significantly overestimated benefits while underestimating costs.

The revised IRR ranges from 2.5% (for the scenario without a PACD extension and no agricultural component), to 5.8% with a twelve months' extension of the LBII contract and the PACD, assuming that 10% of farmers use agricultural inputs, and to 8.7% if 25% of the farmers use inputs. There is, as yet, no evidence that this 25% figure will be reached. When an agricultural component is added the IRR climbs to 10.9%, and the IRR increases to 15.7% for the scenario assuming an agricultural and credit component together with a twelve months' extension of the LBII contract to June 1996. The IRRs obtained illustrate the importance of an agricultural component to ensure an economically viable project.

A PACD extension of twelve months will also enable the Project to significantly increase the number of hectares of both reclaimed and improved land from 10,000 hectares to 16,000 hectares.

10.3 Recommendations

- The LBII contract and the SZWMP PACD should be extended by twelve months until June 30, 1996 and June 30, 1997 respectively, but only if an agricultural component is added.

- An agricultural component or a separate project to include agricultural extension and input should be designed as soon as possible for the Project area.

- Whereas the third scenario is acceptable with an increase in rice production of 19,000 tons and an IRR of 10.9 %, the evaluation team recommends the fourth scenario, which includes both an agricultural and a credit component, to be implemented either within the present Project or as a follow-on project. In this case, rice production will increase by 26,700 tons by the year 1999 as expected in the PP, and the IRR becomes 15.7 %.

TABLE 12.
ESTIMATED PROPORTION OF LAND AREAS AND RICE YIELDS
WITHOUT A PACD EXTENSION AND WITHOUT AN AGRICULTURAL COMPONENT *

	USING AGRICULTURAL INPUTS						NOT USING AGRICULTURAL INOUTS									
	IMPROVED LAND AREAS				RECLAIMED AREAS		IMPROVED LAND AREAS				RECLAIMED AREAS					
	FLOODED AREA OOO Ha	MEAN INCR YLD/ HA TONS	CONT. BERMS AREA 000 Ha	MEAN INCR YLD/ HA TONS	RECL-AIMED AREA 000 Ha	MEAN INCR YLD/ HA TONS	FLOODED AREA OOO Ha	MEAN INCR YLD/ HA TONS	CONT. BERMS AREA 000 Ha	MEAN INCR YLD/ HA TONS	RECL-AIMED AREA 000 Ha	MEAN INCR YLD/ HA TONS	TOTAL CULTI-VABLE AREA 000 Ha	EST. CULTI-VATED AREA 000 Ha	MEAN YIELD INCR. TONS/ HA	TOTAL YIELD INCR. 000's TONS
YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00
1992	0.00	0.00	0.02	0.00	0.00	0.00	0.40	0.20	0.02	0.10	0.06	0.00	0.50	0.25	0.1657	0.04
1993	0.07	1.80	0.12	0.32	0.35	1.40	1.15	0.50	0.60	0.20	0.65	0.30	2.94	1.47	0.5244	0.77
1994	0.20	1.80	0.12	0.50	0.35	1.50	2.36	0.50	1.43	0.25	1.72	0.40	6.17	3.70	0.51	1.90
1995	0.35	1.90	0.30	0.80	0.35	1.70	3.60	0.50	2.25	0.30	3.15	0.50	10.00	7.50	0.555	4.16
1996	0.35	2.00	0.30	1.00	0.35	1.90	3.60	0.50	2.25	0.40	3.15	0.70	10.00	8.00	0.657	5.26
1997	0.35	2.00	0.30	1.20	0.35	2.10	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.733	6.60
1998	0.35	2.00	0.30	1.20	0.35	2.30	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.74	6.66
1999	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2000	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2001	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2002	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2003	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2004	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2005	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2006	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2007	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2008	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2009	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2010	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2011	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2012	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2013	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72
2014	0.35	2.00	0.30	1.20	0.35	2.50	3.60	0.50	2.25	0.40	3.15	0.90	10.00	9.00	0.747	6.72

* ASSUMES VERY LOW ADOPTION RATE OF AGRICULTURAL TECHNOLOGY WITHOUT AG. COMPONENT AND MINIMUM CREDIT FACILITIES.

...AFFECTED BY SZWMP

...WITHOUT A PAID EXTENSION AND WITHOUT AN AGRICULTURAL COMPONENT

YEARS	TOTAL CULTIVABLE AREA (000 HA)	ESTIMATED CULTIVATED AREA (000 HA)	AVERAGE YIELD INCREASE TONS PER HECTARE	TOTAL YIELD INCREASE 000's TONS	PRICE OF RICE $/TON *	GROSS BENEFIT	LBII COSTS	GOS SHARE	VILL. LABOR	AG. COMP	TOTAL COSTS	NET BENEFIT
						(THOUSAND US DOLLARS)						
	1	2	3	4	5	6	7	8	9	10	11	12
1990	0.00	0.00	0.00	0.00	0	0	335	104	0	0	439	-439
1991	0.00	0.00	0.00	0.00	0	0	1263	221	0	0	1484	-1484
1992	0.50	0.25	0.17	0.04	278	12	2423	231	201	0	2855	-2843
1993	2.94	1.47	0.52	0.76	315	241	4051	191	166	0	4408	-4168
1994	6.17	3.69	0.52	1.90	155	295	4460	260	226	0	4946	-4651
1995	10.00	7.50	0.56	4.19	172	722	2592	195	170	0	2957	-2236
1996	10.00	8.00	0.66	5.26	190	998	283	189	164	0	636	362
1997	10.00	9.00	0.73	6.60	207	1365	283	209	173	0	665	700
1998	10.00	9.00	0.74	6.66	207	1378	235	34	25	0	294	1084
1999	10.00	9.00	0.75	6.72	207	1391	116	41	25	0	182	1209
2000	10.00	9.00	0.75	6.72	207	1391	120	45	25	0	190	1201
2001	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2002	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2003	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2004	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2005	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2006	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2007	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2008	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2009	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2010	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2011	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2012	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2013	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
2014	10.00	9.00	0.75	6.72	207	1391	120	48	25	0	193	1198
											IRR =	0.025

*Assumes price of paddy to increase from 85 FCFA/KG in 1993 to 90 FCFA in 1994, 100 FCFA in 1995, 110 FCFA in 1996 to stabilze at 120 FCFA in 1997

THE ECONOMIC INTERNAL RATE OF RETURN = 2.5%

SENSITIVITY ANALYSIS : IF COSTS INCREASE BY 10% AND BENEFITS DECREASE BY 10% IRR = 0.03%

IF COSTS INCREASE BY 20% AND BENEFITS DECREASE BY 20% IRR = -1.9%

ASSUMES EXCHANGE RATE PRE-DEVALUATION US $ = 270 FCFA

ASSUMES EXCHANGE RATE POST-DEVALUATION US $ = 580 FCFA

TABLE 14
ESTIMATED PROPORTION OF LAND AREAS AND RICE YIELDS*
WITH A PACD EXTENSION AND WITHOUT AN AGRICULTURAL COMPONENT

	USING AGRICULTURAL INPUTS						NOT USING AGRICULTURAL INPUTS									
	IMPROVED LAND AREAS				RECLAIMED AREAS		IMPROVED LAND AREAS				RECLAIMED AREAS					
	FLOODED AREA OOO Ha	MEAN INCR YLD/ HA TONS	CONT. BERMS AREA 000 Ha	MEAN INCR YLD/ HA TONS	RECL-AIMED AREA 000 Ha	MEAN INCR YLD/ HA TONS	FLOODED AREA OOO Ha	MEAN INCR YLD/ HA TONS	CONT. BERMS AREA 000 Ha	MEAN INCR YLD/ HA TONS	RECL-AIMED AREA 000 Ha	MEAN INCR YLD/ HA TONS	TOTAL CULTI-VABLE AREA 000 Ha	EST. CULTI-VATED AREA 000 Ha	MEAN YIELD INCR. TONS/ HA	TOTAL YIELD INCR. 000's TONS
YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.02	0.00	0.00	0.00	0.40	0.20	0.02	0.10	0.06	0.00	0.50	0.25	0.1657	0.04
1993	0.07	1.80	0.12	0.32	0.35	1.40	1.15	0.50	0.60	0.20	0.65	0.30	2.94	1.47	0.5244	0.77
1994	0.20	1.80	0.12	0.50	0.35	1.50	2.36	0.50	1.43	0.25	1.72	0.40	6.17	3.70	0.51	1.90
1995	0.35	1.90	0.30	0.80	0.35	1.70	3.60	0.50	2.25	0.30	3.15	0.50	10.00	7.50	0.555	4.16
1996	0.47	2.00	0.41	1.00	0.47	1.90	4.86	0.50	3.04	0.40	4.25	0.70	13.50	10.80	0.657	7.10
1997	0.56	2.00	0.48	1.20	0.56	2.10	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.733	10.56
1998	0.56	2.00	0.48	1.20	0.56	2.30	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.74	10.66
1999	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2000	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2001	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2002	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2003	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2004	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2005	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2006	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2007	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2008	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2009	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2010	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2011	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2012	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2013	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76
2014	0.56	2.00	0.48	1.20	0.56	2.50	5.76	0.50	3.60	0.40	5.04	0.90	16.00	14.40	0.747	10.76

*ASSUMES VERY LOW ADOPTION RATE OF AGRICULTURAL TECHNOLOGY WITHOUT AG. COMPONENT AND MINIMUM CREDIT FACILITIES.

... YIELDS, COSTS, BENEFITS AND IRR AS AFFECTED BY SZWMP
(WITH A PACD EXTENSION AND WITHOUT AN AGRICULTURAL COMPONENT)

YEARS	TOTAL CULTIVABLE AREA 000 HA	ESTIMATED CULTIVATED AREA 000 HA	AVERAGE YIELD INCREASE TONS PER HECTARE	TOTAL YIELD INCREASE 000's TONS	PRICE OF RICE $/TON	GROSS BENEFITS	LBII COSTS	GOS SHARE	VILL. LABOR	AG. COMP	TOTAL COSTS	NET BENEFITS
						(THOUSAND US DOLLARS)						
	1	2	3	4	5	6	7	8	9	10	11	12
1990	0.00	0.00	0.00	0.00	0	0	335	104	0	0	439	-439
1991	0.00	0.00	0.00	0.00	0	0	1263	221	0	0	1484	-1484
1992	0.50	0.25	0.17	0.04	278	12	2423	231	201	0	2855	-2843
1993	2.94	1.47	0.50	0.74	315	231	4051	191	166	0	4408	-4177
1994	6.17	3.70	0.51	1.90	155	295	4460	260	226	0	4946	-4652
1995	10.00	7.50	0.56	4.20	172	724	3969	195	170	0	4334	-3609
1996	13.50	10.80	0.66	7.10	190	1346	2592	189	164	0	2945	-1600
1997	16.00	14.40	0.73	10.56	207	2184	283	209	173	0	665	1519
1998	16.00	14.40	0.74	10.66	207	2205	283	209	173	0	294	1911
1999	16.00	14.40	0.75	10.76	207	2226	235	34	25	0	182	2044
2000	16.00	14.40	0.75	10.76	207	2226	116	41	25	0	190	2036
2001	16.00	14.40	0.75	10.76	207	2226	120	45	25	0	193	2033
2002	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2003	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2004	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2005	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2006	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2007	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2008	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2009	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2010	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2011	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2012	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2013	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
2014	16.00	14.40	0.75	10.76	207	2226	120	48	25	0	193	2033
											IRR =	0.058

...es price of paddy to increase from 85 FCFA/KG in 1993 to 90 FCFA in 1994, 100 FCFA in 1995, 110 FCFA in 1996, to stabilize at 120 FCFA in 1997
...CONOMIC INTERNAL RATE OF RETURN = 5.8%

...IVITY ANALYSIS : IF COSTS INCREASE BY 10% AND BENEFITS DECREASE BY 10% IRR = 3.40%
IF COSTS INCREASE BY 20% AND BENEFITS DECREASE BY 20% IRR = 1.20%

...ES EXCHANGE RATE PRE-DEVALUATION US $ = 270 FCFA
...ES EXCHANGE RATE POST-DEVALUATION US $ = 580 FCFA

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TABLE 16
ESTIMATED PROPORTION OF LAND AREAS AND RICE YIELDS*
WITH A PACD EXTENSION AND WITH AN AGRICULTURAL COMPONENT, BUT WITHOUT CREDIT FACILITIES

	USING AGRICULTURAL INPUTS						NOT USING AGRICULTURAL INPUTS									
	IMPROVED LAND AREAS				RECLAIMED AREAS		IMPROVED LAND AREAS				RECLAIMED AREAS					
	FLOODED AREA	MEAN INCR YLD/ HA	CONT. BERMS AREA	MEAN INCR YLD/ HA	RECL-AIMED AREA	MEAN INCR YLD/ HA	FLOODED AREA	MEAN INCR YLD/ HA	CONT. BERMS AREA	MEAN INCR YLD/ HA	RECL-AIMED AREA	MEAN INCR YLD/ HA	TOTAL CULTI-VABLE AREA	EST. CULTI-VATED AREA	MEAN YIELD INCR. TONS/ HA	TOTAL YIELD INCR. 000's TONS
	OOO Ha	TONS	000 Ha	TONS	000 Ha	TONS	OOO Ha	TONS	000 Ha	TONS	000 Ha	TONS	000 Ha	000 Ha		
YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.02	0.00	0.00	0.00	0.40	0.20	0.02	0.10	0.06	0.00	0.50	0.25	0.1657	0.04
1993	0.07	1.80	0.12	0.32	0.35	1.40	1.15	0.50	0.60	0.20	0.65	0.30	2.94	1.47	0.5244	0.77
1994	0.20	1.80	0.12	0.50	0.35	1.50	2.36	0.50	1.43	0.25	1.72	0.40	6.17	3.70	0.51	1.90
1995	0.53	1.90	0.45	0.80	0.53	1.70	3.40	0.50	2.13	0.30	2.98	0.50	10.00	7.50	0.61	4.56
1996	1.42	2.00	1.22	1.00	1.42	1.90	3.78	0.50	2.36	0.40	3.31	0.70	13.50	10.80	0.88	9.51
1997	1.96	2.00	1.68	1.50	1.96	2.10	4.16	0.50	2.60	0.40	3.64	0.90	16.00	14.40	1.06	15.26
1998	2.24	2.00	1.92	1.50	2.24	2.30	3.84	0.50	2.40	0.40	3.36	0.90	16.00	14.40	1.15	16.57
1999	2.52	2.00	2.16	1.50	2.52	2.50	3.52	0.50	2.20	0.40	3.08	0.90	16.00	14.40	1.25	17.99
2000	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2001	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2002	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2003	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2004	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2005	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2006	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2007	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2008	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2009	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2010	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2011	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2012	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2013	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01
2014	2.80	2.00	2.40	1.50	2.80	2.50	3.20	0.50	2.00	0.40	2.80	0.90	16.00	14.40	1.32	19.01

*Assumes increasing adoption rate of agricultural technology up to a maximum of 50%, even with an AG. component, because of minimum credit facilities and probable unavailability of cash for purchase of agricultural inputs.

TABLE 17

CALCULATION OF LAND AREAS, RICE YIELDS, COSTS, BENEFITS AND IRR AS AFFECTED BY SZWMP WITH A PACD EXTENSION, WITH AN AGRICULTURAL COMPONENT, AND WITH CREDIT FACILITIES

YEARS	TOTAL CULTIVABLE AREA 000 HA	ESTIMATED CULTIVATED AREA 000 HA	AVERAGE YIELD INCREASE TONS PER HECTARE	TOTAL YIELD INCREASE 000's TONS	PRICE OF RICE $/TON *	GROSS BENEFITS	LBII COSTS	GOS SHARE	VILL. LABOR	AG. COMP	TOTAL COSTS	NET BENEFITS
						(THOUSAND US DOLLARS)						
	1	2	3	4	5	6	7	8	9	10	11	12
1990	0.00	0.00	0.00	0.00	0	0	335	104	0	0	439	-439
1991	0.00	0.00	0.00	0.00	0	0	1263	221	0	0	1484	-1484
1992	0.50	0.25	0.17	0.04	278	12	2423	231	201	0	2855	-2843
1993	2.94	1.47	0.51	0.75	315	236	4051	191	166	0	4408	-4173
1994	6.17	3.70	0.51	1.90	155	295	4460	260	226	0	4946	-4652
1995	10.00	7.50	0.61	4.56	172	786	3969	195	170	1000	5334	-4547
1996	13.50	10.80	0.88	9.51	190	1805	2592	189	164	1500	4445	-2641
1997	16.00	14.40	1.06	15.26	207	3158	283	209	173	500	1165	1993
1998	16.00	14.40	1.15	16.57	207	3429	283	209	173	0	294	3135
1999	16.00	14.40	1.25	17.99	207	3721	235	34	25	0	182	3539
2000	16.00	14.40	1.32	19.01	207	3933	116	41	25	0	190	3743
2001	16.00	14.40	1.32	19.01	207	3933	120	45	25	0	193	3740
2002	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2003	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2004	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2005	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2006	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2007	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2008	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2009	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2010	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2011	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2012	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2013	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
2014	16.00	14.40	1.32	19.01	207	3933	120	48	25	0	193	3740
											IRR =	0.109

*Assumes price of paddy to increase from 85 FCFA/KG in 1993 to 90 FCFA in 1994, 100 FCFA in 1995, 110 FCFA in 1996, to stabilize at 120 FCFA in 1997

THE ECONOMIC INTERNAL RATE OF RETURN = 10.9%

SENSITIVITY ANALYSIS : IF COSTS INCREASE BY 10% AND BENEFITS DECREASE BY 10% IRR = 8.30%

IF COSTS INCREASE BY 20% AND BENEFITS DECREASE BY 20% IRR = 5.80%

ASSUMES EXCHANGE RATE PRE-DEVALUATION US $ = 270 FCFA

ASSUMES EXCHANGE RATE POST-DEVALUATION US $ = 580 FCFA

TABLE 18
ESTIMATED PROPORTION OF LAND AREAS AND RICE YIELDS
WITH A PACD EXTENSION, WITH AN AGRICULTURAL COMPONENT, AND WITH CREDIT FACILITIES*

	USING AGRICULTURAL INPUTS						NOT USING AGRICULTURAL INPUTS									
	IMPROVED LAND AREAS				RECLAIMED AREAS		IMPROVED LAND AREAS				RECLAIMED AREAS					
	FLOODED AREA	MEAN INCR YLD/ HA	CONT. BERMS AREA	MEAN INCR YLD/ HA	RECL-AIMED AREA	MEAN INCR YLD/ HA	FLOODED AREA	MEAN INCR YLD/ HA	CONT. BERMS AREA	MEAN INCR YLD/ HA	RECL-AIMED AREA	MEAN INCR YLD/ HA	TOTAL CULTI-VABLE AREA	EST. CULTI-VATED AREA	MEAN YIELD INCR. TONS/ HA	TOTAL YIELD INCR. 000's TONS
	OOO Ha	TONS	000 Ha	TONS	000 Ha	TONS	OOO Ha	TONS	000 Ha	TONS	000 Ha	TONS	000 Ha	000 Ha		
YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.02	0.00	0.00	0.00	0.40	0.20	0.02	0.10	0.06	0.00	0.50	0.25	0.1657	0.04
1993	0.07	1.80	0.12	0.32	0.35	1.40	1.15	0.50	0.60	0.20	0.65	0.30	2.94	1.47	0.5244	0.77
1994	0.20	1.80	0.12	0.50	0.35	1.50	2.36	0.50	1.43	0.25	1.72	0.40	6.17	3.70	0.51	1.90
1995	1.05	2.00	0.90	0.80	1.05	1.70	2.80	0.50	1.75	0.30	2.45	0.50	10.00	7.50	0.78	5.82
1996	2.36	2.20	2.03	1.00	2.36	1.90	2.70	0.50	1.69	0.40	2.36	0.70	13.50	10.80	1.14	12.31
1997	4.48	2.20	3.84	1.50	4.48	2.10	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.69	24.29
1998	4.48	2.20	3.84	1.50	4.48	2.30	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.74	25.10
1999	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2000	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2001	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2002	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2003	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2004	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2005	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2006	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2007	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2008	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2009	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2010	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2011	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2012	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2013	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71
2014	4.48	2.20	3.84	1.50	4.48	2.70	1.28	0.50	0.80	0.40	1.12	0.90	16.00	14.40	1.86	26.71

*ASSUMES INCREASING ADOPTION RATE OF AGRICULTURAL TECHNOLOGY UP TO A MAXIMUM OF 80%, EVEN WITH AN AG. COMPONENT, BECAUSE NOT ALL FARMERS WILL BE ABLE OR WILLING TO TAKE ADVANTAGE OF CREDIT FACILITIES FOR PURCHASE OF AG. INPUTS.

FACILITIES

YEARS	CULTIVABLE AREA 000 HA	ESTIMATED CULTIVATED AREA 000 HA	AVERAGE YIELD INCREASE TONS PER HECTARE	TOTAL YIELD INCREASE 000's TONS	PRICE OF RICE $/TON	GROSS BENEFITS	LBII COSTS	GOS SHARE	VILL LABOR	AG COMP	TOTAL COSTS	NET BENEFITS
						(THOUSAND US DOLLARS)						
	1	2	3	4	5	6	7	8	9	10	11	12
1990	0.00	0.00	0.00	0.00	0	0	335	104	0	0	439	-439
1991	0.00	0.00	0.00	0.00	0	0	1263	221	0	0	1484	-1484
1992	0.50	0.25	0.17	0.04	278	12	2423	231	201	0	2855	-2843
1993	2.94	1.47	0.50	0.74	315	231	4051	191	166	0	4408	-4177
1994	6.17	3.70	0.51	1.90	155	295	4460	260	226	0	4946	-4652
1995	10.00	7.50	0.78	5.82	172	1003	3969	195	170	1000	5334	-4330
1996	13.50	10.80	1.14	12.31	190	2335	2592	189	164	1500	4445	-2110
1997	16.00	14.40	1.69	24.29	207	5026	283	209	173	1000	1665	3361
1998	16.00	14.40	1.74	25.10	207	5193	283	209	173	500	794	4399
1999	16.00	14.40	1.86	26.71	207	5527	235	34	25	0	182	5345
2000	16.00	14.40	1.86	26.71	207	5527	116	41	25	0	190	5337
2001	16.00	14.40	1.86	26.71	207	5527	120	45	25	0	193	5334
2002	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2003	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2004	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2005	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2006	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2007	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2008	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2009	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2010	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2011	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2012	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2013	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
2014	16.00	14.40	1.86	26.71	207	5527	120	48	25	0	193	5334
											IRR =	0.157

Assumes price of paddy to increase from 85 FCFA/KG in 1993 to 90 FCFA in 1994, 100, FCFA in 1995, 110 FCFA in 1996, to stabilize at 120 FCFA in 1997.

THE ECONOMIC INTERNAL RATE OF RETURN = 15.7%

SENSITIVITY ANALYSIS : IF COSTS INCREASE BY 10% AND BENEFITS DECREASE BY 10% IRR = 12.70%

IF COSTS INCREASE BY 20% AND BENEFITS DECREASE BY 20% IRR = 9.80%

ASSUMES EXCHANGE RATE PRE-DEVALUATION US $ = 270 FCFA

ASSUMES EXCHANGE RATE POST-DEVALUATION US $ = 580 FCFA

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PROJECT LOGFRAME

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
GOAL			
To increase cereals production in the southern zone of Senegal.	1. Rice production in the project area increased by 50 percent by 1999 on 15,000 hectares; from 54,000 tons in 87/88 to 81,000 tons of paddy rice in 1999.	1. Statistics provided by Ministry of Rural Development	1. No severe and prolonged drought affects the Casamance during project years. Political stability continues.
	2. Overall cereals production in the project area increased by 25 percent by 1999; from 103,000 tons in 87/88 to 132,000 tons in 1999.	2. Project monitoring statistics.	2. Cereals can be exported or consumed locally. Marketing not a problem.
		3. Post-project impact evaluations.	3. Both financial and cultural incentives exist to increase production of cereals.
			4. Applied research findings for particular crops/areas produced and extended to farmers.
			5. Farmers will have access to and use fertilizer and improved seeds.
PURPOSE			
To improve farmer recovery of land and utilization of water for agricultural production purposes.	1. 15,000 ha. of valley land recovered or benefitting from improved water supply.	1. Project evaluations	1. No labor constraints in using new fields or new techniques.
	2. Better availability of water throughout growing season leading to less plant stress and lengthened growing season.	2. On-going project monitoring and project documents.	2. Demand for improved water management is high. Farmers want to follow through, see it to their advantage.
	3. Increased yield and production stability during years of variable or low rainfall. Rice yields increased by 1.8 MT per hectare during years of normal rainfall.	3. ISRA reports.	

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
	4. Set of methodologies and approaches determined to provide most technically, environmentally, economically and socially appropriate mix of water control infrastructure, water management techniques, soil and water conservation practices in the watersheds, and forms of local participation. 5. Increased regional and local capacity to plan, execute, operate and maintain water control works. 6. Technical Ministries in regions assisting farmers improve 2,000 ha. per year through better water management.		
OUTPUTS			
1. Water management plans, including designs, for small watershed areas completed and implemented at request and through assistance of local farmers.	1. Water management plans for 60 sites on a small watershed basis (including plateaus, slopes and valleys) completed leading to installation of mix of: anti-salt dikes, water retention dikes, land-terracing, land levelling, diversions and waterways, and contour berms; depending on needs, requirements, technical, social and environmental constraints in each watershed area.	1. Contractor Reports.	1. Availability of COS functionnaires able and willing to do required work.
2. Protection of highrisk valleys against salt-intrusion.	2. Small anti-salt dikes installed using village labor and maintained by villagers, resulting in desalination of 10,000 has, improved water availability on an additional 5,000 hectares.	2. Project evaluations	2. Support of administrative officials at all levels; cooperation from NGO.

SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
3. Well-defined set of institutional relationships between MRD and MH and capacity for supervising and carrying out water management planning, development, follow-up, and evaluation/monitoring.	3. Working group: - following standardized approach and procedures, - organizing villages and local organizations, - planning and designing best mix of water management structures, - getting agreement among villagers and villages on the plans and designs, - following through with construction and organization of management committee for maintenance and follow-on.	3. Project monitoring reports.	3. Coordination and good working relationship among all organizations, Ministries involved in project implementation.
4. Research completed by ISRA or other research organizations on topics related to water management concerning social/cultural problems, infrastructure/technical questions, soil and topography, and best mix of water management techniques.	4. Applied research results leading to improved methodologies and approaches starting in year 4 of the project.	4. ISRA and other research reports.	4. Land tenure and land distribution are not constraints to infrastructure development and improved water management and water utilization.
5. Private sector involved in infrastructure development.	5. a. 60 percent of overall value of infrastructure construction carried out by private sector. b. Procedures and relationships developed for GOS to increase use of private sector.	5. MRD reports	5. Local population provides labor for infrastructure development.
6. PVOs and possibly PCVs working closely with village organizations in developing and supporting water management activities and improved water utilization.	6. 60 local organizations formed and trained by PVOs and PCVs for using better water management techniques and maintaining infrastructure.	6. Project reports	6. Private contractor and/or GOS can procure materials for construction in a timely manner.
7. Environmental studies completed on impacts of water control structures on soils, water, flora and fauna in the project area.	7. - Anti-salt dike round-table, - ground water study, - regional water control modeling study, - water-borne disease assessment, - and terrestral ecosystem study all completed as scheduled.	7. Study Reports	7. Available private contractors and PVOs willing to provide required services at acceptable quality standards and costs.

DELIVERY ORDER STATEMENT OF WORK

ATTACHMENT I

DELIVERY ORDER STATEMENT OF WORK

BACKGROUND

a) Project Definition

Article 2.1. of the project Grant Agreement provides the following definition of the project:

> "The Southern Zone Water Management project will help farmers recover lost-productive farmland and improve their utilization of water to increase production of crops. The project consists of four components which will be coordinated to protect and reclaim salinized lands, to improve water management on non-salinized lands, and to increase cereal crop productivity. The project will finance technical assistance, training, commodities, infrastructure development services and other costs supportive of the four components".

b) Project Goal

The goal of the project is to increase cereals, mainly rice production in the Kolda and Ziguinchor regions.

c) Project Purpose

The project will help farmers recover lost-productive farmland and improve their utilization of water to produce crops.

d) Project Components

* Water Control and Management
* Institutional Strengthening
* Operational and Applied Research
* Project Monitoring

e) Planned Project Outputs

It is anticipated that by the end of the project:

i) approximately 60 valleys and 15,000 hectares of land will have been recovered or will have improved water control and utilization,

ii) village water management committees will have contributed to the development of water management plans; and villages and private contractors will have constructed dikes and berms,

iii) the Ministry of Rural Development and Hydraulics will be capable of supporting water management development in the southern zone; local and regional organizations will increase their capacity to plan, execute, operate and maintain water control works,

iv) national research institutions will be able to identify locally adapted water, soil and crop management practices to maximize benefits of anti-salt protection, to improve farmers ability to reclaim salinized land, and to increase crop production,

v) rice yields are increased from 0.8 MT/ha to 1.8 MT/ha during years of normal rainfall,

vi) a set of methodologies and approaches will have been determined to provide the most technically, environmentally, economically and socially appropriate mix of water control infrastructure, water management techniques, soil conservation practices, water conservation practices, and the best forms of local participation.

f) Project History and Implementation Status.

The project was authorized by USAID/Senegal on 19 August 1988 and the Grant Agreement signed on August 22, 1988. The Project Assistance Completion Date (PACD) is June 30, 1996. The implementing agency is the Directorate of Rural Engineering and Hydraulics of the Ministry of Rural Development and Hydraulics (MRDH).

The project is implemented through a Project Management Unit (PMU), based in Ziguinchor, which consists of:

- A National Project Director (2-4 yrs)
- A Technical Assistance Team from Louis Berger International, Inc. (LBII), composed of:

  * Chief of Party, Water Resources Engineer (5 yrs)
  * Water Resources Engineer (4 yrs)
  * Sociologist (2 yrs)
  * Agronomist (4 yrs)
  * Administration and Finance Director (5 yrs)

The members of the PMU guide and coordinate work with GOS counterparts in two Regional Water Management Teams. Each team is comprised of:

* 1 Water Resources/Civil Engineer
* 1 Surveyor/Construction Supervisor
* 1 Agronomist with soils training
* 1 Agro-Extentionist

MRDH has established Regional Technical Committees (RTC) in the Regions of Kolda and Ziguinchor. The Project Director heads these committees comprised of the Regional Inspectors of Agriculture and Hydraulics. The committees receive advice and support from other regional services as required for the successful implementation of the project and works with representatives from the Village Water Management Teams and Inter-Village Water Management Councils. The committees are responsible for implementation and monitoring of the work programs and plans developed with the project management unit (PMU). The second major role of the RTC is to report to the Regional Development Committee (RDC) already established in each region. The RTC-RDC link enables the project to maintain good working relations with the regional administrations. The technical assistance contract with LBII was signed in June 1990 but the technical assistance team did not become fully operational until late 1990. The 1992 Construction Program I developed Mayor and Nguindir valleys where 9 dikes were completed in July 1992. The 1993 Construction Program II is developing Kounounding Djoe, Kandion Mangana and Badobar valleys where 14 dikes are being constructed.

The project involves the private sector and local Non-Governmental Organizations (NGOs) in implementation including design, dike construction and consulting services. This project has experienced tremendous delays in field implementation. The major causes of these delays include:

- delays in submission and approval of the annual workplan and budget,
- two changes in the technical assistance team's Chief of Party,
- a change in the Government of Senegal's National Project Director,
- GOS contributions are not provided at the levels stipulated in the Project Paper and in a timely manner despite efforts by the GOS National Director to obtain them.

ARTICLE I: ACTIVITY TO BE EVALUATED

Project Title:	Southern Zone Water Management
Project number:	685-0295
Authorization Date:	22 August 1988
Date Project Agreement signed:	22 August 1988
Life of Project Funding:	$18,000,000
Project Assistance Completion date:	30 June 1996

ARTICLE II: OBJECTIVE

The purpose of the evaluation is to assess the progress towards achievement of project goals and objectives and to identify improvements that will facilitate the attainment of the project purpose. Key project assumptions will be reviewed and analyzed. The evaluation should make recommendations regarding modifications required to project goal, purpose and strategy. Special attention will be given to the project institutional arrangements, watershed management, operational and applied research and environmental and project monitoring to identify early corrections needed. In addition, the project will assess the extent to which the project contributes to achievement of the Mission's strategic objectives. The evaluation will be undertaken during November-December 1992.

ARTICLE III: STATEMENT OF WORK

A. Project Design: Assumptions, Objectives and Approaches

The evaluation team will:

1. review and analyze the project assumptions contained in the logframe and determine whether they are still valid;

2. assess progress towards attainment of project objectives and determine whether they can be achieved during the life-of-project. If the existing objectives cannot be achieved, the evaluation team will make recommendations as to how the objectives should be revised;

3. analyze the major constraints to project implementation and identify lessons learned from the 1992 construction program I in which the population participated;

4. assess the adequacy of project resources and timeframe for accomplishing project objectives;

5) assess institutional arrangements and watershed management approach and make suggestions for needed improvements;

6) analyze the strategy for GOS and private sector involvement, particularly in designing, constructing and managing watershed control systems; and,

7) assess the level of GOS financial contribution and technical support and the impact it is having on the progress of the project.

8) recommend any new objectives or approaches which will strengthen project design.

9) review the project purpose and determine whether it is likely to attain the project goal in a cost effective way in the present institutional environment in the Casamance.

10) Topographic studies and the ensuing engineering designs of specific valleys indicate that the area of land which can be rehabilitated or recliamed far exceeds the estimates provided in the Project Paper. The question then arises whether the project objective should be:

* intervention in 60 valleys which will rehabilitate land area far in excess of that proposed in the Project Paper,

* partial intevention in 60 valleys to rehabilitate or recuperate 15,000 ha, or

* intervention in sufficient valleys to recuperate or rehabilitate 15,000 ha.

11) Appropriateness of leaving input supply and extension out of project.

B. Project Components

1. Water Control and Management

The contractor will evaluate and make recommendations concerning:

(a) the process and plans for selecting valleys and construction sites;

(b) the quality of the design, construction, operations and maintenance of the systems completed under the Program I (1992) and construction plans for Program II (1993);

(c) the appropriateness of the type and size of dike being built given project objectives and cost constraints;

(d) project costs and the adequacy of the project budget and resources to achieve water control and management objectives; and,

(e) the appropriate role of sub-contractor and village groups in constructing dikes and the implications of these roles on project cost, timing and sustainability.

(f) private sector capacity to execute contracts;

(g) the merits of PROGES purchasing heavy equipment and putting it at the disposition of contractors through a rental, lease or credit mechanism;

(h) the viability of expending further funds to accomplish the "global program" rather than the "essential program" approved by the National Project Committee (NPC). Defintion of the respective programs is provided in "Proposition d'aménagement de la Phase II" circulated to the NPC;

(i) the economic benefits of a more thorough development of fewer valleys versus providing major structures only in a larger number of valleys;

(j) in conjunction with the team economist analyze Program I construction costs and propose measures to reduce future construction costs.

2. Institutional Strengthening

The evaluation team will evaluate and make recommendations concerning:

(a) the progress LBII has made in identifying skills to be developed by the technical ministry and counterparts and in developing an appropriate training program;

(b) steps LBII has taken to identify the responsibilities of village groups in the areas of watershed planning, construction, and operations and maintenance; and provide them with appropriate training and other support;

(c) steps USAID and LBII have taken to simplify contracting procedures with private sector contractors;

(d) progress LBII has made in involving NGO's in project activities and training them.

(e) the capacity of village communities to absorb additional workload associated with increased rice production;

(f) the strategy of PROGES and NGO managed pilot parcels for demonstration, vulgarization and extension;

(g) the strategy needed for post project sustainability at the village level;

(h) the scope and framework of NGO involvement;

(i) the merits of PROGES providing credit to contractors so they may purchase heavy equipment;

3. Operational and Applied Research

The evaluation team will evaluate and make recommendations concerning:

Agronomy:

(a) the capacity, willingness and capability of ISRA to carry out the adaptive research for the project, and the potential contribution of this research to project objectives;

(b) the nature and severity of constraints affecting agricultural production in the project area and the capacity of farmers to deal with them;

(c) the effect of the construction works realized by the project in improving the conditions of rice cultivation in the project area (salinity, acidity, etc...);

(d) the suitability of the applied research themes being promoted by ISRA given the above constraints;

(e) the effectiveness of PMU demonstration on-farm trials in developing appropriate technologies for dissemination to farmers;

(f) in conjunction with the team sociologist will evaluate the degree to which land reclamation and crop production and diversity has been actively and successfully encouraged by the project;

(g) specific agricultural activities and research needed to attain project objectives;

(h) the reasons for the delay in the implementation of Operational and Applied Research component (soil and water management systems, crop production systems, hydro-pedological monitoring,monitoring of the environmental impacts of the Affiniam Dam, etc..) and the impact this delay will have on the achievement of project goals and objectives.

(i) Program I pilot parcels.

Agro-economy:

(a) types of baseline data that need to be put in place in order to assess performance of farm households in applying improved agricultural practices resulting in yield and income increases;

(b) the adequacy of ISRA's (Senegalese Agricultural Research Institute) proposed data collection and analysis system to accurately assess changes over time in the project area, especially as it pertains to the adoption of new practices;

(c) the impact that the ISRA activity will have on achieving project objectives;

(d) specific economic studies and/or database collection/analysis which ISRA should undertake to better assess the needs of the farmers and measure the impact of project activities on an on-going basis;

(e) the economic impact of partial versus global valley development stemming from limited project resources;

(f) the economic impact of the project on rural economies and measures to accelerate short-term benefits;

(g) the contractor should also provide a revised cost benefit analysis and compare it with that contained in the project paper and Engineering Annex;

(h) in conjunction with the team agronomist, assess the reliability of the input supply and extension delivery system and their adequacy for the project to achieve its goal;

(i) in conjunction with team engineer, analyze construction costs and propose ways to reduce them;

(j) in conjunction with the team sociologist, suggest strategies strengthening village economies, farmer productivity and short-term farmer financial returns.

4. Project Monitoring

The evaluation team will review and make recommendations regarding:

(a) the integrated project monitoring and environmental monitoring plans(or steps taken towards the development of such a plan);

(b) the extent to which the project monitoring system, including the environmental monitoring plan and the ISRA Cooperative Agreement, can provide the information needed by USAID's Assessment of Program Impact reporting system;

(c) the effects of the construction works realised on the overall land use practices for agriculture, herding, and fishing;

(d) gender disaggregated data being collected.

C. Project Management and Implementation

The evaluation team will:

1. Evaluate and make recommendations on the effectiveness of the management, collaboration and oversight provided by the following project parties: USAID (including the Project Monitoring Officer), Louis Berger II (LBII), the GOS (including Regional Technical Committees, Inspectorates of Agriculture, the Ministry of Rural Development and Hydrology, and Regional Water Management Teams), Village Water Management Committees, National Project Committee (NPC) and NGOs.

2. Identify the additional management interventions that should be undertaken by the above parties to improve project management (One particular question that should be examined is the level of direct USAID oversight required in the Casamance);

3. Assess the degree to which each of the above project parties has fulfilled its responsibilities;

4. Assess the major constraints encountered during implementation that relate to institutional arrangements;

5. Identify the lessons learned from implementation experience with regard to preparation of annual work plans and budgets, site work organization, villagers, private sector and NGO involvement and training;

6. Evaluate the performance of the previous and current technical assistance team as well as the capabilities of the current team. Has a sufficient level of effort been planned for each technical specialist?

7. Assess the project vehicle management practices; and,

8. Assess the progress LBII has made in preparing counterparts to assume responsibility for project activities in 1996.

9. Provide reassessment of human and material resources necessary to implement project.

10. Assess coordination with other projects and NGOs.

D. Sociological Aspects

The evaluation team will assess and make recommendations regarding:

1. actual and future roles of beneficiaries in construction, operations and maintenance of watershed control system;

2. the validity of the assumptions regarding the role of the community in rice production, i.e. what is the level of interest in increasing rice production and by whom?

3. the effectiveness and sustainability of approaches to the organization and involvement of farmers and villages in project areas; What incentives (short-term and long-term) are necessary to ensure village participation in construction and maintenance of structures?

4. the farmers' capability to manage water retention structures;

5. the need for additional extension and input supply support and the financial implications of additional support;

6. the effectiveness of the PMU and ISRA personnel in reaching the farmers with appropriate recommendations given the local organization within a watershed and the production constraints and the desires and needs of the farmers;

7. the success thus far of the ISRA program (if it has begun) to upgrade the project field agent's capacity to better meet the needs of the farmers;

8. the adequacy of resources on the PMU's sociological staff to adequately track and monitor the project;

9. household labor strategies, labor requirements, migration practices and migration rates limit to, as they affect the ability of the project to meet the project goal;

10. land tenure issues;

11. the receptiveness of farmers to the themes being promoted by the project and the effectiveness of the methodologies used in disseminating information;

12. strategies for short term farmer returns;

13. mechanisms for strenghtening village economies and productivity

14. in conjunction with the team economist, suggest strategies for strengthening village economies, farmer productivity and short-term farmer financial returns;

15. capacity of the village water committee to handle a more complete set of project support activities, including input supply and extension;

16. in conjunction with the team agronomist evaluate the receptiveness of farmers to the themes being promoted by the project and the effectiveness of the methodologies used in disseminating information.

E. Special Issue

Given the importance of gender considerations in assessing the "people level impacts" of the SZWM Project, the evaluation team will document the differential participation of men and women at each level of project activity subject to the availability of data. Special attention will be given to documenting on a gender disaggregated basis the allocation of sub-project benefits. Based on this analysis, the evaluation team will draw conclusions regarding the principal constraints to effective participation by men and women in project activities, and will draw conclusions regarding opportunities to maximize effective participation of men and women in future project activities.

ARTICLE IV: REPORTING REQUIREMENTS

At the end of the second week in country, the contracting team will submit an outline of the evaluation to USAID. After three and a half

weeks, the Contractor will submit a first draft of the evaluation to USAID. USAID will review the document and provide comments to the contractor. The contractor will incorporate these comments into the evaluation and will submit a revised draft to USAID. USAID will review the evaluation a final time and will again provide comments to the contractor. These comments should be incorporated into the evaluation. A final copy of the evaluation in English will be submitted to USAID/Senegal prior to the departure of the team leader. A month later, the contractor will submit to USAID five copies of the evaluation report translated into French. All copies must be of a quality to ensure easy and clear reproduction.

The final evaluation report will contain the AID required executive summary and project identification data sheet. The team leader will be responsible for completing the abstract and narrative sections of the AID evaluation summary form. Detailed instructions for completing these section of the form will be provided to the contractor by USAID/Dakar together with A.I.D.'s required format for evaluation reports.

ARTICLE V: RELATIONSHIPS AND RESPONSIBILITIES

A. Under the supervision of USAID/PDO and the general guidance of the USAID Evaluation Officer, the team leader will direct members of the Evaluation team.

B. Cooperating country liaison officials: Mr. Abdoulaye Séne, Directeur du Génie Rural et de l'Hydraulique, and Mr. Pierre Tendeng, Directeur National du Projet.

C. AID Liaison Officials: Mr. Iqbal Qazi, Deputy PDO and Seydou Cisse, USAID's Evaluation Officer. Abdoulaye Barro, the Project Officer, will backstop the team and provide day to day guidance; Contractor: Louis Berger International (LBII, Terry Hart).

ARTICLE VI: PERFORMANCE PERIOD

The total period of the evaluation will be seven weeks. It will begin o/a November 1, 1993 and end on/a December 18, 1993. The schedule below is illustrative and will be discussed again and revised after the arrival of the team.

Phasing of Evaluation team's work (Note: A six-day work week is authorized)

FIRST WEEK	Evaluation team arrives in Dakar
Day 1 - Mon. Nov. 1	Team arrives in Dakar

Day 2-3 Tue. Nov. 2 Wed. Nov. 3	Team meets USAID staff (Including the Mission's Agriculture and Natural Resources Office) Collects documentation Logistics, USAID briefing
Day 4 - Thur Nov. 4	Team meets with Ministry of Rural Development. Team reviews evaluation plan and schedule and documentation;
Day 5 - Fri. Nov. 5	Team departs for Ziguinchor (6:30 am, arrives late afternoon). RTC Ziguinchor brief evaluation team.
Day 6 - Sat. Nov. 6	Interview TA Team and PMU and procede to Sedhiou. Meet with Kolda RTC in Sedhiou and then visit sites.

SECOND WEEK

Day 8 - Mon. Nov. 8 Sat. Nov. 13	Continue site visits and interviews at both Program I and II. Visit other anti-salt projects in the area (AJAC, PRIMOCA etc.) as basis for comparison

THIRD WEEK

Day 15 - Mon. Nov. 15 Thru Wed. Nov. 17	Continue interviews and final observations.
Day 18 - Thur Nov. 18	Begin Drafting First Outline

FOURTH WEEK

Day 22 - Mon. Nov. 22	Fax draft outline to USAID.
Day 23 - Tue. Nov. 23	Team continues drafting report and continued site visits as needed.
Day 27 - Sat. Nov. 27	Team faxes first complete draft to USAID

FIFTH WEEK

Day 30 - Tue. Nov. 30	Evaluation Team briefs USAID on evaluation findings and USAID provides feedback
Day 31 - Wed. Dec. 1	Team begins revising first draft based on comments from USAID.
Day 32 - Thur.Dec. 2	Team leader briefs GOS
Day 34 - Sat. Dec. 4	Team submits revised draft to USAID.
Day 35 - Sun. Dec. 5	Agro-soils scientist and economist departs.

SIXTH WEEK

Day 39 - Thur. Dec. 9	Team leader submits third draft.

SEVENTH WEEK

Day 43 - Mon. Dec. 13	Team leader meets with USAID to discuss third draft.
Day 44 - Tue. Dec. 14	Team leader starts makes final revisions to report.
Day 46 - Thur.Dec. 16	Final Draft Submitted to and reviewed by USAID
Day 47 - Sat. Dec. 18	Team Leader Departs

ARTICLE VII: WORK DAYS ORDERED

Position	Work days
Team leader/Water Resources Engineer 7 weeks x 6 days	42 days
Economist Rural Development Specialist 5 weeks x 6 days	30 days
Agro-soil Scientist 5 weeks x 6 days	30 days

Methodology

The evaluation methodology will include, but will not be limited to:

* reading project documentation at USAID;
* interviewing USAID staff particularly PDO and ANR and GOS staff;
* interviewing field agents, Ziguinchor and Kolda project staff and receiving briefings on the overall program and the specific objectives for the developments of the SZWMP;
* meet with ISRA/Djibelor rsearchers who will be implementing the applied research component,
* visit other water management projects in the area (PRIMOCA, AJAC, etc.)
* reviewing the LBII programs and interviewing project technicians;
* reading all relevant document prepared by RTC, LBII technicians and consultants;
* contacting project beneficiaries.

ARTICLE VIII: AID ILLUSTRATIVE BUDGET

Funding amounts are specified in Attachment III, Budget.

The in-country per diem and transportation for the Social Scientist will be paid by AID.

ARTICLE IX: SPECIAL PROVISION

A. Composition of the Evaluation Team

1. International team

The Contractor will provide three experienced and knowledgeable specialists to undertake this evaluation. They should be fluent in French and possess considerable evaluation experience. The IQC team's discipline and level of effort are as follows:

(a)	Water Resource Engineer (team leader)	7 weeks
(b)	Agricultural Economist	5 weeks
(c)	Agro-Soils Scientist	5 weeks
(d)	Social Scientist (provided by USAID)	4 weeks

a) Engineer/Team leader: Water resources or Agricultural engineer with extensive experience in planning, designing, constructing and observing the operations and management of village-based watershed development systems (especially in areas with

tidewaters and salinity related problems). He will be responsible for team management, coordination, report preparation and briefing.

The team leader will review the selection, design and construction criteria developed by RTC and the technical assistance team. She or he will assess the design and construction of completed water retention dikes and those under construction and review plans for proposed water control systems. the team leader will examine the role of the private sector and assess its potential to provide construction services and perform studies (topography, soils, hydrology, etc.). Team leader will make recommendations for future design and construction programs.

The team leader will be responsible for assigning responsibilities associated with the evaluation. The division of tasks outlined in this Statement of Work is intended to form a basis from which to make decisions regarding the division of labor. USAID should be consulted should the IQC team decide to depart in a significant way from the division of tasks described here.

Other qualification include the following requirements:

1) Project design and evaluation experience. The team leader should have served in a similar capacity on other evaluation teams, preferably for AID projects;
2) proven team leader skills;
3) Masters degree in agricultural engineering;
4) sound working knowledge to develop watershed plans with appropriate inputs of topography, soils, hydrology, agronomy social etc;
5) Experience with site structures design, and construction, salty and acidic soils, mangroves;
6) knowledge of plant, water and soil relations;
7) Experience with rice culture and other farming practices found in West Africa;
8) French language skills equivalent to FSI's S-3 and R-3 ratings;
9) good communication skills, especially in drafting reports and in briefing both French and English speaking audiences
10) good writing skills

b) Economist: an Economist with extensive private sector and rural/agriculture development experience. The economist will examine the objectives and assumptions of the project and actions taken to improve farmer recovery of land and water utilization for agricultural production purposes. These will be compared with progress indicators as spelled out in the project paper. Divergences from the plan will be examined and explained. She or he will assess the potential for developing viable water control system for replication by farmers.

The economist will make recommendations with regard to the feasibility of achieving the original objectives, or provide alternatives which conform to realities as seen by the evaluation team. The economist will review the project's economic assumptions and consider whether these remain valid and, if not, comment on the implications for the project. The economist will recommend new objectives as appropriate. She or he will review the project economic monitoring methodology and make recommendations in light of the evaluation team's findings. The economist will be responsible for evaluating those aspects of the project related to ISRA's involvment and monitoring and development.

Other qualification include the following requirements:

1) Doctorate degree in Economics;
2) AID project design and evaluation experience;
3) strong communication skills.
4) Experience in critical project budget review with ability to perform sound financial analysis.

c. Agronomist/Soil Scientist: The Agronomist or Soil Scientist will examine the soil qualities of the project zone. He or She will evaluate the methodologies used by the project to extend the technical packages to farmers or farmers groups. Particular attention will be given to Soil and Crop management pratices introduced by the PMU. It should be determined if progress has been made in improving the soil qualities in these areas.He or She will appraise 1) the quality of training provided to the beneficiaries and relevant MDRH staff and 2) progress in achieving objectives, account for divergencies from planned performance, estimate the likelihood of realization of original objectives in light of changing circumstances and recommend new objectives and measures which conform to realities as seen by the Evaluation team

Other qualification include the following requirement:

1) AID project design and Evaluation experience;

2) Doctorate degree in agronomy or soil science;

3) Experience with rice culture plus a solid background in soil and water conservation practices;

4) Knowledge of plant - water - soil relations

5) Experience with land preparation to increase salt leaching and permit earlier rice transplanting;

6) Experience with accelerated land reclamation techniques;

7) French language skill equivalent to FSI's S-3 and R-3 rating;

8) Good communication skill.

9) Working experience in the operation/functioning of tidal swamp rice fields is required.

2. Sociologist

USAID/Senegal will provide a sociologist for a period of four weeks to work with this three person-team.

The social scientist will examine the project's impact upon the beneficiaries and local social structures. She or he will assess the assumptions, objectives and intent as outlined in the project paper and use relevant measures to gauge progress. The social scientist will determine whether the course of action taken by the project is having the effect intended upon the beneficiary population and make appropriate recommendations. She or he will recommend systems for ensuring beneficiary future participation in the construction maintenance and repair of the water retention or control dikes. As appropriate, the social scientist will recommend changes in project assumptions, objectives and implementation methods. Finally, she or he will review the project's internal assessment results in light of the evaluation team's findings. The social scientist will prepare a draft sociological assessment which the IQC team will revise as needed and utilize in its final evaluation.

B. Duty Post - Dakar and site visits in the regions.

C. Language Requirements - All team members are to be fluent in French: preferably S3+/R3; S3/R3 minimum.

D. Access to Classified Infromation: Contractor shall not have access to any government classified material.

E. Logistic Support: USAID will provide a vehicle to be used by the contractor. The contractor will pay driver's per diem, overtime, and milage. The evaluation team should supply its own data and word-processing equipment.

F. Work Week: A six-day work week is authorized.

G. Payment Procedures: Two thirds of the payment for the work performed under this IQC will be provided upon submission of a final copy of the evaluation that is acceptable to USAID. The last payment will be made after the five copies of the evaluation translated into French have been recieved.

A.I.D. EVALUATION SUMMARY FORM

A.I.D. EVALUATION SUMMARY – PART I

1. BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS.
2. USE LETTER QUALITY TYPE, NOT "DOT MATRIX" TYPE.

IDENTIFICATION DATA

A. Reporting A.I.D. Unit:	B. Was Evaluation Scheduled In Current FY Annual Evaluation Plan?	C. Evaluation Timing
Mission or AID/W Office _____ (ES# _____)	Yes ☐ Slipped ☐ Ad Hoc ☐ Evaluation Plan Submission Date: FY ____ Q ____	Interim ☐ Final ☐ Ex Post ☐ Other ☐

D. Activity or Activities Evaluated (List the following information for project(s) or program(s) evaluated; if not applicable, list title and date of the evaluation report.)

Project No.	Project /Program Title	First PROAG or Equivalent (FY)	Most Recent PACD (Mo/Yr)	Planned LOP Cost (000)	Amount Obligated to Date (000)

ACTIONS

E. Action Decisions Approved By Mission or AID/W Office Director Action(s) Required	Name of Officer Responsible for Action	Date Action to be Completed

(Attach extra sheet if necessary)

APPROVALS

F. Date Of Mission Or AID/W Office Review Of Evaluation: (Month) (Day) (Year)

G. Approvals of Evaluation Summary And Action Decisions:

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Name (Typed)				
Signature				
Date				

ABSTRACT

H. Evaluation Abstract (Do not exceed the space provided)

COSTS

I. Evaluation Costs

1. Evaluation Team

Name	Affiliation	Contract Number OR TDY Person Days	Contract Cost OR TDY Cost (U.S. $)	Source of Func

2. Mission/Office Professional Staff Person-Days (Estimate) _____

3. Borrower/Grantee Professional Staff Person-Days (Estimate) _____

A.I.D. EVALUATION SUMMARY – PART II

SUMMARY		
J. Summary of Evaluation Findings, Conclusions and Recommendations (Try not to exceed the three (3) pages provided) Address the following items: • Purpose of evaluation and methodology used • Purpose of activity(ies) evaluated • Findings and conclusions (relate to questions) • Principal recommendations • Lessons learned		
Mission or Office:	Date This Summary Prepared:	Title And Date Of Full Evaluation Report:

SUMMARY (Continued)

ATTACHMENTS

K. Attachments (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier; attach studies, surveys, etc., from "on-going" evaluation, if relevant to the evaluation report.)

COMMENTS

L. Comments By Mission, AID/W Office and Borrower/Grantee On Full Report

INSTRUCTIONS FOR COMPLETING AND SUBMITTING "A.I.D. EVALUATION SUMMARY"

This form has two parts. Part I contains information to support future A.I.D. management action, and to process the evaluation into A.I.D.'s automated "memory". Part II is a self-contained summary of key elements of the full evaluation report; it can be distributed separately to interested A.I.D. staff.

WHAT WILL THIS FORM BE USED FOR?

- Record of the decisions reached by responsible officials, so that the principals involved in the activity or activities evaluated are clear about their subsequent responsibilities, and so that headquarters are aware of anticipated actions by the reporting unit.
- Notification that an evaluation has been completed, either as planned in the current Annual Evaluation Plan or for *ad hoc* reasons.
- Summary of findings at the time of the evaluation, for use in answering queries and for directing interested readers to the full evaluation report.
- Suggestions about lessons learned for use in planning and reviewing other activities of a similar nature. This form as well as the full evaluation report are processed by PPC/CDIE into A.I.D.'s automated "memory" for later access by planners and managers.

WHEN SHOULD THE FORM BE COMPLETED AND SUBMITTED? After the Mission or A.I.D./W office review of the evaluation, and after the full report has been put into a final draft (i.e., all pertinent comments included). The A.I.D. officer responsible for the evaluation should complete this form. Part of this task may be assigned to others (e.g., the evaluation team can be required to complete the Abstract and the Summary of Findings, Conclusions, and Recommendations). The individual designated as the Mission or A.I.D./W evaluation officer is responsible for ensuring that the form is completed and submitted in a timely fashion.

WHERE SHOULD THE FORM BE SENT? A copy of the form *and attachment(s)* should be sent to each of the following three places in A.I.D./Washington:

- The respective Bureau Evaluation Office
- PPC/CDIE/DI/Acquisitions, Room 209 SA-18 (Note: If word processor was used to type form, please attach floppy disk, labelled to indicate whether WANG PC, WANG OIS or other disk format.)
- SER/MO/CPM, Room B930 NS (please attach A.I.D. Form 5-18 or a 2-way memo and request duplication and standard distribution of 10 copies).

HOW TO ORDER ADDITIONAL COPIES OF THIS FORM: Copies of this form can be obtained by sending a "Supplies/Equipment/Services Requisition" (A.I.D. 5-7) to SER/MO/RM, Room 1264 SA-14 in A.I.D./Washington. Indicate the title and number of this form ("A.I.D. Evaluation Summary", A.I.D. 1330-5) and the quantity needed.

PART I (Facesheet and Page 2)

A. REPORTING A.I.D. UNIT: Identify the Mission or A.I.D./W office that initiated the evaluation (e.g., U.S.A.I.D./Senegal, S&T/H). Missions and offices which maintain a serial numbering system for their evaluation reports can use the next line for that purpose (e.g., ES# 87/5).

B. WAS EVALUATION SCHEDULED IN CURRENT FY ANNUAL EVALUATION PLAN? If this form is being submitted close to the date indicated in the current FY Annual Evaluation Plan (or if the final draft of the full evaluation report was submitted close to that date), check "yes". If it is being submitted late or as carried over from a previous year's plan, check "slipped". In either case, indicate on the next line the FY and Quarter in which the evaluation was initially planned. If it is not included in this year's or last year's plan, check "ad hoc".

C. EVALUATION TIMING: If this is an evaluation of a single project or program, check the box most applicable to the timing of the evaluation relative to the anticipated life of the project or program. If this is the last evaluation expected to inform a decision about a subsequently phased or follow-on project, check "final", *even though the project may have a year or more to run before its PACD.* If this is an evaluation of more than a single project or program, check "other".

D. ACTIVITY OR ACTIVITIES EVALUATED: For an evaluation covering more than four projects or programs, only list the title and date of the full evaluation report.

E. ACTION DECISIONS APPROVED BY MISSION OR A.I.D./W OFFICE DIRECTOR: What is the Mission or office going to do based on the findings, conclusions, and recommendations of the evaluation; when are they going to do it; and who will be responsible for the actions required? List *in order of priority or importance* the key actions or decisions to be taken, unresolved issues and any items requiring further study. Identify as appropriate A.I.D. actions, borrower/grantee actions, and actions requiring joint efforts. Indicate any actions that are preliminary pending further discussion or negotiation with the borrower/grantee.

F. DATE OF MISSION OR A.I.D./W OFFICE REVIEW OF EVALUATION: Date when the internal Mission or office review was held or completed.

G. APPROVALS OF EVALUATION SUMMARY AND ACTIONS DECISIONS: As appropriate, the ranking representative of the borrower/grantee can sign beside the A.I.D. Project or Program Officer.

H. EVALUATION ABSTRACT: This one-paragraph abstract will be used by PPC/CDIE to enter information about the evaluation into A.I.D.'s automated "memory". It should invite potentially interested readers to the longer summary in Part II and perhaps ultimately to the full evaluation report. It should inform the reader about the following:

- If the evaluated activity or activities have characteristics related to the reader's interests.
- The key findings, conclusions, and lessons.
- An idea of the research methods used and the nature/quality of the data supporting findings.

Previous abstracts have often been deficient in one of two ways:

- Too much information on project design, implementation problems, and current project status discourages readers before they can determine if there are important findings of interest to them.
- A "remote" tone or style prevents readers form getting a real flavor of the activity or activities evaluated; progress or lack of progress; and major reasons as analyzed by the evaluation.

In sequential sentences, the abstract should convey:

- The programming reason behind the evaluation, and its timing (e.g., mid-term, final);
- The purpose and basic characteristics of the activities evaluated;
- A summary statement of the overall achievements or lack thereof to date;
- A picture of the status of the activities as disclosed in the full evaluation report;
- An idea of the research method and types of data sources used by the evaluators;
- The most important findings and conclusions; and key lessons learned.

Avoid the passive tense and vague adjectives. Where appropriate, use hard numbers. (An example of an abstract follows; "bullets" may be used to highlight key points).

EXAMPLE OF AN ABSTRACT

The project aims to help the Government of Zaire (GOZ) establish a self-sustaining primary health care (PHC) system in 50 rural health zones (RHZ). The project is being implemented by the Church of Christ in Zaire and the GOZ's PHC Office. This mid-term evaluation (8/81-4/84) was conducted by a GOZ-USAID/Z team on the basis of a review of project documents (including a 4/84 project activity report), visits to nine RHZ's, and interviews with project personnel. The purpose was to clarify some uncertainties about the initial design and set future priorities for activities. The major findings and conclusions are:

- This well-managed and coordinated project should attain most objectives by its 1986 end.

- Progress has been good in establishing RHZ's, converting dispensaries into health centers, installing latrines (over double the target), and training medical zone chiefs, nurses, and auxiliary health workers. Long-term training has lagged however, and family planning and well construction targets have proven unviable.

- The initial assumption that doctors and nurses can organize and train village health committees seems invalid.

- User fees at health centers are insufficient to cover service costs. A.I.D.'s PRICOR project is currently studying self-financing procedures.

- Because of the project's strategic importance in Zaire's health development, it is strongly recommended to extend it 4-5 years and increase RHZ and health center targets, stressing pharmaceutical/medical supplies development and regional Training for Trainers Centers for nurses, supervisors, and village health workers.

The evaluators noted the following "lessons":

- The training of local leaders should begin as soon as the Project Identification Document is agreed upon.

- An annual national health conference spurs policy dialogue and development of donor subprojects.

- The project's institution-building nature rather than directly service nature has helped prepare thousands of Zairois to work with others in large health systems.

I. EVALUATION COSTS: Costs of the evaluation are presented in two ways. The first are the cost of the work of the evaluation team per se. If Mission or office staff serve as members of the team, indicate the number of person-days in the third column. The second are the indirect estimated costs incurred by involvement of other Mission/Office and borrower/grantee staff in the broader evaluation process, including time for preparations, logistical support, and reviews.

PART II (Pages 3-6)

J. SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS: The following reflects a consensus among A.I.D.'s Bureaus on common elements to be included in a summary of any evaluation. The summary should not exceed the three pages provided. It should be self-contained and avoid "in-house" jargon. Spell out acronyms when first used. Avoid unnecessarily complicated explanations of the activity or activities evaluated, or of the evaluation methodology; the interested reader can find this information in the full evaluation report. Get all the critical facts and findings into the summary since a large proportion of readers will go no further. Cover the following elements, preferably in the order given:

1. Purpose of the activity or activities evaluated. What constraints or opportunities does the loan and/or grant activity address; what is it trying to do about the constraints? Specify the problem, then specify the solution and its relationship, if any, to overall Mission or office strategy. State logframe purpose and goal, if applicable.

2. Purpose of the evaluation and methodology used. Why was the evaluation undertaken? Briefly describe the types and sources of evidence used to assess effectiveness and impact.

3. Findings and conclusion. Discuss major findings and interpretations related to the questions in the Scope of Work. Note any major assumptions about the activity that proved invalid, including policy related factors. Cite progress since any previous evaluation.

4. Principal recommendations for this activity and its offspring (in the Mission country or in the office program). Specify the pertinent conclusions for A.I.D. in design and management of the activity, and for approval/disapproval and fundamental changes in any follow-on activities. *Note any recommendations from a previous evaluation that are still valid but were not acted upon.*

5. Lessons learned (for other activities and for A.I.D. generally). This is an opportunity to give A.I.D. colleagues advice about planning and implementation strategies, i.e., how to tackle a similar development problem, key design factors, factors pertinent to management and to evaluation itself. There may be no clear lessons. Don't stretch the findings by presenting vague generalizations in an effort to suggest broadly applicable lessons. If items 3-4 above are succinctly covered, the reader can derive pertinent lessons. On the other hand, don't hold back clear lessons even when these may seem trite or naive. Address:

-- Project Design Implications. Findings/conclusions about this activity that bear on the design or management of other similar activities and their assumptions.

-- Broad action implications. Elements which suggest action beyond the activity evaluated, and which need to be considered in designing similar activities in other contexts (e.g., policy requirements, factors in the country that were particularly constraining or supportive).

NOTE: The above outline is identical to the outline recommended for the Executive Summary of the full evaluation report. At the discretion of the Mission or Office, the latter can be copied.

K. ATTACHMENTS: Always attach a copy of the full evaluation report. A.I.D. assumes that the bibliography of the full report will include all items considered relevant to the evaluation by the Mission or Office. NOTE: if the Mission or Office has prepared documents that (1) comment in detail on the full report or (2) go into greater detail on matters requiring future A.I.D. action, these can be attached to the A.I.D. Evaluation Summary form or submitted separately via memoranda or cables.

L. COMMENTS BY MISSION, AID/W AND BORROWER/GRANTEE: This section summarizes the comments of the Mission, AID/W Office, and the borrower/grantee on the full evaluation report. It should enable the reader to understand their respective views about the usefulness and quality of the evaluation, and why any recommendations may have been rejected. It can cover the following:

- To what extent does the evaluation meet the demands of the scope of work? Does the evaluation provide answers to the questions posed? Does it surface unforeseen issues of potential interest or concern to the Mission or Office?

- Did the evaluators spend sufficient time in the field to fully understand the activity, its impacts, and the problems encountered in managing the activity?

- Did any of the evaluators show particular biases which staff believe affected the findings? Avoid ad hominem discussions but cite objective evidence such as data overlooked, gaps in interviews, statements suggesting a lack of objectivity, weaknesses in data underlying principle conclusions and recommendations.

- Did the evaluation employ innovative methods which would be applicable and useful in evaluating other projects known to the Mission or Office? Note the development of proxy measures of impact or benefit; efforts to construct baseline data; techniques that were particularly effective in isolating the effects of the activity from other concurrent factors.

- Do the findings and lessons learned that are cited in the report generally concur with the conclusions reached by A.I.D. staff and well-informed host country officials? Do lower priority findings in the evaluation warrant greater emphasis?