

Document of
The World Bank

Report No: ICR00003420

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON A

GLOBAL ENVIRONMENT FACILITY GRANT (GEF-TF096330)
IN THE AMOUNT OF US\$4.0 MILLION

AND ON A

JAPANESE SOCIAL DEVELOPMENT FUND GRANT (JSDF-TF098754)
IN THE AMOUNT OF US\$2.78 MILLION

TO THE

REPUBLIC OF YEMEN

FOR A

AGRO-BIODIVERSITY AND CLIMATE ADAPTATION PROJECT
AND ASSOCIATED
PILOTING COPING STRATEGIES FOR RAINFED FARMERS PROJECT

September 2, 2015

Agriculture Global Practice
Middle East and North Africa

CURRENCY EQUIVALENTS

(Exchange Rate Effective March 31, 2015)

Currency Unit = Yemeni Rials (YR)

YR 1.00 = US\$ 0.004

US\$ 1.00 = YR 250

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AAA	Analytic and Advisory Activities
ACAP	Agro-biodiversity and Climate Adaptation Project
AREA	Agriculture Research and Extension Authority
BAS	Beneficiary Assessment Survey
BNPP	Bank-Netherlands Partnership Program
CALI	Costing Adaptation through Local Institutions
CAMA	Civil Aviation and Meteorology Authority
CAS	Country Assistance Strategy
CBY	Central Bank of Yemen
CCIG	Climate Change Initiative Grant (under PHRD)
CERA	Climate and Environmental data Retrieval and Archiving
COCA	Central Organization for Control and Auditing
CRRC	Climate Resilience of Rural Communities
DA	Designated Account
EA	Environmental Assessment
EPA	Environment Protection Authority
ERM	Entity-Relationship Model
ERR	Economic Rate of Return
ESMP	Environmental and Social Management Plan
ESW	Economic and Sector Work
FAO	Food and Agriculture Organization
FCS	Fragile and Conflict-affected States
FM	Financial Management
FU	Field Unit
GCM	General Circulation Model
GDFRDC	General Directorate for Forests, Range and Desertification Control
GDIS	General Directorate of Irrigation Structures
GDOFI	General Directorate of On-Farm Irrigation
GDP	Gross Domestic Product
GDSLRL	General Directorate of Surveys and Land Reclamation
GEF	Global Environment Facility
GEO	Global Environment Objective
GHG	Greenhouse Gas

GIS	Geographic Information System
GoY	Government of Yemen
GPS	Global Positioning System
GSCP	Groundwater and Soil Conservation Project
GSMC	General Seed Multiplication Corporation
ICARDA	International Center for Agricultural Research in the Dry Areas
IDDEALES	Initiatives de Développement Durable et Equitable et Actions Locales pour les Echanges de Savoir
ILRS	Irrigation and Land Reclamation Sector
IMCCC	Inter-Ministerial Committee on Climate Change
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
ICR	Implementation Completion Report
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFR	Interim Financial Report
IEG	Independent Evaluation Group of the World Bank Group
ISN	Interim Strategy Note
JSDF	Japan Social Development Fund
LDCF	Least Developed Country Fund
MAI	Ministry of Agriculture and Irrigation
MCM	Mesoscale Climate Model
M&E	Monitoring and Evaluation
MOF	Ministry of Finance
MOPIC	Ministry of Planning and International Cooperation
MTR	Mid-Term Review
MWE	Ministry of Water and Environment
NASS	National Agricultural Sector Strategy
NGO	Non-Governmental Organization
NIP	National Irrigation Program
NWP	Numerical Weather Prediction
NWRA	National Water Resources Authority
PAD	Project Appraisal Document
PCU	Project Coordination Unit
PDO	Project Development Objective
PHRD	Policy and Human Resources Development Fund (Japan) – see CCIG
PIF	Project Identification Form
PIM	Project Implementation Manual
PPCR	Pilot Program for Climate Resilience
PSC	Project Steering Committee
PSU	Project Support Unit
RALP	Rainfed Agriculture and Livestock Project
RWDGD	Rural Women Development General Directorate
SAPEP	Smallholder Agricultural Productivity Enhancement Project
SASP	Seeds and Agricultural Services Project
SDPRR	Socio-Economic Development Plan for Poverty Reduction

SFD	Social Fund for Development
SOE	Statement Of Expenditures
SRES	Special Report on Emission Scenarios
TCC	Technical Coordination Committee
TFESSD	Trust Fund for Environmentally and Socially Sustainable Development
TOR	Terms of Reference
TPM	Third Party Monitoring
TRMM	Tropical Rainfall Measuring Mission
UML	Unified Modeling Language
WSSP	Water Sector Strategy Program
YASAD	Yemeni Association for Sustainable Agricultural Development
YGRC	Yemeni Genetic Resources Center

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REPUBLIC OF YEMEN

AGRO-BIODIVERSITY AND CLIMATE ADAPTATION PROJECT

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A. Basic Information			
Country:	Yemen, Republic of	Project Name:	Agro-biodiversity and Adaptation
Project ID:	P103922	L/C/TF Number(s):	TF-96330,TF-98754
ICR Date:	06/17/2015	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	GOVERNMENT OF YEMEN
Original Total Commitment:	USD 6.78M	Disbursed Amount:	USD 5.24M
Revised Amount:	USD 6.78M		
Environmental Category: B		Global Focal Area: C	
Implementing Agencies: Ministry of Agriculture and Irrigation			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	05/17/2007	Effectiveness:		06/28/2010
Appraisal:	02/12/2010	Restructuring(s):		06/27/2013 07/30/2014
Approval:	05/27/2010	Mid-term Review:	08/31/2012	03/27/2014
		Closing:	08/31/2014	03/05/2015

Key dates for the JSDF-funded grant (TF098754) include: (a) approval: 02/23/2011; effectiveness: 05/31/2012, and closing: 03/05/2015.

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	High
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	Ratings	Borrower	Ratings
Quality at Entry:	Moderately Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Moderately Satisfactory	Overall Borrower Performance:	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators

Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	None
PDO rating before Closing/Inactive status	Moderately Satisfactory		

D. Sector and Theme Codes

	Original	Actual
Sector Code (as % of total Bank financing)		
Agricultural extension and research	2	10
Crops	30	30
General agriculture, fishing and forestry sector	30	30
Public administration- Agriculture, fishing and forestry	36	30
Tertiary education	2	
Theme Code (as % of total Bank financing)		
Biodiversity	25	25
Climate change	75	75

E. Bank Staff

Positions	At ICR	At Approval
Vice President:	Hafez M. H. Ghanem	Shamshad Akhtar
Country Director:	Asad Alam	A. David Craig
Practice Manager/Manager:	Steven N. Schonberger	Luis F. Constantino
Project Team Leader:	Garry Charlier	Kanta K. Rigaud
ICR Team Leader:	Garry Charlier	
ICR Primary Author:	Surajit Goswami	

F. Results Framework Analysis

Project Development Objectives and Key Indicators (as approved)

The Project Development Objectives (PDOs) were: (a) to enhance capacity and awareness at key national agencies and at local levels, to respond to climate variability and change; and (b) to better equip local communities to cope with climate change through the conservation and use of agro-biodiversity.

In addition, under the JSDF grant, the project was to provide a suite of options to poor and vulnerable farmers in the highlands, particularly women, to cope with climate change.

Revised Project Development Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

Not applicable

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Lessons from community pilots are documented and scaled up			
Value (quantitative or qualitative)	0	Scaling up begins		Scaling up begun
Date achieved	08/31/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	Partially achieved. Lessons learned, captured, and mostly disseminated to the targeted farming communities. However, scaling up was delayed due to the political crisis.			
Indicator 2:	Strategy for climate resilient agriculture for rainfed highlands adopted and applied by key national agencies			
Value (quantitative or qualitative)	Limited and fragmented understanding and capacity to deal with climate change	Strategy is being adopted and implemented		Strategy prepared
Date achieved	08/31/2010	08/31/2014		10/05/2014
Comments (incl. % achievement)	Mostly achieved. Strategy for climate-resilient agriculture for rainfed highlands was prepared and finalized in consultation with key stakeholders. Application of the strategy within the key national agencies commenced with technical specialists undertaking climate modeling, trained, and using data sets developed under the project. However, the final stage of formal adoption has yet to be completed because of political crisis and ongoing war.			
Indicator 3:	Direct project beneficiaries			
Value (quantitative or qualitative)	0	10,000		11,123
Date achieved	08/31/2010	08/31/2014		02/10/2015

Comments (incl. % achievement)	Target exceeded and 111% achieved. Included beneficiaries of terrace upgrading, construction of water storage tanks, flood protection works, soil conservation, and small income generation projects.			
Indicator 4:	Female beneficiaries			
Value (quantitative or Qualitative)	0 percent	40 percent		41.9
Date achieved	08/31/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	105% of target achieved.			
Indicator 5:	Client days of training provided (number)			
Value (quantitative or Qualitative)	0	7,696		11,202
Date achieved	08/31/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	Target exceeded and 146% achieved.			
Indicator 6:	Client days of training provided - Female (number)			
Value (quantitative or Qualitative)	0	3,683		5,435
Date achieved	08/31/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	Target exceeded and 148% achieved. About 50% of the participants from the farming communities were women.			
Indicator 7:	JSDF - Pilot communities have developed plans for natural resource management focusing on conservation and adaptation planning based on agro-biodiversity resources (Number, Custom)			
Value (quantitative or Qualitative)	0	8		10
Date achieved	03/15/2011	12/31/2014		10/05/2014
Comments (incl. % achievement)	Target exceeded and 125% achieved.			
Indicator 8:	JSDF - Beneficiaries, especially female, have been trained on water conservation, nutrition, natural resource conservation, etc., beyond the 10 -12 pilot villages (Number, Custom)			
Value (quantitative or Qualitative)	0	1,500		1,522
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	101% of target achieved.			

Indicator 9:	JSDF - Number of community pilots using local knowledge & agro-biodiversity resources designed and developed (Number, Custom)			
Value (quantitative or Qualitative)	0	20		50
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Target exceeded and 250% achieved.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Comp 1 - By YR2 inventory of agro-biodiversity resources completed and documented			
Value (quantitative or Qualitative)	0%	100%		100%
Date achieved	08/31/2010	08/31/2012		02/10/2015
Comments (incl. % achievement)	The Project took stock of existing inventories of the landraces, and added new landraces collected from targeted project areas. A total of 1603 crop landraces and 9 landraces of famous fruit trees were collected and kept in the Gene Bank at the Agriculture Research and Extension Authority (AREA). Although completed with delays, because the work that followed this step, such as selection and testing of landraces (see the next indicator) were undertaken before the full inventory was in place, the overall delay was minimal.			
Indicator 2:	Comp 1- By YR2 climate resilience profiles of at least 5 landraces developed, and these landraces piloted			
Value (quantitative or Qualitative)	0	5		46
Date achieved	08/31/2010	08/31/2012		10/05/2014
Comments (incl. % achievement)	Target well exceeded and 920% achieved. By project closing, AREA tested 46 landraces for five crops (sorghum, wheat, barley, lentils, and peas). To carry out the testing of the 46 landraces, the Project utilized an AREA laboratory that had been financed under the project. The laboratory enabled AREA, for the first time in Yemen, to conduct molecular analysis. The landraces that had stability and climate resilience under different environmental zones were then submitted to the General Seed Multiplication Corporation for multiplication and dissemination.			
Indicator 3:	Comp 2- By YR1 existing MOU on sharing and harmonization of climate data strengthened and institutionalized in relevant climate-related agencies			
Value (quantitative or Qualitative)	0%	100%		100%
Date achieved	08/31/2010	08/31/2012		03/05/2015

Comments (incl. % achievement)	100% of target achieved. Signatories of the MOU are: MAI, CAMA, EPA, and NWRA. The Project developed a sustainable climate information system (CIS) with harmonized standard information, and requisite organizational arrangements associated with climate data collection.			
Indicator 4:	Comp 2 - By YR4, number of trained technical specialist in climate related agencies to undertake climate modeling			
Value (quantitative or Qualitative)	0	8		15
Date achieved	08/10/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	Target exceeded and 188% achieved. Local capacity to predict regional climate change based on global circulation model output was improved. Fifteen technical specialists from CAMA (9), MAI/AREA (2), EPA (2), and NWRA (2), were trained on climate modeling and prediction of climate change.			
Indicator 5:	Comp 2 - Improved local data sets developed and local capacity to predict regional climate change based on global circulation model output enhanced on a pilot basis			
Value (quantitative or Qualitative)	Minimal local data sets available	100%		100%
Date achieved	08/31/2010	08/31/2014		02/10/2015
Comments (incl. % achievement)	100% achieved. Four specialists of CAMA, NWRA, EPA and AREA trained with CAMA being responsible for managing the collected data sets.			
Indicator 6:	Comp.3 - By end of YR2 number of community coping strategies developed			
Value (quantitative or Qualitative)	0	100		145
Date achieved	08/31/2010	08/31/2012		02/10/2015
Comments (incl. % achievement)	145% of target achieved. 145 sites were developed of which 122 were tested and piloted (see below)			
Indicator 7:	Comp. 3 - By end of YR3 at least 20 coping strategies are tested and piloted in local landscape units			
Value (quantitative or Qualitative)	0	20		122
Date achieved	08/31/2010	08/31/2013		02/10/2015
Comments (incl. % achievement)	Results well exceeded target and 610% achieved. The excellent performance was due to increased demand for smaller water tanks and larger availability of budgetary resources for that purpose. Coping strategies tested and piloted include: 43 terraces, 52 water storage tanks, 13 soil conservation and 14 wadi banks. In the strictest sense these were number of sub-projects, not strategies, which are supposed to be more generic in nature, e.g. agro-forestry, bee-keeping, land terracing, soil conservation, water conservation, water harvesting/collection, banks or bunds, crop diversification, change in agronomic practices, etc. However, the project assumed that each of the sub-projects at each location would have enough distinctive features to be counted as a coping strategy for that location even though they could be aggregated broadly under a more generic definition.			

	The results reported here follow that definition of coping strategy. The targets set and the results reported here follow that definition of coping strategy.			
Indicator 8:	Comp 3 - By end of Year 3, draft Strategy for Climate Resilient Agriculture for Rainfed High Highlands endorsed by MAI			
Value (quantitative or Qualitative)	Climate considerations not included in Strategy	Strategy drafted and endorsed		Strategy has been prepared and endorsed
Date achieved	08/31/2010	08/31/2013		10/05/2014
Comments (incl. % achievement)	Mostly achieved. Strategy prepared in consultations with key stakeholders (including CAMA, NWRA, EAP and AREA) and endorsed by MAI. But formal adoption is pending due to ongoing crisis and war.			
Indicator 9:	Comp. 4 - By end of YR1, monitoring and evaluation system in place.			
Value (quantitative or Qualitative)	0	M&E system in use by the end of YR1		M&E system in place and used once the Project came out of the 2011-12 hiatus
Date achieved	08/31/2010	08/31/2011		06/30/12
Comments (incl. % achievement)	Achieved with delay. In YR1 the Project suffered from the Arab Spring-related disturbances.			
Indicator 10:	MTR findings and lessons learned are being incorporated into PIM.			
Value (quantitative or Qualitative)	0	PIM is revised incorporating MTR findings and lessons learned		PIM is revised incorporating MTR findings and lessons learned
Date achieved	08/31/2010	08/31/13		04/01/2014
Comments (incl. % achievement)	Achieved with delays (mainly due to delay in having the MTR).			
Indicator 11:	JSDF - Comp 1: Community agro-biodiversity plans developed in villages (Number, Custom)			
Value (quantitative or Qualitative)	0	12		10
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	83% of target achieved. These plans were developed with community-based water user groups (WUG), where in 2 cases the WUGs did not develop their plans.			
Indicator 12:	JSDF - Comp 2: Criteria for selection of projects finalized (Text, Custom)			
Value (quantitative or Qualitative)	No	Yes		Yes
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	100% of target achieved.			

Indicator 13:	JSDF - Comp 2: By YR3 at least 20 small income generation projects are up and running (Number, Custom)			
Value (quantitative or Qualitative)	0	20		54
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Target exceeded and 270% achieved. Beekeeping and animal raising were the sub-projects in greatest demand by the farmers.			
Indicator 14:	JSDF - Comp 2: Conservation methods documented (community local knowledge) (Text, Custom).			
Value (quantitative or Qualitative)	No	Yes		Yes
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Achieved.			
Indicator 15:	JSDF - Comp 3: At least 10 small-scale upgrading projects approved and implemented by communities (Number, Custom)			
Value (quantitative or Qualitative)	0	10		91
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Target well exceeded and 910% achieved. These small-scale infrastructure upgrading projects were tied to conservation of water, soil, terraces, crops and seeds and sought to maximize the use of local knowledge and adaptation practices.			
Indicator 16:	JSDF - Comp 3: Committee has been set up to oversee process (Text, Custom)			
Value (quantitative or Qualitative)	No	Yes		Yes
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Achieved. This was mostly to formalize the structure used under ACAP and create the “institutional memory” for future interventions for more sub-projects within rainfed poor farmer communities.			
Indicator 17:	JSDF - Comp 4: Awareness raising and dissemination programs designed (Text, Custom)			
Value (quantitative or Qualitative)	No	Yes		Yes
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Achieved. The Project sought to support an education and awareness-raising program targeting the rainfed areas beyond the 8-10 pilot villages, by using community facilitation teams and technical experts. These facilitation teams were established in each of the eight targeted districts.			
Indicator 18:	JSDF - Comp 4: First phase of community awareness program launched (Text, Custom).			

Value (quantitative or Qualitative)	No	Yes		Yes
Date achieved	03/15/2011	12/31/2014		02/10/2015
Comments (incl. % achievement)	Achieved. The “first phase” of a new community awareness program (involving facilitation teams) trained 70 beneficiaries on income generation activities in Al Mahweet and AL Rujum districts.			

G. Ratings of Project Performance in ISRs

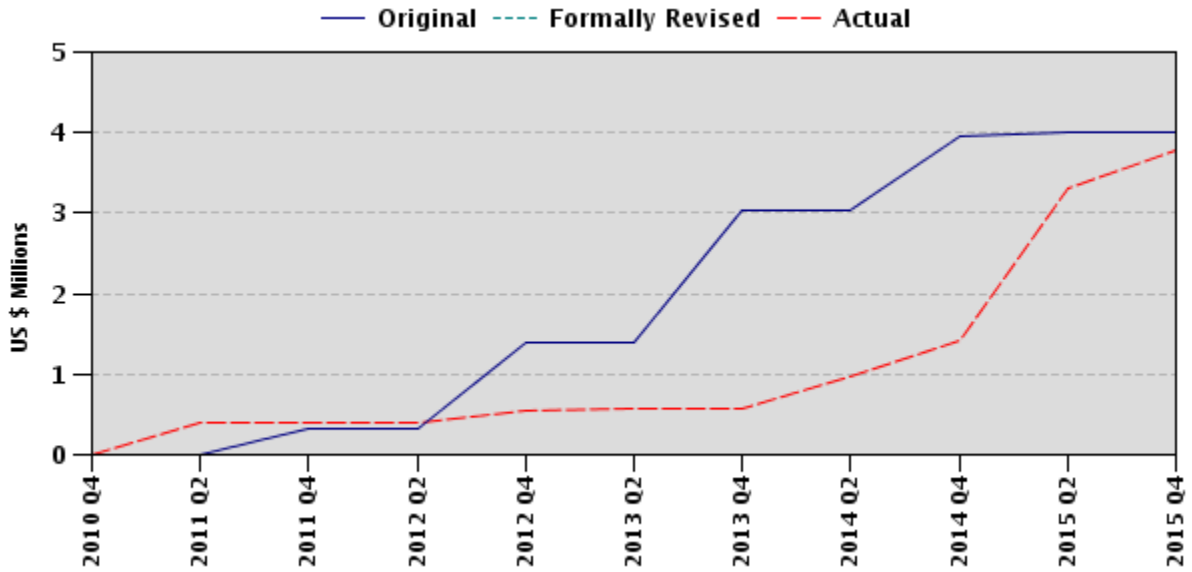
No.	Date ISR Archived	PDO	IP	Actual Disbursements (USD millions)
1	06/29/2010	Satisfactory	Satisfactory	0.00
2	01/07/2011	Satisfactory	Satisfactory	0.40
3	10/01/2011	Unsatisfactory	Unsatisfactory	0.40
4	06/29/2012	Moderately Satisfactory	Moderately Satisfactory	0.55
5	02/10/2013	Moderately Satisfactory	Moderately Satisfactory	0.58
6	07/30/2013	Moderately Satisfactory	Moderately Unsatisfactory	0.70
7	02/25/2014	Moderately Unsatisfactory	Moderately Satisfactory	1.05
8	06/25/2014	Moderately Satisfactory	Moderately Satisfactory	1.43
9	12/08/2014	Moderately Satisfactory	Moderately Satisfactory	3.20

H. Restructuring (if any)

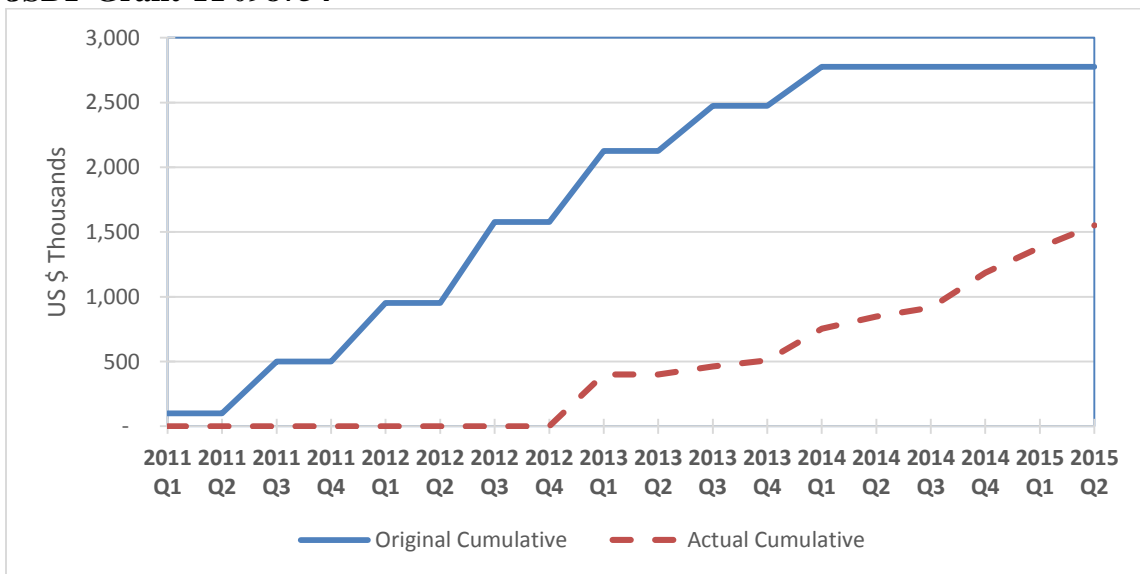
Restructuring Date(s)	Board Approved PDO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		PDO	IP		
06/27/2013	N	MS	MS	0.58	(i) modification of the project implementation arrangements; (ii) adjustment of the financing plan; (iii) introduction of “Selection of Individual Consultants” as an additional method for procurement of consultant’s services; and (i) modification of the date of the mid-term review.
07/30/2014		MS	MS	2.36	Extension of Closing Date

I. Disbursement Profiles

GEF Grant TF096330



JSDF Grant TF098754



1. Project Context, Development Objectives and Design

1. The Agro-biodiversity and Climate Adaptation Project (ACAP) was implemented with the support of two grants – US\$4.0 million from the Global Environmental Facility Trust Fund (GEF) and US\$2.8 million from the Japan Social Development Fund (JSDF). Both grants were intended to build climate resilience of the rainfed agro-ecosystem in Yemen’s highlands; hence the aim of ACAP was to conserve agro-biodiversity and enhance national capacity in climate modeling and analysis. This ICR presents the achievements of ACAP with both sources of funding included. The ICR was prepared during a difficult and extended period of political upheaval and deteriorating security conditions that prevented in-country visits.

1.1 Context at Appraisal

2. At Appraisal, almost half of the population living in rural areas was classified as poor, and 83 percent of the poor lived in rural areas. They derived a large share of their income from agriculture or agriculture-related activities. However, Yemeni agriculture faced severe constraints to development, in particular the depletion of groundwater resources. In addition, based on the Intergovernmental Panel for Climate Change (IPCC) projections, temperatures across the country were expected to rise anywhere between 1.4 and 2.8 degrees Celsius by 2050. Precipitation and cloud cover patterns were more uncertain, and rainfall variability was likely to be more pronounced. The increased variability in precipitation raised the risk of crop failure and loss of livelihoods in a region where the level of poverty was already high and water was already a scarce resource. One study estimated that climate change could lead to a 50% reduction of crop yields for rain-based agricultural crops by 2020.

3. The good news was that the agro-biodiversity of the highlands, together with the traditional knowledge of farmers, had been the cornerstone of communities’ ability to adapt to changing climatic conditions in the past. With systematic documentation and testing for climate resilience, these agro-biodiversity resources and the traditional knowledge had the potential to ‘climate proof’ rainfed agriculture in the future. However, there was a need to understand the extent and direction of climate change in the country, and it was essential to develop national capacity in climate data collection and analysis to generate country-specific climate scenarios.

4. Rationale for Bank involvement. IDA has been supporting the development of the agriculture sector in Yemen for over three decades. Its past portfolio included projects in agricultural research and extension and productivity improvement. Recent IDA projects had focused on groundwater and soil conservation (FY04), and on rainfed agriculture and livestock (FY07). The ACAP was expected to continue to support the agriculture sector, while broadening the focus to meet the challenges posed by climate change. The ACAP was to be strategically aligned with both the Ground Water and Soil Conservation (GSCP) and the Rainfed Agriculture and Livestock Project (RALP). The ACAP was to collaborate with the GSCP to encourage water harvesting and increasing irrigation efficiency as part

of a climate-resilient “win-win strategy”. With the RALP, ACAP was to collaborate through its activities under Component 1, which are complementary to Component 1 of RALP, to include climate considerations in the identification and improvement of local landraces of cereals and lentils. In addition, as the convener of the Climate Investment Fund and the Pilot Program on Climate Resilience (PPCR), the Bank provided intellectual leadership on the issue of building climate resilience and ‘climate proofing’ development in some of the least developed countries. The ACAP was one of the first pilot operations to address adaptation on the ground in a country selected for the PPCR. The sequencing of the various projects, with ACAP having to follow the Bank’s other two initiatives as well as PPCR requirements, however, led to considerable delay between the Concept Review (May 2007) and Appraisal (February 2010).

1.2 Original Project Development Objectives (PDO) and Key Indicators (*as approved*)

5. The original PDOs were: (a) to enhance capacity and awareness at key national agencies and at local levels, to respond to climate variability and change; and (b) to better equip local communities to cope with climate change through the conservation and use of agro-biodiversity. The key indicators were: (a) Strategy for Climate-Resilient Agriculture for Rainfed Highlands adopted and applied by key national agencies (PDO Indicator 2); and (b) Lessons from the community pilots are documented and scaled up (PDO Indicator 1).

1.3 Revised PDO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

6. The PDO remained unchanged. With the JSDF financing, the ACAP was to provide a suite of options to poor and vulnerable farmers in the highlands, particularly women, to cope with climate change. The options that were proposed by JSDF were not that different from the coping strategies that the GEF grant provided. Equipping local communities with coping strategies was the same as providing a suite of options to cope with climate change.

7. The JSDF grant added three key indicators, namely, (a) number of pilot communities that had developed plans for natural resource management focusing on conservation and adaptation planning based on agro-biodiversity resources (PDO Indicator 7); (b) number of beneficiaries, especially female, that were trained on water conservation, nutrition, natural resource conservation, etc., beyond the 10-12 pilot villages (PDO Indicator 8); and (c) number of community pilots using local knowledge & agro-biodiversity resources designed and developed (PDO Indicator 9). Lastly, to make the GEF-financed activity similarly accountable, four more key indicators were added to the list as follows (a) number of direct project beneficiaries (PDO Indicator 3); (b) percentage of female beneficiaries (PDO Indicator 4); number of client days of training provided (PDO Indicator 4); and (d) percentage of client days of training provided for females (PDO Indicator 5). The multiplicity of indicators (9 PDO indicators and 18 Intermediate Outcome Indicators) were, however, quite integrated and manageable because of the integration at the level of project components (see below).

1.4 Main Beneficiaries

8. The Project enabled beneficiaries, who were farmers in the rainfed highlands, to cope with climate change by building the knowledge base on climate change and agro-biodiversity. The Project had a strong focus on gender, and on promoting the role of female farmers, especially in traditional knowledge. The changing climatic conditions were seen as an opportunity to empower women farmers, making them important players in the preservation of indigenous agro-biodiversity and valuing them as recipients of critical knowledge that were to reduce their level of poverty and better manage natural resources. The key direct beneficiaries were the selected 8-10 village communities where the coping strategies were to be piloted.

9. In terms of institutional beneficiaries, at the national level, the Project initiated improvements in collection, recording, and analysis of climate data and development of national/regional climate models. Consequently, the Project supported various national agencies such as the Civil Aviation and Meteorology Authority (CAMA), the National Water Resources Authority (NWRA), and the Agriculture and Extension Authority (AREA), and it created a coordination and cooperation mechanism among such entities.

1.5 Original Components (as approved)

10. The Project had four components. *Component 1, Agro-biodiversity and Local Knowledge Utilization and Assessment*, was to build on the traditional knowledge of farmers, develop an inventory of local agro-biodiversity, and identify and test selected landraces for climate resilience. Information on the agro-biodiversity resources was used to develop natural resource management and alternative income-generation plans with the communities as part of a ‘no regrets’ approach to building climate resilience in the highlands. *Component 2, Climate Modeling and Capacity Building*, focussed on raising awareness on climatic changes and developing initial local predictive capacity of weather patterns and long-term climate change scenarios for the country. *Component 3, Integrating Climate Change into Rainfed Agriculture*, focussed on integrating climate resilience into rainfed agriculture. At the national level this was done through capacity development of the MAI and development of a climate-resilient rainfed strategy and at the local level through the development and piloting of a menu of coping strategies in partnership with the communities. The activities of Component 3 were: (a) awareness generation; (b) piloting coping strategies (network strengthening, planning, capacity for accessing grants for micro-enterprises, coping strategies – infrastructure, and coping strategies – income generation/diversification); and (c) Climate-resilient Strategy for Rainfed Agriculture. *Component 4, Project Management, Coordination, Monitoring and Evaluation*, focussed on project management, coordination, and M&E.

1.6 Revised Components

11. The components under the GEF-funded ACAP were not revised. The JSDF Grant built upon Components 3 and 4 of the GEF Grant and deepened their respective activities by providing additional funding at the local and central levels.

12. The components of the JSDF grant were the following: *JSDF Component 1 - Community Natural Resource Management Planning*, was to develop community natural resource management plans for the preservation of local agro-biodiversity. This was linked with Component 3(b) (see description of the Component 3 of the GEF grant mentioned above). *JSDF Component 2 - Establishment of Small Income Generation Projects*, was to develop and carry out small income generation projects in selected communities, and particularly among women, for agro-biodiversity conservation and adaptation. This was linked with Component 3(b). *JSDF Component 3 - Small-Scale Upgrading and Capacity Building*, was to develop and carry out small-scale upgrading of infrastructure in selected communities for agro-biodiversity conservation and adaptation. This was linked with Component 3(b). *JSDF Component 4 - Community Awareness Raising Program*, that was to carry out a community awareness program related to agro-biodiversity conservation and adaptation in rainfed areas. This was linked with Component 3(a). Lastly, *JSDF Component 5 - Project Management*, was to support project implementation management and administration, including monitoring and evaluation and audits of the above activities under the JSDF Grant. This was linked to the original Component 4 of the GEF Grant for this evaluation.

1.7 Other Significant Changes

13. The Project was restructured twice. The first restructuring (on June 27, 2013) focused more on changes in the implementing agency, the financing plan, and the date of the Mid-Term Review (MTR). Following the closing of the GSCP and its Project Coordination Unit (PCU) on June 30, 2012, the implementation responsibility for ACAP was transferred to the RALP's Project Support Unit (PSU), which was also under the Ministry of Agriculture and Irrigation (MAI). At the same time, the date of the Mid-Term Review (MTR) of the Project was rescheduled from August 31, 2012 to March 31, 2014. The second restructuring on July 30 2014 extended the closing date by about six months from August 31, 2014 to March 5, 2015 to account for start-up delays associated with the socio-political events of late 2010 and 2011.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

14. Incorporation of Lessons Learned. The project design drew on lessons from ongoing and completed projects, including the GSCP, RALP, and the Seeds and Agriculture Services Project. Some early lessons from analytical work on how to deal with climate change, in terms of information, knowledge, and approaches, had also shaped the design of the Project. The focus was rightly on rainfed agriculture because, in spite of the potential for development, traditional rainfed and livestock production systems had been neglected over the years. Hence RALP was developed to redress this shortcoming.

15. Project Preparation. Within rainfed agriculture, ACAP correctly addressed the crucial design issue of the choice of project sites. Yemen has a complex situation as the country lies in the latitudinal band where global circulation models differ in projected

precipitation trends. There was no consensus among the 21 global climate models in the IPCC Fourth Assessment Report about the sign of the projected changes in winter, summer, or annual rainfall or its distribution pattern over Yemen. This made the situation with respect to rainfed agriculture particularly difficult as crop choice, cropping pattern, and crop management are all rainfall-dependent.

16. Site selection was undertaken through purposively selected biophysical agro-ecological gradients to improve sample representativeness. Site selection was done to:

- (a) include project sites located along a mesoscale geographic gradient;
- (b) cover some of the most important areas of rainfed highlands;
- (c) cover a range of altitudes within the highlands;
- (d) cover a range of mean annual precipitation;
- (e) cover a range of agro-ecological gradients; and
- (f) overlap with the governorates of ongoing complementary projects to allow for scale-up.

17. Another key design issue involved development of the institutions. At the national level, the Government of Yemen recognized the climate risks, and demonstrated strong commitment to addressing those through a number of initiatives that were expected to build overall capacity of relevant institutions indicated above. At the community level, the Project rightly built on the expertise of the GSCP/RALP relating to the participatory approach for mobilizing and sensitizing the communities, and establishing and strengthening of traditional farmer networks, including women's networks. With the help of sociologists, the Bank's previous interventions had assisted with Water Users Association (WUA) formation, capacity building, and implementation support for sustainable WUAs. The ACAP was to use this extensive network of WUAs in working with communities for piloting coping strategies in local landscape units. Bringing in the JSDF-financed activities to strengthen specific areas, such as community resource management planning or community awareness raising, was also quite astute even though it increased the work of coordinating the various activities at the local level.

18. Risk Assessment. Risks Assessment in the PAD was extensive but the PAD also seemed to have indicated that, after the mitigating measures were in place, none of the residual risk would be substantial. While the rapid deterioration in the security environment was totally unanticipated at appraisal, it was still optimistic to conclude that all residual risks, particularly those related to sectoral institutions, would be addressed quickly and the risk would be reduced from substantial to moderate. Mainstreaming of climate change-related policies and related institutional changes, even under favorable country circumstances, are challenging. A more realistic risk assessment would have flagged the weakness of coordination of various agencies at the national level and indicated that substantial risks would remain in many categories even after attempts to mitigate them. This shortcoming in coordination arrangements as well as new (climate-related) activities at the local level led to moderately satisfactory Quality at Entry, instead of it being fully satisfactory, even though the project was piggy-backing on two Bank interventions with MAI.

2.2 Implementation

19. The ACAP became effective in late August 2010, within about two months of Board approval, and was launched in September 2010. However, following the so-called Arab Spring uprising throughout the Arab world, Yemen underwent a severe political upheaval throughout 2011. Amid security concerns, the Bank suspended missions to the country in March 2011, and then also suspended disbursements for the entire portfolio from July 2011 to January 2012. This virtually brought the procurement and payment activities to a standstill, and hampered implementation progress. Project ratings were downgraded accordingly across the board. Notwithstanding, MAI continued to make progress towards achievement of the PDO. This was confirmed in June 2012 when ratings were upgraded to reflect continued implementation progress with key project activities.

20. The high level of national ownership and commitment to the Project, and its steady implementation progress in spite of very difficult country conditions, were the most important factors that contributed toward a successful implementation after the hiatus in 2011-12. Since the lifting of the suspension of disbursements in Yemen, various mechanisms for project implementation, which included coordination among entities at the national level, contracting of various vendors, as well as organization at the community level, progressed well. By the MTR in March 2014, although disbursements and progress on deliverables were still lagging, most of project activities were being carried out as planned. Subsequently, implementation progress picked up even further and most project activities were completed by the closing date of March 5, 2015. At closing, about 96.6 percent of the GEF grant and 61.6 percent of the JSDF grant (82.2 percent combined; 84 percent total project funds) were utilized.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

21. *M&E Design.* A monitoring system was put in place to track: (a) progress in achieving scheduled activities and outputs; (b) expenditures against budget allocations; (c) project impact on key outcomes and indicators of achievement; and (d) implementation of the environmental and social management plan (ESMP). Given the pilot nature of this Project, a baseline survey possibly would have shown “zero readings” for most activities and was not carried out. Also, because of the pilot nature of the Project, simple indicators sufficed. For example, the PDO of “enhancing capacity and awareness at key national agencies responding to climate variability and change” required the relevant agencies to have MOUs on sharing and harmonizing climate data, creating databases, and having training, followed by having a strategy “adopted and implemented”. Follow-up Bank interventions were expected to articulate further the details of strategy implementation, but a comprehensive vision of what it meant to have the strategy implemented was unavailable at appraisal of this Project. For the other PDO of “better equipping local communities to cope with climate change through the conservation and use of agro-biodiversity”, may be because the Project followed other interventions such as the RALP, the M&E design was articulated in more detail. Even then, the pilot nature of the intervention created some ambiguity. For example, “coping” implied just having many viable options, which the Project was developing for the communities and individuals and, later in the JSDF,

community plans developed. Lastly, in spite of an attempt to indicate the option value of the interventions, the M&E system was not designed to track project benefits quantitatively.

22. *M&E Implementation.* Implementation units (PCU/PSU) had been established with adequate staffing, training and supervision under GSCP and RALP. The PCU/PSU maintained data for this Project separately. This was particularly important for RALP because there were some overlapping activities. The separation within the PCU/PSU permitted Bank supervision missions to report M&E data accurately.

23. *M&E Utilization.* M&E information was oriented more towards monitoring of progress by components. The Project did make reallocations based on what was progressing well (or based on what could be implemented well given the circumstances). The M&E system did not permit cost-benefit analyses. Neither did it permit replicating the calculation of project efficiency utilizing the options methodology in the PAD.

2.4 Safeguard and Fiduciary Compliance

A. Safeguards Compliance

24. *Environmental Safeguards:* The ACAP was classified as environmental category B mainly due to the small-scale infrastructure-related activities, and was designed to ensure compliance with the requirements of the following safeguard polices that had been triggered: Environmental Assessment (OP 4.01) and Pest Management (OP 4.09). An Environmental and Social Impact Assessment (ESIA) was undertaken which underscored the largely positive environmental and social impacts expected to be generated through ACAP. The ESIA was accompanied by an Environmental and Social Management Plan (ESMP) and a brief Integrated Pest Management Plan (IPM).

25. *Compliance with Environmental Safeguards:* As indicated in the section above on M&E, environmental monitoring followed the regular monitoring events established for the Project and inclusion of updates in progress reports. In addition, a national environmental consultant was hired in September 2014 to assess the environmental and social impact of the Project, which also confirmed compliance with environmental safeguards.

26. *Social Safeguards:* Land for the construction of water tanks and other small infrastructure was obtained through voluntary donations from the local communities (and documented); thus, the Involuntary Resettlement (OP 4.12) safeguard policy was not triggered by the Project. Processes and procedures for voluntary land donation was included in the Project Operational Manual.

27. *Third Party Monitoring (TPM).* As a result of the socio-political and security situation, Bank missions and site visits were suspended. However, to verify implementation of the ESMP, a TPM firm undertook supervision of project activities, and the ensuing reports confirm satisfactory compliance. The Bank team stayed closely involved with the TPM firm during its work.

B. Fiduciary Compliance

28. *Procurement Management Arrangements:* Because of the MAI experience with Bank-financed operations, capacity for managing and implementing procurement-related processes was adequate, and procurement activities were implemented efficiently and transparently. A procurement post-review, based on a desk review, noted that procurement had been handled well, and most payment reviews of project transactions noted that funds were claimed for eligible expenditures, properly recorded and reported, and that all related supporting documents were in order and filed accordingly. The performance of the PCU/PSU procurement staff throughout the Project was generally fair. Ratings were lowered once, largely because of the disbursement suspension by the World Bank (from July 2011 to January 2012).

29. *Financial Management (FM) Arrangements:* The Ministry of Agriculture and Irrigation (MAI), through the PCU/PSU implemented all components, including those for JSDF financed activities. The PCU/PSU maintained acceptable FM arrangements in place (qualified staffing; automated accounting system, acceptable FM manual, monthly reconciliation, and timely reporting). The PCU/PSU maintained a segregated Designated Account for each Grant at the Central Bank of Yemen and used the traditional SOEs as the main disbursement method beside the Direct Payments and Special Commitments. All audit reports (by the external auditors) were submitted to the Bank with unqualified (clean) opinions and found acceptable. Due to the security situation in the country, the final audit report has been overdue since 30-Jun-2015 and is expected by 30-Sep-2015.

2.5 Post-completion Operation/Next Phase

30. There is considerable uncertainty for the post-completion phase because of the renewed and persisting political unrest since September 2014. This is likely to substantially hamper climate-related database management and information dissemination as well as activities within MAI. However, most of the project activities at the community level (either under this Project or those financed similarly under RALP) were focused on the farmer groups which assumed control of the assets/activities. For example, in each governorate, one seed growers association, or a network of seed growers groups, is distributing seed produced by seed grower groups. They are expected to continue with their activities even with a non-functioning national government. ACAP is also expected to influence the design of forthcoming operations in the sector, such as that of the Climate Resilience of Rural Community (CRRC) Project. Forthcoming sectoral operations are expected to utilize participatory beneficiary involvement similar to that in ACAP, where beneficiaries were involved in planning/design of activities as well as in implementation. Similarly, these operations are expected to extensively rely upon field-level coordination among various agencies (and the private sector/universities where feasible because of ACAP's very positive experience with such coordination). In addition, operational arrangements in forthcoming projects are expected to utilize field units of MAI and benefit from local government participation.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: High

31. The FY13 Interim Strategy Note (ISN) covering FY13-14 had as one of its strategic pillars, *Achieving Quick Wins and Protecting the Poor*. Within this strategic pillar, the revised CAS objective was to Increase Resilience to Natural Disasters and Climate Change. The PPCR program, and this Project within the PPCR program, was a key to that CAS Objective, thereby making the project objective highly relevant. The relevance of the project objective could also be derived directly from the country conditions. As mentioned in the country context above, the increased variability in precipitation (due to climate change) raises the risk of crop failure and loss of livelihoods in a region where the level of poverty is already high and water is already a scarce resource. The rating is also based on the relevance of project design, which in turn reflects the relevance of project components/activities and policy areas, as well as the quality of the results framework. In terms of components, the project design relevance is rated high, as the project increases options for affected communities and individuals within them. These options are expected to strengthen their capacity to cope with climate change. In addition, the Project helped the country to develop climate change-related policies by improving strategies at relevant agencies. The quality of the results framework, including that for the JSDF activities, is similarly good: The statements of objectives were clear for such a pilot project and were linked to intermediate and final outcomes. The causal chain between funding and outcomes was clear (provided the activities, such as training, met quality standards). There are, however, many exogenous factors in this very fragile state which could derail the Project's efforts to build capacity at the relevant agencies. Some of these factors were identified at the design stage.

3.2 Achievement of Project Development Objectives

Rating: Substantial

32. The PDOs were: (a) to enhance capacity and awareness at key national agencies and at local levels, to respond to climate variability and change; and (b) to better equip local communities to cope with climate change through the conservation and use of agrobiodiversity. The ACAP "mostly achieved" PDO (a) and "achieved" PDO (b) as substantiated by the indicators meeting or mostly meeting the targets. The list of indicators can be found in the Data Sheet at the beginning of this report, but it is made available below to present the requisite evidence here.

33. The key indicator for PDO (a) was Indicator 2: Strategy for climate-resilient agriculture for rainfed highlands adopted and applied by key national agencies. Towards this objective, ACAP carried out: (i) data collection through surveys, collation, collaboration with other agencies, etc., to create a database for climate projections; (ii) facility analysis to identify and strengthen select weather stations; (iii) institutional capacity analysis to determine staff training in technical aspects of climate modeling; (d) special survey and modeling in select areas on impacts of rainfall variability and its feedback into

the determination of a Climate Resilient Agricultural Strategy for highland areas in Yemen; and (e) wide stakeholder consultations to validate and refine the Strategy.

34. After refinement, the Strategy for Climate Resilient Agriculture for rainfed highlands was prepared and finalized in consultation with key institutional stakeholders. This led to signing of an MOU (with MAI, CAMA, EPA, and NWRA as signatories). This MOU is expected to have sharing and harmonization of climate data strengthened and institutionalized in relevant climate-related agencies. The related agencies are already functioning with staff trained under the Project, with the number of trained technical specialists in climate-related agencies to undertake climate modeling exceeding the target by 88 percent and with data sets developed and training on climate change forecasting fully completed. However, the final stage of formal adoption of the Strategy has yet to be completed because of political crisis and ongoing war. Hence, the rating is “mostly achieved”.

35. The key indicators for PDO (b) were Indicators 1, 3, 4, 5, and 6 (GEF-financed) and 7, 8, and 9 (JSDF-financed). Towards PDO (b) the ACAP: (a) carried out an inventory of the landraces; (b) had 46 races tested for climate resilience (target of 5); (c) had races that exhibited stability and climate resilience under different environmental zones submitted to the General Seed Multiplication Corporation for multiplication and dissemination; and (d) identified and disseminated coping options for income generating micro-enterprises based on the preferences of the farming communities which had agro-biodiversity conservation as its basis.

36. In addition, towards PDO (b), the ACAP also generated awareness of conservation (agro-biodiversity and natural resources, including water) and coping mechanisms to address climate change at the community level in eight targeted districts. It worked with 10 pilot villages under GEF and, beyond the pilot villages, under JSDF. It led to the preparation of community natural resources conservation plans with various water users group under the JSDF as well as implementation of coping strategies based on infrastructure and engineering interventions (GEF and JSDF), and income-generating coping interventions (GEF and JSDF). For details on this extensive work completed under the project, please refer to Annex 2 Component 3 items (d) and (e). Lastly, to facilitate replication after project closing, the Project documented the modalities and approaches, and the lessons learned. Although ACAP could have implemented even more infrastructure and engineering interventions, because the JSDF was utilized only about 62 percent of what was estimated during the grant preparation, the results demonstrate that the constraint was not availability of financial resources but implementation capacity at the local level.

37. PDO (b) was achieved, based on the project exceeding the targets of all its indicators except that for Indicator 1, and partly achieving the target for Indicator 1. For Indicator 1, while the lessons were learned, captured, and mostly disseminated to the targeted farming communities, the scaling up was delayed due to the political crisis. But balancing this shortfall, the Project:

- a) Achieved 111% of target in terms of beneficiaries that included beneficiaries involved in upgrading of terraces, construction of water storage tanks, flood protection works, soil conservation, and small income generation projects. The project also achieved 105% of its target of female beneficiaries (Indicators 3 and 4);
- b) Achieved 146% of target for client days of training provided within the communities and 148% of target for client days of training to women within the above outcome (Indicators 5 and 6);
- c) Achieved 125% of target for pilot communities that developed plans for natural resource management focusing on conservation and adaptation planning based on agro-biodiversity resources (Indicator 7);
- d) Achieved 125% of target for beneficiaries, especially female, that were trained on water conservation, nutrition, natural resource conservation, etc., beyond the 10-12 pilot villages (Indicator 8); and
- e) Vastly exceeded the target (achieved 250% of target) for the number of community pilots using local knowledge & agro-biodiversity resources that were designed and developed (Indicator 9).

3.3 Efficiency

Rating: Substantial

38. At appraisal, financial and economic analysis had been carried out based on the real option methodology that was designed as a pilot application with the hope that this approach could later generate guidelines for the economic analysis of the other adaptation projects. Given the lack of data and the impossibility to conduct field work due to the security situation, the analysis conducted at project completion does not attempt to reconstruct analysis conducted at appraisal. Instead, the analysis of efficiency is based on cost-effectiveness both at the project level as well as at the level of components. In Annex 3, the cost-effectiveness analysis is supplemented by an assessment of the relevance of the assumptions made at appraisal based on key M&E data and documents provided. In particular, the analysis looks at the benefits appearing from the components 1, 2, and 3 and provides a detailed review of the potential economic return of the technologies introduced by the project.

39. The project focused on the operations in four governorates: (i) Al-Mahweet, (ii) Ibb, (iii) Taiz, and (iv) Sana'a. Within these four governorates, ACAP targeted 14,000 households. With an estimated average size of 6.5 people per household, the total number of beneficiaries targeted amount to 91,000 people. To evaluate the economic efficiency, the cost-effectiveness of ACAP was compared to that of the IFAD-financed Murat River Watershed Rehabilitation Project (MRWRP), which had similar objectives and targeted about 80,000 beneficiaries. The cost per beneficiary of ACAP of US\$ 55.8 compares favourably with that of MRWRP's US\$ 481.4, leading to the above rating of efficiency. The efficiency rating is also substantiated by the component-by-component efficiency analysis shown below.

40. **Component 1: Agro-biodiversity and Local Knowledge Utilization and Assessment.** Under various scenarios of a changing climate, reducing the sensitivity of

systems to shocks such as floods or droughts, through use of climate-resistant crop varieties, will reduce risks effectively¹. This is particularly important in drought-prone areas where irrigation is not available. The traditional open pollinated cultivars could expect a yield of about 900 kg/ha, compared to about 300 kg/ha for the hybrid cultivars that were used before ACAP. The difference represents about 600 kg of losses avoided per hectare, or a value of about US\$ 115.8/ha and per year (see Annex 3). The component cost was US\$ 390,000, implying that if just 3,368 ha benefited from the use of climate-resistant crop varieties, ACAP's Component 1 would be cost-effective in one year.

41. **Component 2: Climate Modeling and Capacity Building.** For Yemen, both global and local climate change impacts matter, given the country's high levels of food import dependency, food insecurity, and poverty. Quantifying the impacts of natural disasters is important to design appropriate mitigation strategies and, therefore, is one of the main economic benefits of climate modeling. For example, Yemen faces a number of natural hazards every year with floods constituting the most important and recurring form of disaster in the country². Over the last twenty years Yemen has suffered through 19 floods and flash floods. The costs of flood damages collected over the past years vary from US\$ 1.5 million to US\$ 1.2 billion. The Project's climate modeling activities will facilitate introduction of climate change mitigation strategies and, therefore, reduce the likelihood of destructive flooding and landslides in the future. Consequently, the very high economic and human costs of lives lost, losses to fix damaged infrastructure, agricultural losses, as well as the cost and misery from relocation of the population are also expected to be reduced. If ACAP is able to reduce the losses of one of the really large (over US\$ 1 billion) flood losses by only about 0.15 percent, its Component 2 cost of US\$ 1.58 million would be cost effective.

42. **Component 3: Integrating Climate Change into Rainfed Agriculture.** Incremental net benefits from this component were mainly generated by two types of investments: (i) interventions to reduce and mitigate climate change damages at the community level (terraces, water tanks, wadi banks, soil conservation) and (ii) small-scale, income-generating activities. As shown in Annex 3, the benefit-cost ratio for the first type of interventions ranged from 1.0 to 2.9 (average 1.75), signifying cost-effectiveness. Among the second type of interventions, sheep/goat rearing was possibly the most representative. They generated net benefits greater than the initial investment by year three/four and were cost-effective as well.

¹ The landraces presenting stability and climate resilience under different environmental conditions were submitted to the General Seed Multiplication Corporation for further multiplication and dissemination through various projects.

² The top four natural disasters in Yemen for the period 1990-2011 with regard to economic damages were all floods (source: <http://emdat.be/database>).

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

43. **The** overall outcome rating for the Project is “Satisfactory” as it is rated “High” on Relevance and “Substantial” on both Achievement of its Objectives, and Efficiency.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

44. **The** Project was designed to have poverty reduction impacts, to address gender aspects and social development, and it and was implemented accordingly.

(b) Institutional Change/Strengthening

45. In terms of institutional development, one of the main issues addressed under ACAP was the capacity of climate change-related agencies of Yemen and improving their coordination. The ACAP initiated various activities in this direction but, given their initial weakness and the challenges they face, the institutional development has to be continued through other initiatives for the foreseeable future. In parallel, ACAP was expected to develop the institutions that would deliver the appropriate seeds and water-related infrastructure to poor farmers in the rainfed areas which are also often quite remote. However, much of the work involved the strengthening of communities with less reliance on sole operational capacity of the Government entities involved. The ACAP, like RALP, was able to develop both the demand and the supply side of this support and build the framework to address climate change at the community level.

(c) Other Unintended Outcomes and Impacts (positive or negative)

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

46. *A Beneficiary Assessment Survey (BAS)*, planned to be undertaken at the end of the Project, could not be completed due to the current security situation, although the BAS had carried out some interviews and focus groups with beneficiaries. It could be completed by MAI if the situation improved; a BAS with institutional stakeholders would then be undertaken as well. The preliminary indication from the incomplete BAS was that the beneficiaries’ assessments were in line with the findings of the BAS for similar activities carried out under the RALP. Essentially, there are two observations from RALP that could be reasonably applicable to ACAP: (a) a vast majority (close to eighty percent) of interviewed beneficiaries rate as positive the benefit to their communities of investments to improve the sustainable management of natural resources (watershed management, terrace rehabilitation, etc.); and (b) almost everyone (about 94 percent) of beneficiaries assessed the women’s participation as good or fair.

4. Assessment of Risk to Development Outcome

Rating: High

47. The current situation of air raids and civil war has resulted in a high risk to development outcome. The Project's sustainability utilizes both national institutions and communities. The above risk would materialize mainly for activities under public sector institutions. The institutional arrangements at the national level, including that at relevant climate change-related institutions, such as CAMA, are highly vulnerable. On the other hand, many working arrangements developed under the Project within a community require very little continuing support from the state.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Satisfactory

48. The rating is based on the following strengths:

- a) The Bank identified that the increased variability in precipitation raised the risk of crop failure and loss of livelihoods in a region where the level of poverty was already high and water was already a scarce resource. Based on progress under other Bank interventions in the sector, the Bank identified ways on how a GEF project could support agro-biodiversity of the highlands and traditional knowledge of farmers, which had been the cornerstone of communities' ability to adapt to changing climatic conditions in the past;
- b) Specifically, within the beneficiary group, the Project addressed gender and environmental aspects related to availability of water, and broken-down terraces and water harvesting infrastructures that had diminished water assets of the poor;
- c) The Bank appraised the strengths and weaknesses of relevant public entities, and developed a plan to improve their capabilities through coordination, development of databases, use of climate models, and training; which are balanced by
- d) Overambitious use of real options methodology for economic and financial analysis that was not documented well at appraisal and that was disconnected with the M&E system established under the Project.

(b) Quality of Supervision (including of fiduciary and safeguards policies)

Rating: Satisfactory

49. The Bank was proactive in identifying small shortcomings in project design and redressed them through JSDF-financed activities. In addition, the rating is based on the adequacy of supervision inputs and processes, particularly after the 2011-12 hiatus. During

that period, the supervision team regularly provided detailed Aide Memoires covering, among other things, fiduciary aspects.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Satisfactory

50. Overall Bank performance is rated as “Moderately Satisfactory,” reflecting the “Moderately Satisfactory” rating for Bank performance in ensuring quality at entry and the “Satisfactory” rating for quality of supervision.

5.2 Borrower Performance

(a) Government Performance

Rating: Satisfactory

51. The rating is based on the following: Ownership that included providing counterpart funding as planned and senior leaders availing themselves to Bank missions without fail. GoY supported implementation arrangements, including appointment of key staff, and initiated restructuring requests.

(b) Implementing Agency or Agencies’ Performance

Rating: Satisfactory

52. The rating is based on the following: MAI implemented the Project, first using the PCU of GSCP and then using the PSU of RALP. Both were quite committed to achieving the project development objective. Fiduciary performance (FM, and procurement) was adequate at MAI throughout the implementation period. The above rating possibly does not do adequate justice to reflect counterpart support from the PSU, particularly during the current stage of the security situation when many buildings, including part of the building where the Bank had its office, were damaged from air attacks. It is true that implementation lagged planned levels throughout the implementation period, but by having a solid mechanism in place, the implementation agency could improve matters in the last year and bring the Project to a successful close.

(c) Justification of Rating for Overall Borrower Performance

Rating: Satisfactory

53. Overall Borrower performance is rated as “Satisfactory,” reflecting the “Satisfactory” rating for both the Government and the Implementing Agency performance.

6. Lessons Learned

54. **To improve relevance of a project, utilize participatory beneficiary involvement in planning/design of activities.** Beneficiary participation made the Project more relevant to the needs of a specific community, even when similar activities were carried out in different locations. This was the case with coping strategies where, because of community participation, there was often an increased demand for smaller water tanks. It also led to easier transition to participatory beneficiary involvement during implementation. With beneficiary involvement during implementation, temporary jobs were created and targeting improved because the unemployed/under-employed were more available to participate.

55. **To improve coordination among various agencies, invest in field-level coordination.** At the field level, ACAP (and RALP) experienced considerable success in coordinating the work of various agencies. This might have been due to outside-the-office connections among this educated group of people even when coordination at the headquarters level was insufficient. Lack of resources in the field units of various ministries might also have played a role in bringing them together when financing from the Project became available.

56. **When one must have inter-agency coordination at the national level, develop iteratively with communication and coordinated action supported through Bank resources.** In ACAP it was a considerable challenge to overcome the bureaucratic tension on the topic of climate change between the climate-focused agency CAMA, the water-focused agency NWRA, and the rainfed farmer-focused agency MAI/PSU. The coordination challenge could also not entirely be finessed away by developing most of the coordination at the field-level, because of the centrality of developing national policies and priorities (see next lesson below). The goal is to ultimately have integrated action from the various agencies, but it can come only in stages.

57. **Even when the goal is to deliver climate change-related global benefits, one must build national policies and priorities, because global benefits will be achieved and sustained only if they are consistent with national policies and priorities.** In addition, project activities at the local level can be sustained only if they fit national policies and priorities. The centrality of developing national policies and priorities cannot be overstated. Specifically, ACAP's approach to development of national policies relied upon climate modeling and database-related training, among other things. In addition, much of the priority setting at the national level required focusing on rainfed agriculture, which had been achieved through RALP and which preceded this Project.

58. **For community-based biodiversity/climate change projects to succeed, one must build over a period of time partnerships and understanding among project implementers and communities.** The understanding was achieved under two Bank projects, GSCP and RALP, which preceded ACAP. Although the reduction in overhead cost from piggy-backing PCU/PSU of Bank projects is often acknowledged, this benefit to GEF projects, from past Bank interventions in building partnerships, is not well understood.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

59. The executive summary of the Borrower/Recipient's completion report is presented in Annex 7. It is included as received from the Borrower with some editing but without modifications to its substance.

60. The draft of the Yemen ACAP ICR was shared electronically with the implementing agency. The PSU highlighted a few corrections and confirmed the level of results and achievements at Project closing. These have been taken into account as warranted and included in the final ICR.

(b) Cofinanciers

61. Not applicable.

(c) Other partners and stakeholders

62. Not applicable.

Annex 1: Project Costs and Financing

I- Yemen ACAP (GEF TF096330)

(a.1) Project Cost by Component (in USD million)

Components	Appraisal Estimate	Actual/Latest Estimate	Percentage of Appraisal
C1:Agro-biodiversity & Traditional Knowledge Utilization	0.37	0.39	105%
C2: Climate Change Modeling and Capacity Building	0.85	1.58	186%
C3: Integrating Climate Change into Rainfed Agriculture	3.40	2.73	80%
C4: Project Management, Coordination and Monitoring and Evaluation	0.68	0.38	56%
Total Baseline Cost	5.30	5.08	96%
Physical and Price Contingencies	0.00	0.00	
Total Project Costs	5.30	5.08	96%
Total Financing Required	5.30	5.08	96%

(b.1) Financing (in USD million)

Source of Funds	Type of Cofinancing	Appraisal Estimate	Actual/Latest Estimate	Percentage of Appraisal
Recipient	Joint	0.42	0.28	67%
Global Environment Facility (GEF)	Joint	4.00	3.86	97%
Beneficiaries	Joint	0.28	0.12	41%
PHRD-CCIG (Climate Change Initiative Grant)	Joint	0.60	--	0%
Local Source of Recipient Country (SFD/RALP)	Joint	--	0.82	-
TOTAL		5.30	5.08	96%

II- Yemen Piloting Coping Strategies for Rainfed Farmers (JSDF TF098754)

(a.2) Project Cost by Component (in USD million)

Components	Appraisal Estimate	Actual/Latest Estimate	Percentage of Appraisal
C1: Community Natural Resource Management Planning	0.17	0.05	32%
C2: Establishment of Small Income Generation Projects	1.06	0.67	63%
C3: Community Small-Scale Upgrading & Capacity Building	1.04	0.82	79%
C4: Community Awareness Program	0.25	0.11	43%
C5: Project Management, Monitoring & Evaluation	0.26	0.19	73%
Total Baseline Cost	2.78	1.84	66%
Physical and Price Contingencies	-		
Total Project Costs	2.78	1.84	66%
Total Financing Required	2.78	1.84	66%

(b.2) Financing (in USD million)

Source of Funds	Type of Cofinancing	Appraisal Estimate	Actual/Latest Estimate	Percentage of Appraisal
Beneficiaries	Joint	-	0.13	
Japan Social Development Fund (JSDF)	Parallel	2.78	1.71	62%
Total Financing		2.78	1.84	66%

Annex 2: Outputs by Component

Component 1: Agro-biodiversity and Local Knowledge Utilization and Assessment

- a) The Project took stock of existing inventories of the landraces, and added new landraces collected from targeted project areas. A total of 1603 crop landraces and 9 landraces of famous fruit trees were collected and kept in the Gene Bank at AREA.
- b) From landraces collected, 46 landraces were selected and tested for climate resilience profiles at three sites in each district.
- c) To carry out the selection and testing, the Project utilized AREA a laboratory that had been financed under the Project with all the requisite equipment and chemicals. The laboratory enabled AREA to conduct molecular analysis for the first time.
- d) The landraces that had stability and climate resilience under different environmental zones were then submitted to the General Seed Multiplication Corporation for multiplication and dissemination.
- e) The Project also identified options for micro-enterprises based on the utilization of agro-biodiversity. It carried out a survey among the farming communities to determine their preference to the type of income generation projects. The communities' preference for collection and packaging of medicinal plants as well as food processing was, however, very low because of other alternatives such as raising sheep and beekeeping.
- f) Under this Component, three training programs were implemented on raising awareness of selected landraces among the farming communities, strengthening of community organizations, preparation of community plans, etc. The Project also helped AREA to disseminate the results of its research work to various stakeholders.

Component 2: Climate Modeling and Capacity Building

- a) Under this Component, the Project carried out a meteorological data survey and collected historic climate data. The activity involved survey, collection, entry, and scanning of the available printed data at various stakeholders within ACAP intervention provinces. The printed data was transferred to digital data and entered in a database.
- b) The above metadata survey identified gaps for ACAP's intervention in the targeted provinces, and selected weather monitoring stations were upgraded.
- c) A study for small-scale rainfall variability including the rainfall index and rainfall variability over some locations (rainfed mountain areas) was carried out.
- d) With the support of various stakeholders on this topic (CAMA, MAI/AREA, EPA, and NWRA), the Project developed a sustainable climate information system (CIS) with harmonized standard information and requisite organizational arrangements associated with climate data collection. The CIS is equipped with required equipment and tools. The stakeholders can access the CIS via the web.
- e) The Project made an assessment of institutional capacity of CAMA, NWRA, MAI, and EPA and their requirements for weather stations. It also prepared a plan to establish new meteorological climate and agricultural measurements stations and sites. Based on the above, eight automatic weather stations (with software and communication

- units) were installed at the following selected sites: (a) Sana'a Governorate (Bani Behlol), (Bani Mattar), (b) Taiz Governorate, (Almoosat), (Saber), (c) Ibb Governorate, (Al-Sadah-Badan), and (d) Almahweet Governorate, (Almahweet town-Alrogm).
- f) Local data sets were developed and local capacity to predict regional climate change based on global circulation model output was improved. CAMA assumed the charge to manage the eight data sets developed under the Project. Fifteen technical specialists from CAMA (9), MAI/AREA (2), EPA (2), and NWRA (2) were trained on climate modeling and prediction of climate change.
 - g) The plan for long-term training for M.Sc. degree was replaced by various more cost-effective capacity building training. These included: (a) 10-day training on collection of data for 20 participants; (b) 10-day training on exchange of data between relevant institutions for 20 participants; and (c) 12-day training on climate modeling for 14 participants.

Component 3: Integrating Climate Change into Rainfed Agriculture

- a) The Project made a detailed assessment of the vulnerability of rainfed agriculture to climate change, followed by consultations with stakeholders to develop a climate resilient rainfed agriculture strategy. Staff in MAI and associated institutions provided specialized training in climate awareness and in developing a coherent response strategy.
- b) The Project implemented the project awareness program for three days in each of the eight targeted districts. 921 community participants -- 520 men and 401 women -- from the eight targeted districts attended. The training was on the importance, utilization, and the role of farmers' communities in agro-biodiversity conservation and coping mechanisms to address climate change. With additional funds obtained under JSDF Component 4, the Project sought to support an education and awareness-raising program targeting the rainfed areas beyond the 8-10 pilot villages by using community facilitation teams and technical experts. These facilitation teams were established in each of the eight targeted districts.
- c) The coping mechanisms included small-scale infrastructure and income generation activities that use local agro-biodiversity, which not only help in sustainable management of natural resources, but also help in the diversification of income sources for the communities.
- d) The small-scale infrastructure included upgrading of terraces, construction of efficient small water storage, soil conservation, and small flood protection structures. Against a target of 20 coping mechanisms, the Project completed and tested 122 small-scale infrastructure items (43 terraces, 52 water tanks, 13 soil conservation and 14 wadi banks). Specific training was also provided to community associations on organizational aspects and the role of the associations in the community to maintain project interventions. With additional funds obtained under JSDF Component 3, 91 small-scale infrastructure upgrading projects were undertaken, which were tied to conservation of water, soil, terraces, crops, and seeds and which sought to maximize the use of local knowledge and adaptation practices.
- e) Income generation activities initially included 20 projects distributed in the three districts (i.e. 5 community income-generation projects in each district). About 200 families benefitted from these projects, 75% of whom were poor with a female head

of the household. This was due to the objective, transparent, and set criteria-based process followed by the committee for the distribution of income generation projects. With additional funds obtained under JSDF Component 2, an additional 54 income generation projects were made operational, dominated by beekeeping and animal raising – activities that created most demand among the farmers. In addition, under JSDF Component 4, the “first phase” of a new community awareness program (involving facilitation teams) trained 70 beneficiaries on income generation activities in Al Mahweet and AL Rujum districts.

- f) The Project trained the communities on how to prepare their community plans and implement them. 734 of the community leaders -- 368 men and 366 women -- attended this training. At the national level, the Project provided training to senior officials from MAI, NWRA, CAMA, AREA, and EPA on climate change and consequences for unsustainable natural resource use. In addition, in various stakeholder agencies, specific training was provided, such as field inventory training at AREA and climate change impact on rainfed agriculture at MAI.
- g) With JSDF Component 1 financing, the Project provided four two-day training workshops for the Water Users Groups (WUGs) and the Associations in all the targeted districts on how to formulate their own community plans, supporting natural resources conservation and with emphasis on agro-biodiversity. 480 participants from the WUGs participated in these workshops and 10 WUGs developed their plans.
- h) The Project constructed community infrastructure (community seed stores and community centers) in two governorates out of four, because the seed stores and the associated building constructed by the SFD under RALP in Al Mahweet and Sana'a governorates were considered to be adequate with no need to construct additional seed stores under ACAP. The Project also established two model farms at two locations. The model farms were cultivated with fruit trees: almonds at Bani Matter in the Al Mahweet governorate and coffee at Bani Hamad in the Ibb governorate.

Annex 3: Economic and Financial Analysis

I. Introduction

1. This Annex presents the financial and economic analysis of the Agro-biodiversity and Climate Change Adaptation Project (ACAP) at its completion stage. The financial analysis aims to demonstrate that income-generating activities on-farm as proposed by the Project, have been profitable and are therefore sustainable. The economic analysis aims at demonstrating that, from an economic perspective, the project as a whole is viable, taking into account, as much as possible, all quantifiable additional costs and benefits with and without project.

2. At appraisal, financial and economic analysis was carried out based on the real option methodology that was designed as a pilot application with the hope that this approach could later generate guidelines for the economic analysis of the other adaptation projects. Given the lack of data and the impossibility to conduct field work due to security reasons, the analysis conducted at project completion does not attempt to reconstruct the analysis carried out at appraisal, but will assess the relevance of the assumptions made at appraisal based on key M&E data and documents provided. In particular, the analysis will look at the benefits resulting from components 1, 2 and 3 and will provide a detailed review of the potential economic returns of the technologies introduced by the Project.

II. Data sources and general assumptions

3. **Sources.** The data used in this analysis have been collected from the Social Fund for Development (SFD), World Bank's supervision reports, and the PSU of the Agro-biodiversity and Climate Change Adaptation Project.

4. **Currency and exchange rate.** The Central Bank kept the official rate of the Yemeni riyal (YER) at the official rate of YR 215 = USD 1.00, despite the unrest that began in 2011. The same exchange rate has been used throughout the present analysis.

5. **Prices.** Input and output prices were collected in January 2015 and expressed in constant terms. These prices were updated using World Food Programme (WFP) Market Surveillance lists from June 2015.

6. For non-traded items, the entire production, at least in the areas of project intervention, is destined for local markets; hence the market price is a fair measure of the willingness to pay and is the best estimate of the opportunity cost. Therefore financial prices are found to be reliable approximations of their economic value for most of the items used in the analysis. A distortion was perceived in the market prices with respect to border prices for sorghum grain, honey, and coffee; their economic values were calculated on an import (for sorghum) and export (for honey and coffee) parity basis. Shadow prices for

rural labor were estimated at 70% of the prevailing market wage rate, while for skilled labor, the market rate was assumed to reflect its opportunity cost.³

III. Financial Analysis

7. Financial benefits analyzed are coming from components 1 and 3. Financial evaluation was chosen randomly from the most representative type of small producers. The evaluation was to provide some idea of the projects' financial benefits. The sample is not representative of the projects' universe, but the analysis gives a sense of the possible economic and financial benefits. While it is difficult to draw general conclusions from this study, it shows, however, that, with the proper design and management, most of the reviewed projects are sustainable and financially viable.

8. **Component 3: Integrating Climate Change into Rainfed Agriculture.** Incremental net benefits from this Component were mainly generated by two types of investments: (i) interventions to reduce and mitigate climate change damages at the community level (terraces, water tanks, wadi banks, soil conservation), and (ii) small-scale income-generating activities. The technical data is based on the feasibility study⁴ by SFD, project supervision reports, and ACAP M&E information. The financial evaluation conducted by the study focused on the most representative types of projects promoted by ACAP. The evaluation provides some idea of the projects' financial benefits and gives a sense of the projects' possible economic benefits.

(i) Interventions to reduce and mitigate climate change damages at the community level:

9. **A) Terraces and soil conservation measures.** Large areas within the project area were severely degraded and most of terraced land has been abandoned⁵. Most of farmers don't have any open grazing land, so they graze the animals on the abandoned and unmaintained terraces. This uncontrolled grazing is unsustainable and is aggravating the vegetative cover of the slopes and increases erosion. The project facilitated transition to a more sustainable use of slopes, thereby securing long-term productivity of those areas and raising incomes for local people.

10. **Terraces.** Data has been collected in 17 locations targeting 81 beneficiaries and covering 35.41 ha, distributed in three governorates (Al-Mahweet/Al-Rogom district (Ozlt Rohan and Ozlt Al-Bddee), Sana'a/Blad Arross district (Ozlat Aroba Asharqe) and Hajja (Watershed Bane Massan). The total capital cost for 35.41 ha (including cost of digging, stones, workmanship) was estimated at about USD 290,385 (USD 8,201 per ha). Recurrent costs were estimated at about 26,238 USD/year (including production costs and annual maintenance cost of terraces). The annual production of sorghum on the total surface of

³ Assumptions used in the Rural Growth Programme by IFAD (2013).

⁴ Feasibility study of the projects resilient to climate change in the watershed by Dr. Ali Abdulmjeed Al-Sururi, 2014.

⁵ Economic and social impact of terraces and outcomes of terrace rehabilitation in Yemen (2009); Case studies for terrace rehabilitation (2009).

terraces rehabilitated has increased from 23.7 tons (about 670 kg/ha) in the first year to 39.7 tons (1,120 kg/ha) in the fourth year, which represents about a 65% increase. The Project presents a Financial Internal Rate of Return (FIRR) of 30%, an NPV of USD 191,946, a benefit-cost ratio of 1.5, and a payback period of about 4 years, which shows to be an attractive investment, given the fact that before project unmaintained terraces remained unused, therefore the financial benefit from the Project is all incremental, with a rapid increase in crop yields (due to terracing).

11. **B) Soil conservation/regeneration measures. Maintenance of natural pastures.**

Data has been collected from 11 locations within the project area where pastures maintenance was carried on 5.325 ha. Total investment cost has been estimated at about USD 20,970 and recurrent costs (annual maintenance of the pastures) at about USD 230.

12. With the project annual production of grass increased from 6.9 tons in the first year to 16.9 tons in the fifth year of the project (from 0.75l to 1.5l of milk per animal), allowing grazing of 70 animals (goats and sheep) and an annual milk production of 19.9 liters. Given the low recurrent cost level, together with an important increase in milk production, the project shows to be financially attractive to farmers, presenting an FIRR of 48%, an NPV of USD 38,910, a benefit-cost ratio of 2.9, and a payback period of about 3 years.

13. **C) Water tanks.** The purpose of the Project was to provide water (through rainwater harvesting) for human and animal consumption during the drought periods. In total, 44 water tanks have been analysed. Project investment costs are about USD 308,430 for 8 drinking water tanks, and USD 902,786 for 36 animal watering tanks. These costs include drilling, stones, transportation, and construction. Recurrent costs (annual maintenance) were estimated at about USD 223 for drinking water tanks and at about 1,005 USD for animal watering tanks. The quantity of drinking water collected annually represents 12,272 m³ which is equivalent to 91,702 USD saved by rural households that otherwise would have had to buy this water at market price (7.44 USD/m³). Furthermore, 79,128 m³ of water with a value of USD 552,056 (at 6.98 USD/m³) are collected annually for animal watering. The human drinking water project presents a FIRR of 26%, an NPV of USD 160,913, a benefit-cost ratio of 1.6, and a payback period of about 3 years, which can be considered an attractive investment for rural households. Furthermore, it has to be noted that maintenance costs are largely covered by the economies made from water collection which contributes to the sustainability of the Project.

14. **D) Wadi banks.** The purpose of the analysed project is to build protection walls for the banks of the agricultural land and the entrances of irrigation canals in the valley. The investment cost of the wadi bank protection has been estimated at USD 70,590. The command area within the wadi is 35 ha. Sorghum has been used as a proxy for agricultural production. Recurrent costs (including crop production costs and wadi banks and canals annual maintenance) are estimated at USD 35,493. The main project benefits came from the increased agriculture productivity with the yields that increased by 30% at the end of the project, from 1.23 t/ha to 1.63 t/ha. The analysis didn't take into account the sorghum fodder production as it's usually not commercialised. The project is financially viable with

an FIRR of 14%, an NPV of USD 3,801, a benefit-cost ratio of 1, and a payback period of about 2 years.

(ii) Small-scale income-generating activities (IGAs)

15. **AREA**, in consultation with local communities, carried out an assessment study of agro-biodiversity-based micro enterprises. The study has resulted in the identification of about 10 potential income-generating activities preferred by the beneficiaries such as sheep fattening, beekeeping, nurseries establishment, almond trees planting, and waste recycling. Collection and packaging of medicinal plants and food processing have also been considered but the communities' preference for these activities is very low since they are not traditional ones and not known. Two IGAs will be presented in the analysis: (i) sheep fattening, and (ii) beekeeping.

16. **Sheep fattening and goat rearing.** The model illustrates the likely returns over time to smallholders participating in this Project and adopting improved husbandry practices (new stables, better hygiene, vaccination, and supplementary feed) as well as having better access to irrigation infrastructure and animal watering. Sheep fattening can potentially be pursued in most districts, and it is carried out under a stall-fed system, thus avoiding possible negative environmental impacts. Good housing conditions are required and new entrepreneurs are advised on appropriate housing to be constructed for sheep to provide a healthy and hygienic environment, and the cost of housing is included in the total investment costs. The existing animal husbandry practices limit the milk and meat yields, keeping them below the potential. Low animal productivity and profitability in livestock husbandry is due to inappropriate livestock feeding practices, limited availability of clean drinking water, and poor housing and livestock husbandry practices. Investment costs include 10 animals, housing, fencing and equipment (USD 2,595 for goat rearing and USD 2,410 for sheep fattening). Recurrent costs represent USD 1,821 and include food, hired labour, and veterinary services. The cash flow remains negative during the first year of the project due to the investment costs, then annual net benefits from the project increase from USD 2,196 in PY2 to USD 4,219 at the end of the project.

17. **Beekeeping and honey production.** Farmers engaged in subsistence production on small areas, and given that they have on average only one cow and few small ruminants, they need to diversify their sources of income. Given the difficult terrain (limited agricultural land, terraces in Western mountainous districts, etc.) farmers need to grow high value, low volume crops or initiate some off-farm IGAs. The Project provided interested farmers with beehives, bees, necessary equipment, and training in order to start a beekeeping activity. With the high premium price paid for local honey, beekeeping is an attractive IGA. The beekeeping model illustrates the establishment of new bee hives. Investment cost include bee hives and colony, queen screen as well as some basic equipment (face nets, smoker, brush, and feeding equipment). Honey production increased from the initial level of 5 kg per year to 10 kg in PY4, resulting in a short pay-back period for the investment cost. The beekeeping project achieved positive net revenue increases during the first year of the project from USD 172 to USD 3,026.

IV. Economic Analysis

18. **Project beneficiaries.** The Project focused its operations in four governorates: (i) Al-Mahweet, (ii) Ibb, (iii) Taiz, and (iv) Sana'a. Within these four governorates, ACAP and JSDF targeted 14,000 beneficiary households. With an estimated average size of 6.5 people per household, the total number of beneficiaries amount to 91,000 people. Economic assessment of climate change adaptation investments is structured as follows: (i) presentation of economic benefits for components 1 and 2, and (ii) cost effectiveness analysis of the overall project.

19. **Component 1: Agro-biodiversity and local Knowledge Utilization and Assessment.** Under this sub-component an agro-biodiversity inventory has been prepared and 46 landraces were selected and tested for climate-resilience in three sites in each district of the project area. The landraces presenting stability and climate resilience under different environmental conditions were submitted to the General Seed Multiplication Corporation for further multiplication and dissemination through climate change-relevant projects.

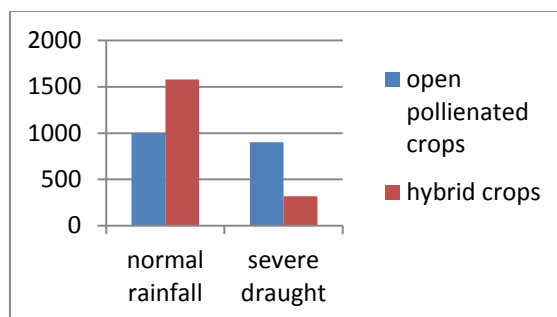
20. This activity is expected to generate substantial financial and economic benefits over the long-term through strengthening resilience of the seed system to climate risks that are often translated into poor crop yields and suboptimal performance of agricultural and livestock enterprises. Furthermore, at farm level, climate risk resilience alters other risks such as asset depletion (damage and loss to assets as a result of extreme climate events), and therefore prevents major financial losses to the farmers. Reducing the sensitivity of systems to shocks such as floods or droughts through use of climate-resistant varieties will allow to effectively reduce risks and bridge the farm-level yield gaps.

21. There is abundant scientific evidence showing that crop biodiversity has an important role in adaptation to a changing environment, as increasing the biodiversity of an agro-ecosystem can help maintain its long-term productivity and contribute significantly to food security. Genetic or species diversity within a field provides a buffer against losses caused by environmental change, pests, and diseases. Biodiversity (on a seed-to-farm scale) provides the resilience needed for a reliable and stable long-term food production (Diaz et al., 2006).

22. Under present and future scenarios of a changing climate, farmers' reliance on crop diversity is particularly important in drought-prone areas where irrigation is not available. Diversity allows the agro-ecosystem to remain productive over a wider range of conditions, conferring potential resistance to drought (Naeem et al., 1994). In the dry-hot habitats of the Middle East, some wild wheat cultivars have an extraordinary capacity to survive drought and make efficient use of water, performing especially well under fluctuating climates (Peleg et al., 2009). Researching the diversity and drought-coping traits of wild cultivars provides scientists with new tools to breed crops better adapted to less rainfall. In semi-arid Ethiopia, growing a mix of maize cultivars in the same field acts like an insurance against dry years. Research shows that fields with mixed maize cultivars outperform monocultures with 60% more yield in dry years (Tilahun, 1995).

23. Given the average open pollinated maize yields in the project area of 1,000 kg/ha (data collected in 2015 for RALP) and the yield of a hybrid maize of about 1,580 kg/ha (FAOSTAT, 2014), and using the results the Ethiopian research as a proxy, we can see that under a scenario of a severe drought the traditional open-pollinated cultivars could expect a yield of about 900 kg/ha, compared to about 300 kg/ha for the hybrid cultivars (chart 1 illustrates these calculations). This represents about 600 kg of losses avoided per hectare, or a value of about 24,897 YER/ha (US\$ 115.8/ha) and per year⁶.

Chart 1. Comparative yields for maize crops under two climate scenarios



24. **Component 2. Climate Modeling and Capacity Building.** For Yemen, both global and local climate change impacts matter, given the country’s high levels of food import dependency, food insecurity, and poverty. Yemen imports between 70 and 90 percent of cereals and is a net importer of many other food items (Ecker et al. 2010). A sharp decline in oil exports and tourism, together with double-digit inflation since the beginning of 2011, have increased the number of poor and food-insecure. Climate change would only add to already important development challenges that Yemen is facing. In this context, climate change modeling allows to assess how far climate change is likely to affect Yemen and thus needs to be considered in future development strategies.

25. Quantifying the impacts of natural disasters is important in order to design appropriate mitigation strategies which is one of the main economic benefits of the climate modeling. Yemen is a disaster-prone country that faces a number of natural hazards every year with floods constituting the most important and recurring form of disaster in the country⁷. It will become even more important in the future, given that global climate change may increase the severity and frequency of extreme weather events (Salinger 2005). Over the last twenty years Yemen suffered through 19 floods and flash floods. Table 1 below presents the floods for which financial damages have been estimated between 1993 and 2008.

⁶ Valued using World Bank Commodities Prices data (July 2015) as a proxy for economic value of maize.

⁷ The top-four natural disasters in Yemen for the period 1990-2011 with regard to economic damages were all floods (source: <http://emdat.be/database>)

Table 1: Human toll and damages due to floods

year	total affected	killed	total damage ('000 USD)
23/10/2008	25.064	75	400.000
13/06/1996	238.210	338	1.200.000
14/05/1996	5.000	7	10.000
05/02/1993	21.500	31	1.500

Source: www.emdat.be

26. The project's climate modeling activities will facilitate introduction of climate change mitigation strategies and therefore reduce the likelihood of destructive flooding and landslides in the future, and so decrease the very high economic and human costs of lives lost, repairs to damaged infrastructure, agricultural losses and of the relocation of the population. The costs of flood damages collected over the past years vary from USD 1'500'000 to USD 1'200'000'000. The damage estimates are based on quantities of the damaged assets without taking into account the spill-over effects of such shocks, given that losses of livestock and perennials can be spread over four years (time it takes until replanted trees start bearing fruit and young animals produce meat and milk).

27. **Cost effectiveness.** In order to discuss the economic efficiency of the project, ACAP costs were compared with a project with similar impact. The comparable IFAD-financed Murat River Watershed Rehabilitation Project (MRWRP) had similar project objectives and targeted about 80'000 beneficiaries, respectively. The cost per beneficiary of ACAP of US\$ 55.8 compares favourably with that of MRWRP's US\$ 481.4, leading to the above rating of efficiency.

Annex 4: Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Kanta P. Rigaud	Environment Specialist	MNSEN	Task Team Leader
Laila Al Hamad	Sr. Social Development Specialist	MNSSO	
Banu Setlur	Environmental Specialist	MNSEN	
Niels Holm Nielsen	Hazard Risk Management Specialist	LCSUW	
Syviengxay Creger	Program Assistant/Temporary	MNSSD	
Ahmedou Hamed	Lead Procurement Specialist	MNAPR	
Moad M. Alrubaidi	Sr Financial Management Specialist	MNAFM	
Danielle Malek Roosa	Senior Counsel	LEGEM	
Renee Desclaux	Senior Finance Officer	CTRFC	
Madhavi M. Pillai	Consultant, Social Development	SDV	
Minna Maria Kononen	Country Relations Officer, GEF	GEFEX	
Naji Abu-Hatim	Sr. Rural Development Specialist	MNSSD	
Pierre Rondot	Senior Sector Economist	MNSSD	
Supervision/ICR			
Kanta P. Rigaud	Lead Environment Specialist	GCCPT	Task Team Leader
Garry Charlier	Sr. Rural Development Specialist	GFADR	Task Team Leader
Salenna W Prince	Operation Officer	GWADR	
Samira Al-Harithi	Procurement Analyst	GGODR	
Moad M. Alrubaidi	Sr Financial Management Specialist	GGODR	
Danielle Malek Roosa	Senior Counsel	LEGEM	
Banu Setlur	Senior Environmental Specialist	GENDR	
Amer Al-Ghorbani	Environmental Specialist	GENDR	
Chaogang Wang	Senior Social Development Spec.	GSURR	
Ibrahim I. M. Basalamah	Social Development Specialist	GSURR	
Naif Abu-Lohom	Sr. Water Resource Specialist	GWADR	
Faiza H.H. Ahmed	Agricultural Specialist, ETC	GFADR	
Ahmed Omar Lajam	Disaster Risk Management, ETC	GSURR	
Zakia Chummun	Language Program Assistant	GWADR	
Nabila Ali Al-Mutawakel	Program Assistant	MNCYE	
Samira Al-Harithi	Procurement Analyst	GGODR	
Edit Ruguru Mwenda	Senior Counsel	LEGAM	
Naji Abu-Hatim	Consultant	MNSSD	
Surajit Goswami	Consultant	GFADR	
Alexandra Sokolova	Agricultural Economist	FAO	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY07	4	20.86
FY08	15	102.79
FY09	11	93.97
FY10	18	154.54
FY11	0	9.46
Total:	48	381.62
Supervision/ICR		
FY11	6	29.93
FY12	10	56.78
FY13	18	110.85
FY14	20	122.62
FY15	16	114.85
Total:	70	435.03

Annex 5: Beneficiary Survey Results (if any)

A *Beneficiary Assessment Survey (BAS)*, planned to be undertaken at the end of the Project, could not be completed due to the current security situation, although the BAS had carried out some interviews and focus groups with beneficiaries. It could be completed by MAI if the situation improved; a BAS with institutional stakeholders would then be undertaken as well. The preliminary indication from the incomplete BAS was that the beneficiaries' assessments were in line with the findings of the BAS for similar activities carried out under the RALP. Essentially, there are two observations from RALP that could be reasonably applicable to ACAP: (a) a vast majority (close to eighty percent) of interviewed beneficiaries rate as positive the benefit to their communities of investments to improve the sustainable management of natural resources (watershed management, terrace rehabilitation, etc.); and (b) almost everyone (about 94 percent) of beneficiaries assessed the women's participation as good or fair.

Annex 6: Stakeholder Workshop Report and Results (if any)

Not applicable.

Annex 7: Summary of Borrower's ICR and/or Comments on Draft ICR

Prepared by: The Project Support Unit of the Ministry of Agriculture and Irrigation in collaboration with the Social Fund for Development
Republic of Yemen

EVALUATION SUMMARY

OVERALL PROJECT RATING

1. **Overall implementation** of the **ACAP** was delayed by 12 to 15 months to the severe start-up delays; the socio-political events of late 2010 and 2011 in Yemen also influenced Project implementation. Nevertheless, **ACAP** performed well with regard its key activities of both grants and achieved most of its stated objectives and results by the closing date of March 5, 2015 (see Section III below for details). The overall project rating is assessed as **Satisfactory**.

Result Framework Analysis

Country and Sector Issues

2. **The ACAP is one of the first pilot operations to address adaptation on the ground**, in a country selected for the **PPCR** program. This project complemented **RALP** by creating a framework for mainstreaming climate considerations, particularly through the components and activities related to soil and water management, terrace rehabilitation, and identification and conservation of selected land races which are resilient to harsh climatic conditions. **In addition, ACAP addressed the 'Strategic Priority on Adaptation'**. It piloted and tested the design of improved coping strategies through the use and conservation of agro-biodiversity resources in the rainfed highlands. The situation with respect to rainfed agriculture was made particularly difficult as cropping patterns and crop management are rainfall-dependent.

Higher level objectives to which the Project contributes

3. **The goals for the agriculture sector** at the macro level include “increased efficiencies and average annual growth of 4.5%, with due attention to environmental sustainability, increased income from agriculture through developing/promoting rainfed agriculture, and building dams and water dikes.” The ACAP directly contributed to this vision for agriculture which is “protection of Yemen’s agricultural diversity from degradation, maintaining agricultural resources and developing sustainable agricultural programs, taking climate variability and change into consideration”. Specifically, it addressed the priority adaptation activities identified in the agriculture and water sectors, through rehabilitation and maintenance of mountainous terraces, development and implementation of sustainable land management strategies to combat desertification and degradation, and promotion of research on drought resistant and heat- and salinity-tolerant crops.

4. **The Government of Yemen’s rural development and agricultural development strategies** also took advantage of local agro-biodiversity and local knowledge to prevent further land degradation and to help farmers adapt to climate change. The National

Biodiversity Strategy and Action Plan include the short-, medium-, and long-term objectives and activities on all aspects of biodiversity, including agricultural biodiversity, which were addressed by ACAP.

5. **Lastly, ACAP was consistent with the GEF-4** under the Climate Change focal area. The experiences and lessons from ACAP would assist other communities, both in the region and globally, as they seek to address the issue of adaptation to climate change.

6. **Current strategic plan/National Agricultural Sector Strategy (NASS):** The overall objectives of the agriculture sector are to increase growth, sustainability and equity by raising agricultural output and to increase rural incomes, particularly for the economically disadvantaged.

7. The NASS and its update place new emphasis on:

- Improving productivity of rainfed agriculture, including through terrace restoration, watershed management, and water harvesting;
- More efficient agricultural water management through adoption of modern irrigation techniques and agronomic packages within sustainable community-led water resources management plans and increased efforts to improve productivity in rainfed agriculture;
- An increased recognition of the role of rural women in meeting food needs, improving nutrition and protecting the environment;
- Improving productivity in irrigated agriculture through modern irrigation techniques and advisory services;
- A strong focus on improving productivity and sustainability of livestock production, as this sub-sector has growth potential and as livestock are the principal asset and economic activity of the economically disadvantaged and landless;
- Diversification of cropping patterns into new or revived cash crops (coffee, honey, almonds, and oil crops) and into more nutritious foods to help improve and diversify household nutrition, and development of related value chains and parallel reduction of area planted with Qat.

8. The sector now focuses on both growth and distribution and prioritizes the poverty reducing and nutritional role that agriculture and agricultural services can play. According to the report, “Although this strategy applies to all farmers, the balance differs somewhat between: **(1)** rainfed and smallholder agriculture; and **(2)** irrigated commercial agriculture. The growth strategy in rainfed and smallholder agriculture focuses more on inclusion and adding value to the assets of the poor and on improving their nutritional status.

I. PROJECT FORMULATION

9. **Project concept and design:** The project design drew on lessons from ongoing and completed projects, including the GSCP, RALP, and the Seeds and Agriculture Services Project. Some early lessons from analytical work on how to deal with climate change, in terms of information, knowledge, and approaches, had also shaped the design of the Project. The ACAP was one of the first pilot operations to address adaptation on the ground, in a country selected for the PPCR program. As such, it benefited from the Bank’s wider role in the climate change dialogue with Yemen and at the same time demonstrated adaptation for scaling up through the PPCR. This Project complemented the RALP by creating a

framework for mainstreaming climate considerations, particularly through the components and activities related to soil and water management, terrace rehabilitation, and identification and conservation of selected land races which are resilient to harsh climatic conditions. Synergies had also been explored with another ongoing IDA project. Thus, the ACAP was designed to test and pilot coping options along a mesoscale transect that covered a range of altitudes, mean annual precipitation, and agro-ecological gradients within the rainfed highlands. Based on the above, its concept and design are considered Satisfactory.

10. **Relevance:** Rainfed agriculture is the primary means of livelihood and a safety net for a majority of the rural poor in the highlands in Yemen. More than half of the country's cultivated area is under rainfed and subsistence farming conditions. For the nearly 84% of the poor in the rural areas that depend on rainfed agriculture, it is the primary source of livelihood and food security. The Government of Yemen's Socioeconomic Development Plan for Poverty Reduction (SDPPR 2006-10) identified increasing the efficiency of rainfed agriculture as one of its strategies to address rural poverty. Hence relevance is rated Satisfactory.

11. **Stakeholder participation in formulation:** At the community level the ACAP follows closely the approach adopted by the PSU, where the main focus is to work in partnerships with local formal or informal/traditional institutions. Farmers and communities participating in the community projects under the sub-component that involve upgrading small-scale community infrastructure and agro-biodiversity-based income generation activities are responsible for managing their resources sustainably. In-kind community contributions (such as labor) are emphasized for local ownership and sustainability of the projects. During implementation, the Project put immense efforts on enhancing the capacity and awareness at both the national and community level in terms of organizing workshops and awareness programs. Consequently, the stakeholders in the communities have acquired adequate knowledge to cope with climate change. The Project efforts to better equip the local communities to cope with climate change through the conservation and use of agro-biodiversity within the project timeframe, seem also to be reasonable. The farmers' interactions and responsiveness to these coping strategies seems to be very high due to their indigenous knowledge related to the importance of the activities under the coping strategies. Based on the above, the stakeholder participation in formulation is considered Satisfactory.

Project Components

a) AGRO-BIODIVERSITY and CLIMATE ADAPTION PROGET (GEF)

12. The ACAP-GEF contains four main components:

Component 1: Agro-biodiversity and Traditional Knowledge Utilization: includes **3 sub-components:** 1.1 Agro-biodiversity Inventories, 1.2 Development of Climate Resilience Profiles of Selected Land races, 1.3 a report on agro-biodiversity utilization and traditional knowledge.

Component 2: Climate Change Modeling and Capacity Building: includes **4 sub-components:** 2.1 Development of Improved Climate Database, 2.2 Downscaling

Climate Models, 2.3 Training and Technical Capacity Development, 2.4 Sharing Climate Information Inputs and Outputs.

Component 3: Integrating Climate Change into Rainfed Agriculture: includes **3 sub-components:** 3.1 Raising Awareness and Capacity Building at national and local levels on climate change, 3.2 Piloting coping strategies at local landscape units, 3.3 Preparation of climate resilient agriculture strategy for rain-fed highlands.

Component 4: Project Coordination and Management: includes **3 sub-components:** 4.1 Project Management, 4.2 Technical Coordination and Liaison, 4.3 Monitoring and Evaluation.

b) PILOTING COPING STRATEGIES FOR RAINFED FARMERS (JSDF)

13. The JSDF Project contains five main components:

Component 1: Community Natural Resources Management Planning. Including the following **2 sub-components:** (i) Community agro-biodiversity plans are developed in about 12 villages; (ii) About 900 beneficiaries from 30 workshops in development of community plans supporting natural resource conservation & adaptation.

Component 2: Establishment of Small-Income Generation Projects. Including the following **3 sub-components:** (i) Criteria for selection finalized, (ii) By end of year 3, at least 20 projects are taken up and running, (iii) Conservation methods documented.

Component 3: Community Small-Scale Upgrading and Capacity. Including the following **3 sub-components:** (i) At least 10 projects approved and implemented by communities (ii) Committee set up to oversee process (iii) Capacity building for about 800 beneficiaries.

Component 4: Community Awareness Program. Including the following **3 sub-components:** (i) Awareness raising and dissemination program designed. (ii) Facilitation team established. (iii). First phase of program launched; 1,500 beneficiaries trained.

Component 5: Project Management and M&E. Including the following **2 sub-components:** (i) TORs for TA; Fiduciary and Grant Monitoring and reporting system in place; and (ii) Periodic Progress Reports and Implementation Completion Report.

II PROJECT IMPLEMENTATION

14. The Project targeted the 8 poorest and most disadvantaged districts in four Governorates including Sana'a (Bilad Ar Roos and Bani Matar), Al-Mahweet, (Al-Mahweet and Ar Rugum districts), Ibb (As Sadah and Ba'adan), and Taiz (Saber Al-Mawadem and Al-Mawaset). These governorates were selected based on the prevalence of rural poverty and of the importance of rainfed agriculture. Within the project districts, the project was targeting about 100,000 households. Depending on seasonal agricultural and non-agricultural employment, these households include landless households, rainfed farmers with little irrigable land, households with small numbers of livestock, and pastoralists with little or no crop lands.

15. **Project Governance:** The ACAP was implemented under the overall supervision of a Steering Committee (SC) under the MAI, chaired by the minister of agriculture and irrigation, and includes representatives of MOPIC, MOF, CAMA, AREA, EPA, NWRA.

The Project Support Unit (**PSU**) in the MAI was in charge of procurement, coordination, and project implementation through the 2 Field Units (FUs) located in 4 governorates to implement project activities on the ground. The implementation responsibilities of **ACAP & JSDF** projects transferred to the **RALP/PSU** of MAI to effectively handle these additional responsibilities. Therefore, the project governance is rated **Satisfactory**.

16. **Administration and Management of the Project:** The Ministry of Agriculture and Irrigation (MAI) was the main implementing agency for the Project and responsible for providing strategic oversight, coordinating funds flow, coordinating with other agencies and, monitoring and reporting on the results. Project administration was carried out by the Project Support Unit, with the field units (FUs) taking the responsibility of **ACAP** implementation. Quarterly review meetings were undertaken by Steering Committee and the National Project Director (NPD). Ten Review Missions by the Bank officials took place during Project duration; some of these reviews were desk reviews and phone consultations (e.g. via Skype and Video-conference on October 30, November 6 and 13, 2014). The **PSU** had an acceptable and qualified financial management and procurement staff and satisfactory arrangements for sound internal controls, a well-functioning automated accounting system, and organized record keeping throughout implementation. The **PSU** had an **FM** manual for **RALP** which was used for **ACAP** as well and the two **JSDF** grants. An acceptable disbursement plan and updated Project budgets were prepared periodically. The Interim Financial Reports (IFRs) are reviewed quarterly, and the Project Financial Statements were audited annually. The previous IFRs were timely received and found acceptable. Both financial management and procurement closed with **Satisfactory** ratings.

17. **Stakeholder participation on project implementation and partnerships:** At the community level the **ACAP** followed closely the approach adopted by the **PSU** and was built on the expertise of the **RALP**. It followed a participatory approach for mobilizing and sensitizing the communities, and establishing and strengthening of traditional farmer networks, including women's networks. With the help of sociologists, **RALP** had assisted in **WUAs** formation, capacity building and implementation support for sustainable **WUAs**. **ACAP** used this extensive network of **WUAs** in working with communities for piloting coping strategies in local landscape units. This had been done by expanding the capacities of the **WUAs** with technical support from a team of specialists in adaptation planning and natural resource conservation.

18. **Public Awareness and Community Sensitization Activities:** The **PSU** supported the implementation of public awareness campaigns in the communities on climate change phenomena, the consequences of unsustainable natural resource use, and strategies for dealing with floods and droughts, and extreme weather events that have increased in frequency in the last few years. These campaigns were conducted in the project area by the FUs and the **PSU** national specialists that included sociologists, income generation specialists, and gender specialist. So participation is rated **Satisfactory**.

19. **Risk management:** The overall risk management is rated as **Moderate**. As reported and outlined in the CAS of 2009, poor governance remains a critical issue in Yemen. Investments in the institutions, equipment's and civil works, and services to communities are likely to be required in coming years. Continued investment in

institutional development, equipment, and buildings also will require sustained funding from the donors and government, which is likely to be available. However, a lack of progress was observed on achieving budget comprehensiveness and implementing a broader fiscal framework based on multi-year expenditures framework. Efforts to move forward in reforming budget implementation, cash management, accounting, and reporting have started through the IDA-supported Accounting Financial Management Information System (AFMIS), but it has been experiencing significant delays. In addition, the rating is based upon the government not achieving budget comprehensiveness.

20. **Co-financing:** The **ACAP** was implemented with support from the **GEF** with a **USD 4.0 million** grant extending over four years. The financing instrument is deemed appropriate as this was designed as a pilot operation. The operation had complementary parallel financing from the **PHRD CCI Grant** (under the Climate Change window), and in part through complementary activities from the IDA-financed Ground Water and Soil Conservation Project (**GSCP**) with which it shared the Project Coordination Unit (**PCU**). Overall, the project disbursed **84%** of the grants. Consequently, Co-financing is considered **Satisfactory**.

21. **Project Restructuring:** The first restructuring of ACAP was signed on July 16, 2013. The purpose was to: (a) formalize the transfer of project implementation responsibility to the MAI/PSU following the closing on June 30, 2012 of (GSCP) and its Project Coordination Unit (PCU); (b) reschedule the (MTR) date of ACAP from August 31, 2012 to March 31, 2014 (due to the severe start-up delays associated with the socio-political events of late 2010 and 2011 in Yemen);, and (c) introduce the modality of “individual consultant” as a procurement method to access consultant services needed to strengthen the capacity of MAI/PSU to handle the additional implementation responsibilities of ACAP. Delays of responsibility implementation transferring took a lot of time as procedures of amending convention were completed only in June 2013. The second restructuring approved on July 8, 08-Jul-2014, extended the closing date of the GEF grant until March 5, 2015.

22. **Monitoring and Evaluation: The M&E system was designed to track performance of the PSU in relation to:** (i) progress in achieving scheduled activities and outputs for each component, (ii) expenditure against budget allocations, (iii) project impact on key outcomes and indicators, and (iv) implementation of the environmental and social management plan. Mechanisms and processes were established for monitoring key dimensions of the Project activities, quality and administrative/managerial efficiency audits, compliance with Memorandum of Understanding (MOU) conditions, and implementation of the Tribal Development Plan (TDP). Monitoring of project implementation and impact has been continuous throughout the Project. It was designed to collect data for on-going evaluation depending on the key performance indicators and to ensure ability to assess whether the Project has achieved its main objectives after completion. The monitoring as adopted for the **IDA Credit (3860-YEM)** was made applicable for the **ACAP** Project. Environmental monitoring followed the regular monitoring events established for the Project. A national Environmentalist Consultant was hired in September 2014 to assess the environmental and social impact as well as to ensure the project compliance with safeguards. Lastly, FUs also prepared quarterly reports on progress within project implementation, internal audits, and compliance with conditions

submitted to respective Boards of Government. Thus, monitoring and evaluation is considered **Satisfactory**.

III. ATTAINMENT OF OBJECTIVE AND OUTCOMES:

The Project Development Objective and Key Indicators

23. **Objectives and Key Indicators:** The development objectives of **ACAP** are: **(a)** to enhance capacity and awareness at key national agencies and at local levels, to respond to climate variability and change; and **(b)** to better equip local communities to cope with climate change through the conservation and use of agro-biodiversity. At completion, results indicate that management of natural resources has significantly been improved; therefore the fulfillment of this objective is **Satisfactory**.

PDO Indicators

Indicator Name	Unit of Measure	Baseline	Actual (Current)	Actual Achievements at ICR Time	End Target
Indicator 1:	Lessons from community pilots are documented and scaled up				
Value	Text	0	0	0	Scaling up begins
Date	Sub Type	31-Aug-10	05-Oct-14	10-Feb-15	31-Aug-14
Comments	100% achieved. Lessons learned disseminated to stakeholder and understood; however, scaling up needs to be assessed				
Indicator 2:	Strategy for climate resilient agriculture for rainfed highlands adopted and applied by key national agencies				
Value	Yes/No	No	Yes	Yes	Yes
Date	Sub Type	31-Aug-10	05-Oct-14	10-Feb-15	
Comments	Strategy preparation is in completed in consultation with key stakeholders. Final adoption by relevant national stakeholders delayed because of current political crisis.				
Indicator 3:	Direct project beneficiaries				
Value	Number	0	10,157	11,123	10,000
Date	Sub Type	31-Aug-10	05-Oct-14	10-Feb-15	31-Aug-14
Comments	111% achieved. The increase in number of beneficiaries a result of implement additional civil works from the upgrading of terraces, construction of water storage tanks, flood protection works, soil conservation and adoption of income generation projects. Beneficiaries of Water storage tanks by SFD are also added.				
Indicator 4:	Female beneficiaries				
Value	Percentage	0	41.03	41.9	40
Date	Sub Type		5 October 2014	10-Feb-15	
Comments	105% achieved. Supplemental 41.9% achieved instead 40% of planned.				
Indicator 5:	Client days of training provided (number)				
Value	Number	0	10,802	11,202	7,696.00
Date	Sub Type		05-Oct-14	10-Feb-15	31-Aug-14
Comments	146% achieved. Client days of training refer to the number of trainees multiplied by the training period. Training of 125 farmers for two days in Feb 2015 and training of 15 specialists in Climate modeling in for ten days in Feb 2015. The achieved percentage is higher than the end target. That is due to better utilization of the allocated training budget thus supporting more trainees. In addition to the utilization of the facilitation team of the field units in the training program. i.e. more trainees				
Indicator 6:	Client days of training provided - Female (number)				
Value	Number	0	5,235	5,435	3,683.00
Date	Sub Type	31-Aug-10	05-Oct-14	10-Feb-15	31-Aug-14

Comments	148% achieved. Additional 90 female attended farmers' orientation training for days in Feb 2015 and female engineers from CAMA attended 10 day training in climate modeling. The higher number of client days of female training because of 50% of the participants in the training offered to the farming communities are female.				
Indicator Name	Unit of Measure	Baseline	Actual(Current)	Actual Achievements at ICR Time	End Target
1. Awareness and capacity on natural resources conservation and adaptation planning have been increased among rural communities					
Indicator 1:	Pilot communities have developed plans for natural resource management focusing on conservation and adaptation planning based on agro-biodiversity resources				
Value	Number	0	12	10	8
Date	Sub Type	15-Mar-11	5 October 2014	10-Feb-15	15-Mar-14
Comments	125% achieved. 10 Community plans completed in 7 districts. After the cancellation of Bilad Al Ros – Sana'a governorate for social conflict. 10 villages are targeted; therefore 10 community plans were developed.				
2. Improved water conservation in the pilot communities					
Indicator 2:	Beneficiaries, especially female, have been trained on water conservation, nutrition, natural resource conservation, etc. beyond the 10-12 pilot villages				
Value	Number	0	1432	1,522	1500
Date	Sub Type	15-Mar-11	05-Oct-13	10-Feb-15	15-Mar-14
Comments	101% achieved. Training on natural resource management has been provided to beneficiaries. In addition 90 female were trained in natural resource management for three days				
3. Individual farmers and communities have more diverse set of livelihood options using the agro-biodiversity resources					
Indicator 3:	Number of community pilots using local knowledge & agro-biodiversity resources designed & developed				
Value	Number	0	22	50	20
Date	Sub Type	15-Mar-11	05-Oct-13	10-Feb-15	15-Mar-14
Comments	250% achieved. 50 community pilots were implemented. This is due to the high demand by farmers for small capacity water tanks, small terrace rehabilitation sites as well as available budget for these works.				

24. The above PDO indicators are supported by Intermediate Outcome Results listed below by GEF and JSDF financing:

GEF Results

25. **Result 1: Information to enhance and develop agro-biodiversity- based coping strategies in place. This is rated Highly Satisfactory.** By YR2, the stocktaking of inventory of agro-biodiversity resources was completed and documented 100%. By YR2, climate resilience profiles of at least 5 landraces were developed, and these landraces piloted. At Completion, **AREA** had tested 46 landraces for five crops (920% of target achieved). 1603 crop landraces and 9 landraces of the famous fruit tree were collected and kept in the Gene Bank at AREA. In addition, 870 landraces for 32 crop types were collected earlier and kept in the Faculty of Agriculture. Gene Bank as follows: **Sana'a** governorate ranked **#1** with **390** collected **landraces**, Taiz governorate ranked **#2** with **250** collected **landraces**, **Ibb** Governorate ranked **#3** with **164** collected **landraces**, and **Al Mahweet** governorate ranked **#4** with **66** collected **landraces**.

26. **Result 2: Enhanced capacity of national agencies to develop climate scenarios based on regional climate models. This is rated Highly Satisfactory.** By YR1, the existing MOU on sharing and harmonization of climate data was strengthened and institutionalized in relevant climate- related agencies. Signatories of the MOU were:

CAMA, MAI, EPA, and NWRA (100% completed). By YR4, the number of trained technical specialists in climate-related agencies to undertake climate modeling: 15 technical specialists from CAMA 9, NWRA 2, EPA 2, and AREA 2 trained on climate modeling. The technical training was implemented in Sana'a, and thus more trainees were included (target was 8: 188% Completed). Improved local data sets developed and local capacity to predict regional climate change based on global circulation model output enhanced on a pilot basis. 8 data sets are developed and training on prediction of climate change is completed. For specialists from CAMA, NWRA, EPA, and AREA. However, CAMA is managing the collected data sets. (100% completed).

27. **Result 3: Designed and piloted coping strategies for climate resilience using agro-biodiversity resources, in select communities in the rain fed highlands & policies and investment plans of rain-fed agriculture reflect climate considerations. This is rated Satisfactory.** By end of YR 2, number of community coping strategies had been developed at 145 sites developed (target was 100). Due to the smaller capacity of the water tanks, the results exceeded the original target. (145% completed). By end of YR3, the target was at least 20 coping strategies to be tested and piloted in local landscape units. Results vastly exceeded the target: 43 terraces, 52 water tanks, 14 wadi banks, and 13 soil conservation measures were completed and tested in local landscape units. (610% completed). This excellent performance was due to available budget resulting from the implementation of smaller capacity of the water tanks and smaller areas of upgrading terraces and wadi bank.. By end of YR3, the target was to have the draft strategy for climate-resilient agriculture for rain-fed highlands endorsed by MAI. Rainfed agriculture strategy for climate-resilient finalized in consultations with key stakeholders (including, CAMA NWRA, AREA, EPA, and MAI) and was submitted to MAI for final endorsement. But formal adoption is pending due to current political crisis.

28. **Result 4: Effective project management, monitoring and improved coordination. This is rated Moderately Satisfactory.** By end of YR1, the target was to have a monitoring and evaluation system in place, and following the MTR, its findings and lessons learned being incorporated into PIM. The Arab Spring-related disturbances delayed the establishment of the M&E system. The PSU hired an M&E expert only on September 15, 2013 for 12 months in two periods of 2 -3 months every year. The Consultant prepared the progress reports for RALP and also prepared a monitoring system for ACAP. The findings of the ACAP mid-term review (which was delayed) and lessons learned were added to the PIM. The Project contracted an Environmental Consultant to prepare the ESMF for the ACAP & the Coping Strategies. The Consultant submitted his work plan in November 2014 and submitted his draft final report in early February 2015. After reviewing the draft final report, comments were conveyed to the Consultant. The draft final report was accepted. The Project Implementation Manual (PIM) covered all necessary details for carrying out the implementation of all activities of the “Agro-biodiversity and Climate Change Adaptation Project (ACAP)” of Yemen and the sub-projects. It provided implementation reference documents for all the parties involved in project implementation.

JSDF Results

29. **Result 1: Community Natural Resources Management Planning.** *This is rated Moderately Satisfactory.* Ten community agro-biodiversity plans were developed in seven districts. In one district (the Bilad Al Ros district of the Sana'a Governorate) the activity was cancelled (target was 12 plans; 83% achieved).

30. **Result 2: Establishment of Small -Income Generation Projects.** *This is rated Moderately Satisfactory.* Criteria for selection of projects was finalized, and beneficiaries selected based on the finalized criteria (100% achieved). In addition, by YR3, 54 sub-projects were up and running (target was 20; 270% achieved). Income generation projects were dominated by beekeeping and animal raising. Lastly, conservation methods were documented and documentation of community local knowledge was completed (100% achieved).

31. **Result 3: Community Small-Scale Upgrading and Capacity Building.** *This is rated Satisfactory.* The results include 62 completed terrace locations and 23 water storage tanks, as well as 6 flood protection works in Northern & Taiz (910% achieved). The main reason behind this achievement is the high demand by farmers for small works, which were not expensive, and the available budget to implement these works. Committees have been set up to oversee the process, including 8 associations for construction supervision & O&M (100% achieved). **The kinds of projects envisaged include:** Upgrading of terraces, Creation or enhancement of community seed storage facilities to store wild relatives and landraces of seeds that have an important resilient value, construction of efficient water storage, establishment of community center for conservation, establishment of model farm, soil conservation, and small flood protection structures.

32. **Result 4: Community Awareness Program.** *This is rated Satisfactory.* Awareness raising and dissemination programs were designed and dissemination launched in April, 2014. Four meetings were held; two days in each district (100% achieved). First phase of community awareness program was also launched. These two-day awareness programs were undertaken by national experts in each district (100% achieved). The First phase Awareness program was done jointly with the GEF-financed awareness program and completed by October 2014.

33. **Result 5: Project Management and M&E.** *This is rated Satisfactory.* Achievement include: (i) TORs for TA; Fiduciary and Grant Monitoring and reporting system was in place. The M&E expert has prepared and/or reviewed the TOR for the recruited national Consultants as well as the M&E system for RALP, and ACAP. Required tasks from the M&E Expert are 100% completed; (ii) Periodic Progress Reports and Implementation Completion Report. The M&E consultant has also prepared the semi-annual progress reports for RALP, and the ACAP. The M&E prepared the projects progress reports for RALP, and ACAP. PSU has contracted **Techman Consulting Services** to prepare both the Beneficiary Assessment Study (BAS) and the implementation completion report (ICR).

34. **Comments on Draft ICR.** The draft of the Yemen ACAP ICR was shared electronically with the implementing agency. The PSU highlighted a few corrections and confirmed the level of results and achievements at Project closing. These have been taken into account as warranted and included in the final ICR.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9: List of Supporting Documents

1. Country Assistance Strategy for the Republic of Yemen for the Period FY 2010-2013, World Bank Group, April 2009.
2. Agrobiodiversity and Local Knowledge Assessment for the Rainfed Highlands of Yemen, Technical Report, by Köstner, Alsheimer, and Lennartz, September 2009.
3. Climate Modelling for the Rainfed Highlands of Yemen, Technical Report, by Christian Bernhofer and Klemens Barfus, September 2009.
4. Coping with Climate Change Impacts – Development of Options for the Rainfed Highlands of Yemen, Technical Report, by Franz Lennartz, and Niels Schütze, September 2009.
5. Institutional, Policy and Capacity Assessment, Technical Report, by Frank Summa and Jurgen Meergans, September 2009.
6. Stakeholder Consultation Report, Technical Report, by Christian Bernhofer and Sabine Hahn-Bernhofer, September 2009.
7. Economic & social impact of terraces & outcomes of terrace rehabilitation in Yemen, by Frederic Pelat, December 2009.
8. Water Harvesting for Improved Rainfed Agriculture in the Dry Environments by T. Oweis and A. Hachum, 2009.
9. Conditions in Rural Yemen: Findings from the RALP Baseline Survey, by Daniel Egel and Tareq Al-Bass Yeslam, November 2010.
10. World Bank Group: Yemen: Interim Strategy Note, October 2012.
11. Implementation Completion and Results Report, Groundwater and Soil Conservation Project, December 2012.
12. Implementation Completion and Results Report, Rainfed Agriculture and Livestock Project, World Bank Group, March 2015.

Annex 10: Photos by Components and Types of Project Investments

Meteorological equipment and software upgrade under ACAP



Awareness and capacity building activities





Signing of local conservation and adaptation plans prepared with communities.



Livestock husbandry and income generating activities (beekeeping).



Terraces rehabilitation and soil and water conservation activities



Water tanks for Rainwater harvesting and small irrigation





MAI- PSU Team.



