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Republic of Yemen

Ministry of Agriculture and Irrigation

Agrobiodiversity and Climate Change Adaptation Project (ACAP)

Environmental and Social Impact Assessment (ESIA)

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Abbreviations and Acronyms

ACAP	Agrobiodiversity and Climate Adaptation Project
ACU	Agricultural Cooperative Union
AOID	Arab Organization for Industrial Development
AREA	Agricultural Research and Extension Authority
BA	Beneficiary Assessment
CAMA	Civil Aviation and Meteorology Authority
CBD	Convention on Biodiversity
CBOs	Community Based Organizations
CITES	Convention on International Trade in Endangered Species
CMS	Conservation of Migratory Species
CSO	Central Statistical Organization
CWMP	Community Based Water Management Project
EIA	Environmental Impact Assessment
EMP	Environment Management Plan
EPA	Environmental Protection Authority
ESIA	Environment and Social Impact Assessment
ESMP	Environment and Social Management Plan
FAO	Food and Agricultural Organization
FFS	Farmer Field Schools
FSR	Farming Systems Research
GDFRDC	General Directorate for Forests, Range and Desertification Control
GDI	Gender development Index
GDIS	General Directorate of Irrigation Structures
GDOFI	General Directorate of On-Farm Irrigation
GDPP	General Department of Plant Protection
GDSLR	General Directorate of Surveys and Land Reclamation
GEF	Global Environment Facility
GSCP	Groundwater Soil Conservation Project
GSMCD	General Seed Multiplication Corporation, Dhamar
ICARDA	International Centre for Agricultural Research in the Dry Areas
IDDEALES	Initiatives de Développement
ILRS	Irrigation and Land Reclamation Sector
IPM	Integrated Pest Management
IPM	Integrated Pest Management Plan
LC	Local Council
MAI	Ministry of Agriculture and Irrigation
MoF	Ministry of Finance
MoHP	Ministry of Health and Population
MoPIC	Ministry of Planning and international Cooperation
MSPs	Multi-stakeholders platforms
MWE	Ministry of Water and Environment
NAPA	National Adaptation Program of Action
NGOs	None Governmental Organizations
NRM	None Resettlement Management
NWRA	National Water Resources Authority
O&M	Operation and Maintenance

OP	Operational Policy
PALM	Participatory Learning Methods
PAR	Participatory Action Research
PCU	Project Coordination Unit
PI	Poverty Index
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
PSC	Technical Coordination Committee
RALP	Rainfed Agriculture and Livestock Project
PSU	Project Support Unit
RRA	Rapid Rural Appraisal
SBWMP	Sana'a Basin Water Management Project
SFD	Social Fund for Development
SMP	Social Management Plan
TCC	Technical Coordination Committee
UNCCD	United Nations Convention on Combating Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WHS	Water harvesting System
WMF	Water Management Federation
WMO	Water Management Organization
WUAs	Water Users Associations
YASAD	Yemeni Association for Sustainable Agriculture Development
YWU	Yemeni Women union

Executive Summary

Introduction

Yemen's economy relies mostly on agriculture and rainfed agriculture in the highlands represents more than half of the total cultivated area of Yemen. Agriculture contributes more than 15% to GDP and employs more than 55% of the active population. The communities in the highlands retain important agrobiodiversity and traditional knowledge related to the utilization of their agrobiodiversity resources. Yemen is well known for its agrobiodiversity based on the large number of landraces of barley, wheat, sorghum, millet, lentil, and cowpea which have evolved over more than two thousand years, and for the construction and management of terraces which help minimize land degradation and improve water use efficiency. Most of these landraces have accumulated adaptive attributes for coping with the adverse environmental and climatic conditions and to the need of local communities. In addition, many wild relative species of these crops and many other plant species having forage and medicinal values are still found in field edges and remnant natural habitats. These landraces and their wild relatives and the associated local knowledge constitute important components of the traditional farming systems prevailing under harsh environments of the rainfed mountainous regions.

Climate change is a real concern for Yemen. Most climate modeling scenarios indicate that the drylands of West Asia and North Africa will be the most affected by droughts and high temperatures in the years to come. A greater frequency of droughts and flash floods has already been observed in recent years. Rainfed agricultural areas are the most vulnerable to the impact of climate change. Yemen's invaluable agrobiodiversity should be conserved, both in-situ (on-farm) and ex-situ (genebanks), as it provides an important genetic base for crop improvement programs, specifically for the development of crop varieties which are likely to be better adapted to impending shifts in climatic patterns. Adaptation to climate change entails a process of building a country's adaptive capacity to respond and adjust to climate variability and extremes by increasing its ability to moderate potential damages, take advantage of new opportunities due to climate change and cope with the consequences of the adverse effects. However, adapting to climate change is challenging and adaptation measures implemented or designed must be flexible enough to perform their desired objectives under a wide variety of future climate conditions. Additionally, the existing scientific knowledge need to be fine-tuned for local application to inform policy choices in the face of difficult trade-offs. These are the challenges faced by Yemen in the context of adaptation.

To achieve optimum adaptation on the ground, it is critical to downscale regional and global predictive climate models and develop vulnerability profiles, at the appropriate scale, for these communities. This localised information and prediction models would ensure that appropriate coping mechanisms are mobilised through improved extension delivery systems to the farming communities. In Yemen, data for the meteo stations is collected by several different agencies and needs to be co-ordinated, and standardised for operability and prediction. There is a need to enhance the capacity of monitoring stations in terms of data collection, retrieval and distribution with an overall aim to improve Yemen's predictive capabilities and decision making. It is also important to understand the micro-climatic variations within the rainfed landscape and what this means in terms of optimum coping strategies for adaptation to climate change.

Project Objectives and Components

The GEF, through the World Bank proposes to finance a 4-year project starting in 2010 named "*Agrobiodiversity and Climate Change Adaptation Project (ACAP)*" The project's main objective is "to improve strategies for rain-fed agriculture to adapt to climate change using agro-biodiversity resources in the Highlands of Yemen" and it is designed to provide economic, social and environmental benefits to the farmers and livestock owners, their families and the rural communities in the project areas through increased agricultural and animal productivity as a result of improved seed production, enhanced livestock protection and expanded water and soil conservation and management.

The Project development objectives 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

The Project outcome indicators are:

- Improved capacity of national agencies to successfully use global and regional climate models to better simulate future climate scenarios for Yemen
- Improved capacity and increased knowledge and awareness on climate variability and change, and access to coping strategies
- Improved coping strategies designed and piloted using agro-biodiversity resources in rainfed highlands

The Project constitutes of four components. **Component 1** will build on the traditional knowledge of farmers and develop an inventory of local agro-biodiversity to identify and test selected land races for climate resilience and develop 'climate resilience' profiles of selected landraces. **Component 2** will focus on developing initial local predictive capacity of weather patterns and long term climate change scenarios for the country. **Component 3** will focus on integrating climate resilience into rain-fed agriculture. At the national level this will done through capacity development of the MAI in and at the local level through the development and piloting of a menu of coping strategies in partnership with the communities. **Component 4** will focus on the management, coordination, monitoring and evaluation of the project.

Project Description

Geographical scope and location

The pilot sites have been selected to represent the critical agro-biodiversity of the highlands, and also be suitable for the development of interventions with the active participation of farmers. Following the implementation of the project, the sites should be able to function as examples for replication and scaling-up in other sites. The first level of selection of governorates was based on the following criteria, to ensure that the sites would:

a. be located along a meso-scale geographic gradient
b. cover most important areas of rainfed highlands
c. cover a range of altitudes within in the highlands
d. cover a range of mean annual precipitation
e. cover a range of agro-ecological gradients
f. partially overlap with the governorates of the RALP project

Site selection at the next level was carried out to identify districts where the project would be implemented. This was done to ensure that each location fulfilled all or most of the following criteria:

a. representative agro-ecosystems
b. continued practice of traditional farming techniques
c. availability of typical local crops
d. availability of (reasonably intact) terrace systems
e. mixture of cropping and animal husbandry, including the use of pasture
f. willingness of local people including women to take part in the project
g. availability of data related to soil, water, climate, biodiversity and agriculture
h. availability of information from preceding projects at the sites
i. potential cooperation with other ongoing projects at the sites, esp. the RALP project
j. possibility to undertaken activities from field to catchments level including altitudinal and agro-ecological gradients
k. possibility to undertake activities from family/group member to community/district level

Table E1 illustrates the governorates and districts.

Table E1 project sites of the ACAP

Governorate	District	Remarks
Al Mahweet	Ar Rugum, Al-Mahweet	Northern extension of the mesoscale transect; ongoing RALP project
Sana'a	Bilad Ar Ros, Bani Matter	Northern central part of the mesoscale transect; ongoing RALP project;
Ibb	As Sadah, Ba'adan	Southern central part of the mesoscale transect; high altitudinal gradients; preceding agrobiodiversity projects
Taiz	Saber Al Mawadem, Al-Mawaset	Southern extension of the mesoscale transect; preceding agrobiodiversity projects

ACAP Budget

The total estimated budget for the ACAP is US$ 4.8 million, which will be provided by the Global Environment Facility Trust Fund (GEF).

The Environmental and Social Impact Assessment Objectives

This Environmental and Social Impact Assessment (ESIA) aims at identifying the potential environmental and social impacts of the ACAP, and develop an environmental and social management plan for mitigation of the potentially negative impacts and for monitoring compliance with relevant environmental laws.

The specific objectives of the study are:

(a) To assess the potential environmental and social impacts of the project as a result of potential interventions;
(b) To compare the impacts in relation to relevant national and World Bank requirements and guidelines;
(c) To develop an environmental and social management plan (including screening criteria) for the mitigation of any potentially negative impacts of the proposed interventions and for monitoring compliance with the relevant laws and policies;
(d) To develop an integrated pest management plan;

World Bank Safeguards Policies

The Yemen Agrobiodiversity and Climate Adaptation Project is classified as environmental category B. Essentially the project is expected to have significant positive environmental and social impacts, with relatively minor negative impacts. This has also been concluded by the environmental and social impact assessment. Each of the ten safeguard policies was checked against the project components and their activities, and the ESIA has determined that the safeguard policies that are triggered by the ACAP are OP 4.01 on Environmental Assessment (EA) and OP 4.09 on Integrated Pest Management (IPM). An environmental and social management plan (ESMP) has been prepared, the objective of which is to eliminate any potential adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The objective of the ESIA is to help ensure the environmental and social soundness and sustainability of the ACAP. It is noted that the current Yemeni legislation also requires that these protective measures be taken, as outlined in the ESMP. The ESIA was prepared in a fully participatory manner, and the methodology used, summary of consultations and list of stakeholders consulted are attached as an annex to this report

Potential Environmental and Social Impacts and Mitigation Measures

Anticipated positive impacts

The project will achieve important socioeconomic benefits that will lead to achieving developmental goals in rural Yemen. Among these benefits:

- Improving life standards of rural population and provision of an enhanced sense of wellbeing
- Providing community empowerment especially for women and vulnerable groups.
- Achieving benefits to women through improved awareness on water conservation, hygiene education, and community participation.
- Achieving economic development through direct income generation opportunities.
- Providing the communities with water harvesting systems
- Mobilize the communities and encouraging community participation

- ③ Terraces rehabilitation and upgrading
- ③ Establishment of flood protection structures
- ③ Building up the skills of farmers with participation tools
- ③ Adapt the communities to the climatic changes
- ③ Introduction of improved varieties tolerant to droughts
- ③ Involving the communities in community participation
- ③ Enhancing social stabilities and reducing tensions when proper management bodies are framed to manage the WHS and distribute water allocations equitably.

Environmental and social impacts and the mitigation measures

Environmental and social impacts are very minor and don not have significant impacts on the agrobiodiversity. There are no risks associated with the implementation of the coping; however, there some impacts as a result of some activities and the related mitigations are introduced in the ESMP:

- ③ Constructions of WHS are associated with needs to provide construction roads through agrobiodiversity. Mitigation would require the care not to construct roads on agrobiodiversity and agricultural lands. It would be useful to use animals to carry materials to the sites. Social conflicts may arise on land provision for the sites or contribution arrangement. More awareness and involvement of the community in the decisions would mitigate this social impact.
- ③ Usually WHS are open water surfaces which would increase breading of mosquitoes resulting in health problems. The ESMP recommends the installation of fine screen nets (for relatively small water cisterns) and provide natural predators for the control of mosquito larvae such as fish and frogs.
- ③ Construction solid wastes are left on the sites causing land degradations. Contractors should be monitored and be obliged to remove the solid wastes according to terms of contracts
- ③ Better access to water supply systems could cause disposal of used oils, fuel and spare parts on water sources and course causing pollution. The ESMP recommended control of oil changing and fuelling activities and to collect and recycle the used oils to generate income generation to the community.
- ③ Overexploitation of groundwater could cause water quality deterioration and water quantity reduction. Proper mitigations associated with awareness water conservation are needed. Reduction of water abstraction and continues monitoring would be another mitigation. Develop alternative water sources through collection of rooftop water harvesting.
- ③ Women would suffer from bad water allocations of the water supplies. A need for O&M committee elected by the community is essential to manage the water supply scheme.
- ③ Intermittent damages to structures such as small flood protection structures are not repaired on time, weakening the structural system of the flood protection works. The mitigation requires the involvement of the community for regular maintenance of the structures through an O&M committee.
- ③ The introduction of improved crops and trees drought tolerant varieties might carry harmful insects and diseases which would produce an impact on the agrobiodiversity, and health. Careful inspection and selection of the varieties before introduced to the communities.

③ Enhancement of traditional practices of fertilizers may cause health problem to women and children for the direct contact during collection and applicator ion. The mitigation for this is to increase awareness on safety uses and provide the community with safety and healthy use guidelines.

The ESMP listed the different mitigation measures in tabular formats both environmental and social including the responsibilities, time frame and costs incurred in implementing the mitigations. The cost of the ESMP is estimated to be US $50,000 for the screen nets only to cover the relatively small, open WHS to prevent spreading of mosquitoes. For larger WHS, other preventatives measures such as introduction of mosquito larvae eating fish can be introduced. Other costs related to both EMP and SMP are included as part of project costs. Costs for training are listed separately, but included as part of the overall project costs.

The ESMP on monitoring

The overall environmental and social impacts of the ACAP are expected to be significantly beneficial in terms of environmental and social issues. Monitoring and evaluation of the implementation of ESMP will need to be put in place as part of the overall project implementation arrangements. Budgetary resources for implementing the ESMP (mitigation measures as well as capacity building/training) and M&E will be allocated as part of the project implementation arrangements. The implementing agency for component 3 will be responsible (through hiring of consultants) for monitoring compliance with the ESMP (as per monitoring indicators outlined in Table 11). The PIU will be responsible for ensuring that capacity building and training activities as outlined in Table 12 are carried out. The PIU's M&E specialist will be responsible for aggregating information on compliance with ESMP (component 3) and capacity building/training. The M&E specialist will include this information as a separate section in the periodic progress reports that the PIU will submit to the World Bank.

The ESMP on training and capacity building

A training and capacity building table was developed to list the major training topics as summarized from the ESMPs. The training costs are estimated to be US $274,000. About 17 topics listed in the table concentrating on women empowerment, community participation, O&M process, and the special trainings suggested by the project. Women and men farmers, community leaders, and agricultural extension officers, are mostly the training recipients. Other target groups such as technicians from Civil Aviation and Meteorology Authority (CAMA), Ministry of Agriculture and Irrigation (MAI), National Water Resources Authority (NWRA), and Agricultural Research and Extension Authority (AREA) are also listed. Training on Integrated Pest Management (IPM) is also included.

Screening of Subprojects

The objective of the screening criteria and procedures is to ensure review of individual sub-projects to be financed under the ACAP in order to identify and address (minimize or eliminate) potential adverse environmental and social impacts. All subprojects under ACAP (Component 3) will be undertaken purely on a voluntary and demand basis, and implemented by the communities (farmers and residents) themselves. Subcomponent 3.2.4 could include some minor infrastructure rehabilitation such as: upgrading of reasonably intact terraces, construction of small flood protection structures, soil protection structures, facility for seed

storage (provision of shelving in existing sheds), construction of water storage structures, establishment of model farm, etc. Subcomponent 3.2.5 of the project will promote agrobiodiversity based income generating activities which could include: construction of small nurseries/home-gardens with a preference for those using grey; water and other conservation methods (to produce plants, vegetables, fruits, aromatic and medicinal plants); planting, preparation and packaging of medicinal herbs (aromatic and spices); small home-based catering business specializing in traditional recipes; agro-processing; beekeeping; planting of almond trees; and producing traditional ceramic ware for conservation purposes (to house seeds, etc.).

Subprojects to be funded under the ACAP are not expected to be of environmental category A in nature or trigger the Bank's involuntary resettlement policy. Additionally, environmental and social screening will be incorporated into the regular subproject development cycle that will identify any such projects, which will then be excluded from the community agrobiodiversity plans.

Use of Screening Criteria for Subprojects

Due to the CDD nature of subcomponents under component 3, community based agrobiodiversity plans will be developed in consultation with the communities, building on their indigenous and traditional knowledge. Participating communities will be assisted in developing agrobiodiversity based coping plans, which will include proposals for the above-mentioned subprojects (subcomponent 3.2.4). During the subproject identification stage (part of the agrobiodiversity based coping plans), MAI technical staff/consultants (or agency/partner responsible for implementation of component 3) will work with representatives at community level in order to identify potential projects for funding using the screening criteria. Once the subprojects are screened and satisfy all criteria, they will be approved for funding. Community sub-grants are not anticipated to be large, and are likely to be in the range of $5000-$10,000 (for rehabilitation activities) and about $3000 for income generating activities. Because activities carried out by ACAP will be relatively small and simple in nature, they are not expected to require formal EPA review and approval. The preventative actions and mitigation measures outlined in the ESMP should be used to address any potential adverse environmental and social impacts.

Environmental and Social Screening Criteria for Subprojects

Title of Subproject: _____

Governorate: _____

District: _____

Village: _____

Signature of representative: _____ Date: _____

1. Does the subproject involve acquisition of land? No _____ Yes _____
   Resettlement of people or loss of assets/income? No _____ Yes _____
   Conversion and degradation of natural areas or habitats? No _____ Yes _____
   Procurement of pesticides? No _____ Yes _____

If yes to any of the above, the subproject is not eligible for funding.

2. Does the subproject involve use, management or rehabilitation of land? No ____Yes _____

3. Does the subproject involve use, management or exploitation of water? No ____ Yes_____

4. Does subproject involve management or disposal of liquid or solid wastes? No ___Yes ___

5. Will the project create solid or liquid waste that could adversely affect local soils, vegetation, rivers, streams or groundwater? No ____ Yes ____

6. Will subproject require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)? No ____ Yes ____

7. Might the subproject lead to soil degradation or erosion in the area? No ____ Yes ____

8. Will the subproject be situated in ecologically sensitive areas or cause impacts on existing natural habitat features? No ____ Yes ____

9. Might the subproject lead to human health and safety risks? No ____ Yes ____

10. Is it possible to achieve the objectives above in a different way with fewer environmental and social impacts? No ____ Yes ____

11. Will subproject result in the introduction of pesticides or an increase of pesticide use if use of such products currently exists? No ____ Yes_____

12. Will subproject result in crop diseases with introduction of new crops? No ____ Yes_____

If any answer in the checklist is "No", there is no need for further action.

If any answer in the checklist is "Yes", the subproject should apply recommended mitigation measures in the ESMP (Tables 9 and 10)

Integrated Pest Management Plan (IPM)

The World Bank's Operational Policy on Pest Management and use of pesticides (OP 4.09) has been triggered to address potential adverse impacts of pesticide use in project activities of the ACAP. Procurement of pesticides is not envisaged under the project. However, farming is expected both to improve and to change cropping patterns to adapt to climatic changes. These changes are in turn not expected to increase the use of agricultural chemicals, fertilizers and pesticides, due to the project activities stressing on encouraging traditional and local practices in using organic fertilizers. However, due to some negligence and improper storage of seeds or importing new infected crops would require some remedies and precautions to avoid excessive and improper pesticide use. Implementation steps of IPM are summarized showing the importance of dealing with pesticides carefully and not using banned pesticides due to the hazardous effects on health, crops and the environment. Detailed lists of Banned pesticides in Yemen are shown in Appendix VII of the ESIA report.

With regard to Pest Management, a Pest Management Specialist should be recruited to review the relevant material with the ACAP PIU, the pest management practices for different crops and assessed the pest management approaches, quantities of pesticides used, capabilities of the farmers in regard to proper handling and use of pesticides, evaluate and suggest measures required to reduce specific risks associated with pesticide use and prepared guidelines keeping in view the Policy, Regulatory Framework and Institutional Capacity. The Specialist also should prepare training courses. Trainers at the end of the training will be able to establish a mechanism in place to demonstrate Integrated Pest Management procedures and to develop a farmer education program that stresses good and safe practices for storage and application of pesticides. Cost for training on IPM is also included in overall project costs.

Consultation with Stakeholders

Public consultations

Consultation with stakeholders has been carried out during the preparation period of the ESMP with the following objectives:

1. To find out whether the communities are likely to accept the coping measures suggested by the Agro Biodiversity and Climate Adaptation Project (ACAP).
2. To find out whether these measures have no or little environmental and social impacts on the communities and
3. To assess the present situation in these areas on how people are coping with the climate changes.

Summary

It is clear that hardship is apparent in all areas with slightly different scales and levels. Low of rainfall puts families in the verge of collapse; some families have immigrated to nearby towns and cities leaving their farms and houses behind In order to sustain their lives and their children lives. Several villages and sub districts in Al-Mahweet have immigrated to towns and cities. Frustration of farmers is clear in terms of the final production of the crop where farmers assume that good production will be sustained, but suddenly rains stops at the middle of the season causing great loss of the crop.

Low rainfall and change of temperatures have been recently affecting cropping seasons, crops, water availability, animals and humans. Introduction of the project to these areas is vital, however, it should be included the following in its different components so that to maximize the benefits by the farmers:

- Awareness raising on water and agricultural issues
- Building up the skills of the communities and the authorities staff in:
    - Community mobilization
    - Community management
    - Metrological information
    - Land and water management techniques etc.

Recently, in most areas farmers consider agriculture as a secondary source of income due to the unstable occurrence of rainfall, high costs of labor and low crops production. Initiation of Water supply and harvesting projects, provision of agricultural machines, introduction of crops and trees that consume less water and produce sufficient income, and improve traditional local practices could encourage farmers to settle in their lands

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Conclusion

The carried out stakeholders consultations were very informative and enriched the ESIA. The ACAP is expected to attain significant important environmental and social benefits that overweigh any limited adverse environmental and social impacts, which could be mitigated through the implementation of the proposed Environmental and Social Management Plan.

Background

Introduction

Yemen's economy relies mostly on agriculture and rainfed agriculture in the highlands represents more than half of the total cultivated area of Yemen. Agriculture contributes more than 15% to GDP and employs more than 55% of the active population. The communities in the highlands retain important agrobiodiversity and traditional knowledge related to the utilization of their agrobiodiversity resources. Yemen is well known for its agrobiodiversity based on the large number of landraces of barley, wheat, sorghum, millet, lentil, and cowpea which have evolved over more than two thousand years, and for the construction and management of terraces which help minimize land degradation and improve water use efficiency. Most of these landraces have accumulated adaptive attributes for coping with the adverse environmental and climatic conditions and to the need of local communities. In addition, many wild relative species of these crops and many other plant species having forage and medicinal values are still found in field edges and remnant natural habitats. These landraces and their wild relatives and the associated local knowledge constitute important components of the traditional farming systems prevailing under harsh environments of the rainfed mountainous regions.

Climate change is a real concern for Yemen. Most climate modeling scenarios indicate that the drylands of West Asia and North Africa will be the most affected by droughts and high temperatures in the years to come. A greater frequency of droughts and flash floods has already been observed in recent years. Rainfed agricultural areas are the most vulnerable to the impact of climate change. Yemen's invaluable agrobiodiversity should be conserved, both in-situ (on-farm) and ex-situ (genebanks), as it provides an important genetic base for crop improvement programs, specifically for the development of crop varieties which are likely to be better adapted to impending shifts in climatic patterns. Adaptation to climate change entails a process of building a country's adaptive capacity to respond and adjust to climate variability and extremes by increasing its ability to moderate potential damages, take advantage of new opportunities due to climate change and cope with the consequences of the adverse effects. However, adapting to climate change is challenging and adaptation measures implemented or designed must be flexible enough to perform their desired objectives under a wide variety of future climate conditions. Additionally, the existing scientific knowledge need to be fine-tuned for local application to inform policy choices in the face of difficult trade-offs. These are the challenges faced by Yemen in the context of adaptation.

To achieve optimum adaptation on the ground, it is critical to downscale regional and global predictive climate models and develop vulnerability profiles, at the appropriate scale, for these communities. This localised information and prediction models would ensure that appropriate coping mechanisms are mobilised through improved extension delivery systems to the farming communities. In Yemen, data for the meteo stations is collected by several different agencies and needs to be co-ordinated, and standardised for operability and prediction. There is a need to enhance the capacity of monitoring stations in terms of data collection, retrieval and distribution with an overall aim to improve Yemen's predictive capabilities and decision making. It is also important to understand the micro-climatic variations within the rainfed landscape and what this means in terms of optimum coping strategies for adaptation to climate change.

Scope of the ESIA

The GEF, through the World Bank proposes to finance a 4-year project starting in 2010 named "*Adaptation to climate Change using Agrobiodiversity of the Rainfed Highlands*" The project main objective is "to improve strategies for rain-fed agriculture to adapt to climate change using agro-biodiversity resources in the Highlands of Yemen" and it is designed to provide economic, social and environmental benefits to the farmers and livestock owners, their families and the rural communities in the project areas through increased agricultural and animal productivity as a result of improved seed production, enhanced livestock protection and expanded water and soil conservation and management.

The "*Agrobiodiversity and Climate Adaptation Project (ACAP)*" contains four components; **Component 1** activities aimed at building on the traditional knowledge of farmers and develop an inventory of local agro-biodiversity to identify and test selected land races for climate resilience and develop vulnerability profiles of selected landraces; **Component 2** focuses on developing initial local predictive capacity of weather patterns and long term climate change scenarios for the rainfed areas of Yemen. **Component 3** focus on developing and piloting a menu of coping strategies, including some which will build on the outputs from Components 1&2. Through **Component 4** the project will enable key agencies, particularly the Ministry of Agriculture and Irrigation, to reflect the climate agenda in their policy and plan documents. The ACAP will be implemented in the Governorates of Sana'a, Al-Mahweet, Ibb, and Taiz (see Table 1).

Table 1 project sites of the ACAP

Governorate	District	Remarks
Al Mahweet	Ar Rugum, Al-Mahweet	Northern extension of the mesoscale transect; ongoing RALP project
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Ibb	As Sadah, Ba'adan	Southern central part of the mesoscale transect; high altitudinal gradients; preceding agrobiodiversity projects
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Coping measures and activities are designed under **Component 2** to provide communities with tools and mechanisms to adapt and cope with climate changes. The activities under this component and its sub-components will mainly have positive impacts to the conversion of land, soil and water. There will need only minor mitigation measures as anticipated project activities will not lead to adverse impacts towards agrobiodiversity in the project areas. On the contrary, project activities are expected to result in an improvement in agrobiodiversity conservation of the ecosystem.

The main purpose of this ESIA is to investigate potential impacts of the proposed main intervention of activities on both the environment as well as the community living in the districts listed in Table 1 above.

Objectives of the ESIA

The specific objectives of the study are:

(e) To assess the potential environmental and social impacts of the project as a result of potential interventions;
(f) To compare the impacts in relation to relevant national and World Bank requirements and guidelines;
(g) To develop an environmental and social management plan (including screening criteria) for the mitigation of any potentially negative impacts of the proposed interventions and for monitoring compliance with the relevant laws and policies;
(h) To develop an integrated pest management plan;

Methodology

The study has intensively conducted through the following steps:

- Compile literature and information pertinent to the study directly from the PSU or from other sources such as internet websites of World Bank and other organizations, books and project documents
- Visiting the project areas in the four governorates mentioned above viewing environmental and social conditions in the rural villages and conducting interviews and discussions with stakeholders in the field:
    - Decision makers
    - NGOs and projects (if available)
    - Farmers
        - ③ Women farmers
        - ③ Men farmers
- Recording and making thorough analysis of the consultation
- Based on the Environmental and Social Impact Assessment (ESIA), an Environmental and Social Management Plan (ESMP) is prepared.

World Bank Safeguards Policies

The World Bank's operational policy on Environmental Assessment (OP 4.01) applies to all projects, and the proposed project falls into environmental screening category "B" of World Bank OP 4.01. The objective of the ESIA is to help ensure the environmental and social soundness and sustainability of investment projects. This will be done by assessing potential impacts of the proposed project on physical, biological, and socio-economic conditions. In addition to OP 4.01, the ESIA addresses the requirements under OP 4.09 – the World Bank's Operational Policy on Pest Mmanagement and use of pesticides – to address potential adverse impacts of pesticide use in project activities. The output of this analysis is an ESIA.

The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of Environmental Impact Assessment (EIA). The Bank classifies the proposed project into one of four categories [A, B, C or F], depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. A proposed project is classified as Category B if it's potential adverse

environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category (A) projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EIA for a Category B project may vary from project to project, but it is narrower than that of Category (A) EIA. Like Category (A) EIA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The EA confirmed the "Category B" classification of the project under World Bank safeguard policies, finding no significant, cumulative or irreversible environmental impacts from the project.

ACAP activities are financed by the World Bank and are therefore subject to the Bank's Safeguard Policies. Each of the ten Policies was checked against the proposed different components and their activities. The following discussion of the Policies is aimed to indicate which ones are triggered by the project and thus may influence the project design, and in particular which specific component(s) and activities might produce significant impact.

Environmental Assessment Safeguard Policy (OP 4.01): Essentially, the project is expected to have significant positive environmental social impacts, in particular in most activities, with only relatively minor negative impacts. The OP 4.01 has been triggered because there is the potential that implementation of ACAP may lead to some adverse environmental impacts. The ESIA has however determined that there will be no potential large-scale, significant or irreversible environmental impacts associated with the project. The potential impacts identified are mainly localized impacts associated with activities to be financed under component 3 (CDD activities) of the project (i.e., involvement of communities on a purely voluntary and demand basis), which can be effectively mitigated and are addressed using the screening criteria and environmental management plan. For any minor negative impacts, the ACAP will be in compliance with this OP 4.01, provided the actions prescribed in the Environmental Management Plan are implemented. The Bank requires (EIA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EIA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EIA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, sitting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favours preventive measures over mitigatory or compensatory measures, whenever feasible

Pest management Safeguard Policy (OP 4.09): The 1ntegrated Pest Management (IPM) approach, including biological pest control, has become the main alternative to control by chemical means. In order to control the quality of imported pesticides, the government established the "Pesticides Formulation Laboratory". In 1999, Parliament approved the Agricultural Pesticides Act. Procurement of pesticides is not envisaged under the project. However, farming is expected both to improve and to change cropping patterns to adapt to climatic changes. These changes are in turn not expected to increase the use of agricultural chemicals, fertilizers and pesticides, due to the project activities stressing on encouraging traditional and local practices in using organic fertilizers. However, due to some negligence

and improper storage of seeds or importing new infected crops with would require some remedies and precautions. Precautions to avoid excessive and improper pesticide use are required. A mechanism will be put in place to demonstrate Integrated Pest Management procedures and to develop a farmer education program that stresses good and safe practices for storage and application of pesticides. The ACAP thus has triggered this policy and the ESMP has recommended relevant training on IPM.

Involuntary Resettlement Safeguard Policy (OP 4.12): Safeguard Policy 4.12 is not triggered by ACAP as project activities will not result in: (i) involuntary taking of land; (ii) relocation or resettlement; (iii) loss of assets or access to assets, and (iv) loss of income sources or means of livelihood. Furthermore, project activities are expected to result in stabilizing, increasing, and diversifying income for participating communities. The project aims to better equip local communities to cope with climate change through the conservation and use of agro-biodiversity, which aims to overcome losses of income due to climate change and cope better with income diversification. Sub-component 3.2 seeks to increase income of farmers through diversification of livelihood options based on agro-biodiversity resources, and through improved conservation and management of water resources to counter the stresses of climate change. Farmers' involvement in activities under this sub-component will be purely on voluntary and demand basis. Furthermore, specific screening criteria for the selection of community sub-projects have been developed as a part of the Environmental and Social Management Plan (in accordance with the CDD Manual for MNA Region), which will screen out sub-projects that may have the potential to trigger OP 4.12. Such sub-projects will not be implemented under the ACAP.

***Physical Cultural Resource Safeguard Policy (OP* 4.11):** This safeguard policy is not triggered by ACAP. One of the site selection criteria in identifying districts where the project would be implemented was to locate availability of reasonably intact terrace systems that could be rehabilitated and upgraded by local farmers and residents. The project will build their capacity by teaching them skills that are needed for the upkeep of terraces, which in turn will eventually help in transferring the knowledge to others in the village. This is an important capacity building exercise. Each of the sub-projects will be monitored and evaluated once it is up and running as well as documented. This will help replicate projects in other communities and make necessary amendments to them. User surveys will also be carried out periodically to get feedback on the projects, and make needed improvements. An oversight committee will be responsible for maintaining the projects and for collecting small maintenance dues. Therefore the project seeks the preservation of these age-old mountainside terraces, and the policy is not triggered.

In summary, the ACAP triggers the following two Safeguard Policies: OP 4.01 on Environmental Assessment, and OP 4.09 on Pest Management. Special provisions have been made in the Environmental and Social Management Plan to fully comply with these Safeguard Policies (see Table 2). In all these cases the World Bank requirements are reinforced and fully mandated by corresponding Yemeni legislation as well.

Table 2: World Bank Safeguard Operational Policies and their applicability to ACAP

No	Safeguard Policy	Policy triggered	Justification
1	OP 4.01 Environmental Impact Assessment	Yes	The project is classified as an environmental and social under Category B requiring partial assessment. All environmental and social impacts of ACAP are adequately examined and mitigation measures are assigned. ACAP will have significant positive impacts on the agrobiodiversity in the project areas and build community capacity to adapt to climate change.
2	OP 4.04: Natural Habitats	No	The policy is not triggered. The project activities will not cause conversion or degradation of natural habitats.
3	OP 4.09: Pest Management	Yes	ACAP will not affect pest management, however it is recommended to trigger this policy due to the vulnerability of the systems and ignorance of people and due to the missing mechanism within the governmental authorities on how to deal with the management of pesticides. Lack of education and awareness amongst farmers, extension workers and related institutes on the effects of pesticides on health and crops is additional reasons to trigger this policy
4	OP 4.11: Cultural Property	No	The policy is not triggered. None of the interventions will affect any known archaeological sites
5	OP 4.12: Involuntary Resettlement	No	The policy is not triggered as project activities will not result in: (i) involuntary taking of land; (ii) relocation or resettlement; (iii) loss of assets or access to assets, and (iv) loss of income sources or means of livelihood. Furthermore, project activities are expected to result in stabilizing, increasing, and diversifying income for participating communities
	OP 4.20: Indigenous People	No	The policy is not triggered. No indigenous people are present in project areas
7	OP 4.36: Forestry	No	The policy is not triggered. No forest areas exist in the project areas
8	OP 4.37: Safety of Dams	No	The policy is not triggered. ACAP does not involve construction of dams, and not depending on any dams
9	OP 7.50: Projects on International Waterways	No	This is applicable to water bodies that form a boundary between two states or any other water body that is a part of these boundary water bodies. OP 7.50 is not applicable to this project.
10	OP 7.60: Projects in Disputed Areas	No	This policy introduces specific requirements for loans in areas disputed by more than one country. This is not applicable to the ACAP.

Detailed Project Description

The Project Approach

The ACAP will investigate climate change impacts on agricultural land use in the rain fed highlands of Yemen to develop coping strategies and enhance implementation efforts for adaptation to climate change. The overall investigation strategy aims at the conservation and utilization of agro biodiversity resources for climate change adaptation and the integration of these strategies in the socio-economic system. This shall be achieved by:

- Bringing together local/traditional knowledge, particularly that of female farmers, with modern farming techniques and practices;
- Developing initial local predictive capacity of weather patterns, climatic changes, and longer term climate change scenarios for the rain fed areas of Yemen.
- developing vulnerability profiles at community, district or governorate level for target species/varieties, and
- Developing a menu of adequate and appropriate coping mechanisms as well as policy, institutional and technology options.

The main tasks will be carried out by four different components and expert groups:

1. Agrobiodiversity and local knowledge assessment
2. Climate modelling assessment
3. Development and implementation of coping mechanisms options
4. Enabling policies, institutional and capacity development

Project Development Objectives

The Project development objectives 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

The Project outcome indicators are:

- Improved capacity of national agencies to successfully use global and regional climate models to better simulate future climate scenarios for Yemen
- Improved capacity and increased knowledge and awareness on climate variability and change, and access to coping strategies
- Improved coping strategies designed and piloted using agro-biodiversity resources in rainfed highlands

This project will provide a suite of options to farmers in the rain-fed highlands, to cope with climate change by building the knowledge base on climate change and agro-biodiversity. At the national level, the project will initiate improvements in collection, recording and analysis of climate data and development of national/regional climate models. Climate-related data is

currently being recorded in monitoring stations under the authority of various organizations such as CAMA, NWRA and AREA, for their purposes and without any coordination. The project will help in creating a coordination and cooperation mechanism among such entities, and will put in place a template that will capture the various climate-related parameters that are being recorded both within and outside the country for Yemen. Simultaneously, at the community level the project will finance documentation of agro-biodiversity and traditional knowledge of the highlands, which have the potential to equip rain-fed agriculture with land races and farming techniques that are more tolerant to climatic variability and change. During the course of the project some coping options would be piloted with the communities in the highlands.

The interventions initiated under this project are intended to be the building blocks which will help meet the challenges of climate change over the long term. The project is designed as a pilot, and is closely aligned with the RALP which is under implementation. Coping options developed during implementation of the proposed project will be scaled up through the RALP.

Geographical scope and location

The selection of appropriate sites for piloting the coping mechanisms is crucial for the project. The pilot sites have to represent the critical agro-biodiversity of the highlands, and also be suitable for the development of interventions with the active participation of farmers. Following the implementation of the project, the sites should be able to function as examples for replication and scaling-up in other sites. The first level of selection of governorates was based on the following criteria, to ensure that the sites would:

g. be located along a meso-scale geographic gradient
h. cover most important areas of rainfed highlands
i. cover a range of altitudes within in the highlands
j. cover a range of mean annual precipitation
k. cover a range of agro-ecological gradients
l. partially overlap with the governorates of the RALP project

Site selection at the next level was carried out to identify districts where the project would be implemented. This was done to ensure that each location fulfilled all or most of the following criteria:

l. representative agro-ecosystems
m. continued practice of traditional farming techniques
n. availability of typical local crops
o. availability of (reasonably intact) terrace systems
p. mixture of cropping and animal husbandry, including the use of pasture
q. willingness of local people including women to take part in the project
r. availability of data related to soil, water, climate, biodiversity and agriculture
s. availability of information from preceding projects at the sites
t. potential cooperation with other ongoing projects at the sites, esp. the RALP project
u. possibility to undertaken activities from field to catchments level including altitudinal and agro-ecological gradients
v. possibility to undertake activities from family/group member to community/district level

Governorates and districts of 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) have been selected as the respective candidate sites for the project (table 1 illustrate the governorates and districts). Maps with project areas are given in Annex 1.

Project components

The Project constitutes of four components. **Component 1** will build on the traditional knowledge of farmers and develop an inventory of local agro-biodiversity to identify and test selected land races for climate resilience and develop 'climate resilience' profiles of selected landraces. **Component 2** will focus on developing initial local predictive capacity of weather patterns and long term climate change scenarios for the country. **Component 3** will focus on integrating climate resilience into rain-fed agriculture. At the national level this will done through capacity development of the MAI in and at the local level through the development and piloting of a menu of coping strategies in partnership with the communities. **Component 4** will focus on the management, coordination, monitoring and evaluation of the project.

Component 1: Agrobiodiversity and local knowledge assessment
Lead Agency: Agricultural Reserach and Extension Authority (AREA)

Objective: To prepare inventories of land races and other agro-biodiversity and develop climate resilience profiles of selected land races

Outcome: Information to enhance and develop agro-biodiversity based coping strategies in place.

This component would build on the existing knowledge base of farmers, who to date have survived by adopting diverse drought mitigation strategies. As changing economic and livelihood patterns rapidly dilute the traditional knowledge of farmers, there is an urgent need to document this traditional knowledge. In this context, this component will facilitate the distillation of knowledge from the farmers on adaptive characteristics of the local landraces and their wild relatives. These inventories will be complemented with information from other existing databases. The vulnerability profiles for selected landraces will be developed after testing and piloting for resilience to impacts of climate change.

Sub-components and Activities

1.1 Agro-biodiversity Inventories

1.1.1 Stocktaking of existing inventories
1.1.2 Agro-biodiversity field inventories
1.1.3 Laboratory analysis and validation

1.2 Development of vulnerability profiles of selected Land Races

1.2.1 Selection of landraces for plot experiments
1.2.2 Lab and field tests of selected landraces to develop vulnerability profiles

1.3 A report on agro-biodiversity utilization and traditional knowledge

Sub-component 1.1: Agro-biodiversity Inventories

The main activities under this sub-component will be:

1.1.1 Stocktaking of existing inventories
1.1.2 Agro-biodiversity field inventories
1.1.3 Laboratory analysis and validation

Implementation will start with reviews of preceding and ongoing inventories. New inventories at the study sites would be planned and conducted together with the local people (especially women). Traditional knowledge is currently being documented within projects of AREA, and by NGOs - the Yemeni Association for Sustainable Agriculture Development (YASAD), and the Initiatives for Sustainable and Equitable Development, and Local Actions for Knowledge Exchange (IDDEALES) and these organizations will be active partners in the inventory development.

With respect to land races of crops, ex-situ seed storage from different regions of the Yemen highlands and documentation in seed data banks is carried out at the Genetic Resource Centre at AREA and the Yemeni Genetic Resource Centre [YGRC] at Sana'a University. The number of conservation facilities has increased from 7 in 1996 to 22 in 2006; and they conserve more than 6000 accessions. Further, morphological descriptions of seeds and phenotypes have been conducted. Therefore, it will be necessary to check for duplicates with the existing accessions. Polymerase studies will be conducted on selected land races to verify nomenclature.

Sub-component 1.2: Development of Climate Resilience Profiles

The activities under this sub-component will be:

1.2.1 Selection of landraces for plot experiments
1.2.2 Lab and field tests of selected landraces to develop vulnerability profiles

With the information from the field inventories a shortlist of land races will be developed for further testing under experimental conditions. The shortlist will be developed in partnership with farmers' groups and would include land races that are perceived by farmers as important for food or forage. Land races will be short listed not necessarily for high yields; but, for their performance under conditions of climatic stress – drought, flood, frost, high temperature, etc. The RALP project already works on 8 landraces selected largely on the premise of increased yields and this project will explore to see if there could be an overlap with any of these landraces.

A field testing methodology will be developed for the selected land races, to test their performance under experimental conditions. Field tests would be conducted at appropriate field centres of AREA, and in some farmers' fields. Simultaneously, laboratory analysis of some of the selected land races will be carried out to test germination rates and seed quality.

Sub-component 1.3: A report on agro-biodiversity utilization and traditional knowledge

The final activity would be preparation of a report with details on the agro-biodiversity in the selected project sites and with detailed plans for development of income generation activities using some of the species/land races with potential for such activities.

Component 2. Climate Modeling and Capacity Building
Lead Agency: Civil Aviation and Meteorological Authority (CAMA)

Objective: To develop national capacity in climate modelling and data analysis

Outcome: Enhanced capacity of national institutions to develop climate scenarios based on regional climate models

Climate change will contribute to the general uncertainty in Yemeni agriculture. This has various reasons: (i) precipitation is a tricky climate element and exact projections - even on precipitation trends only - are hard to make, (ii) Yemen lies in a latitudinal band were global circulation models differ in projected precipitation trends (some indicate more some less precipitation, but there is observational evidence of increased variability of rainfall), (iii) the effect of complex topography (typical for Yemeni highlands) is poorly modelled in current climate models, and (iv) data to validate existing climate model output against measurements are limited. Therefore, both the selection of a proper modelling strategy or feasible model chain as well as necessary "tuning" of models or model output seems almost impossible. However, it will be useful to check on the possible boundaries of future climate change to limit the still growing uncertainty.

Key steps to achieve the objective outlined above, include: (i) to build a central database for a better statistical description of the Yemeni climate and for climate model validation; (ii) to assess and use existing GCM outputs and future GCM results to derive probable changes and their expected range; (iii) to combine existing data records (including available products based on remote sensing like TRMM and additional measurements started in the GEF project) to mimic the range of possible climate futures for areas / sites representing rainfed agriculture in the highlands of Yemen, and (iv) to utilize mesoscale climate models designed and parameterized for a similar region for regional downscaling or other techniques of regional downscaling.

Sub-component 2.1 Development of Improved Climate Database
Currently there is limited localized information, capacity and organizational arrangements associated with climatic data collection, storing and processing – which to date has been compiled through a variety of agencies, including the Civial Aviation and Meteorology Authority (CAMA), National Water Resources Authority (NWRA), Environnment Protection Authority (EPA), and AREA. This system is clearly insufficient and needs to be fortified to meet the challenges of improved climate prediction models. Activities under this sub-component would include:

2.1.1 Meta data survey and collection on historic climate data
2.1.2 Data collection of agro-meteorological data at selected sites
2.1.3 Assessment of small scale variability of rainfall
2.1.4 Data assessment and processing; Preparation of the data for validation and downscaling of climate models
2.1.5 Statistical analysis on the climate of rainfed highlands of Yemen
2.1.6 Assessment of institutional capacity in data collection and analysis of CAMA, NWRA, AREA and EPA, including the number and capacity of weather stations
2.1.7 Establishing a data transparency policy: Exchange of metrological information on climate data of all relevant organizations (CAMA, NWRA, EPA and AREA),

including the terms of the exchange of historic climate data and plans to establish new networks of meteorological, climate and agricultural measurement stations and sites.

Upgrading selected weather monitoring stations. Small scale upgrading of equipment in weather monitoring stations (of AREA, CAMA, others) would be financed under the project to enable regular collection of temperature and precipitation data.

Sub-component 2.2: Downscaling Climate Models

Activities under this sub-component will be focused on establishing access to global data bases like CERA for GCM (Global Circulation Model) output data, process the GCM output data for the larger region of Yemen (including neighbouring regions), analyze the GCM output for (i) statistical characteristics (trends, quintiles, regional patterns of climate variables, esp. precipitation). Activities would include:

2.2.1 Assessment of existing GCM results
2.2.2 Analysis of existing GCM results (statistical evaluation, interpretation and processing)

Sub-component 2.3: Development of Climate Scenario for the Rain-fed Highlands

2.3.1 Assessment of historic climate data from selected sites
2.3.2 Building scenario data for climate (especially precipitation) in rainfed highlands of Yemen based on collection of new datasets

The focus of this sub-component would be on combining existing data records (including available products based on remote sensing like TRMM) to mimic the range of possible climate futures for areas / sites representing rainfed agriculture in the highlands of Yemen.

Sub-component 2.4 Training and Technical Capability development

There exists a basic to intermediate climate data management capacity n Yemen due to the sufficiently large proportion of trained people in relevant institutions like CAMA and EPA. This data management capacity needs to be enhanced to deal with large spatial data sets from model output or remote sensing. The climate modelling capacity in Yemen is not sufficient yet. There are insufficient University level programs of study in Atmospheric Sciences. A pre-requisite for advances in climate modelling will be training at international centres of excellence, where those models are developed and applied. This sub-component therefore, focuses on developing the capability of technical specialists within CAMA and NWRA and AREA to undertake climate modelling. The main activities would be:

2.4.1 Masters level training of technical and scientific personnel through an internationally acclaimed centre for climate modelling
2.4.2 Custom training of 6-8 technical staff members from CAMA, NWRA and AREA in climate modelling

Sub-component 2.5 Sharing Climate Information Inputs and Outputs

2.5.1 Identify key climate data sources/agencies
2.5.2 Agreed arrangements on data collation; and standards for data collection towards harmonization
2.5.3 Awareness raising and capacity for targeted users
2.5.4 Sharing outputs with end-users

Component 3: Integrating Climate Change into Rain-fed Agriculture
Lead Agency: Ministry of Agriculture and Irrigation (MAI)

Objective: To develop a strategic approach to integrate climate change into rainfed agriculture

Outcome: Pilot coping strategies implemented; policies and investment plans of rain-fed agriculture reflect climate considerations

A detailed assessment of the vulnerability of rain-fed agriculture to climate change will be undertaken, followed by consultations with stakeholders to develop a climate resilient rain-fed agriculture strategy. Staff in MAI and associated institutions will be provided with specialized training in climate awareness and in developing a coherent response strategy. Coping mechanisms would be developed and piloted using the knowledge generated in Component 1 from the agro-biodiversity inventories and the vulnerability profiles of selected land races. In addition, community based pragmatic 'win-win' options for adaptation will be developed and implemented by the communities. These would be small scale infrastructure and income generation activities that use local agro-biodiversity, which will not only help in sustainable management of natural resources, but will also help in the diversification of income sources for the communities. This approach is premised on the fact that climate change is an issue that involves long time scales, beyond the scope of an individual's or a community's time horizon for planning. Diversifying livelihood options and sustainable management of natural resources, especially water, are expected to have immediate positive impact on the resource base and incomes.

Sub-components and Activities

Sub-component 3.1: ***Raising awareness and capacity building at national and local levels on climate change***

3.1.1. Broad based awareness programs to decision makers, implementing agencies and communities
3.1.2. Targeted technical training programs for MAI
3.1.3. System for transmission of weather forecasts and early warning system to farmers

Activities under this sub-component will address capacity at two levels- at the policy and program level, awareness and technical capacity of staff in the MAI would be developed to take climate change into account in designing rain-fed agriculture programs. At the community level the aim is to increase awareness of climate phenomena and the need to develop response strategies. A simple system to broadcast weekly weather forecasts to farmer would be established with the information generated from Component 2 by CAMA.

3.1.1. Broad based awareness programs to decision makers, implementing agencies and communities.

The program would be undertaken at two levels: at the community level farmers' networks would be involved in disseminating information through workshops on climate change phenomena, the consequences of unsustainable natural resource use, and strategies for dealing with floods and droughts, extreme weather events that have increased in frequency in the last

few years. The program would consist of field demonstrations, farmer-based hands-on training sessions, co-learning, twinning programs, local workshops, booklets, and posters, among other vehicles, and use communication tools that take into account the high level of illiteracy in these areas, particularly for females. Additionally, events such as festivals for seeds, traditional cooking, and agricultural knowledge will be held in several villages. Facilitation teams would be responsible for designing and implementing the awareness raising program, which would be based on the needs articulated in the agro-biodiversity and adaptation plans. For implementing agencies and decision makers short training programs would be organized through NWRA and CAMA to share information on climate change, potential impacts on the rain-fed areas and how to incorporate climate considerations into the policies and plans of respective agencies.

3.1.2. Targeted technical training programs for MAI.

These special training programs would focus on climate change impacts on rain-fed agriculture, and the specific actions that MAI needs to take to respond effectively to the challenge.

3.1.3. System for transmission of weather forecasts and early warning system to farmers.

In collaboration with CAMA, a program for frequent weather updates for farmers would be developed, to provide weekly and monthly forecasts of rainfall and temperature and extreme events. Low cost innovative technologies would be used to deliver this information to farmers in a timely manner (e.g. SMS text messaging).

Sub-component 3.2: *Piloting coping strategies in local landscape units*

Coping strategies in this context could be information, a technology or a technique that enables farmers to adapt agricultural practices to changing climatic conditions. In the present project coping strategies could be a combination of all or some of the following:

- information that alerts farmers to changing weather conditions;
- information on crop varieties / land races or new crops suited to changed soil, temperature and precipitation conditions
- crop management techniques to ensure success under new temperature/precipitation regimes – different sowing, inter-cropping, fertilizing, pruning, irrigation and harvesting protocols; sustainable pest management techniques;

The activities under this subcomponent will draw upon the information generated from Component 1 and Component 2 and will include:

3.2.1. Establishing and strengthening of traditional farmer networks, including women's networks
3.2.2. Targeted capacity building to access small grants to implement agro-biodiversity based plans
3.2.3. Developing agro-biodiversity based coping plans at local landscape units
3.2.4. Upgrading small scale community infrastructure as coping strategies
3.2.5 Piloting agro-biodiversity based income generation activities

3.2.1. Establishing and strengthening of traditional farmer networks, including women's networks.

Traditional farmer networks would be strengthened with incentives for group activities and workshops on adaptation. Farmers' networks would be the main channel for community awareness rising on climate change and the coping mechanisms. They would also be the primary channels for scaling up implementation of coping mechanisms through the ongoing RALP and Groundwater and Soil Conservation project of the Bank.

3.2.2 Targeted capacity building to access small grants to implement agro-biodiversity based plans.

Community groups would be given training on landscape level planning to conserve and sustainable use local agro-biodiversity, and implement soil and water conservation measures. This training would inform community members, especially women of the options available to diversify their income sources through the use and value addition to local agrobiodiversity. The training would also include preparation of agro-biodiversity based small and micro-scale business plans.

3.2.3. Developing agro-biodiversity based coping plans at local landscape units.

Inventories of traditional knowledge and agro-biodiversity of the highlands would provide the baseline information on plant genetic resources of the highlands, which would be stress. Select pilot communities in the rain-fed highlands of Yemen will be supported in natural resource conservation and adaptation planning. The purpose of these plans is to identify ways to preserve local agro-biodiversity that has potential for conservation and income generation and, soil and water conservation needs in the landscape unit. These plans would address the needs of the communities as they relate to the sustainable and productive use of natural resources, which will help in adaptation to climate change. The gender dimension will be addressed through women-only discussions. Each committee would be accompanied by a local agro-biodiversity specialist. Eight to ten rain-fed villages will be selected along relevant gradients of land cover/land use intensification and altitudinal zones from within a number of governorates, including Taiz, Al-Mahweet, Ibb and Sana'a.

3.2.4. Upgrading small scale community infrastructure as coping strategies.

Each of the pilot communities will benefit from small scale upgrading of infrastructure. This upgrading will be tied to conservation of water, soil, terraces and seed storage - among others – and seek to maximize the use of local knowledge and adaptation practices. The kinds of projects envisaged include:

a) upgrading of terraces
b) creation or enhancement of community seed storage facilities to store wild relatives and landraces of seeds that have an important resilient value
c) construction of efficient water storage
d) establishment of community centre for conservation
e) establishment of model farm
f) Soil conservation
g) small flood protection structures

Each village will benefit from 2-3 upgrading projects, which will have been prioritized in the community agro-biodiversity based coping plans. Labour-intensive activities should rely primarily on labour from the community. For instance, terraces, which have a high water retention quality on hill sides and whose deterioration could contribute to more extreme

floods in the low lands, should be upgraded by local farmers and residents, who will be learning skills that are needed for conservation and who will be responsible for the upkeep of terraces, and for eventually transferring the knowledge to others in the village. This is an important capacity building exercise.

In-kind community contribution will be emphasized to help with the sustainability of the project, such as the participation of labour. Each community will implement one project at a time. Only after successful implementation of the first activity; they will be able to request funds for the subsequent activity.

The upgrading activities will be accompanied by a team of specialists to ensure the conservation aspects of each project. Additionally, conservation-related training sessions will be organized to benefit the community as a whole. Each of the projects will be monitored and evaluated once it is up and running as well as documented. This will help replicate projects in other communities and make necessary amendments to them. User surveys will also be carried out periodically to get feedback on the projects, and make needed improvements. An oversight committee will be responsible for maintaining the projects and for collecting small maintenance dues.

3.2.5 Piloting agro-biodiversity based income generation activities.

The aim of this component is to offer communities a practical way of alleviating poverty through the sustainable use and conservation of agro-biodiversity resources by financing small sustainable projects run by farmers in the targeted rain-fed areas. For instance, native species (that have both ecological and economic importance) that have been lost could be re-introduced to repopulate local areas and yield a diversified portfolio of income streams to enhance resilience of local communities against climatic and other shocks. Additionally, they will be encouraged to test out new practices that will increase the productivity of crops and improve water usage. The kinds of projects that would be financed include:

a) Construction of small nurseries/home-gardens with a preference for those using grey water and other conservation methods. These would produce plants, vegetables, fruits, aromatic and medicinal plants
b) planting, preparation and packaging of medicinal herbs (aromatic and spices)
c) small home-based catering business specializing in traditional recipes
d) agro-processing
e) beekeeping
f) planting of almond trees
g) Producing traditional ceramic ware for conservation purposes (to house seeds, etc.)

Each project will be prepared and implemented by a small self-selected group of 3 to 5 individuals. Projects will be selected for funding according to pre-set criteria which include the sustainability of the project, and use of indigenous/local knowledge and conservation techniques, amongst other things. The poverty level of the recipient as well as his/or her skill-set will also be a determining factor. Special efforts will be made to target female-headed households.

These small projects will have a cap of $3000/individual project. The community will also be asked to provide in-kind contribution. For instance, a farmer interested in a small nursery can

allow other farmers to use his land for the same purpose, and the return from the sale of the product will be split equally amongst them.

Farmers involved in small income generation projects will be accompanied in the process of developing the project idea and implementing it. In the case of projects targeting increased crop productivity or the use of new more productive seeds, for instance, an agro-biodiversity specialist will accompany these projects and document the agricultural calendar, soil, water input and productivity of seeds to ensure their sustainability, and make any necessary adjustments along the way. In the case of traditional recipes and medicinal herbs, a social specialist will accompany the process to document the kinds of recipes and herbs and their benefits. This process of documentation is critical in ensuring that traditional methods of farming, cooking, water use, and seed conservation are not lost, and can be replicated by other farmers, particularly young women who are often not exposed to the sort of experiences their mothers were exposed to.

Additionally, project recipients will be provided with technical, logistical and training support towards improving capacities in matters of production, conservation, processing, and marketing. This training support will also be based on the needs articulated in the agro-biodiversity plans. The marketing aspect in particular will be paid close attention; because of the restrictions on women's mobility, a designated specialist will be in charge of marketing the goods in markets and during festivals.

Sub-component3.3: Preparation of a Climate Resilient Agriculture Strategy for Rainfed highlands

3.3.1 Vulnerability Assessment of agriculture in rainfed highlands
3.3.2 Stakeholder consultations with relevant agencies including communities and civil society
3.3.3 Development of agriculture strategy for rainfed highlands

3.3.1. Vulnerability Assessment of agriculture in rainfed highlands.
A detailed assessment will be commissioned to assess the vulnerability of the rain-fed highlands to climate change. This study will identify the impacts on crop productivity, cropping pattern, food production, rural employment and other socio-economic parameters due to changes in temperature and rainfall, soil loss and increase in frequency of extreme weather events. The study will provide guidance to decision makers on the costs of not making rain-fed agriculture climate resilient and result in a draft climate resilient rain-fed agriculture strategy for the country.

3.3.2 Stakeholder consultations with relevant agencies including communities and civil society.
The MAI will organize stakeholder consultations to discuss the vulnerability assessment report and draft rain-fed agriculture strategy with a wide range of stakeholders including civil society and communities. The aim of this exercise is to build consensus for the strategy.

3.3.3 Development of agriculture strategy for rainfed highlands.
The MAI, based on feedback from stakeholders will prepare the strategy which will be endorsed by the Government of Yemen.

Component 4: Project Management, Coordination, Monitoring and Evaluation

The objective of this component is to work with the Project Implementation Unit [PIU] to provide effective management to support project implementation. The PIU will liaise with the lead agencies for each component, nurture and facilitate coordination between the components, liaising with technical partners, and stakeholders in the project.

Project implementation will be overseen by the PIU which will be under the Ministry of Agriculture and Irrigation. The PIU will be headed by a Project Director and have staff to oversee procurement, financial management and administrative support functions and an international expert on climate change and natural resource management issues to provide technical oversight for the project.

The work of the PIU will be guided by a Technical Coordination Committee of key stakeholders and the project implementation group for each component. A monitoring system will be put in place that tracks performance of the PIU and its partners in relation to (a) progress in achieving scheduled activities and outputs; and (b) expenditure against budget allocations; and (c) project impact on key outcomes and indicators of achievement.

Overall strategic guidance for the project is provided by the Steering Committee chaired by the Deputy Minister for Agriculture and Irrigation with membership from the following Ministries:

- The Ministry of Agriculture and Irrigation (MAI) (Chair)
- Ministry of Planning and international Cooperation (MoPIC)
- Ministry of Finance (MoF)
- The Civil Aviation and Meteorology Authority (CAMA)
- The National Water Resources Authority (NWRA)
- The Agricultural Research and Extension Authority (AREA),
- The Environment Protection Authority (EPA)

The Technical Coordination Committee (TCC) will provide technical guidance to the project. This committee will discuss all technical issues and prepare a quarterly summary for the Project Steering Committee (PSC). The core team members of the TCC will be organized into technical working groups to provide advice on various aspects of project implementation. The TCC will comprise of the following key ministries and institutions:

- *The Ministry of Agriculture and Irrigation (MAI) (Chair)*
- *The Civil Aviation and Meteorology Authority (CAMA)*
- *The National Water Resources Authority (NWRA)*
- *The Agricultural Research and Extension Authority (AREA)*
- *Environment Protection Authority (EPA)*
- *The Project Implementation Unit (PIU)*

Objectives and Principles of the ESIA

Introduction

The Environmental and Social Impact Assessment (ESIA) found the ACAP to be a major advance in Yemen for supporting traditional rainfed agricultural systems (as opposed to groundwater withdrawal systems), including: building on traditional knowledge of farmers to develop 'climate resilience' profiles of selected landraces; developing initial local predictive capacity of weather patterns and long term climate change scenarios for the country; integrating climate resilience into rain-fed agriculture by developing capacity of MAI at the national level, and through the development and piloting of a menu of coping strategies in partnership with the communities at the local level. The ESIA confirmed that the overall environmental and social impact of the project should be positive - the social and environmental benefits of the project (in terms of increased agricultural and animal productivity as a result of improved seed production, enhanced livestock protection and expanded water and soil conservation and management) will outweighs any potential adverse environmental or social impacts. Further, it is found that any potential adverse impacts can be prevented or minimized by the preventive actions and mitigation measures recommended in the ESMP. The ESIA confirmed the "Category B" classification of the project under World Bank safeguard policies, finding no significant, cumulative or irreversible environmental impacts from the project. Furthermore, it recommends capacity building in integrated pest management at various levels to address any pest management concerns. Therefore the ESIA has concluded that OP 4.01 on environmental assessment and OP 4.09 on pest management are the only policies triggered by the project. No other safeguard policies are triggered by the project.

Based on the ESIA an Environmental and Social Management Plan (ESMP) is developed, which specifies environmental and social screening criteria for sub-projects, provides options to mitigate risks and potential adverse environmental and social impacts, enhance project design and implementation practices by ensuring that the project components, particularly the sub-projects under Component 3, are environmentally and socially sound and sustainable throughout the project life and thereafter.

The following tables list the objectives and the operational principles of the environmental and social assessment of the project according to the World Bank.

Environmental Impact Assessment

Objectives of the ESIA

1. To help ensure the environmental and social soundness and sustainability of investment projects.
2. To support integration of environmental and social aspects of projects into the decision making process
3. To minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management

Operational Principles of the ESIA

The principles are listed below:

1. Assess potential impacts of the proposed project on physical, biological, and socio-economic. *The study has assessed the impacts and found that the project has significant positive environmental, social and socio-economic impacts which outweigh the minimal negative impacts, if any, and mitigation measures have been developed accordingly.*
2. Assess the adequacy of the applicable legal and institutional framework, including applicable international environmental agreements, and confirm that they provide that the cooperating government does not finance project activities that would contravene such international obligations. *The legal and institutional arrangements developed within the ACAP are adequate. The government has initiated multilateral agreements.*
3. Provide for assessment of feasible investment, technical, and siting alternatives, including the "no action" alternative, potential impacts, feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training and monitoring requirements associated with them. *A complete chapter is developed addressing the project alternatives including the "no action"*
4. Prevent and, where not possible to prevent, at least minimize, or compensate for adverse project impacts and enhance positive impacts through environmental management and planning that includes the proposed mitigation measures, monitoring, institutional capacity development and training measures, an implementation schedule, and cost estimates. *The ESIA has described the impacts and the mitigations needed for the different interventions.*
5. Involve stakeholders, including project-affected groups and local nongovernmental organizations, as early as possible, in the preparation process and ensure that their views and concerns are made known to decision makers and taken into account. Continue consultations throughout project implementation as necessary to address EIA-related issues that affect them. *The project has initiated its activities in partnership with different stakeholders through the different stages of the proposed components*
6. Use independent expertise in the preparation of EIA where appropriate. *The project complies*
7. Provide measures to link the environmental assessment process and findings with studies of economic, financial, institutional, social and technical analyses of a proposed project. *The project complies*
8. Disclose draft EA in a timely manner, before appraisal formally begins, in an accessible place and in a form and language understandable to key stakeholders. *The project complies*
9. Promote use of demand driven, ecologically based biological or environmental pest management practices (Integrated Pest Management [IPM] in agricultural projects and reduce reliance on synthetic chemical pesticides. Include assessment of pest management issues, impacts and risks in the EA process. An IPM is prepared in this context.
10. Procure pesticides contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and intended users. Do not procure formulated products that are in WHO Classes IA and IB, or formulations of products in Class II unless there are restrictions that are likely to deny use or access to lay personnel and others without training or proper equipment Reference: WHO's "Recommended Classification of Pesticides by Hazard and Guidelines to Classification" (IOMC, 2000-2002). *A checklist of prohibited pesticides has been prepared by the project (see attached annex*).

Environmental Policy, Legal and Administrative Framework

This chapter covers the national legislation and the national institutions that are essential prerequisites in environmental management of the ACAP.

Legal framework

Three laws are of direct relevance to the ACAP, these are: the Environment Protection Law, the Pesticides Law, and the Water Law. The key elements of the legislation are presented below.

National environmental legislation

1) Environment Protection Law

In 1995, Parliament enacted a comprehensive Environment Protection Law (Law No. 26 of 1995), consisting of five chapters and 95 articles.

The law's objectives are to protect the environment, to combat pollution, and to protect natural resources, society, human health, and living beings from activities that damage the environment. In addition, the law is designed to protect the national environment from activities practiced beyond the national boundaries and to implement international commitments ratified by the Republic of Yemen in relation to environmental protection, control of pollution, conservation of natural resources, and the protection of such globally important environmental elements as the ozone layer and climatic changes.

To avoid future adverse environmental effects, the law stipulates the incorporation of environmental considerations in economic development plans at all levels and stages of planning for all sectors. It also, imposes the performance of environmental assessment for all projects proposed by government, public, private, and cooperative agencies, and foreign companies. No licenses are to be issued for projects that degrade the environment. There is as yet no regulatory framework to support the implementation of the Environment Protection Law and the provision of undertaking environmental assessment for projects is not enforced.

The law also details provisions on the protection of land and water resources, and the use of pesticides. Mainly, the law prescribes controls on the digging of wells, raising water-harvesting levels, soil erosion, desertification and pollution, and urban and industrial expansion on agricultural lands. The articles on the use of pesticides stipulate the control measures over importation, handling, storage, registration, analysis and disposal of expired stocks as per the international standards of FAO, WHO, and the Arab Organization for Industrial Development (AOID).

The law also broadened the role of the Environment Protection Council (established in 1990) to include planning, licensing, monitoring, and auditing functions and to develop the procedures for defining, adopting, and monitoring environmental standards. The Law also outlines the role of line ministries and other technical authorities in the protection of air, water, and soil.

The Environment Protection Law provides the national, legal mandate for the application of the Bank's Safeguard Policies that are relevant to the ACAP project.

2) Pesticides Law

The Pesticides Law was decreed in 1999 (Law No. 25 of 1999) and includes seven chapters and 36 articles. Executive regulations for enforcement are to be issued by resolution of the Minister of Agriculture. A registration guide and executive regulations were prepared to facilitate enforcement. Penalties for violations are stated.

The law's objectives are to regulate the handling, registration, and inspection of pesticides and to avoid the poisonous effects on humans, and animals, the environment, and economically beneficial insects. The competent authority for enforcing the law is the General Authority of Plant Protection of the Ministry of Agriculture and Irrigation, and the authority is to coordinate its work with the Environmental Protection Authority.

The Pesticides Law provides the national, legal basis for the application of the Bank's Pest Management Safeguard Policy in ACAP interventions.

3) Water Law

The Water Law was issued in 2002 (Law No. 33 of 2002), in nine chapters and 82 articles. The law defines water resources as any water available in the republic's territory and its share of common waters jointly owned with neighboring countries. This is comprised of ground water, surface water, wastewater after purification, and saline water after desalination.

The law's main objective is to regulate, develop, sustain and increase efficiencies in water utilization, protect from pollution, transport, and engage the beneficiaries of water installations in participatory management, investment, development, operation, maintenance and preservation at the various stages of development. Water is considered as a common property accessible to all.

Management of water resources is entrusted to the National Water Resources Authority (NWRA), which is to form the strategy, assess the resources, classify water basins and zones, and prepare the national water plan, which is considered as one of the components of national economic and social planning. Priorities of water use are: drinking and domestic use shall have absolute priority. Then in declining priority, watering livestock, public utilities, irrigation, industrial purposes, minimal level of environmental needs. For these uses water distribution and transport should be done according to sanitary means.

The responsibility of sustainable water management in the irrigation sector and the setting up of operation and maintenance of irrigation structures is delegated to the Ministry of Agriculture and Irrigation (MAI). Moreover, MAI should provide protection from floods, soil and wadi banks erosion, maintain agricultural terraces and prevent the expansion of industrial or other infrastructure at the expense of wadi or rainwater runoff channels.

Existing and acquired water rights prior to the issuance of the law will be maintained, except in special cases when fair compensation will be ensured. Traditional water rights of rainwater

harvesting and natural runoff flow in relation to irrigation shall be maintained. The same applies for the traditional rights on natural springs, streams, and creeks. The traditional rights for surface wells whose depths do not exceed sixty meters prior to the issuance of the law shall be preserved. Holders of traditional rights are required to register their rights with NWRA, within three years of the issuance of the law.

It is noted that no individual, group, or civilian or military government entity may dig water wells or establish any water installation for holding or diverting rainfall runoff, or stream water in or above wadi beds, unless a license from NWRA has been previously secured. Sustainable procedures for conservation of water and protection from pollution are elaborated in terms of site selection, specification of equipment, and control of the erection of any structures for agricultural, industrial, or any other activities in specific water shortage regions. Further, NWRA with the relevant government entities is charged to:

- Issue permits for wastewater and waste oil disposal.
- Provide support facilities to farmers for the adoption of modern irrigation methods aimed at conserving water;
- Set up water dams, dikes, and reservoirs for harvesting rainwater and recharging the aquifers;
- Provide support for conserving soil and vegetative cover for combating desertification;
- Encourage community efforts for participatory management and conservation of water resources;
- Assign areas protected from any industrial activity, the wastes of which constitute a hazard to water resources.
- Prepare the procedures for regulating disposal of industrial and agricultural waste water;
- Prohibit the transport or disposal of pollutant wastes;
- Issue permits to set up industrial establishments, the wastes of which would lead to pollution or quality degradation of water resources, until an environmental impact study is provided.

The Water Law is a notable achievement in Yemeni legislation. Executive regulations for enforcement are to be prepared by NWRA within six months from the date of issuance of the law. As it stands, the new Water Law provides important legislation for environmental management of ACAP activities.

4) Cooperatives Societies and Unions Law (Law No. 39 of 1998*)*

Law 39 of 1998 concerning Cooperative Societies and Unions, which is the organizational and legal reference for all cooperatives and cooperative unions in the Republic of Yemen. This law is seen of relevance to the ACAP since it addresses community mobilization in terms of collective actions that would lead to better community involvement in the design, implementation and operation and maintenance of the coping measures and the income generation activities.

Law no. 39 of 1998 grants a relevant Ministry and its departments and branches in the governorates the right to supervise and assure compliance with relevant laws, and provide advice and technical assistance to the cooperatives to plan their activities as well as to attend their General Assembly meetings. It defines five specific types of cooperatives. Any other type of cooperative, such as Agricultural Cooperative Union (ACU) and its branches in the

country can be created according to the provision of Article 142, which states that it is lawful to establish other cooperative societies, according to provision of this Law, in other services. More specifically, Article 142 stipulates that a decree of establishment under appropriate line Ministry shall be developed and forwarded to the Ministry of Social Affairs and Labour for approval and issuance.

International and regional environmental legislation

The Yemeni Government has ratified multilateral environmental agreements on agrobiodiversity and natural resources, oceans and seas, hazardous materials and chemicals, atmosphere and air pollution, and health and workers safety. The following list provides the multilateral agreements relevant to the project activities:

Yemen is party to a number of international environmental agreements, the most important of which are:

- ③ the Convention on Biodiversity (CBD) singed on 1/12/2005
- ③ the Convention on the Conservation of Migratory Species (CMS); starting on the 1st of December, 2006; Yemen is party No.100
- ③ The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). *Signed at Washington, D.C., on 3 March 1973 and amended at Bonn, on 22 June 1979*
- ③ the United Nations Framework Convention on Climate Change (UNFCCC)
- ③ Kyoto Protocol
- ③ the United Nations Convention on Combating Desertification (UNCCD)
- ③ Environmental Modification
- ③ Hazardous Wastes
- ③ World Cultural & Natural Heritage, Paris 1982
- ③ Civil Responsibility for Damage from Oil Pollution, Paris 1979
- ③ Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971
- ③ Law of the Sea
- ③ Ozone Layer Protection. On December 19, 1994, the United Nations General Assembly proclaimed 16 September the International Day for the Preservation of the Ozone Layer, commemorating the date in 1987, on which the Montreal Protocol on Substances that deplete the Ozone Layer was signed
- ③ Yemen has also signed Stockholm Convention on Persistent Organic Pollutants (Signed: 12/05/2001; Ratified: 01/09/2004), which is a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.

Administrative framework

Project Implementation Unit (PIU)

The Ministry of Agriculture and Irrigation (MAI) will be the implementing agency of the ACAP. The project implementation unit (PIU) will be responsible to coordinate and manage the implementation of all project activities, in agreement with the other partners.

Project implementation will be overseen by the PIU which will be under the Ministry of Agriculture and Irrigation. The PIU will be headed by a Project Director and have staff to oversee procurement, financial management and administrative support functions and an international expert on climate change and natural resource management issues to provide technical oversight for the project.

A Project Steering Committee (PSC) of key stakeholders will be established to develop and coordinate activities between the partners. MAI's wealth of institutional and technical experience and its national mandate for agricultural issues in general and agrobiodiversity in particular will support the work of the PCU and to cooperate harmoniously with government partners to achieve the project's objectives. Additionally a Technical Coordination Committee (TCC) will be established to help during the transition phase between project preparation and project implementation.

Partnership arrangements

A wide range of stakeholders will be involved in the project, many of whom have already helped to shape the project design. They will participate during implementation in different ways: some will be involved as lead agencies – responsible for providing a leadership role and oversight of components, other will play a role as contributing technical agencies and partners in line with their institutional mandates. Community cooperatives and organizations will also be directly involved in the project delivery.

Institutional and implementation arrangements

The project will be implemented over 4 years, with primary coordination provided by the Ministry of Agriculture and Irrigation, and day to day implementation oversight provided by the Project Coordination Unit, consisting of the Project Director, supported by a core staff including procurement and financial management. In addition, there would be an international expert to deal with climate change and natural resource management issues, including M&E. The lead agencies for each of the components are (provisionally) as follows: Component 1: AREA; Component 2: CAMA; Component 3: MAI; Component 4: PCU, MAI.

Overall strategic guidance for will be provided by the Project Steering Committee (PSC) chaired by the Deputy Minister for Agriculture and Irrigation with membership from the following Ministries and agencies: MoPIC, CAMA, AREA, EPA, NWRA, PCU, MoF.

The Technical Coordination Committee (TCC) will include technical representation of the above entities but also include universities, NGOs, ICARDA, etc. In order to coordinate with on-the-ground activities, focal points from key community cooperatives may also have some representation in the technical committees as required.

The main partners working with ACAP will be the institutions listed as members of the PSC. At the technical level, the Technical Coordination Committees should be installed along the four components that accompany the project and support the PIU in all technical issues related to the implementation of the project. This includes specific branches of the organizations that are already listed as members of the PSC, see list below:

Ministry of Agriculture and Irrigation, MAI, Plant Production, Sana'a, which has an important role in developing national agricultural policies and legislations with respect to

plant production and seed management. One important task could be the certification of seeds and agricultural products from rainfed highlands. Within MAI, the Irrigation and Land Reclamation Sector (ILRS) represents all relevant aspects of agricultural irrigation. It has four General Directorates (GDOFI = General Directorate of On-Farm Irrigation, GDIS = General Directorate of Irrigation Structures, GDFRDC = General Directorate for Forests, Range and Desertification Control, GDSLR = General Directorate of Surveys and Land Reclamation). The ACAP aims to improve rain water use and on-farm hydrology (incl. spate irrigation), for the benefit of climate change adaptation. Therefore, results will be relevant for irrigated areas of Yemen. Ministry of Agriculture and Irrigation, Agricultural Research and Extension Authority (AREA), Genetic Resources Centre, which is an important unit within AREA responsible for the documentation, conservation and research of germplasm on agrobiodiversity.

Ministry of Water and Environment, Environment Protection Authority (EPA), Sana'a, which has an important role in climate, water and biodiversity, related issues. EPA played a leading role in the preparation process of the National Adaptation Program of Action (NAPA).

Universities and their respective institutions, like Sana'a University (Yemeni Genetic Resrch Centre; plays a central role in the interdisciplinary conduction and coordination of research on genetic resources and local knowledge assessment including cooperation with non-governmental organizations), Dhamar University (Faculty of Agriculture; can contribute knowledge and experimental facilities on crop species and management), and Aden University (Faculty of Agriculture, Department of Applied Ecology; has experience on the flora of wild species and their traditional use).

General Seed Multiplication Corporation, Dhamar (GSMCD), which plays a central role in the coordination and conduction of seed management and improvement as well as collaboration with local communities in the rainfed areas

Yemeni Association for Sustainable Agriculture Development (YASAD), Sana'a, which plays a central role in linking science with practice and promoting sustainable agriculture including agrobiodiversity aspects.

Initiatives de Développement (IDDEALES), Durable et Equitable et Actions Locales pour les Echanges de Savoir (Initiatives for Sustainable and Equitable Development, and Local Actions for Knowledge Exchange) which represents an important NGO complementary to YASAD and conducing local projects in rainfed areas of high agrobiodiversity.

Agricultural Cooperative Union (ACU), which represents the farmers and has valuable knowledge of their local situations and training needs.

International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, which has experience in agricultural and agrobiodiversity aspects in West Asia including participatory approaches with local communities.

Yemeni Women union, (YWU), is a union that deals with the welfare of women in terms of training, empowerment, abuse, etc.

Baseline data

Project area description

The rural population relies on agriculture as a source of income. According to the Yearly Statistics Book (Central Statistical Organization, 2008), the cultivated area in Yemen is 1,485,031 ha in which about 383,563 hectares (26%) are located in ACAP governorates (Sana'a, Al-Mahweet, Ibb, and Taiz).

Information on existing natural and socio-economic resources is of fundamental importance for evaluation of environmental impacts. The baseline data on the current status of the physical, biological and socio-economic environments of the project areas are presented in the following paragraphs.

The Physical Environment

The physiographic characteristics of Yemen are very diverse, consisting of high, steep mountains, escarpments, deserts, coastal plains and hundreds of wadis running between the mountains and through the coastal plains. The country is classified into five physical regions (Mountain Massif, Eastern Plateau, Desert Regions, Coastal Plans and Yemen Islands). The project areas of the **ACAP** are located in massif regions, where Sana'a, A1-Mahweet Governorates in the central mountain massif, Ibb and Taiz in the southern mountain massif. The following sections describe the different physical conditions of Yemen and the ACAP areas:

- Arid tropical climate, which covers the coastal plains region and lower mountain slopes in the west and south and is characterized by high temperatures and low precipitation ranging from 0 to 400 mm.

- Arid sub-tropical climate, which is a transitional climate between the tropical climate of the coastal, plains region and the temperate climate of the highland region. Mean monthly temperature climate varies from 16°C to 28°C. Precipitation ranges from less than 100 mm to 800 mm. It covers the lower and upper mountain slopes and the eastern plateau region. (Taiz, Ibb and Al-Mahweet governorates)

- Temperate climate, which covers the mountains ranging in altitude from 1,800 to 3,700m above sea level. Mean monthly temperature in this climate ranges from 10°C to 18°C. Precipitation varies from 200 mm to more than 1,200 nm. (Sana'a,)

In most areas of Yemen, the reliability of rainfall is a critical concern, reflected in the fact that little or no truly rainfed agriculture is practiced. In virtually all cases, some form of rainfall supplementation occurs, whether tube-wells or hand-dug well systems or flood-water harvesting. Three main types of water collection are utilized for irrigated agriculture:

- Rain-water harvesting, which is based on collecting and retaining (mainly through contour bench terracing) overland flow in zones where soils permit agriculture. The numerous mountain terraces collect and retain rain and overland flow in a similar way in areas where natural slopes may be excessive, 12 percent or greater.

- Flood-water harvesting (or spate irrigation), which traditionally involves simple

earth-built diversion systems and irrigation networks near wadis. With small spates, these temporary embankments can be effective; with large spates, they are often swept away. Modern spate structures are built in wadi Zabid, Mawr, Siham to divert floods and withstand high flashes.

- Ground-water irrigation, which supports a11 agricultural area of about 444,000 ha, of which about 408,000 ha from tube wells and 36,000 ha from spring water.

Groundwater remains the main water source for different water uses. The water levels in most critical aquifers are declining due to heavy extraction; in some cases water is extracted twice as fast as water recharge. Available fresh water per capita is decreasing. It fell down from 1,100 m^3 in 1,990 to 500 m3 in 1995. Considering the present pattern of water utilization and population growth, it is expected that water per capita will be only 100 cubic meters in the coming 25-30 years. In 2012, about 81 percent of urban and 21 percent of rural populations had access to safe drinking water. Water-borne diseases are one the main causes of infant mortality.

The Biological Environment

Yemen is very rich in flora and has a wide range of natural vegetation types, a mixture of species from East Africa, the Sahara-Arabia, and the Mediterranean. The vegetation coverage ranges from 9 to 43 percent and is dominated by grasses and dwarf shrubs. Precise data on the status and number of rare and endangered plants in Yemen are not available, however, some eight species plus some 19 additional species are considered endangered at the national level. Medicinal flora is not well documented in Yemen and research on the subject is limited, however, medicinal and aromatic plants are of great interest to rural highlands of Yemenis.

Yemen's fauna comprises a population of 71 recorded land mammal species. Five species of gazelle have been recorded, four of which are believed to be almost extinct in the country. Other species are ibex, Oryx, baboon, red fox, wolf, hyena, jackal and bats. Among the most notable are the Arabian Leopard, which is considered endangered or already extinct and the cheetah, which has not been seen in the wild since 1963. Yemen is very rich in bird life and more than 350 species have been recorded. The presence of a wide variety of habitats and strategic positioning at the transition of three geographic regions make the country all ideal stopover in the flight paths of migratory birds, notably birds of prey and waders.

The major threat to flora in Yemen and the ACAP regions are cultivation and poor agricultural practices, wood cutting for timber firewood and charcoal, over-grazing, soil salinity, wind erosion and expansion of villages and cities. The major threat to fauna is over-hunting, killing of animals perceived as dangerous such as snakes, and destruction of habitats through deforestation and urbanization.

The Socio-Economic Conditions

As noted above, the project areas for the **ACAP** are located in four of Yemen's 4 governorates (see table 1). In each of these governorates, the project will be implemented in eight districts.

Population: The birth rate is 43 births for every 1000 persons. The total fertility rate is 6.7 children born per woman. The growth rate of the population is around 3.2 percent per year, while life expectancy is 57 years. The mortality rate for girls is 15 percent higher than for boys. Table 3 below list the population fro each district.

Table 3: Total Population of the Districts

District	Area (km^2)	Population density (person/ km^2)	No. of households	No. of families	population		
					male	female	total
Bani Matter	398	78.5	4161	4123	15862	15397	31259
Bilad Ar Roos	1127	8.3	11981	12410	51112	48887	100012
Al-Mahweet	žfl ž	1.0			–ž ž	ž–	ž–
Al Rugum	fl	1.0	ž			ž –	ž
As Sadah	270	306	12519	11663	39696	42806	82502
Ba'adan	240	484	15284	15569	54957	61088	116045
Saber Al-Mawadem	ž	542	–	– ž–	– ž–		–ž
Al-Mawaset	ž ł	555	–	–	ž		––
Totals	99,243.8		89467	89742	312117	338896	651050

Poverty: Some 45 percent of the population in rural areas lives below the poverty line. For the nation as a whole, 50 percent lives below the poverty line, with as many living on less than 2 USD/day, and 18 percent living on less than 1 USD/day. Table 4 lists Poverty Index (PI) for the ACAP areas.

Table 4: Poverty level in the targeted ACAP areas

Name of territory	Number of Districts	Name of the poorest district (s)	% of poverty index	Name of the least poor district (s)	% of poverty index
Sana'a	8	Attyal Khwlan Jahanh Bani Dhabyan Attyal Bilad Ar Rus Al Husn	65.3	Sanhan	44.9
Al -Mahweet	5	Hufash	68.5	Shibam and Kawkaban	53.8
Ibb	6	Hazm Al Udayn Hubaysh Far Al Udayn	72.9	Mudhaykhirah	63.8
Taiz	4	Mawiyah	71.2	Haifan	50.9

Health: Around 18 percent of the population cannot afford adequate nutrition and some 46 percent of children under five are malnourished. As much as 90 percent of the population has less than the minimum standard of domestic water supply. Infant mortality, in terms of the number of children dying before reaching age one, is high.

Education: The overall primary education rate is 78 percent, but only 55 percent of primary school-aged girls attend school (with even less in rural areas at 24 percent). The overall literacy rate is 50 percent - male literacy being 70 percent and female literacy 30 percent which is typical to the ACAP areas.

Employment: The overall unemployment rate in Yemen is 39 percent, with the employment rate for women being less than one-third that of men. Typically, women are employed in low-productivity rainfed agriculture and small livestock activities. Access to credit is limited generally, but especially for women.

Access to Services: Large parts of the project area, especially those located in the mountains and remote regions, are inaccessible, with only limited connection via roads. Most villages in the hinterland can be reached only with 4-wheel drive vehicles. Few villages have electricity; however, the use of cell phones is widespread.

Farmers and Livestock Owners: The ACAP areas are dominated by farming practices of terraces where farmer's main income is from cultivation of these terraces. Both women and men farmers share the responsibility if farming activities in addition to the household activities for women. The areas contain several types of cattle such as goats, cows, and sheep. There also camels and donkeys who are used for carrying materials and for ploughing. The intended beneficiaries of the **ACAP** are obviously the fanners and livestock owners whose productivity and economic well-being will be improved by the interventions of tile project. They will see the direct benefits of the enhanced seed production, improved livestock protection and expanded water and soil conservation and management. In addition to the farmers and livestock owners, their families (women and children), their neighbours and local communities should also benefit from the project in terms of improved living conditions and incomes and expanded economic opportunities. Women in rural areas, whom Yemeni cultural traditions have kept at a lower status and prevented from gaining control over important household resources, particularly stand to benefit from the project. There are educated and active women in many villages in the project areas whose roles in local development will be enhanced by the project. The EIA team met with a number of farmers and livestock owners, villagers and other locals in the project areas visited in both formal and informal settings.

Area cultivated: The majority of the crops lands is cultivated by cereals then fodder crops. There are few areas cultivated by legumes, vegetables, and fruits. The most widely cultivated crop is sorghum, followed by Qat and wheat. See table 5.

Table 5:Governorates Total Areas and % Cultivated

Governorate	Total Area (km^2)	Cultivated Areas (ha)	% of Crops Area to the total area
Ibb	5,344	88,671	16.6
Taiz	10,009	87,922	8.8
Al-Mahweet	2,332	30,491	13.1
Sana'a	11,961	176,479	14.8
Total area cultivated		383,563	

Source: 2007 Statistical Book of CSO for all data except total areas of governorates which has been taken from MoPIC Third Economic and Social Plan

Gender issues

Background

Over the last several decades, considerable effort has been made throughout the world to provide women farmers and women on the farm with efficient, effective, and appropriate technology, training, and information. The positive effects are beginning to show in agricultural production statistics and in indices of family welfare. Yet these successes still fall far short of what is needed at a time when public sector investments in agricultural research and extension are under pressure, when ever-greater demands are being placed on rural women in the face of rapid social transformation, and, in an increasing number of the rural areas, when evidence of environmental degradation is mounting and the dilemma of climatic changes.

Yemen is facing a significant challenge of gender inequalities which is considered to be amongst the highest in the world is challenged by many cultures and traditions hat prevents them from participation. Yemen is ranked 121st out of 140 countries in Gender Development Index (GDI). Generally speaking, in addition to the traditions and culture that prevent women from contribution in many of the life domains they suffer from restricted access to resources like land as well as education and employment opportunities. Only 33% of rural girls compared to 73% of rural boys and 78% of urban girls are enrolled at schools. This in on one hand suggests not only a low level of schools enrolment for both sexes in rural area but also inequity in rural girls access to schools compared to their fellows of urban girls and even rural boys. Women are overwhelmed with plenty of farming and domestic responsibilities posed on them by the traditional labour distribution arrangements. This, among other factors, is considered one of the big challenges that prevent women from participation.

Girls in villages did not have access to the same educational resources as in the cities. Especially with regard to computer skills, which are so necessary for employment and for development today, lack of access to this information was damaging to the potential for village women to succeed.

> *"If we want to encourage women's contributions. They need to be pulled out of the dark tunnel and the vicious cycle that they live in. Girls illiteracy programs and education are the keys "*
>
> *Ar Rujum, Al-Mahweet – Women Farmer*

The unavailability of computer at schools is very linked to the absence of sufficient energy. Unemployment is also higher among educated women. Although the role played by women in the household economics is significant, their input is to a far extent invisible and underestimated. Women are more engaged in the informal sector which is seldom recorded in the official statistics. Women are also overwhelmed by additional domestic responsibilities associated to the absence of services. They are the primary responsible person on fetching water, firewood and animal fodder and this, among other factor, is seen to be a major challenge for women.

"Women suffer a lot in the rural area; no easy accesses to water, health problems especially to pregnant women, children's care are women's affair, farming activities are a must for the women and part of her marriage arrangements. Just to say a few and what is left many. At the end of the day no respect from some men"
Bilad Ar Roos – Women farmer and house hold care taker

Gender analysis

Introduction

During the field work that was conducted as part of this ESIA, certain categories of women are seen to be more vulnerable. This includes the poor and those do not have recorded genealogies or tribal origin, gender related issues were assessed during the interviews. It was found that the situation of women in certain places is very restricted and their mobility is very limited like the case in Sana'a. On the other hand, women were found to be more active in the public life in places like Saber Al-Mawadem. Table 6 below shows common women economic activities in the ACAP areas

Table 6: Common Women Economic Activities in the ACAP areas

Service Territory	District Surveyed	Key Economic Activities Practiced by Women
Sana'a	Bani Matar	The majority of women are housewives who help their husbands in farming activities, and their domestic role. Women contribution in the public life is unacceptable due to the social and tribal considerations
	Bilad Ar Roos	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is unacceptable due to the social and tribal considerations
Al-Mahweet	Al-Mahweet	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is unacceptable due to the social and tribal considerations
	Ar Rujum	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is unacceptable due to the social and tribal considerations
Ibb	As Sadah	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is unacceptable due to the social and tribal considerations
	Ba'adan	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is unacceptable due to the social and tribal considerations
Taiz	Saber Al-Mawadem	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is some how acceptable where women go to markets and sell farming and house products
	Al-Mawaset	The majority of women are housewives who help their husbands in farming activities and household activities. Women contribution in the public life is some how acceptable where women go to markets and sell farming and house products

The term gender describes the socially determined attributes of men and women, including male and female roles. Gender has proven to be an essential variable for analysing the roles, responsibilities, constraints, opportunities, incentives, costs, and benefits in agriculture. Innumerable development projects, government programs, research studies, and theoretical models have demonstrated that the improvement of women's access to agricultural research and extension services and water must begin with an analysis of men's and women's participation in the agricultural production process along two related dimensions: their role in agriculture and their role in the household.

Gender in agriculture

It is now widely demonstrated that rural women, as well as men, are engaged in a range of productive activities essential to household welfare, agricultural productivity, and economic growth. Yet women's substantial contribution continues to be systematically marginalized and undervalued in conventional agricultural and economic analyses and policies, while men's contribution remains the central, often the sole, focus of attention.

Women are typically, and wrongly, still characterized as ***economically inactive*** in statistical surveys of agriculture, a result that tells us more about survey methodology than about reality (Janelid, 1975). Agricultural extension services still do not attach much importance to reaching women farmers or women on the farm. Policy makers and administrators typically still assume that men are the farmers and women play only "supportive role" as farmers' wives (Samanta, 1994).

The recent investigation of GEF project in the rainfed rural areas (unpublished) suggest domination of women in farming activities. Women own almost the same cultivated area as men. On family level in smallholder farms the women are carrying the major work load. A lot of their time is spent collecting firewood; carrying water etc. loosing the opportunity for more profitable activities.

The public consultation study of the ESIA indicated that women in some areas do all farming activities when men are seeking livelihood in the nearby towns. The study also indicates that women farmers share most farming activities with the men.

Gender at the household level

The rural household typically is a unit made up of individuals working in similar ways to meet common goals under the direction of a male head. In reality, the household is a more complex and dynamic social entity which may change its composition and goals over time as family members and dependents of varying age groups and sexes engage in various activities to meet the specific responsibilities assigned to each.

However, while it is useful to draw attention to the fact that the distribution of labor along gender lines is a social and economic dimension, such division is not clearly adapted in equal terms. Women still has the major role in the house while men, the leading figure, is only giving orders and share no responsibility in the different tasks and activities in the house. The perception of men is dedicated along this line of superiority.

Women Empowerment

The rapidly changing climate, increased variability in rainfall, water stress, and the poor management of natural resources affected the recent farming practices. This in turn is increasingly threatening community livelihoods in the highland areas forcing women to bear heavier work burdens and men to migrate to urban areas to seek out a better living condition. The changing climactic conditions is seen as an opportunity to empower women farmers, making them important players in the preservation of historic agro-biodiversity and valuing them as recipients of critical knowledge that will help reduce their level of poverty and better manage natural resources. In particular, women farmers are seen as the holders of critical knowledge that can give way to more efficient farming practices, better water and soil usage, and the growing of crops that are nutritional, productive, and suited to local conditions.

Despite low in the skills of female farmers, inaccessibility of women in many areas, and limited participation of women in the selection and design of projects; acknowledgement of women's needs and interests should be integrated in any activity or project. A national agricultural strategy should trigger the importance of women's' participation and involvement side by side with the men. The following are some suggestions in that line:

1. Conduct additional gender-sensitizing programs for policy makers and project implementers.
2. Collect gender-disaggregated data on rural and agricultural activities.
3. Encourage a more participatory approach, particularly involving more rural women.
4. Ensure equitable access to productive resources and extension services.
5. Design situation-specific implementation strategies, taking into account the unique socio-cultural and ecological variations of each area.

Recommendations for more effective women empowerment

Building on present potentials

Rural women in developing countries do possess skills and techniques which are an asset to the development process. Where groups already exist, capacity building of existing groups can be more successful than forming a new group to which members are less likely to be committed. Similarly, rural people are less likely to resist adoption of an innovation when the new technique is based upon a concept or procedure they are already familiar with or are currently using.

It is important for during the initiation and development of projects to get acquainted with the organizations and knowledge systems available at the local level to determine how they can be improved, rather than assuming that nothing of significance is currently available. For example, instead of forming entirely new groups for women, local informal group or committees could be strengthened through short training exercises on farm bookkeeping and record-keeping, leadership, participation and democratic procedures.

Institution strengthening

Several aspects of institution strengthening, including project integration and gender-sensitization of officials, have been presented. The (World Bank 1992) summarizes four organizational principles which might serve as broader guidelines to institutional development: (1) situation specificity, (2) project flexibility, (3) farmer participation, and (4) mainstreaming women's programs. By incorporating these principles with the other factors

such as socio-cultural and local considerations, projects concerned with women's welfare will be more likely to have a meaningful and sustainable impact.

Training Programs

Capacity building and training is a field that is not well adapted to women. The following suggestions are made for improving and redesigning training programs for farming women:

1. Adapt programmes to women's needs and skills.
2. Allow sufficient time to enable women to acquire new skills and adjust schedules to fit women's existing workloads.
3. Provide training in agricultural and other productive activities, not just home and family welfare topics.
4. Emphasize activities for which there is an actual income-generation potential.
6. Ensure the involvement and full participation of women from poorer and less educated backgrounds.
7. Use trainers who are not only technically competent and up-to-date, but who empathize with the needs and aspirations of rural women.
8. Provide practical field experience in the use of innovations.
9. Shift more resources to village-based training rather than residential training.

Project Alternatives

No Project Alternative

The "no project" option means that there is no urgent need to adapt to climate change and to use coping measure. A "no project" alternative means continuing the present approach to agrobiodiversity management, with little or no considerations for agrobiodiversity conservation and ecosystem issues, limited investments specifically targeting crop loss, soil degradation, terraces destruction, water loss, and limited participation of local communities and relevant stakeholders. **This alternative is therefore rejected.**

A purely scientific program of Technical Assistance with no community involvement

This alternative was considered and rejected as designing coping mechanisms in a laboratory setting would not be pragmatic and would not have the benefit of "learning by doing" and feedback from farmers, the ultimate users of the coping mechanisms.

A community based natural resource management project

This alternative was considered and rejected because it is increasingly evident that the natural ecosystems are themselves vulnerable to climate change. Instead, the project will use the traditional knowledge of the agro-ecosystems, coupled with improved climate understanding over time, to design a range of coping mechanisms. While 'win-win' or 'no-regrets' measures are important and have a place in adaptation, they themselves could be vulnerable in the longer term if they are not underpinned by increasingly rigorous scientific and technical knowledge.

Focus on rain-fed agriculture vs. irrigated agriculture

While both rainfed and irrigated agricultural systems are constrained by water, the choice of the project to focus on rain-fed areas was based on the direct vulnerability of the rain-fed areas to variations of precipitation and temperature as a consequence of climate change, and the greater need for the farmers to cope with the inter-annual variation and variability of precipitation. This is coupled with the fact that rain-fed highlands are globally important agro-ecosystems holding critical agrobiodiversity resources that could provide locally based solutions to cope with climate change and enhance food security both in Yemen and elsewhere. Moreover, the design takes into consideration a key lesson from implementation of the Seeds and Agriculture Services project [P03917] which was that, "c*onsidering that about 60% of agriculture in Yemen is under rain-fed conditions, follow-on projects should place more emphasis on rain-fed agriculture."*

Location of an agro-ecological gradient vs. total overlap with RALP project sites

While a total overlap with RALP sites would have been convenient, it would not have captured the key aspects related to biodiversity and climatic variability over a meso-scale agro-ecological gradient. In addition, the present design takes into account one of the key lessons from implementation of the Seeds and Agriculture Services project, which is, "the pattern and distribution of rainfall as well as temperature in Yemen varies from one region to the other. This unique microclimatic situation should be taken into account during the implementation stage in future projects for variety development and testing activities." Therefore, the project and especially Component 3, are designed to test and pilot coping

options along a meso-scale transect that covers a range of altitudes, mean annual precipitation and agro-ecological gradients within the rain-fed highlands.

The ACAP alternative

This project will provide a suite of options to farmers in the rain-fed highlands, to cope with climate change by building the knowledge base on climate change and agro-biodiversity. At the national level, the project will initiate improvements in collection, recording and analysis of climate data and development of national/regional climate models. Climate-related data is currently being recorded in monitoring stations under the authority of various organizations such as CAMA, NWRA and AREA, for their purposes and with little coordination. The project will help in creating a coordination and cooperation mechanism among such entities, and will put in place a template that will capture the various climate-related parameters that are being recorded both within and outside the country for Yemen. Simultaneously, at the community level the project will finance documentation of agro-biodiversity and traditional knowledge of the highlands, which have the potential to equip rain-fed agriculture with land races and farming techniques that are more tolerant to climatic variability and change. During the course of the project some coping options would be piloted with the communities in the highlands.

The interventions initiated under this project are intended to be the building blocks which will help meet the challenges of climate change over the long term. The project is designed as a pilot, and is closely aligned with the RALP which is under implementation. Coping options developed during implementation of the proposed project will be scaled up through the RALP. More details about the different components are described in chapter 2 above.

Accordingly it is clear that there will be many environmental and social benefits from the ACAP that over-weigh it's limited and minor impacts, in addition to the developmental and socio-economic benefits. Therefore, ACAP alternative is the most accepted one.

Potential Environmental and Social Impacts

This chapter highlights the environment and social assessment of the potential environmental and social impacts of project activities, particularly of subprojects envisaged under Component 3, (see project description) which includes land use management, water management, crop management and societal coping measures with focus to women. A screening matrix has been developed listing the different activities and the relative impacts it may produce against specific environmental and social receptors which are explained in the following sections.

Identification of potential environmental and social risks

The following sections list a discussion of the main expected potential environmental and social impacts on each of the subproject components.

Anticipated environmental and social positive impacts

The impacts would positively be in favour to the communities since the activities introduced will allow farmers to cope with climatic changes in terms of water availability as supplementary irrigation, rehabilitation the deteriorated terraces that farmers are abandoning, in addition to women empowerment. The following lists the positive impacts.

Providing the communities with water harvesting systems: WHS are use for supplementary irrigation to irrigate crops during short or/ and changes of times of rainfall. Water provided to cattle's are also a great benefit during the same periods and also during rainy seasons. Yemen through past periods of time has been using WHS in all mountainous areas due to the importance of such systems to the stability of communities. **Mobilize the communities and encouraging community participation** would make operation and maintenance more effective and water distribution and allocation more equitable resulting in social coherence and stability.

Terraces rehabilitation: terraces are the main agricultural source in the rainfed highlands where Yemenis have been using these systems efficiently, maintaining them properly and depending on their production of different types of crops. The rehabilitation and maintenance of terraces would allow communities to use them more efficiently which would result in more agricultural activities, increasing income to families, and settlement of farmers. Social relationships and interaction would be positively enhanced through cooperation and participation.

Establishment of flood protection structures: climate change also produces high flood flow causing damages to infrastructure, agricultural land and houses. Helping the communities to avoid damages to their fields and farms by providing such protection structures means preservation of crops and farms and saving long season production costs input and sustains the livelihood of the farmers. **Building up the skills of farmers with participation tools** will encourage farmer's participation in a regular maintenance of these structures allowing the structure to last longer and stand against sudden floods. **Women empowerment:** increasing awareness and education levels among women especially of their rights and mobilizing them into comities and associations will enable them to recognize their strengths and to share responsibilities with the community more effectively. Additionally, it will allow women to take decisions on matters and activities that concern them and on most issues that affect both

women and men. It is known that women work the hardest in Yemeni rural areas where they do most of the household works in addition to farming activities, water fetching etc… More empowerment would result in giving women better status and provide them with better opportunities to reduce hardship, alleviate illiteracy, improve the health status of women and their children and contribute more positively to the community they live in.

Introduction of improved seed varieties tolerant to droughts: the climate change affected the agricultural system and reducing the production of the usual crops. Introducing new varieties seed tolerant to droughts (and thermo-stress) would enable farmers to cope with the climate change through the cultivation of such varieties. Consequently, such improved varieties will result in sustainable production, better income and social stability. These improved and better seeds will result in improved crop varieties that are likely to be better adapted to shifts in climate patterns.

Income generation activities: such as:

1. Construction of small nurseries/home-gardens to produce plants, vegetables, fruits, aromatic and medicinal plants
2. planting, preparation and packaging of medicinal herbs (aromatic and spices)
3. small home-based catering business specializing in traditional recipes
4. agro-processing
5. beekeeping
6. planting of almond trees
7. Producing traditional ceramic ware for conservation purposes (to house seeds, etc.)

Communities will be offered a practical way of alleviating poverty through the sustainable use and conservation of agro-biodiversity resources by financing small sustainable projects run by farmers in the targeted rain-fed areas. **Involving the communities in a participation process** of implementing such activities will offer them with better tools of management, social stability and good income.

However, any activity will be accompanied with impacts that may affect the outcome and the results envisaged and aimed at by the project people. Therefore, it is necessary to address the anticipated impacts, if any, and the required mitigation measures in order to implement the different activities positively and effectively. The next part highlights the anticipated negative impacts of the activities.

Anticipated negative impacts

The following environmental receptors are the ones relevant to the project activities and they will be used to assess the environmental impacts of the different activities on each of them.

- Agrobiodiversity
- Air quality
- Water quality
- Water quantity
- Soil degradation
- Pasture
- Human health
- Animal health

The social receptors are suggested to outline the social agenda within the community in such a

way on how the subproject interventions affect the community. The receptors are:

- Social satiability
- Community participation
- Household income
- Family relations and
- Women empowerment

The assessment of negative impacts is based on a quantitative assessment ranging from 1-4 where "4" is high impact (H), "3" is moderate (M), "2" is low (L) and "1" is neutral or negligible (N). The decision for impact evaluation is based on the following rules:

- If any of the attributes is ranked "High", the overall impact is significant (H).
- For an impact to score as "Neutral" or no impact, all attributes has to be ranked as "Neutral" (N).
- For the rest of rules, an impact is evaluated based on the dominant ranking.
- In case of a tie, the higher rank prevails (e.g. if the number of attributes ranked as "Low" equals the number of attributes ranked as "Moderate", the overall impact is considered of "Moderate" significance.

Analysis of Impacts

Land Use and Management

Measures to enhance traditional practices of soil fertility: Farmers are mainly using animal organic matters as fertilizers in addition to chemical fertilizers. Manure application and cover the land with stems, leaves and roots from harvests are some traditional practices used by involving women in the process of collection, and application on the fields. The environmental impact of organic manure on the human's health is **moderate** and would require specific mitigation measures. **The social impact is, however, negligible.**

Measures to increase and preserve soil moistures: any activity in the project to provide a substantial soil moisture enhancement will have no environmental and social impact. On the contrary positive impacts will prevail.

Rehabilitation and maintenance of terraces: Terraces rehabilitation would involve some construction aspects that might produce **low impacts** to the environment such as *roads to provide easy access for construction, transport of agricultural soil, and solid construction wastes.* Social impact would be important in the case of community involvement and interactions. However social aspects might produce **moderate** impacts such in terms of the community refusing *to provide their contributions*.

Enhancement of traditional practices of soil fertilization: the only impact on the environment which is moderate that people especially women might be affected when dealing the manure.

Water Management

Safe and free access to water through water supply systems especially for women: environmental impacts of such systems are delineated by; (1) d*isposal of oil and fuel and spare parts on agricultural land and pasture and increase of smoke which produce moderate impact (M) and (2) the overexploitation of water that produces high impact (H).*

Rehabilitation and construction of water harvesting system and springs (WHS): the WHS will have a *low (L) impacts on the environment due to the following aspects; use of agricultural land as WHS sites, wastes of construction material. While it will produce moderate (M) impact on health as a result the increase of mosquitoes*. The social impact is found **moderate**.

Establishment of flood protection structures: environmentally, low impacts (L) are resulted due to; (1) *Establishment of protection structures in areas causing impacts on the existing habitat features, (2) Solid wastes such as debris are left nearby the structures after completion of the construction and (3) Intermittent damages are not repaired or rehabilitated on time, weakening the structural system of the flood protection works.* On the other hand, social impact are seen to be moderate (M) due to; (1) *Refusal of some farmers to provide the contribution for the construction of the structures* and *(2) Improper maintenance of the structure.*

Crop Management

Introduction of improved crops (drought tolerant varieties): the activity may result in low impact (L) on the environment due to the presence of *some insects and crop diseases with the new varieties.* Negligible social impact (N) is foreseen with this activity.

Introduction of improved trees (drought tolerant varieties): the activity may result in low impact (L) on the environment due to the presence of *some insects and crop diseases with the new varieties.* Negligible social impact (N) is foreseen with this activity.

***Preservation of seeds*:** the impact on the environment is low (L) due to the miss management of preservation whilst social impact is negligible (N)

Establishment of community centres for conservation: the activity could have low (L) environmental impacts due to: *(1) Building the community centre on agricultural land and pasture and (2) Construction solid wastes are left on the site.* The social impact is also low (L) which is due to; *(1) Refusal of farmers to provide the contribution for the establishment of the centre and (2) The canter could be used for activities other than conservation activities.*

Income Generation Activities

Construction of small nurseries/home-gardens with a preference for those using grey water and other conservation methods: the environmental impacts would result from: *(1) Grey water used is not well treated (2) Solid wastes of construction materials such as plastics and metals may pollute the environment near the nurseries* which both have low significance (L). Socially, low impact (L) will be due to *Refusal of farmers to provide the contribution for the construction of the nurseries/ home gardens* and moderate impact (M) due to *improper operation and maintenance of the nurseries/home gardens.*

Agro processing: a waste water production may produce low (L) impact on the environment while on the social aspect; it has negligible impact (N)

Producing traditional ceramic ware: low (L) environmental impact resulted from *using clay from fertile agricultural lands.* The social impact is negligible (N).

Beekeeping: environmentally, the activity will have negligible impact (N). Socially, it will have moderate (M) impact due to *the disputes between farmers on who first gets the beekeeping nurseries* which will affect the social stability.

Women Empowerment

Safe and free access to water through water supply systems especially for women: the social aspect of this activity might produce conflicts among women in terms of *water allocations.* The impact is seen to be of moderate (M) significance.

Empowerment of women: *reluctances and unwillingness of the community especial men to support women* could be resulted when implementing this activity. A moderate impact (M) is seen as a result.

Tables 7 and 8 list the environmental and social management matrixes. The matrices describe the activities, the impacts and the impact significance on the both environmental and social receptors.

Table 7: The Environmental Management Matrix

No.	Activities	Environmental Aspects	Environmental receptors								
			Agrobiodiversity	Air quality	Water quality	Water quantity	soil degradation	pasture	Human health	animal health	overall impact
1. land use and management activities											
1.1	**Soil conservation techniques**	Not applicable (NAˇ	N	N	N	N	N	N	N	N	N
1.2	**Preserve soil moistures**	(NA)	N	N	N	N	N	N	N	N	N
1.3	**Rehabilitation of terraces**										
1.3.1		Roads are constructed on agricultural land and pasture areas to provide easy access for terrace rehabilitation	L	N	N	N	L	L	N	N	L
1.3.2		transport fertile soil from agricultural land and pasture areas to the rehabilitated terraces	L	N	N	N	L	L	N	N	L
1.3.3		Solid wastes such as debris are left on the terraces after completion of the construction	L	N	N	N	L	L	N	N	L
1.4	**Enhancement of traditional practices of soil fertilization**	Users health may be affected especially women due to unsafe use and application of manure	N	N	N	N	N	N	M	N	M
1.5	**Enhancement of traditional practices on soil moisture**	NA	N	N	N	N	N	N	N	N	N
2. water management activities											
2.1	**Safe and free access to water through water supply systems especially for women**										
2.1.1		Disposal of oil and fuel and spare parts on agricultural land and pasture and increase of smoke	L	L	M	N	L	L	L	N	M
2.1.2		overexploitation of water	N	N	H	H	N	N	N	N	H

No.	Activities	Environmental Aspects	Environmental receptors								
			Agrobiodiversity	Air quality	Water quality	Water quantity	soil degradation	pasture	Human health	animal health	overall impact
2.2	**Rehabilitation and construction of water harvesting systems and springs**										
2.2.1		Construction of the Water Harvesting Systems on agricultural land an pasture	L	N	N	N	L	L	N	N	L
2.2.2		Solid wastes such as debris are left on land nearby the harvesting systems after completion of the construction	L	N	N	N	L	L	N	N	L
2.2.3		increase of mosquitoes due to open water surfaces	N	N	N	N	N	N	M	N	M
2.3	**Establish small flood protection structures**										
2.3.1		Establishment of protection structures in areas causing impacts on the existing habitat features	L	N	N	N	N	N	N	N	L
2.3.2		Solid wastes such as debris are left nearby the structures after completion of the construction	L	N	N	N	L	L	N	N	L
2.3.3		Intermittent damages are not repaired or rehabilitated on time, weakening the structural system of the flood protection works.	L	N	N	N	L	L	N	N	L
3. Crop management activities											
3.1	**Introduction of improved crops (drought tolerant varieties)**	some insects and crop diseases might be introduced with the new crops	L	N	N	N	L	N	L	L	L
3.2	**Introduction of improved trees (drought tolerant varieties)**	some insects and crop diseases might be introduced with the new crops	L	N	N	N	L	N	L	L	L
3.3	**Preservation of seeds storage**	storage techniques˜Bad seeds	L	N	N	N	N	N	N	N	L

No.	Activities	Environmental Aspects	Environmental receptors								
			Agrobiodiversity	Air quality	Water quality	Water quantity	soil degradation	pasture	Human health	animal health	overall impact
3.4	**Establishment of community centre for conservation**										
3.4.1		Build the community centre on agricultural land and pasture	L	N	N	N	L	L	N	N	L
3.4.2		Construction solid wastes are left on the site	L	N	N	N	L	L	N	N	L
4. Income generation activities											
4.1	**Construction of small nurseries/home-gardens with a preference for those using grey water and other conservation methods**										
4.1.1		Insufficient water availability to irrigate home gardens and nurseries	N	N	N	N	N	N	N	N	N
4.1.2		Grey water used is not well treated and did not passed through simple treatment processes	L	N	L	N	L	L	L	L	L
4.1.3		Solid wastes of construction materials such as plastics and metals may pollute the environment near the nurseries	L	N	L	N	L	L	N	N	L
4.2	**Agro processing**	Waste water produced due to agro processing may contain some pollutant substances	L	N	L	N	L	L	L	L	L
4.3	**Producing traditional ceramic ware for conservation purposes (to house needs, etc.)**	Material used such as clay are taken from fertile agricultural farms and pasture areas	N	N	N	N	L	L	N	N	L
4.4	**Beekeeping**	Not Applicable (NA)									

N= no impact or negligible
L= low impact
M= moderate impact
H= high impact

Table 8: Social Management Matrix

No.	Activities	Social Aspects	Social receptors					
			Social stability	Community participation	Household income	Family relations	Women empowerment	Overall impact
1. Land use and management								
1.1	**Soil conservation techniques**	Not Applicable (NA)	N	N	N	N	N	N
1.2	**Preserve soil moistures**	NA	N	N	N	N	N	N
1.3	**Rehabilitation of terraces**							
1.3.1		Refusal of farmers to provide the contribution for the rehabilitation activities of their terraces	L	L	N	L	N	L
1.4	**Enhancement of traditional practices of soil fertilization**	NA	N	N	N	N	N	N
1.5	**Enhancement of traditional practices on soil moisture**	NA	N	N	N	N	N	N
2. Water management								
2.1	**Rehabilitation and construction of water harvesting systems and springs**							
2.1.1		Refusal of some farmers to provide the contribution for the rehabilitation and construction of the structures that serves the community	M	L	N	M	N	M
2.1.2		Land allocation for the system not provided	M	M	N	M	N	M
2.1.3		Improper operation and maintenance of the system	M	M	N	M	N	M
2.2	**Establish small flood protection structures**							
2.2.1		Refusal of some farmers to provide the contribution for the construction of the structures	M	L	N	M	N	M
2.2.2		Improper maintenance of the structures	L	M	N	L	N	M
3. Crop management activities								

No.	Activities	Social Aspects	Social receptors					
			Social stability	Community participation	Household income	Family relations	Women empowerment	Overall impact
3.1	**Introduction of improved crops (drought tolerant varieties)**	NA	N	N	N	N	N	N
3.2	**Introduction of improved trees (drought tolerant varieties)**	NA	N	N	N	N	N	N
3.3	**Preservation of seeds**	NA	N	N	N	N	N	N
3.4	**Establishment of community centre for conservation**							
		Refusal of farmers to provide the contribution for the establishment of the center	M	L	N	M	N	L
		The center could be used for activities other than conservation activities	L	L	N	L	N	L
4. Income generation activities								
4.1	**Construction of small nurseries/home gardens with a preference for those using grey water and other conservation methods**							
4.1.1		Refusal of farmers to provide the contribution for the construction of the nurseries/ home gardens	L	L	N	L	N	L
4.1.2		improper operation and maintenance of the nurseries/home gardens	L	M	M	L	N	M
4.2	**Agro processing**	NA	N	N	N	N	N	N
4.3	**Producing traditional ceramic ware for conservation purposes (to house needs, etc.)**	NA	N	N	N	N	N	N

No.	Activities	Social Aspects	Social receptors					
			Social stability	Community participation	Household income	Family relations	Women empowerment	Overall impact
4.4	**Beekeeping**	Disputes may rise on who first gets the beekeeping nurseries	M	M	N	M	N	M
5. Women empowerment								
4.1	**Safe and free access to water through water supply systems especially for women**	Disputes on water allocations when water supply systems are limited	M	M	N	M	L	M
4.2	**Women empowerment**	Reluctances and unwillingness from the community to give women more empowerments	L	N	N	M	M	M

N= no impact or negligible
L= low impact
M= moderate impact
H= high impact

The Environmental and Social Management Plan (ESMP)

Introduction

The Environmental and Social Management Plan (ESMP) aims at defining a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators. The ESMP identifies certain roles and responsibilities for different stakeholders for implementing, supervising and monitoring the environmental and social performance of the project.

All activities that will be carried out under sub-component 3 (3.2.4 and 3.2.5) of the project will be purely on voluntary, demand-driven basis and will be implemented by the communities (local farmers and residents) themselves. Some of these activities could include: upgrading of reasonably intact terraces; construction of water harvesting systems (WHS); soil conservation and flood protection structures, etc. The farmers and residents will be taught skills that are needed for conservation and who will be responsible for the upkeep of terraces, and for eventually transferring the knowledge to others in the village. Additionally, the upgrading activities will be accompanied by a team of specialists to ensure the conservation aspects of each project. Furthermore, conservation-related training sessions will be organized to benefit the community as a whole. It should be noted that each of the projects will be monitored and evaluated once it is up and running as well as documented. An oversight committee will be responsible for maintaining the projects and for collecting small maintenance dues. The above-mentioned sub-projects are the ones that could have minor negative environmental and or social impacts that will implement mitigation measures are outlined in the ESMP.

The following sections will also present the main social mitigation measures. It is also important to mention that more than one of the mitigation measures will address in fact more than one impact. Reference will be made to these measures in their place.

Institutional Arrangements

Management Setup

This Project is implemented through the coordinated efforts of four Ministries/Agencies:

- Ministry of Agriculture (MAI)
    - Agricultural Research and Extension Authority (AREA)
- Ministry of Water and Environment
    - National Water Resources authority (NWRA)
    - Environmental Protection Authority (EPA)
- Ministry of Planning and International Cooperation
- Civil Aviation and Meteorology Authority (CAMA).

The Ministry of Agriculture and Irrigation (MAI) is the main implementing agency for the project and will be responsible for providing administrative oversight, coordinating funds flow, coordination with other implementing agencies and, monitoring and reporting on the results. Project administration will be carried out by the Project Implementation Unit (PIU)

which would lead the coordination activities with the other implementing agencies according to their specific roles and responsibilities.

Overview and Structure

The PIU will be responsible to coordinate and manage the implementation of all project activities, in agreement with the other partners. The work of the PIU will be guided and monitored by MAI. A Project Steering Committee (PSC) of key stakeholders will be established to provide strategic guidance and oversight for the project. Additionally, a Project Technical Committee (PTC) will be established to oversee implementation and provide technical guidance to the project, to support the PSC, and guide the PSU in all technical issues of this project.

The Project Implementation Unit (PIU)

Staffing: The Project Implementation Unit (PIU) for the project will consist of the following positions: Project Director, GEF Project Technical Specialist, Financial Specialist, Procurement Specialist, Monitoring and Evaluation Officer and Support Staff. Additional to these staff an international expert will be hired as a technical specialist to assist the Project Director in the implementation of the Project, with expertise in natural resource management and climate change.

Responsibilities: The PIU will be responsible for ensuring effective project implementation and specifically:

- Ensuring active participation of beneficiaries and the local population
- Removal of constraints and enable smooth project implementation
- Ensuring the participation of government organizations
- Liaising with the other MAI staff and other stakeholders
- Procuring services and equipment in accordance with the World Bank's procurement guidelines
- Preparation of annual work plans and budgets
- Preparation and submission of quarterly and annual progress reports to the Steering Committee and donor
- Accounting for project expenditures, which are to be audited annually
- Monitoring and evaluation of project activities
- Organizing the Steering Committee meetings and reporting to the Steering Committee
- Organizing Technical Coordination Committee meetings
- Securing the committed co-financing to the project from the government
- Liaising and coordinating with the RALP and other relevant projects (e.g. GSCP)

The PIU also has access to a great diversity of technical expertise provided by MAI staff and national and international consultants. This team will represent the Technical Coordination Committee (TCC) whose input will be channelled and coordinated by the PSU to make sure cost-effective contribution to the four project components. The core team members can be organized in ad-hoc technical working groups to provide technical advice in various aspects of project implementation including decision making on technical issues, monitoring & evaluation, technical guidance to project implementation, and approval of reporting activities.

Project Steering Committee

The Ministry of Agriculture and Irrigation (MAI) will be the government's focal point for the project, and as Chair of the Project Steering Committee (PSC) will provide strategic coordination and monitor progress. MAI will be supported within this committee by the Ministry of Water and Environment (MWE) and other partners and stakeholders. The chair of the TCC would be the vice chair of the PSC.

The PSC will meet every six months to provide strategic direction for the project implementation and assess the project's progress against planned outputs, and will at the same time seek to ensure that the necessary inter-agency coordination is in place and working well. The PSC will comprise of key ministries and institutions that have an influential role in the development of the rainfed highlands of Yemen. The members of the Committees would include the following:

- *The Ministry of Agriculture and Irrigation (MAI) (Chair),* which has an important role in developing national agricultural policies and legislations. MAI is responsible to provide the technical guidance and extension services for the farmers, with respect to plant production and seed management, as well as constructing of irrigation structures (small dams, canals, water tanks, diversion weirs). It has also a leading role for agro-biodiversity.
- *Ministry of Planning and International Cooperation (MOPIC):* The ministry and its units are responsible for planning and developing international cooperation; it can link to other internationally supported projects and activities relevant to the GEF project
- *Ministry of Finance (MOF):* The ministry and its units are responsible for any financial planning in Yemen; any subsidy or support from the GoY will be subject to the MOF
- *The Civil Aviation and Meteorology Authority (CAMA)* is responsible for climate monitoring, climate data gathering, and weather forecasting (both for general public and civil aviation). CAMA has access to Yemeni climate data, experience in weather forecasting, and a structure that can facilitate a climate modelling activity.
- *The National Water Resources Authority (NWRA)* is responsible for water resource planning and monitoring, legislation, and public awareness. It has the sole responsibility and mandate for water resources management. One of its tasks is to provide ongoing assessment, coordination and enforcement of all components of the water law. NWRA is currently establishing a network of rain gauging stations.
- *The Agricultural Research and Extension Authority (AREA),* which is an important unit within MAI; AREA has been mandated with the supervision and coordination of national agricultural research activities, technical supervision of extension activities, and evaluation and certification of research results in the country.
- *Ministry of Water and Environment, Environment Protection Authority (EPA),* Sana'a, which has an important role in climate, water and biodiversity related issues. EPA played a leading role in the preparation process of the *National Adaptation Programme of Action* (NAPA).

The Technical Coordination Committee (TCC) will be established to co-ordinate and specify the implementation of the project. This committee would discuss all technical issues and prepare a quarterly summary for the Project Steering Committee (PSC). The Deputy Minister of Irrigation and Land Reclamation Sector (ILRS) has been proposed by MAI as chairman of the TCC. Also one of the General Directorates within the ILRS is proposed to act as vice chair.

Technical Coordination Committee
The TCC would meet every month or as needed to guide the PSU and ensure technical oversight of the four project components. The core team members would be organized into ad-hoc technical working groups to provide advise various aspects of project implementation including decision making on technical issues, monitoring & evaluation, guidance on project implementation, and approval of reporting activities. The TCC will comprise of key ministries and institutions that have an influential role in the development of the rainfed highlands of Yemen. The members of the Committees may include the following:

- *The Ministry of Agriculture and Irrigation (MAI) (Chair),* which has an important role in developing national agricultural policies and legislation.
- *The Civil Aviation and Meteorology Authority (CAMA)*
- *The Agricultural Research and Extension Authority (AREA)*
- *The Environment Protection Authority (EPA)*

The ESMP on environmental mitigation measures

Summary of impacts and mitigation measures

Potential negative environmental and social impacts that have been identified and ranked as "High", "Moderate" or "Low" in Chapter 8 of this report are discussed and in order to eliminate or reduce the environmental and social impacts identified due to the project activities, it is recommended to adopt and implement a series of mitigation measures as follows:

1. **Construction of water harvesting systems, and the rehabilitation of the terraces would necessarily need truck roads, if not available, to transport construction materials which would produce an impact on the agrobiodiversity, agricultural and soil areas.** To the maximum extent possible, avoid constructing roads through agrobiodiversity settlements, agricultural land or pasture. Whenever possible use animals to transport building materials to the sites as an alternative to road construction.

2. **Removal and transportation of fertile soils from agricultural lands and pasture areas to rehabilitate the terraces systems has minor impact to the environment.** Therefore it is suggested to avoid taking fertile soils from pasture areas and use soil from wild land that are not cultivated or used as settlements for habitats. It would be interesting to initiate and develop agreements and roles among communities not use or transport fertile soils from agricultural lands that are currently used.

3. **Solid wastes such as debris are left on the construction sites after completion of the construction causing impact on the agrobiodiversity of the area.** Contractors who have been hired from outside the area or from within the community and according to the roles and regulations of contracting, should be obliged and responsible to remove solid wastes during and after completion of the works

4. **The water supply projects would provide easy access to water which may cause an impact on the agrobiodiversity, agricultural and pasture areas due to the disposal of used oil and fuel and spare parts on agricultural land and pasture and increase of**

smoke. It is, therefore, necessary to avoid disposing of used oils and parts on areas of agrobiodiversity, agriculture and pasture. For mitigating this measure the ESMP recommended control of oil changing and fuelling activities. It may be profitable to collect used oils, if possible, and sell it as an income generation source for the community. Recycling the used oil and reusing it, which may require small and simple recycling plant might as well be a way of generating income to the community.

5. **Water supply projects might lead to great dependency on the groundwater leading to overexploitation of the aquifers causing high impacts on the groundwater quality and quantity.** Even though such systems would allow women to spend more time on other activities, necessary mitigation measures should be taken such as: (i) continues monitoring of the water source to limit the extent of groundwater depletion and quality deterioration, (ii) reduce the amount of abstraction and determine a rational use for the water among the community, (iii) start the implementation of awareness rising campaigns of water conservation (iv) utilize efficiently rooftops rainwater harvesting as an additional source for household use to ease the stress on groundwater and reduce overexploitation.

6. **Establishment of small flood protection structures in areas may cause impacts on the existing habitat features.** Addressing integrally the agrobiodiversity component, the technical and economical aspect of the site selection, would mean selection of the sites to the maximum extent possible in areas where habitats are not featured. However, if construction of protection works is unavoidable in habitat area, it is advised to make all necessary precautions as not to disturb the habitat features of the area.

7. **Intermittent damages to structures such as small flood protection structures are not repaired or rehabilitated on time, weakening the structural system of the flood protection works**. Continues monitoring of the impact of the flood structure on the agrobiodiversity and accordingly taking the necessary precautions and mitigations. In addition, it would ultimately important to hand over the O&M of the structure to the community which would require the formation of an operation and maintenance committee responsible for regular maintenance with an emphasis of conducting regular maintenance especially after rain and floods

8. **The introduction of improved crops and trees drought tolerant varieties might carry harmful insects and diseases which would produce an impact on the agrobiodiversity, and health.** The mitigation measures would require careful inspection of the verities against diseases that may be harmful and those that are free from such diseases should be selected. Careful inspection of varieties from insects should be done before they are introduced to the areas and those are free of harmful insects should be selected.

9. **Using grey water to irrigate small nurseries/home-gardens that is not well treated and did not pass through simple treatment processes may have an impact on the environment.** Therefore it is necessary to prevent such waters to reach water sources and courses. Prior to using the grey waters, it could be better to install simple treatment systems and treat the grey waters. Increasing awareness among communities would reduce the negative impacts.

10. **Enhancement of traditional practices of soil fertilization means the use and application of traditional animal organics which are usually dealt with by women**

and children without any safe measures. Such use and application may result to an impact to the health of humans. Therefore it is necessary to (i) avoid direct contact direct contact with the organic matters and should wear safety wears (ii) provide the community with safety and healthy guidelines and procedures of the safe use and application of organic matter and (iii) avoid transportation of infected animal organic manure from affected areas to another areas.

The following table lists the mitigation measures and the associated institutional responsibilities, time frame and associated costs.

Table 9: Environmental Management Plan (EMP)[1]

Activities	*Environmental aspect*	Impact	Potential Significance				Mitigations	Responsibilities		Time frame	Cost $
			None	Significant				Implementation	monitoring		
				L	M	H					
Rehabilitation of terraces	Roads are constructed on agricultural land and pasture areas to provide easy access for terrace rehabilitation	*Agrobiodiversity*		*			1- To the maximum extent possible, avoid constructing roads through agrobiodiversity settlements. 2- Whenever possible use animals to transport building materials to the sites as an alternative to road construction	MAI	PIU	Continuous during rehabilitation	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- To the maximum extent possible, avoid constructing roads through agricultural lands 2- Whenever possible use animals to transport building materials to the sites as an alternative to road construction	MAI	PIU	Continuous during rehabilitation	NA
		Pasture		*			1- To the maximum extent possible, avoid constructing roads through pasture areas 2- Whenever possible use animals to transport building materials to the sites as an alternative to road construction	MAI	PIU	Continuous during rehabilitation	NA
		Human health	*								
		Animal health	*								

[1] Activities mentioned under Table 9 will be undertaken by the communities themselves, with supervision from relevant technical specialists (agrobiodiversity specialist, social, specialist, soil scientist, etc., under general guidance from MAI).

	transportation of fertile soil from agricultural land and pasture areas to the rehabilitated terraces	*Agrobiodiversity*		*			1- Avoid taking fertile soils from areas that are used as settlements for habitats. 2- use soil from wild land that are not used as habitats settlements. 3- initiate agreements and roles among communities not transport fertile soils from areas of settlements of habitats	MAI	PIU	Continuous during rehabilitation	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Avoid taking fertile soils from agricultural lands and pasture areas2- use soil from wild land that are not cultivated 3- initiate agreements and roles among communities not transport fertile soils from agricultural lands and pasture areas	MAI	PIU	Continuous during rehabilitation	NA
		Pasture		*			1- Avoid taking fertile soils from pasture areas. 2- use soil from wild land that are not cultivated used as settlements for habitats 3- initiate agreements and roles among communities not use transport fertile soils from agricultural lands	MAI	PIU	Continuous during rehabilitation	NA
		Human health	*								
		Animal health	*								
	Solid wastes such as debris are left on the terraces after completion of the construction	*Agrobiodiversity*		*			contractors, either from within the community or not, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								

		Soil degradation		*			contractors, either from within the community or not, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Pasture		*			contractors, either from within the community or not, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Human health	*								
		Animal health	*								
Enhancement of traditional practices of soil fertilization	Users health may be affected especially women due to unsafe use and application of manure	*Agrobiodiversity*	*								
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation	*								
		Pasture	*								
		Human health			*		1- people, especially, women and children, should avoid direct contact with the organic matters and should wear safety wears 2- provide the community with safety and healthy guidelines and procedures of the safe use and application of organic matter3- avoid transportation of infected animal organic manure from affected areas to another areas	MAI	PIU	During initial phase of fertilization process and should be a continues process	NA
		Animal health	*								
Safe and free access to water through water supply systems especially for women	Disposal of oil and fuel and spare parts on agricultural land and pasture and increase of smoke	*Agrobiodiversity*		*			1- Avoid disposing of used oils and parts on areas of biodiversity 2- collect oils, if possible, and sell it as an income generation source for the community. 3- Recycle the used oil and reuse it, which may require small and simple recycling plant. The outcome would be as income generation for the community	MAI	EPA	During the routine maintenance and operation	plant should be supplied by GARWS with contributions in money or kind from farmers

		Air quality		*			1- reduce the generation of smoke by using good quality environmental friendly generators 2- use of suitable filters on the generators to reduce the emission of carbon dioxide	MAI	EPA	During the routine maintenance and operation	should be supplied by GARWS which is responsible for RWS
		Water quality			*		1- Dispose of used oils away from water courses and sources 2- collect oils, if possible, and sell it as an income generation source fro the community. 3- Recycle the used oil and reuse it, which may require small and simple recycling plant. The outcome would be as income generation for the community	MAI	EPA	During the routine maintenance	plant should be supplied by GARWS with contributions in money or kind from farmers
		Water quantity	*								
		Soil degradation		*			1- Avoid promptly disposing used oils and parts on all types of lands 2- collect oils, if possible, and sell it as an income generation source fro the community. 3- Recycle the used oil and reuse it, which may require small and simple recycling plant. The outcome would be as income generation for the community	MAI	EPA	During the routine maintenance and operation	plant should be supplied by GARWS with contributions in money or kind from farmers
		Pasture		*			1- Avoid promptly disposing used oils and parts on pasture areas 2- Collect oils, if possible, and sell it as an income generation source fro the community. 3- Recycle the used oil and reuse it, which may require small and simple recycling plant. The outcome would be as income generation for the community	MAI	EPA	During the routine maintenance and operation	plant should be supplied by GARWS with contributions in money or kind from farmers
		Human health		*			1- reduce the generation of smoke by using good quality environmental friendly generators 2- use of suitable filters on the generators to reduce the emission of carbon dioxide	MAI	EPA	During procurement and routine maintenance and operation	it should be supplied by GARWS
		Animal health	*								

	overexploitation of water	*Agrobiodiversity*	*								
		Air quality	*								
		Water quality				*	1- Continues monitoring of the water source to limit the extent of water quality deterioration 2- reduce the amount of abstraction and determine a rational use for the water among the community. 3- Start the implementation of awareness rising campaigns of water conservation. 4- utilize efficiently rooftops rainwater harvesting as an additional source for household use to ease the stress on groundwater and reduce overexploitation	MAI	NWRA	1&2-During lifetime of the project 3-during initial phase of the project 4-during project lifetime	rooftop harvesting can supplied by SFD, PW and MAI special projects. NWRA can implement water conservation awareness campaigns
		Water quantity				*	1- Continues monitoring of the water source to limit the extent of water quantity abstraction 2- reduce the amount of abstraction and determine a sensible use for the water among the community. 3- start the implementation of awareness rising campaigns of water conservation. 4- utilize efficiently rooftops rainwater harvesting as an additional source for household use to ease the stress on groundwater and reduce overexploitation	MAI	NWRA	1&2-During lifetime of the project 3-during initial phase of the project 4-during project lifetime	rooftop harvesting can supplied by SFD, PW and MAI special projects. NWRA can implement water conservation awareness campaigns
		Soil degradation	*								
		Pasture	*								
		Human health	*								
		Animal health	*								
Rehabilitation and construction of water harvesting systems and springs	Construction of the Water Harvesting Systems (WHS) on agricultural land an pasture	*Agrobiodiversity*		*			1- to the maximum extent possible, avoid constructing water harvesting systems on agrobiodiversity areas 2- hydrological investigations should take place as to locate WHS on upper catchments where run off flow channels exist	MAI	PIU	During initial phase of construction	NA

		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- to the maximum extent possible, avoid constructing water harvesting systems (WHS) on agricultural and fertile lands 2- hydrological investigations should take place as to locate WHS on upper catchments where run off flow channels exist	MAI	PIU	During initial phase of construction	NA
		Pasture		*			1- Avoid whenever possible using pasture land as WHS sites 2- hydrological investigations should take place as to locate WHS on upper catchments where run off flow channels exist	MAI	PIU	During initial phase of construction	NA
		Human health	*								
		Animal health	*								
	Solid wastes such as debris are left on land nearby the harvesting systems after completion of the construction	*Agrobiodiversity*		*			Contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			Contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Pasture		*			Contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Human health	*								

		Animal health	*								
	increase of mosquitoes due to open water surfaces	*Agrobiodiversity*	*								
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation	*								
		Pasture	*								
		Human health			*		1- Cover WHS that are reasonably small with very fine screen nets. 2- disinfect water surfaces regularly with insecticide that are safe to humans. 3- mosquito larvae eating fish should be introduced into WHS where the water quality is suitable for their survival, to provide natural predators for the control of mosquito larvae	MAI	MoHP	During the final phase of construction	Screen nets cover for the entire project areas about 50,000$ (NOTE: the screens are applicable for relatively small WHS)
		Animal health	*								
Establish small flood protection structures	Establishment of protection structures in areas causing impacts on the existing habitat features	*Agrobiodiversity*		*			1- select protection sites to the maximum extent possible in areas where habitats are not featured 2- If construction of protection works is unavoidable in habitat area, it is advised to make all necessary precautions as not to disturb the habitat features of the area	MAI	PIU	During initial phase of the activity	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation	*								
		Pasture	*								
		Human health	*								
		Animal health	*								

		Agrobiodiversity		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
	Solid wastes such as debris are left nearby the structures after completion of the construction	*Air quality*	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Pasture		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Human health	*								
		Animal health	*								
	Intermittent damages are not repaired or rehabilitated on time, weakening the structural system of the flood protection works.	*Agrobiodiversity*		*			1- Monitor the impact of the flood structure on the agrobiodiversity and take the necessary precautions 2- establish maintenance committee responsible for regular maintenance. 3- conduct regular maintenance especially after rain and floods	MAI	PIU	During lifetime of the structure	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Monitor the impact of the flood structure on the soil and take the necessary precautions. 2- Establish maintenance committee responsible for regular maintenance. 3- conduct regular maintenance especially after rain and floods	MAI	PIU	During lifetime of the structure	NA

		Pasture		*			1- Monitor the impact of the flood structure on the pasture and take the necessary precautions. 2- Establish maintenance committee responsible for regular maintenance. 3- conduct regular maintenance especially after rain and floods	MAI	PIU	During lifetime of the structure	NA
		Human health	*								
		Animal health	*								
Introduction of improved crops (drought tolerant varieties)	some insects and crop diseases might be introduced with the new crops	*Agrobiodiversity*		*			1- Crops verities should carefully inspected against genetic disorders or diseases and those are free of diseases should be selected 2- careful inspection of varieties from insects before are introduced to the areas those are free of harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Crops verities should carefully inspect against genetic disorders or diseases which may have negative impacts on soils. Varieties that are free of diseases should be selected. 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
		Pasture	*								
		Human health		*			1- Crops verities should carefully inspected against diseases that may be harmful to humans and those are free of such diseases should be selected. 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA

		Animal health		*			1- Crops verities should carefully inspected against diseases that may be harmful to animals and those are free of such diseases should be selected. 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
Introduction of improved trees (drought tolerant varieties)	Some insects and diseases might be introduced with the new trees	*Agrobiodiversity*		*			1- Trees verities should carefully inspected against genetic disorders or diseases and those are free of diseases should be selected 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Trees verities should carefully inspect against genetic disorders or diseases which may have negative impacts on soils. Varieties that are free of diseases should be selected. 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
		Pasture	*								
		Human health		*			1- Trees verities should carefully inspected against diseases that may be harmful to humans and those are free of such diseases should be selected. 2- careful inspection of varieties from insects before are introduced to the areas and those are free of harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA

		Animal health		*			1- Trees verities should carefully inspected against diseases that may be harmful to animals and those are free of such diseases should be selected. 2- Careful inspection of varieties before they are introduced to the areas and those that are free from harmful insects should be selected	AREA	AREA	During initial phase of the activity	NA
Preservation of seeds	Bad seeds storage techniques	*Agrobiodiversity*		*			1- Use better preservation techniques. 2- Establish a data base bank for landraces	AREA	AREA	During lifetime of the project	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation	*								
		Pasture	*								
		Human health	*								
		Animal health	*								
Establishment of community centre for conservation	Build the community centre on agricultural land and pasture	*Agrobiodiversity*		*			1- Avoid the disturbance of existing agrobiodiversity. 2- Construct the center in the villages or towns close to farmers	MAI	PIU	During construction phase	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Avoid causing any degradation to soils during construction 2- Construct the center in the villages or towns close to farmers	MAI	PIU	During construction phase	NA
		Pasture		*			1- Avoid causing any degradation to pasture land and grazing areas during construction. 2- Construct the center in the villages or towns close to farmers	MAI	PIU	During construction phase	Costs included in the project costs
		Human health	*								
		Animal health	*								

	Construction solid wastes are left on the site	*Agrobiodiversity*		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Pasture		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	PIU	During final phase of construction	NA
		Human health	*								
		Animal health	*								
Construction of small nurseries/home-gardens with a preference for those using grey water and other conservation methods	Insufficient water availability to irrigate home gardens and nurseries	*Agrobiodiversity*	*								
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation	*								
		Pasture	*								
		Human health	*								
		Animal health	*								
	Grey water used is not well treated and did not pass through simple treatment processes	*Agrobiodiversity*		*			1- Avoid untreated grey water reaching agrobiodiversity areas 2- install simple proper treatment systems. 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
		Air quality	*								

		Water quality		*			1- Avoid untreated grey water reaching water sources and courses. 2- Install simple proper treatment systems. 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
		Water quantity	*								
		Soil degradation		*			1- Avoid untreated grey water reaching fertile soils and agricultural areas. 2- install simple proper treatment systems 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
		Pasture		*			1- Avoid untreated grey water reaching pasture areas 2- install simple proper treatment systems. 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
		Human health		*			1- Avoid untreated grey water reaching being used by humans. 2- Install simple proper treatment systems. 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
		Animal health		*			1- Avoid untreated grey water reaching used by animals 2- install simple proper treatment systems. 3- increase awareness on better use of grey waters	MAI	EPA	During lifetime of the project	should be incorporated in the initial costs of the activity
	Solid wastes of construction materials such as plastics and metals may pollute the environment near the nurseries	*Agrobiodiversity*		*			contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	MAI	During final phase of construction	NA
		Air quality	*								
		Water quality		*			1- avoid throwing such debris onto water sources and courses 2- contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	MAI	During final phase of construction	NA
		Water quantity	*								

		Soil degradation		*			1- avoid throwing such debris onto fertile soils and agricultural areas 2- contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	MAI	During final phase of construction	NA
		Pasture		*			1- Avoid throwing such debris onto pasture land. 2- contractors, either from within the community or outside, should be obliged according to terms of contracts to remove solid wastes after completion of the works	MAI	MAI	During final phase of construction	NA
		Human health	*								
		Animal health	*								
Agro processing	Waste water produced due to agro processing may contain some pollutant substances	*Agrobiodiversity*		*			1- Avoid untreated agro processing wastes reaching agrobiodiversity areas. 2- Install simple proper treatment systems. 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity
		Air quality	*								
		Water quality		*			1- Avoid untreated agro processing wastes reaching water sources and courses. 2- install simple proper treatment systems 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity
		Water quantity	*								
		Soil degradation		*			1- Avoid untreated agro processing wastes reaching agricultural soils which may cause some degradation. 2- install simple proper treatment systems 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity

		Pasture		*			1- Avoid untreated agro processing wastes reaching pasture areas. 2- Install simple proper treatment systems 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity
		Human health		*			1- Avoid untreated agro processing wastes sued or dealt with by humans. 2- Install simple proper treatment systems. 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity
		Animal health		*			1- Avoid untreated agro processing wastes used by animals. 2- install simple proper treatment systems 3- increase awareness and guidelines on how to reuse agro processing wastes	MAI	EPA	During lifetime of the activity	should be incorporated in the initial costs of the activity
Producing traditional ceramic ware for conservation purposes (to house needs, etc.)	material used such as clay are taken from fertile farms	*Agrobiodiversity*	*								
		Air quality	*								
		Water quality	*								
		Water quantity	*								
		Soil degradation		*			1- Avoid to the extent possible using fertile soils. 2- use clay materials from wild and abandoned agriculture areas	MAI	MAI	During lifetime of the activity	NA
		Pasture		*			1- avoid to the extent possible using soils from pasture areas 2- use clay materials from wild	MAI	MAI	During lifetime of the activity	NA
		Human health	*								
		Animal health	*								
Total estimated cost of EMP											50,000

The ESMP on social mitigation measures

Summary of social mitigation measures

Potential negative social impacts that have been identified and ranked as "High", "Moderate" or "Low" in Chapter 8, are discussed here in the following section in order to eliminate or reduce the social impacts identified due to the project activities, it is recommended to adopt and implement a series of mitigation measures. The mitigation measures fall mainly on community mobilizations. Resolving disputes, conflicts, and disagreements are foreseen in the ESMP due to inversions of some activities such as constructing water harvesting systems, rehabilitation of terraces, and establishments of flood protection structures, income generation and women empowerment. The mitigations are summarized as follows:

1. **Refusal of farmers to provide the contribution for the rehabilitation activities of WHS, terraces and the establishments of flood protection structures and community centres would have significant impacts on the social aspect.** The necessary mitigation measures focus on increase awareness among farmers about the importance of rehabilitation and the reasons for contributions either in kind or money to feel ownership. Mobilize the community and organize it into groups or associations to take the responsibility to make the necessary management plans that deal with of the rehabilitation and construction issues on behalf of the community which will in turn strengthens social stability and family relations. In addition, it would be important to build the skills of the community with the tools of community participation.

2. **Land allocations are essential to construct the sites which are the responsibility of the farmers. In some cases there are possibilities that such land is not provided resulting in disputes among farmers causing social instability, and disagreements between families.** The community and not individuals should decide on the site collectively addressing the importance of the activities to the community. Special arrangements could be agreed with the owner of the land such as buying the land and make it as endowment for the whole community. Develop special arrangements and standards among the community to benefit from the systems through the establishments of O&M committees. Mobilize the community and organize it into groups or associations to make the necessary management plans that deal with of the rehabilitation and construction issues on behalf of the community which will in turn strengthens social stability and family relations. In addition, it would be important to build the skills of the community with the tools of community participation.

3. **When the systems are rehabilitated or constructed, there could be a possibility that improper operation and maintenance can take place especially in communities that have influential people who only see their individual interests. During the public consultation there exist some cases of this type in the visited areas.** Farmers suggested the importance of managing and operating the systems in an equitable way by setting roles and standards to better operate and maintain the systems in order to allow the whole community to benefit from the systems and enhance social stability. An O&M committee is therefore, to be set from among the community to fulfil this task. Building its capacity in terms of management of the systems is important.

4. **Establishment of a conservation centre could be used for activities other than conservation activities.** Ignorance and self interests may lead to the misuse of the centre and make a place of different activities as place for Qat sessions for example. Awareness campaigns on the purpose of the centre and its benefits to the community should trigger at the initial construction phase. Additionally, a management body should be formed to manage the centre. Build up the skills of the community with participation tools to enhance cooperation among people. Such measures would stimulate cooperation among families and stabilize the community.

5. **Water supply projects might lead to great dependency on the groundwater leading to overexploitation of the aquifers. As a result water availability would be reduced substantially causing conflicts within the community in allocations and water shares distributions.** Women would be the most effected persons since most of the households work is on her burden such as water fetching. Therefore, the related authorities should implement awareness campaigns on the importance of water conservation. The water supply project should be run by an O&M committee that deals with the management of the water system. As an additional source, utilization of rooftops rainwater for household use to ease the stress on groundwater and reduce overexploitation.

6. **Women may face reluctances and unwillingness from the community to give women more empowerments.** Therefore, it is important to conduct awareness campaigns about the importance of women participation on the different activities of the community especially those related to women and accept women as partners with men. Allow women to organize themselves into women committees that deal with women affairs and interests. Address the issue of women participation as to produce more benefits and rewards to the community

Table 10 lists the social mitigation measures and the associated institutional responsibilities, time frame and associated costs

Conclusion:
The mitigations described in the Social Management Plan (SMP) are focused on the methodology of community participation since such measures are impacting the social parameter of the community. The procedures and steps required to implement these mitigations are mostly related to improving community relations, enhancing social stability and community and women empowerment. The ACAP in its project documents stresses on community mobilization towards efficiently implementing the climate change adaptations techniques.

The process of community participation, its techniques and those most related to the project is described in Annexes V and VI. More training and capacity building should accompany the participation process impeding the necessary tasks and issues designed in the project. Table 12 lists the training topics related to the project.

Table 10: Social Management Plan (SMP):

Activities	Social aspect	Impact	Potential Significance				Mitigations	Responsibilities		Time frame	Cost $
			None	Significant				Implementation	monitoring		
				L	M	H					
Rehabilitation of terraces	Refusal of farmers to provide the contribution for the rehabilitation activities of their terraces	*Social stability*		*			increase awareness among farmers about the importance of terrace rehabilitation and the reasons for contributions either in kind or money	MAI	PIU	Continuous during rehabilitation	Included in the project costs
		Community participation		*			1- build the skills of the community with the tools of community participation 2-organize the community into groups that deal with issues of rehabilitation on behalf of the community	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								
		Family relations		*			1- build the skills of the community with the tools of community participation 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
Rehabilitation and construction of water harvesting systems and springs	Refusal of some farmers to provide the contribution for the rehabilitation and construction of the structures that serves the community	*Social stability*			*		1- increase awareness among farmers about the benefits of WHS construction and rehabilitation towards social stability of the community by providing water either as supplementary irrigation , cattle drinking or households uses in dry spell periods 2- discussions with the farmers about the importance of contribution which means ownership of the structure to the community as a whole	MAI	PIU	Continuous during rehabilitation	Included in the project costs
		Community participation		*			1- build the skills of the community with the tools of community participation 2- organize the community into groups that deal with issues of rehabilitation and construction on behalf of the community	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								

		Family relations			*		1- build the skills of the community with the tools of community participation 2- develop special arrangements and standards among the community to allocate and decide on contributions according to each family income sources and livelihood 3- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
	Land allocation for the system not found	*Social stability*			*		1- collective decision should be taken by the community to select a suitable site that would enhance social stability and coherence 2- special arrangements could be agreed with the owner of the land such as buying the land and make it as endowment for the whole community 3- increase awareness among the community about cooperation and participation	MAI	PIU	During initial phase of the rehabilitation	Included in the project costs
		Community participation			*		1- increase awareness among the community about cooperation and participation 2- organize the community into groups that deal with issues of rehabilitation and construction on behalf of the community	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								
		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 3- develop special arrangements and standards among the community to benefit from the systems 4- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								

Rehabilitation and construction of water harvesting systems and springs	Improper operation and maintenance of the system	*Social stability*			*		1- set up roles and standards to better operate and maintain the systems in order to allow the whole community to benefit from the systems 2- Build the skills of the community with the tools of community participation 3- select a committee that deals with operation and maintenance of the systems that distributes water with equitable allocations and shares to enhance social stability	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Community participation			*		1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								
		Family relations			*		1- Build the skills of the community with the tools of community participation 2- select a committee that deals with operation and maintenance of the systems that distributes water with equitable allocations and shares to enhance social stability 3- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
Establish small flood protection structures	Refusal of farmers to provide the contribution for the construction of the structures	*Social stability*			*		1- increase awareness among farmers about the benefits of flood structure to protect their lands from floods 2- discussions with the farmers about the importance of contribution which means ownership of the structure 3- train farmers about the participatory approaches	MAI	PIU	During initial phase of the activity	Included in the project costs
		Community participation		*			1- Train farmers about the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								

		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
	Improper maintenance of the structures	*Social stability*		*			1- Build the skills of the community with the tools of community participation 2- select a committee that deals with operation and maintenance of the systems that distributes water with equitable allocations and shares to enhance social stability	MAI	PIU	During final phase of construction	Included in the project costs
		Community participation			*		1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								
		Family relations		*			1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
Establishment of community centre for conservation	Refusal of farmers to provide the contribution for the establishment of the centre	*Social stability*			*		1- increase awareness among farmers about the benefits of the centre 2- discussions with the farmers about the importance of contribution which means ownership of the centre 3- train farmers about the participatory approaches	MAI	PIU	During initial phase	Included in the project costs
		Community participation		*			1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								

		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
	The canter could be used for activities other than conservation activities	*Social stability*		*			1- Explain to the community the purpose of the centre and its objectives 2- elect a management board that runs the centre and keeps it maintained 3- train farmers about the participatory approaches	MAI	PIU	During construction phase	Included in the project costs
		Community participation		*			1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								
		Family relations		*			1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
Construction of small nurseries/ home-gardens with a preference for those using grey water and other conservation methods	Refusal of farmers to provide the contribution for the construction of the nurseries/ home gardens	*Social stability*			*		1- increase awareness among farmers about the benefits of the nurseries/ home gardens 2- discussions with the farmers about the importance of contribution which means ownership of the nurseries/ home gardens 3- train farmers about the participatory approaches	MAI	PIU	During initial phase of the activity	Included in the project costs
		Community participation		*			1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Household income	*								

		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	Continuous during the lifetime of the project	Included in the project costs
		Women empowerment	*								
	improper operation and maintenance of the nurseries/home gardens	*Social stability*		*			1- Build the skills of the community with the tools of community participation 2- select a committee that deals with operation and maintenance of the nurseries that enhance social stability	MAI	PIU	During construction of the activity	Included in the project costs
		Community participation		*			1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Household income			*		1- re elect the O&M committee 2- build up the skills of the O&M on marketing 3- cultivation of crops according to the needs of the markets	MAI	PIU	During lifetime of the project	Included in the project costs
		Family relations		*			1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Women empowerment	*								
Bee keeping	Disputes may rise on who first gets the beekeeping nurseries	*Social stability*			*		1- set up roles and guides on allocation of the beekeeping 2- organize a committee that deal with allocations 3- emphasis should be for poor families to increase their income	MAI	PIU	During initial phase of construction	Included in the project costs
		Community participation			*		1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Household income	*								

		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Women empowerment	*								
Safe and free access to water through water supply systems especially for women	Disputes on water allocations when water supply systems are limited	*Social stability*			*		1- initiate awareness campaigns on the importance of water conservation 2- organize an O&M committee that deals with the management of the water systems 3- train farmers about the participatory approaches	MAI	NWRA	During initial phase of the project	Included in the project costs
		Community participation			*		1-Train farmers on the participatory approaches 2- mobilize the community and organize it with the tools of community participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Household income	*								
		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation	MAI	PIU	During lifetime of the project	Included in the project costs
		Women empowerment		*			1- allow women to participate and share decision with the men about water allocations and management of the system 2- build up the skills of women on the tools of participation	MAI	PIU	During lifetime of the activity	Included in the project costs
Women empowerment	Reluctances and unwillingness from the community to give women more empowerments	*Social stability*		*			increase awareness about the importance of women participation on the different activities of the community especially those related to women and accept women as partners	MAI	YWU	During lifetime of the activity	Included in the project costs
		Community participation	*								
		Household income	*								

		Family relations			*		1- Build the skills of the community with the tools of community participation and encourage them to take decisions that benefit the community 2- strengthen family ties through community works and participation 3- enhance women relations between families	MAI	PIU	During lifetime of the activity	Included in the project costs
		Women empowerment			*		1- allow women to organize themselves into women committees that deal with women affairs and interests 2- allow women to take decisions on matters along with the men 3- address the issue of women participation as to produce more benefits and rewards to the community	MAI	YWU	During lifetime of the activity	Included within the project costs

The ESMP on monitoring

The following table presents a fully fledged environmental monitoring program that needs to be implemented throughout the project's life time.

Table 11: Monitoring activities of the ESMP

Parameter	Location	Frequency	Responsibility	Costs $
Crops disease	farms	Beginning of cropping season, middle of the season	AREA	Include in the project activities costs
Training on IPM	Farms and trial farms (ToT)	As above	AREA	Include in the project activities costs
Groundwater quality and quantity	Wells at the project areas	Annually	NWRA	Include in the project activities costs
of flood structures	Flood protection areas	Semi annually	MAI	Include in the project activities costs
Proper disposal of oils and parts	Project areas	Beginning of cropping season, middle of the season and end of season	EPA	Include in the project activities costs
Operation and maintenance of WHS	Sites of WHS	Semi annually	MAI	Include in the project activities costs
Empowerment of women	Villages	Semi annually	YWU	Include in the project activities costs

It is clear from the table is that the parameters are of a more general type and specific issues under each parameter can be addressed before implementation of the monitoring process and according to the needs of the implementing agency so that clear understanding of the implementation process can be assessed satisfactorily.

Cost estimates and Sources of funds

The sources of funds for the implementation of the ESMP will mainly be from the project's operations budget. *Budgetary resources for implementing the ESMP (mitigation measures as well as capacity building/training) and M&E will be allocated as part of the project implementation arrangements.* The main cost elements associated with the implementation of the ESMP can be categorized as follows:

Manpower: In order to implement the ESMP, a part-time environmental consultant should be recruited. The duties and responsibilities will include monitoring the implementation of the mitigation measures, recording any environmental violations and most importantly recording and analysing the environmental monitoring data. The periodical environmental reports as stated in the above tables will be included in the periodical project progress report that should be submitted to the implementing agency.

In addition, a social development consultant will be recruited to conduct periodical social studies and enhance the socio-economic aspects of the project. The cost associated with each element is embedded in the overall project staffing budget.

Implementation of mitigation measures: Most of these costs are included in the activities of the project. Therefore, any associated costs related to construction will be part of the works contract.

The ESMP on capacity building and training

The training and capacity building of the subproject components are crucial for the community. The major social impact cannot be mitigated without building the capacities and skills of the community in order to adapt to the intervention of the subprojects. Recently as has been discussed with the farmers, the major issues in the present WHS are the mismanagement which allows only a few people to benefit from the systems leaving community ain a social dilemma. The following Table 12 list most of the parameters needed for training.

The ESMP on monitoring and reporting

The overall environmental and social impacts of the ACAP are expected to be significantly beneficial in terms of environmental and social issues. Monitoring and evaluation of the implementation of ESMP will need to be put in place as part of the overall project implementation arrangements. *Budgetary resources for implementing the ESMP (mitigation measures as well as capacity building/training) and M&E will be allocated as part of the project implementation arrangements.* The implementing agency for component 3 will be responsible (through hiring of consultants) for monitoring compliance with the ESMP (as per monitoring indicators outlined in Table 11). The PIU will be responsible for ensuring that capacity building and training activities as outlined in Table 12 are carried out. The PIU's M&E specialist will be responsible for aggregating information on compliance with ESMP (component 3) and capacity building/training. The M&E specialist will include this information as a separate section in the periodic progress reports that the PIU will submit to the World Bank.

Table 12: ESMP on capacity building and training

No.	Training	Target groups	Trainers	frequency	Cost$/ one week/district	No. of districts	Cost of the eight districts /year	Cost of during the 4 years
1	Community participation: tools, techniques, action plans, etc.	Farmers, community leaders, Agricultural staff in the area	ACAP PIU, will hire specialists in community mobilization	Semi annually	Costs included in the project			
2	Operation and maintenance of WHS	Farmers, community leaders, Agricultural staff in the area	ACAP, PIU will coordinate with MAI to hire consultant	Once during the lifetime of the project	2000	8	16,000	16,000
3	Masters level training	Technical and scientific personnel from CAMA, NWRA and AREA	International acclaimed centres for climate modelling	Once during the entire lifetime of the project	Costs included in the project (sub-component 2.4)			
4	Custom training in climate modelling	6-8 technical staff members from CAMA, NWRA and AREA	CAMA	Once during the entire lifetime of the project	Costs included in the project (sub-component 2.4 and 3.1.1)			
5	Special training programs on climate change impacts on rain-fed agriculture, and the specific actions that MAI needs to take to respond effectively to the challenge.	MAI staff	CAMA	Once each year	Costs included in the project (sub-component 3.1.2)			
6	Awareness raising and	Farmers,	CAMA	Once each	Costs included			

No.	Training	Target groups	Trainers	frequency	Cost$/ one week/district	No. of districts	Cost of the eight districts /year	Cost of during the 4 years
	capacity building on metrological information	community leaders, Agricultural staff in the projects area		two years	in the project (sub-component 2.5, and 3.1.1)			
7	Capacity building to access small grants to implement agro-biodiversity based plans.	Community groups	PCU will hire specialists	Once a year	Costs included in the project (sub-component 3.2.2)			
8	Conservation-related training sessions	Communities in the project areas	PCU will hire specialists	Once a year	Costs included in the project (sub-component 3.2.5)			
9	Technical and training support towards improving capacities in production, conservation, processing, and marketing	Income generation recipients	PCU will hire agronomist and social specialists	Once a year	Costs included in the project (sub-component 3.2.5)			
10	Hygiene education	Farmers, community leaders, Agricultural staff in the area	PCU will hire a specialist in hygiene education	Once a year	1000	8	8000	32,000
11	Specialized training in climate awareness and in developing a coherent response strategy	Staff in MAI and associated institutions	PCU will hire specialists to conduct the training	Once during the lifetime of the project	Costs included in the project (component 3)			

No.	Training	Target groups	Trainers	frequency	Cost$/ one week/district	No. of districts	Cost of the eight districts /year	Cost of during the 4 years
12	Water conservation	Farmers, community leaders, Agricultural staff in the area	NWRA	Once during the lifetime of the project	1500	8	12,000	12,000
13	Crops varieties and their tolerance to droughts	Farmers, community leaders, Agricultural staff in the area	AREA	annually	1000	8	8000	32,000
14	Pollution control and proper disposal of wastes	Farmers, community leaders, Agricultural staff in the area	ACAP, PIU will higher a specialist in environmental protection	annually	2000	8	16,000	64,000
15	Integrated Pest Management education campaigns	Extension workers in the districts, technicians, NGOs (ToT)s	ACAP, PIU will higher a specialist in Pest Management	Once during the lifetime of the project at each district MAI office	5,000	8	40,000	40,000
16	Integrated Pest Management education campaigns	farmers		annually	2000	8	16000	64000
17	Empowerment of women	Women farmers	Yemeni women union (YWU)	annually	1500	8	12,000	12,000
Total estimated cost								272,000

The table is an estimate, and actual costs could vary during the course of project implementation.

Environmental and social Screening Criteria

Screening of Subprojects

The objective of the screening criteria and procedures is to ensure review of individual sub-projects to be financed under the ACAP in order to identify and address (minimize or eliminate) potential adverse environmental and social impacts. All subprojects under ACAP (Component 3) will be undertaken purely on a voluntary and demand basis, and implemented by the communities (farmers and residents) themselves. Subcomponent 3.2.4 could include some minor infrastructure rehabilitation such as: upgrading of reasonably intact terraces, construction of small flood protection structures, soil protection structures, facility for seed storage (provision of shelving in existing sheds), construction of water storage structures, establishment of model farm, etc. Subcomponent 3.2.5 of the project will promote agrobiodiversity based income generating activities which could include: construction of small nurseries/home-gardens with a preference for those using grey; water and other conservation methods (to produce plants, vegetables, fruits, aromatic and medicinal plants); planting, preparation and packaging of medicinal herbs (aromatic and spices); small home-based catering business specializing in traditional recipes; agro-processing; beekeeping; planting of almond trees; and producing traditional ceramic ware for conservation purposes (to house seeds, etc.).

Subprojects to be funded under the ACAP are not expected to be of environmental category (A) in nature or trigger the Bank's involuntary resettlement policy. Additionally, environmental and social screening will be incorporated into the regular subproject development cycle that will identify any such projects, which will then be excluded from the community agrobiodiversity plans.

Use of Screening Criteria for Subprojects

Due to the CDD nature of subcomponents under component 3, community based agrobiodiversity plans will be developed in consultation with the communities, building on their indigenous and traditional knowledge. Participating communities will be assisted in developing agrobiodiversity based coping plans, which will include proposals for the above-mentioned subprojects (subcomponent 3.2.4). During the subproject identification stage (part of the agrobiodiversity based coping plans), MAI technical staff/consultants (or agency/partner responsible for implementation of component 3) will work with representatives at community level in order to identify potential projects for funding using the screening criteria. Once the subprojects are screened and satisfy all criteria, they will be approved for funding. Community sub-grants are not anticipated to be large, and are likely to be in the range of $5000-$10,000 (for rehabilitation activities) and about $3000 for income generating activities. Because activities carried out by ACAP will be relatively small and simple in nature, they are not expected to require formal EPA review and approval. The preventative actions and mitigation measures outlined in the ESMP should be used to address any potential adverse environmental and social impacts.

Environmental and Social Screening Criteria for Subprojects

Title of Subproject: _____

Governorate: _____

District: _____

Village: _____

Signature of representative: _____ Date: _____

1. Does the subproject involve acquisition of land?	No _____ Yes _____
Resettlement of people or loss of assets/income?	No _____ Yes _____
Conversion and degradation of natural areas or habitats?	No _____ Yes _____
Procurement of pesticides?	No _____ Yes _____

If yes to any of the above, the subproject is not eligible for funding.

2. Does the subproject involve use, management or rehabilitation of land?	No _____ Yes _____
3. Does the subproject involve use, management or exploitation of water?	No _____ Yes _____
4. Does the subproject involve management or disposal of liquid or solid wastes?	No _____ Yes _____
5. Will the project create solid or liquid waste that could adversely affect local soils, vegetation, rivers, streams or groundwater?	No _____ Yes _____
6. Will subproject require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)?	No _____ Yes_____
7. Might the subproject lead to soil degradation or erosion in the area?	No _____ Yes _____
8. Will the subproject be situated in ecologically sensitive areas or cause impacts on existing natural habitat features?	No _____ Yes _____
9. Might the subproject lead to human health and safety risks?	No _____ Yes _____
10. Is it possible to achieve the objectives above in a different way with fewer environmental and social impacts?	No _____ Yes _____
11. Will subproject result in the introduction of pesticides or an increase of pesticide use if use of such products currently exists?	No _____ Yes _____
12. Will subproject result in crop diseases with introduction of new crops?	No _____ Yes _____

If any answer in the checklist is "No", there is no need for further action.

If any answer in the checklist is "Yes", the subproject should apply recommended mitigation measures in the ESMP (Tables 9 and 10)

Integrated Pest Management Plan (IPM)

Introduction

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

The IPM approach can be applied to both agricultural and non-agricultural settings, such as the home, garden, and workplace. IPM takes advantage of all appropriate pest management options including, but not limited to, the judicious use of pesticides. In contrast, *organic* food production applies many of the same concepts as IPM but limits the use of pesticides to those that are produced from natural sources, as opposed to synthetic chemicals.

The Integrated Pest Management Plan (IPM) matrix outlines anticipated risks and mitigation measures for sub-projects that could trigger the Pest Management safeguard policy.

Pest Management Regulation

Pesticide Law was approved by the parliament in 1999 (Law 25, 1999) and consisted of seven chapters and 36 articles. Executive regulation 10, 2002 was issued by resolution of the Minister of Agriculture and Irrigation. A registration guide was prepared to facilitate enforcement. Penalties for violation of the law are clearly stated. The objectives of the law are to regulate the handling, registration and inspection of pesticides and to avoid adverse effects on human, animal, environment and economically beneficial insects. The competent authority for enforcing the law is the GDPP. This authority is committed to coordinate its work with Environment Protection Authority. The GDPP undertakes the necessary measures for control and inspection of any of the operations of handling of pesticides in a periodic or at sudden occasions. According to Article 22(1), The Minister of Agriculture and Irrigation proposed to the Minister of Justice the name of GDPP staff, who, after the issuance of special decree (293, 2000); enjoy the status of legal controllers competent with the implementation of the provisions of this law.

Pesticide Use and its Impact on Health

Pesticides are toxic compounds. Pesticides differ in their toxicity. Some pesticides may cause acute allergy by contact of pesticides with skin. In case of wounds or cut on the skin, the pesticide may penetrate the skin and reach the blood circulation in the body. Other pesticides are carcinogenic i.e. cancer causing and may lead to fatal consequences. Some pesticides are volatile and may through inhalation cause lung damage. It has been reported that pesticide toxicity may lead to sterility in male and deformation in of spring.

Guidance on Implementation of Integrated Pest Management (IPM)

Integrated pest management is a decision-making process for the selection, implementation, and evaluation of pest management practices. Pests are organisms that compete with humans, domestic animals, or crops for nutritional resources. They include species of insects, mites, nematodes, molluscs, plant pathogens, vertebrates and weeds.

IPM utilizes all available methods to achieve the most economically and environmentally sound management program. IPM is the integration of available techniques to reduce pest populations and maintain them below the levels causing economic injury in a way that avoids harmful side effects. Specific pest management needs vary with the crop, cropping system, pest problems, pesticide use history, socio-economic conditions, and other factors. There are, however, well-defined principles that guide the implementation of integrated pest management. Based on these principles, some guidelines are offered for the development and execution of IPM activities for community micro-projects. The implementers of the micro-projects should adopt these guidelines to the conditions found in their micro-projects. IPM can decrease pest losses, lower pesticide use, and reduce overall operation costs, while increasing crop yield and stability.

Implementation steps of IPM

Step 1: Assess IPM needs and establish priorities

- Consider the relative importance of agriculture in the overall project;
- Consider the relative importance of target crops as a source of community livelihood;
- Review pesticide use history, trends and availability of IPM technology;
- Identify training needs for farmers and extension agents; and
- Respect and use local knowledge.

Step 2: Identify key pests for each target crop

- Become familiar with key pests of target crops and the damage they cause; and
- Correctly identify the common pest.

Step 3: Monitor the fields regularly

- ıinspect crops regularly to determine the level of pests and natural enemies;
- Solicit assistance of agricultural extension staff if necessary; and
- Determine when crop protection measures, perhaps including pesticides are necessary.

Step 4: Select appropriate blend of IPM tools

- Maximize the effectiveness of traditional and introduced non-chemical control techniques;
- Use pesticides only if no practical, effective and economic non-chemical control methods are available;
- Examples of Non-chemical Pest Management Techniques include;
    - Maintaining good soil fertility and a diverse agro-ecosystem;
    - Plant resistant crop varieties;
    - Selecting proper plant varieties for location and season;
    - Rotating crops;

- Planting clean seed;
- Correct planting and harvest periods;
- Proper irrigation methods;
- Correct fertilizer and rates;
- Good crop sanitation;
- Hand picking of larger pests;
- Use of natural control agents (biological control); and
- Using attractants and repellents on selected pests.

Step 5: Develop education, training, and demonstration programs for extension workers

- Conduct special training for extension workers, government officials and public.
- Conduct hands-on training of farmers in farmers' fields (as opposed to a classroom);
- Use the participatory "Farmers' Field School" approach; and

Suggested Mitigation Measures for Crop/Pest Management

Major Issues	Actions Recommended
1. Increased use and reliance	(a) Promote adoption of IPM on chemical pesticide practices through farmer education and training; and (b) Move farmers away from input-dependent crop/pest management practices and promote use of locally produced organic matter, botanical pesticides and biological control.
2. Change current pest management	(a) Allocate adequate resources to implement National Plant Protection Policy; (b) Increase IPM awareness amongst policy makers and farming community; and (c) Abolish free distribution of pesticides to farmers and promote safe handling and application of pesticides.
3. Enforcement of legislation	(a) Strengthen institutional capacity to effectively supervise compliance with pesticide legislation.
4. IPM extension	(a) Strengthen IPM extension; (b) Strengthen collaboration for field implementation of IPM; and (c) Involve NGOs in promoting IPM activities.
5. Environmental hazards of pesticide misuse	(a) Create public awareness of pesticide misuse hazards through public awareness campaigns; (b) Carry out monitoring of pesticide poisoning in the farming and rural communities.
6. Increase in disease vectors	(a) Establish strong collaboration between the project and national vector-borne disease control programs such as malaria control program.
7. Increased dependence on chemical control	(a) Support traditional mixed cropping systems to keep pest species from reaching damaging levels. (b) Promote proper disposal of unused agricultural chemicals and packaging materials.

Training on IPM

The ACAP PCU should hire Consultant on IPM to prepare a training course in order to review the relevant materials and modules prepared and delivered by relevant organizations, the pest management practices for different crops and assessed the pest management approaches, quantities of pesticides used, capabilities of the farmers in regard to proper handling and use of pesticides, evaluate and suggest measures required to reduce specific risks associated with pesticide use and prepared guidelines keeping in view the Policy, Regulatory Framework and

Institutional Capacity. The Specialist should prepare and deliver training courses as training of trainers (ToT) who will be responsible to train farmers in the districts of the project. The cost for training on IPM is included under Table 12 – ESMP Capacity Building and Training. The following is a proposed description of the contents.

Trainers: Extension workers in the districts, technicians, NGOs on proper and safe use of pesticides.

The objectives of the training are

- To enhance the building capacity and skills of agricultural specialists, technicians and NGOs who will be responsible to conduct the same training for farmers.
- To enhance the understanding and awareness of farmers on proper handling of pesticides, IPM and its implementation.
- To make farmers capable to distinguish between natural enemies (parasitoids and predators) and pests in the field.
- To minimize the use of pesticides in project areas.

The contents of educational material include,

- Proper and safe use of pesticides
- Farmers must know that pesticides are toxic compounds.
- Farmers must know the types of pesticides, rate of application and time to initiate spraying.
- Farmers must learn to understand the instructions on the label
- Farmers must use protective devices during spraying
- Farmers should not eat, drink, chew Qat or smoke during spraying
- Disposal of empty pesticide containers.
- Prevention of accumulation of obsolete and unwanted pesticides.
- Proper storage of pesticides
- Concepts and fundamentals of IPM, the pest management practices used by farmers.
- Application of biological control utilizing the parasitoids and predators (natural enemies) found locally and imported from abroad.
- Demonstrate IPM activities implemented in Yemen, such as IPM package on Peach Fruit Fly; IPM on Potato Tuber Moth and IPM on Black Aphid on Nuts.
- The application of different traps for forecasting of pests
- To make farmers capable to distinguish between natural enemies and pests.

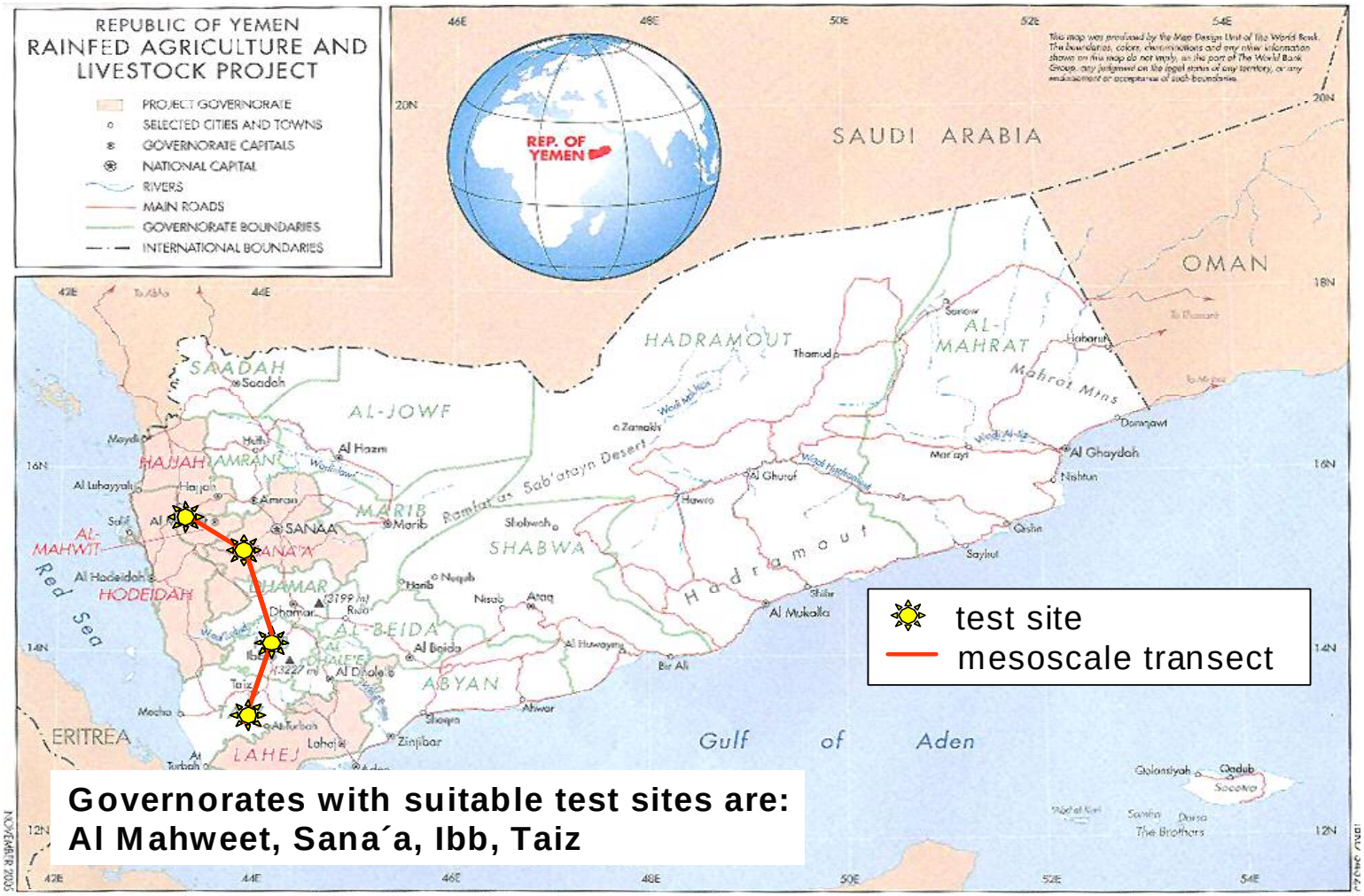
Banned pesticides

During the early eighties, synthetic parathyroid compounds were used to control pests in agriculture and public health. Also, the government started paying more attention to this matter in order to organize the commerce of pesticides and to solve problems created by the expanding use of pesticides. The first measures by the government against the misuse of pesticides, was to prohibit the sale and use of chlorinated hydrocarbon compounds.

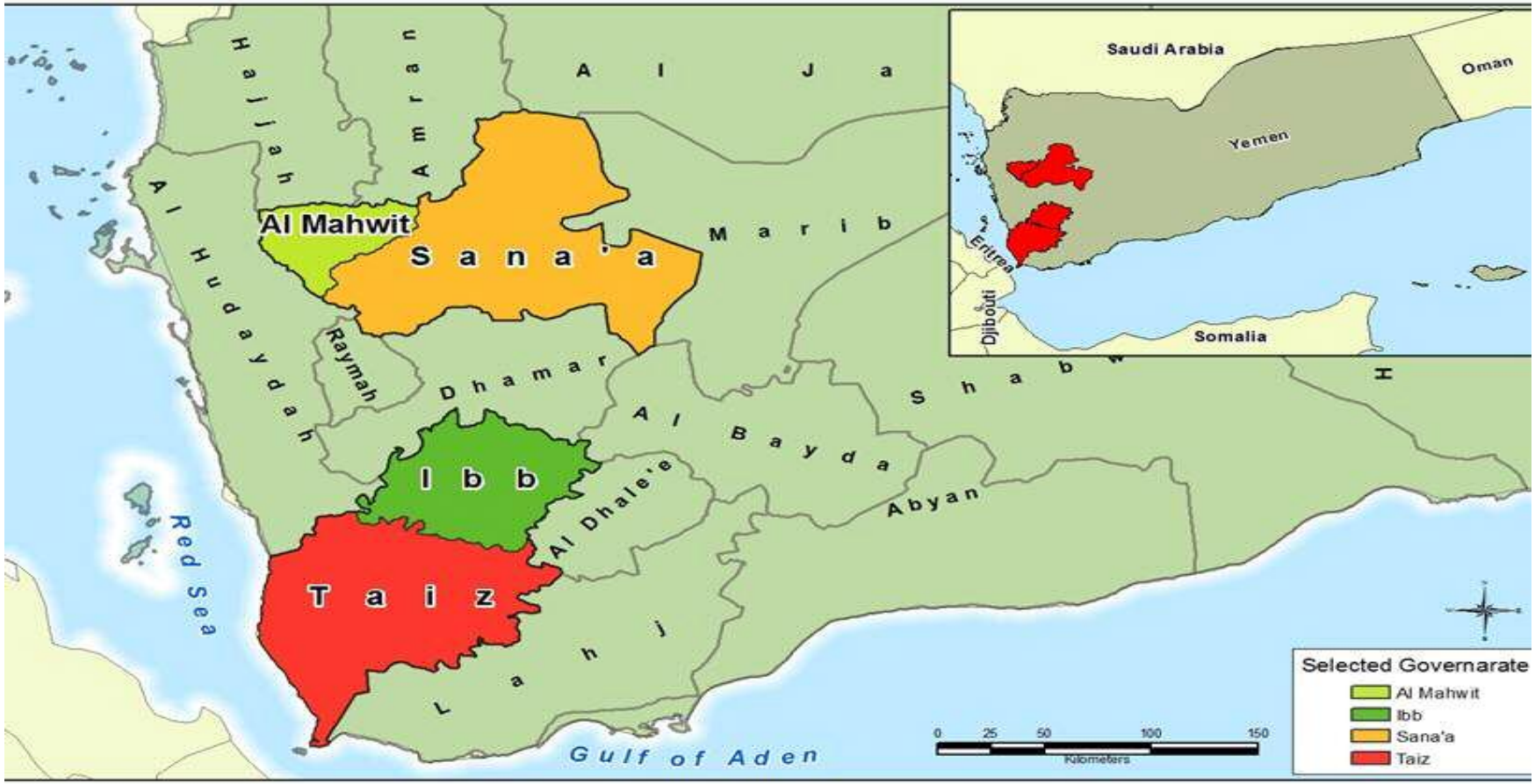
The abuse use of fertilizer has created several health and environmental problems. For example, the pollution of water and soil by nitrate compounds which are transformed in the body into nitrite, which make it toxic if ingested by humans and animals (more information in Annex VII)

Appendices

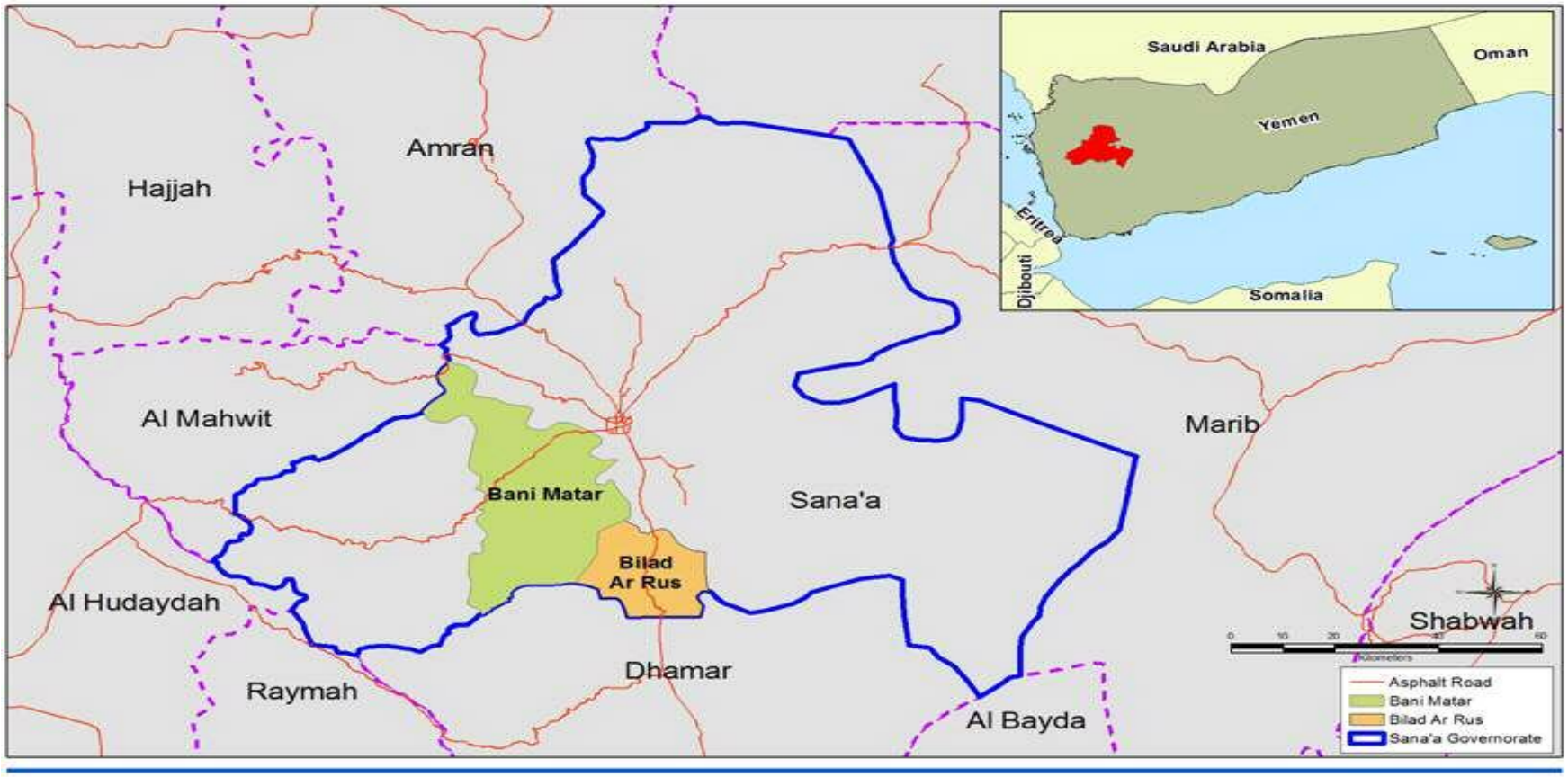
Appendix I
Maps of project area



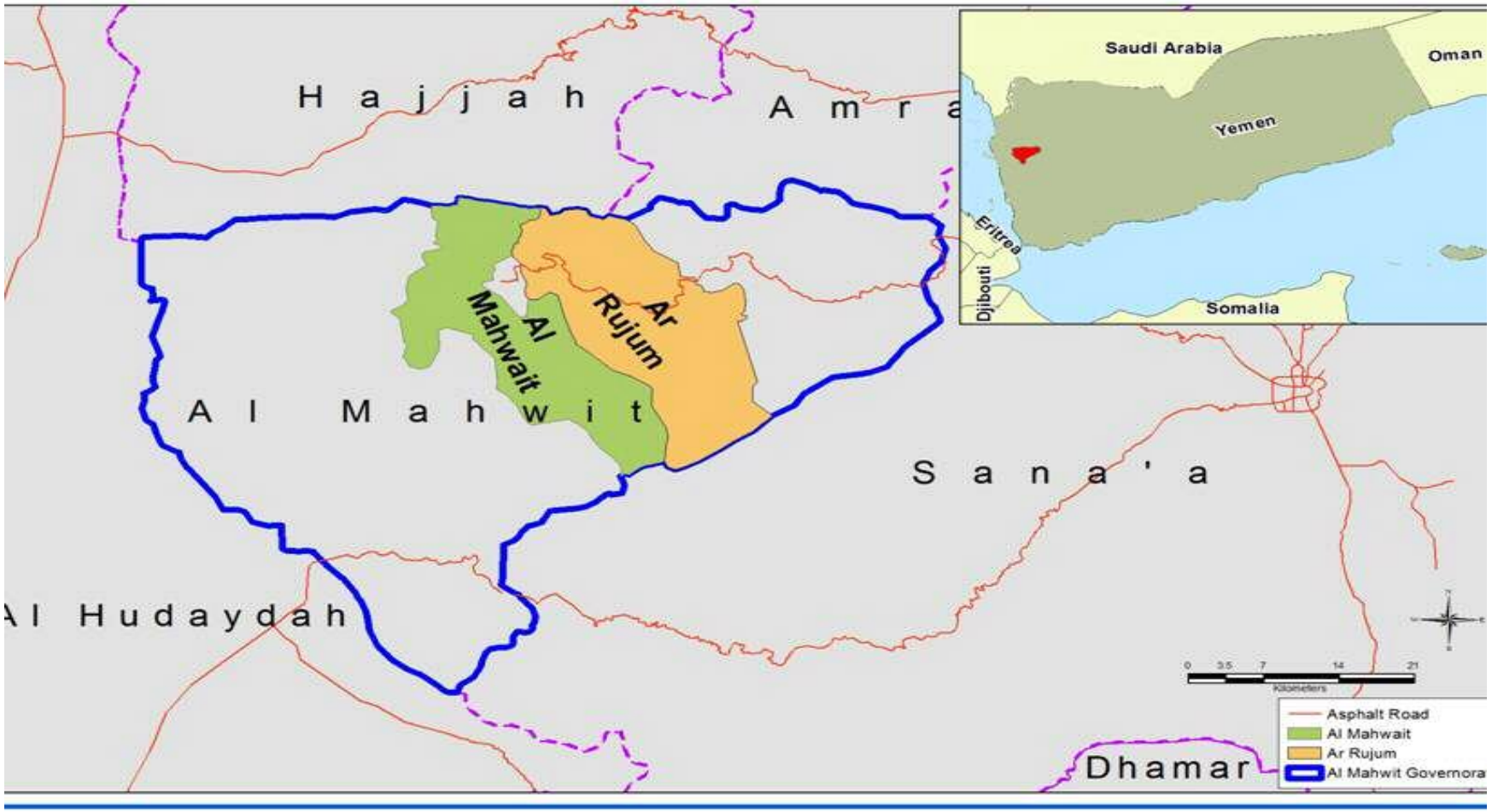
Map 1 governorates with mesoscale transect



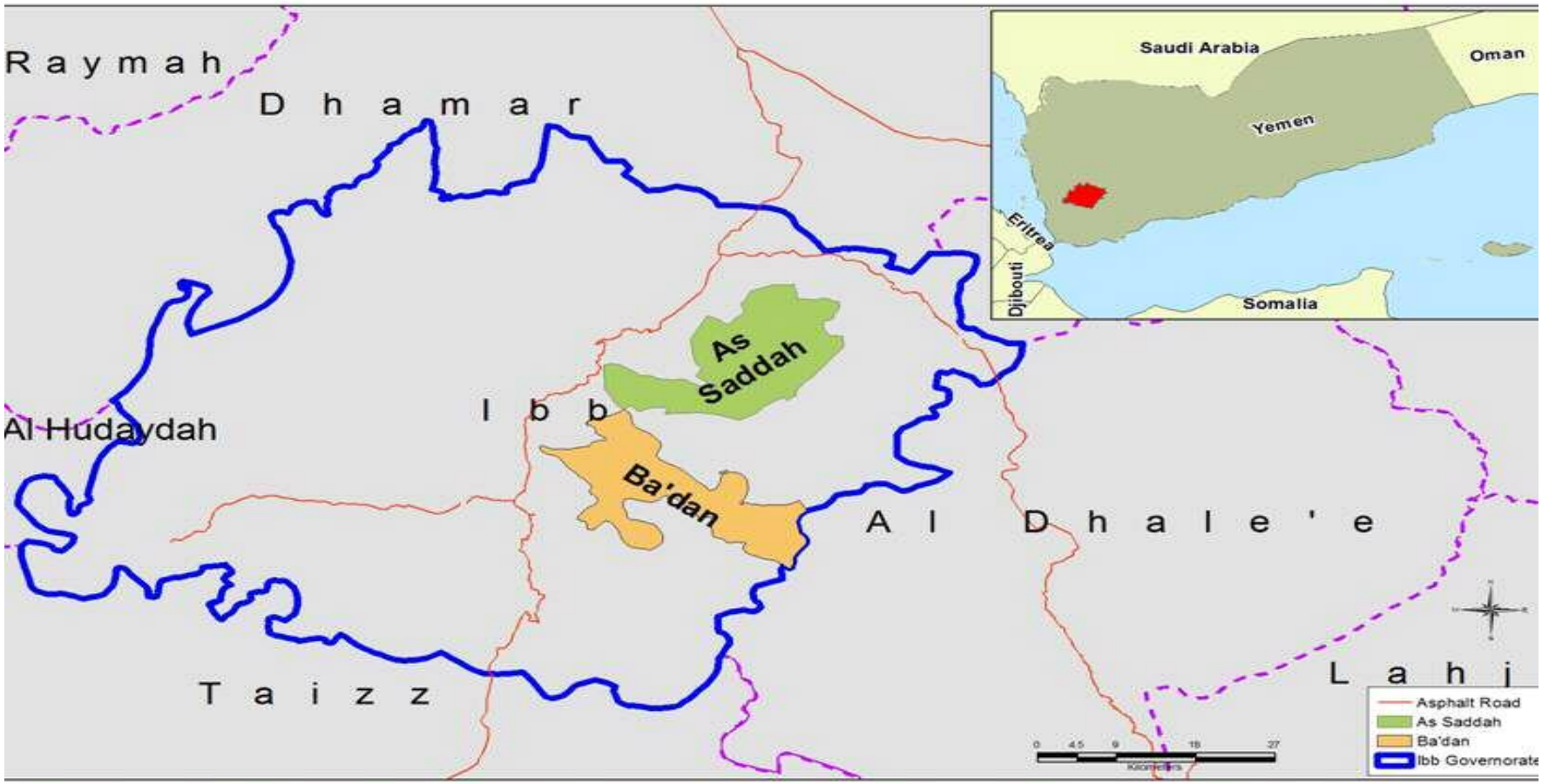
Map 2 Yemen General Map



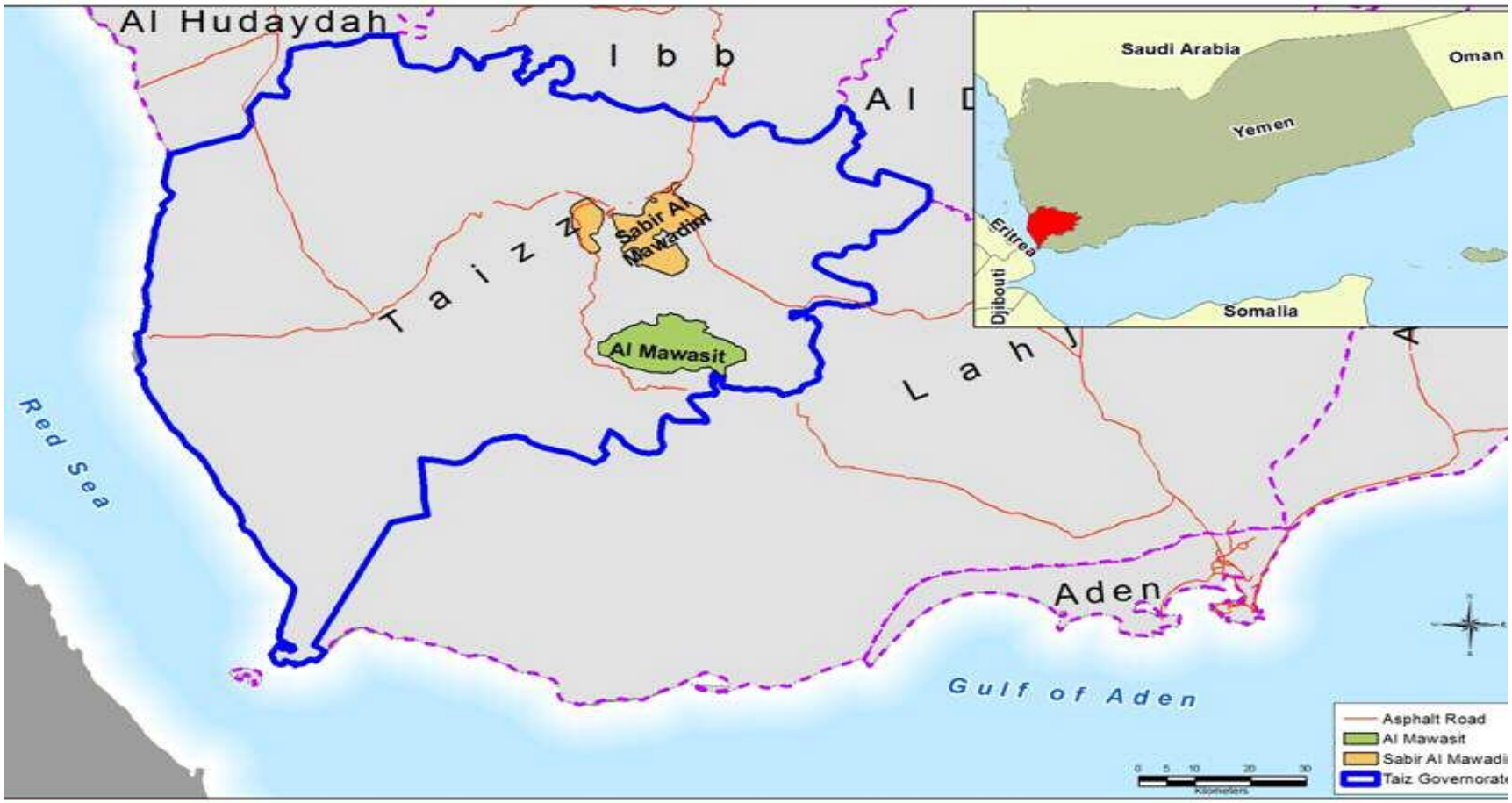
Map 3 Site of Bani Matar and Bilad Ar Russ districts in Sana'a governorate



Map 4 Site of Al-Mahweet and Ar Rujum districts in Al-Mahweet governorate



Map 5 Site map of As-Sadah and Ba'adan districts in Ibb Governorate


Al Hudaydah
Ibb
Taiz
Sabir Al Mawadim
Al Mawasit
Lahj
Aden
Red Sea
Gulf of Aden
Saudi Arabia
Oman
Yemen
Eritrea
Djibouti
Somalia
Asphalt Road
Al Mawasit
Sabir Al Mawadi
Taiz Governorate

Map 6 Site of Saber Al-Mawadem and Al-Mawaset districts in Taiz Governorate

Appendix II
Analysis of Data Collected and Interviews

Detailed Analysis of Data Collected and Interviews

Introduction

The Agro Biodiversity and Climate Adaptation Project is to be triggered to help support the Yemeni government overcome the climatic changes affecting the country specially the rural areas. The project constitute of four components of which one namely " Coping with Climate Change Impacts" with the objectives of introducing coping measures that can be categorized in: (i) measures of land use management like e.g. crop rotations with intercropping; (ii) measures to enhance soil fertility; (iii) all kinds of water management related coping measures like e.g. on farm hydrological approaches which cover tank construction and supplemental irrigation to measures on watershed scale like e.g. dam dimensioning and construction; (iv) Using the potential of local agro biodiversity like e.g. drought tolerant varieties; (v) terrace maintenance; (vi) erosion prevention; and last but not least (vii) societal coping measures with a focus on women's activities which cover a wide range of household and farming activities. The four components are linked together and the field study has addressed the interconnected issues between them. Issues such metrological information, water awareness, community management were also discussed during the public consultations.

The objectives of the public consultation are:

4. To find out whether the communities are likely to accept the coping measures suggested by the Agro Biodiversity and Climate Adaptation Project.
5. To find out whether these measures have no or little environmental and social impacts on the communities and
6. To assess the present situation in these areas on how people are coping with the climate changes.

The next paragraphs will provide an insight into these objectives

Methodology

The consultations of different stakeholders in the designated areas have been conducted according to the following methodology:

1- Selection of the field team who should have previous experiences in public consultation and participation tools such as PRA involving at least one women member.
2- Conduct a one day workshop to the team highlighting the following:
    a. The background of the Agro Biodiversity and Climate Adaptation Project.
    b. The tasks needed to executed
    c. Discussions and finalization of the checklist list to be referred to during the discussions with the beneficiaries
    d. Prepare the necessary forms
3- Prepare a list of the names and telephones of the heads of the agricultural offices in the eight districts to meet them and facilitate the meetings with beneficiaries and agree on the dates.
4- Prepare the different logistics needed for travelling and lodging in the field such as cars rental, hotel reservations, etc…
5- Interviews and discussions with stakeholders in the project areas have covered the following:
    - Government institutions

- NGOs and projects (if available)
- Farmers
    - ③ Women farmers
    - ③ Men farmers

6- Conduct the field visits starting with Bani Matar at the governorate of Sana'a as a test site.
7- Discuss with the team at the end of the day the results and suggest any modifications to the mechanism of discussions, approaches, and shortcomings if any. Accordingly the necessary changes and modifications should be incorporated into the next field visits.
8- Continue the next visits for the other districts.
9- Compiling of data and information at the end of the day of each visit into reports so as not to miss any observation or comment.
10- The team at the end of each day will meet for 2-3 hours to discuss the findings and to make sure that the results are in line with the activities and copping options of the Agro biodiversity and Climate Adaptation Project.

Approach

The public consultation has covered four governorates and eight districts as listed in the following table:

Governorate	District	No. of villages
Sana'a	Bani Matar	4
	Bilad Ar Roos	3
Al-Mahweet	Al-Mahweet	4
	Ar Rujum	1
Ibb	As Sadah	2
	Ba'adan	2
Taiz	Saber Al Mawadem	4
	Al Mawaset	2

The total numbers of people interviewed are 131 men and 34 women from all villages. Women were reluctant to give their names so we just listed them in total numbers.

Findings

A thorough review has been done on the different literature GEF produced (Lennartz, et al 2009, and GEF, 2009) to gather the different links and threads regarding the coping options and the activities required for the climatic change adaptation. Several issues have been listed related to land, water, women, crops and existing adaptation mechanisms.

Land Use Management

The term covers measures of land use management that farmers are involved with such as soil fertility and soil moisture, usage and rehabilitation of terraces.

Soil fertility: farmers are adapted to use organic matter to fertilize the soil (all areas) which is produced by animals. In Taiz they are adding human wastes to the land. However due to the lack of rainfall which caused less pasture areas; shortages of animals have become a major issue to the communities. Farmers, therefore, have introduced chemical fertilizers as supplementary to the organic (all areas). They realized that continuation of the application of

chemical fertilizers for more than two consecutive years reduces the soils fertility which is have been observed due to the low crop production. In some areas such as Bilad Ar Roos and Ba'adan, farmers keep harvested crops roots and leaf on the soil to decompose. Farmers in As Sadah add silt to their farms which contains good organic matters. They also apply too much traditional organic fertilizers to the soil after maize cultivation to allow soil regains its fertility. Bani Matar also has the experience of adding ash to the soil to increase its fertility.

The process of collecting and transporting organic matter is still inadequate and unhealthy. Women take an important part of this process either inside the stable where animals produce the organic matter, during transportation, preservation in halls and spreading on the filed. Men and children share parts of the activities.

Soil moisture: Traditional procedures are well used such as Tathmeen (Kamee) which is a process of tiling the wet clay soils before the cropping season (Bani Matar). Tilling and levelling the land would cover the voids resulting in preventing water evaporation form the soil (Bani Matar, Bilad Ar Roos) usually In clay soils only one rainfall would be enough for the crop during the season. In Ar Rujum farmers understand that adding traditional fertilizers help preserve the moisture in the soil while In Al-Mahweet farmers cover the soil with fertilizers to preserve the soil moisture. Other process of keeping the soil moisture preserved is by leaving roots and leafs of wheat and barley on the soil to decompose (Ba'adan). Farmers in Saber keep the water moisture in the soil by ploughing the soil in January and keep it intact until the start of the summer season which also has the effect of airing the soil and killing the insects. Tiling the land, adding fertilizers and rotate the crops enhances soil fertility and preservers soil moisture.

Traditional practices require more technical guidance and extension services to optimize soil moisture content and utilize during dry periods.

Terraces: most farmers in all areas use terraces due to the mountainous areas and high gradients. However, in recent periods farmers tended to abandoned these systems due to high costs of maintenance, low rainfall, and difficult terrains (all areas). Maintenance, however, occurs during the beginning of the cropping season (all areas) and only for those usually used. Such maintenance takes place on an individual basis where owners rehabilitate them by themselves or by hiring labour. Women do have substantial share of the rehabilitation. Terraces are heavily deteriorated are abandoned since farmers can not afford to cover the costs of maintenance such as in Saber. Terraces which are not utilized by the owners either put on sharing, lease, or kept unused. Animals are usually used in ploughing and tilling the soil in small narrow terraces, while machines are used in wider easy access ones (Saber).

Water management

Water Harvesting systems: Highlands of Yemen are famous of water harvesting systems where people have adapted very beautifully to the different climatic changes occurred during the old times. We have inherited well sited, properly designed and constructed harvesting systems for the different purposes of drinking, household, cattle and irrigation. However, negligence of these systems in the past decades resulted in deterioration and misuse. Farmers felt the hardship due to lack of water for different purposes especially with the alarming falling of groundwater levels.

Farmers in the different areas in need of harvesting systems with one or combination of one of the following:

- Rehabilitation of existing systems
- Expansion and existing systems
- Build new systems

The main purposes of the systems are for cattle, supplementary irrigation, and recharge of springs and collection of spring waters. Farmers are ready to provide land to build the new systems an assign it as endowment and mange collectively the systems according to agreed rules.

The government and private sector constructed several systems in the highland, however proper management and administration is lacking which resulted in insufficient use of available water and social conflicts between the beneficiaries.

Framers in Ar Rujum utilize spring water to irrigate peanut trees. In As Sadah farmers used the constructed dams to recharge the downstream springs. In Ba'adan houses are supplied through pipe network with waters from springs. Spring water is collected in cisterns and water spills over these collected tanks (cisterns) is used for supplementary irrigation according to agreed water rights.

Increase awareness amongst farmers on water conservation of water resources such as common cisterns and dams in addition to the introduction of community management.

Constructing water harvesting systems nearby farms as supplementary irrigation especially would be useful when rainfall comes late or stops before cropping season ends.

Crop Management

New crops: Peanut trees planted in Bani Matar replacing Qat cultivation and s as an additional crop, similarly in Al-Mahweet and Saber which actually consumes less water and produces better income from the farmers. Seeds and harvested crops are preserved in barrels. Olive trees are introduced in Ba'adan as cash crop which takes less water. Local wheat and barley types are cultivated in most of the areas that withstand climatic changes; however research is needed to provide improved seeds for these types. Similarly, it is important to provide farmers with crops that withstand dry spells and produce better income such as improved wheat olive trees and peanuts

Seeds preservation: in all areas, seeds are selected from the best harvest and preserved in barrels, steel tanks (Ba'adan), bags, or inside rooms (Huqab) as in Bani Matar or (Kiute) as in As Sadah. Huqab and Kiute are actually rooms divided by walls into sections; each section preserves a specific type of seeds and crop.

Cropping seasons: Cropping seasons timing did not change in all areas, however, farmers adapt themselves where they start planting when rain falls. There are two cropping seasons in all areas notably summer and winter seasons. Late rainfall results in abandoning agriculture in that season. In some seasons rain starts to fall on time and farmers starts cropping and suddenly during the season rain stops causing great crop loss to the farmers. Farmers try to cope with the noticeably unpredicted rainfall depending on their own knowledge and experience. Technical and awareness support are very much required by the farmers. Crop rotation and intercropping is practiced in most areas with the traditional types of crops farmers used to cultivate.

Metrological information and data: Farmers are not aware of such information and believe that such information would help them adapting to the climate changes. They understand very well that there are changes of temperatures in the year. They recently noticed that temperature rises during the summer period and fall during the winter period which was the same previously.

Educate farmers and staff of related authorise in the different areas of the RALP about how to get these information, what do they mean and what to do with them is an important issue to enable them to set priorities and plans for adaptation during the whole season.

Women

Farm and house activities: In Most areas, women have suffered a lot due to lack of rain. She has to transport water for longer distances in addition to the increased load of taking care of animals, and field activities. She has to bring animal fodders, fetch water, cordwood for cooking and taking care of the family and fertilize the farms with animal products. During the presence of men, they share farm responsibilities – if not more- while house activities lie completely on women. During the absence of men, she has to do all work in the farm. During dry seasons, women and girls travel longer distances to fetch water and collect cordwood.

Education: high illiteracy exists amongst women and girls leave schools at an early age to help the family in the farm and in the house. Similarly to men, women lack awareness in water issues and have low educational capacity.

Summary

It is clear that hardship is apparent in all areas with slightly different scales and levels. Low of rainfall puts families in the verge of collapse; some families have immigrated to nearby towns and cities leaving their farms and houses behind In order to sustain their lives and their children lives. Several villages and sub districts in A-Mahweet have immigrated to towns and cities. Frustration of farmers is clear in terms of the final production of the crop where farmers assume that good production will be sustained, but suddenly rains stops at the middle of the season causing great loss of the crop.

Low rainfall and change of temperatures have been recently affecting cropping seasons, crops, water availability, animals and humans. Introduction of the project to these areas is vital, however, it should be included the following in its different components so that to maximize the benefits by the farmers:

- Awareness raising on water and agricultural issues
- Building up the skills of the communities and the authorities staff in:
  - Community mobilization
  - Community management
  - Metrological information
  - Land and water management techniques etc…

Recently, in most areas farmers consider agriculture as a secondary source of income due to the unstable occurrence of rainfall, high costs of labour and low crops production. Initiation of Water supply and harvesting projects, provision of agricultural machines, introduction of crops and trees that consume less water and produce sufficient income, and improve traditional local practices could encourage farmers to settle in their lands.

Appendix III
List of stakeholders consulted

Governorate: Sana'a

District: Bani Matter

Agriculture office

No.	Name	Affiliation	Post
1	Ali Mansour Al Matari	Agricultural Office	Head of Agricultural extension
2	Saleh Muhammad Katran	Agricultural Office	Extension officer
3	Mujahed Ahmad Katran	Agricultural Office	Agricultural technician

Villages: Bait Kahen

No.	Name	Affiliation	Post
1	Khaled d Ali Mansour		Farmer
2	Ali Saleh Ahmad Al Matari		Farmer
3	Aziz Muhammad Ali Mukbel		Farmer
4	Muhammad Hameed Mansour		Farmer
5	Muhammad Hameed Mansour		Farmer
6	Muhammad Ali Mukbel		Farmer

Village: Al Batha

No.	Name	Affiliation	Post
1	Adel Muhammad Al-Sufiani		Farmer and head of private water supply project
2	Ali Abdullah Mista'a		Farmer
3	Waleed Ali Saleh Mista'a		Farmer
4	Abdullah Kassim Al-Sufiani		Farmer
5	Khaled Ali Abdullah Mista'a		Farmer
6	Nabil Ali Saleh Mista'a		Farmer
7	Fawaz Muhammad Garallah		Farmer
8	Ameen Ali Museed		Farmer
9	Ameen Muhammad Garallah		Farmer
10	Ali Abdullah Naji		Farmer
11	Muhammad Saleh Hasan		Farmer
12	Sami Ali Mista'a		Farmer
13	Muhammad Hadi Garallah		Farmer
14	Muhammad Ahmad Mista'a		Farmer

Village: Bait Awad, Bait Kharab

No.	Name	Affiliation	Post
1	Fadhel Saleh Garallah	Bait Kharab Water Users Association	WUA Chairman
2	Yahia Muhammad Awad		Farmer
3	Mansour Abdullah Al-Awadi		Farmer
4	Muhammad Awad Yahia		Farmer

Ten women interviewed from all villages

District: Bilad Ar Roos

Agriculture Office

No.	Name	Affiliation	Post
1	Abdul Galil Haidar	Agricultural Office	Head of Agricultural office
2	Ali Muhammad Al-Absi	Agricultural Office	Extension officer
3	Muhammad Ameen Naji	Agricultural Office	Extension officer
4	Saeed Muhammad Al Qadasi	Agricultural Office	Agricultural Technician

Village: Wa'alan, Wadi Adduba

No.	Name	Affiliation	Post
1	Ahmad Muhammad Saeed		Farmer
2	Ali Saleh Ali		Farmer
3	Muhammad Ahmad Saeed		Farmer
4	Saleh Ali Al Badsh		Farmer
5	Sulaih saleh Ali		Farmer
6	Ismaeel Ali Al Kawl		Farmer
7	Ali Saeed Al Haj		Farmer

Village: A'athar

No.	Name	Affiliation	Post
1	Saleh Muhammad Al-Dabash		Farmer
2	Ali Saleh Al-A'ansi		Farmer
3	Abdul Wali Al-Qadhi		Farmer
4	Abdulla Ahmad Muhammad		Farmer
5	Ahmad Ali Aldaba		Farmer
6	Ali Ahmad Al-Haj		Farmer
7	Muhammad Ahmad Shamsan		Farmer
8	Muhammad Ahmad Al-A'ansi		Farmer
9	Muhammad Saleh Museed		Farmer
10	Bandar Ahmad Museed		Farmer

In addition to 13 women interviewed from both villages

Governorate: Al-Mahweet

District: Al-Mahweet

Agriculture office and Local Authority

No.	Name	Affiliation	Post
1	Yahia Muhammad	Local Authority	Director of Local Council
2	Muhammad Al Thubhani	Agricultural Office	Head of Office
3	Muhammad Ahmad Al Bushari	Agricultural Office	Extension officer
4	Fadhel Al Jumae'e	Agricultural Office	Agricultural Technician
5	Ahmad Ali Hubaish	Local Authority	Member of Local Council

Billares: Na'aman, A Tiari, Al Kuroon and Al Ma'aina

No.	Name	Affiliation	Post
1	Muhsen Feras Hubaish		Farmer
2	Muhammad Hussain Abdulla		Farmer
3	Khaled Aqabat		Farmer
4	Muhammad Murshed Hubaish		Farmer
5	Mutahar Ahmad Hubaish		Farmer
6	Hassan bin Hasan Hubaish		Farmer
7	Shahrazad Khamash Hubaish		Female farmer and house wife
8	Tahani Khamash Hubaish		Female farmer and house wife
9	Um Rwa'a Ahmad Hubaish		Female farmer and house wife
10	Um Ragad Naji Hubaish		Female farmer and house wife
11	Wife Abdul Kareem Hubaish		Female farmer and house wife
12	Muhammad Mutahr al-Ashmoori		Farmer (Al Kuroon village)
13	Khamash Feras Hubaish		Farmer (Bait A Tiari)
14	Nabil Muhammad Hussain		Farmer (Al Ma'aina village)
15	Ali Al Nozaily		Farmer (Al Ma'aina village)

District: A Rujum

Agriculture office and Local Authority

No.	Name	Affiliation	Post
1	Muhammad Ali Al Ga'adabi	Local Authority	Director of Local Council
2	Abdul Razak A Shahedhi	Agricultural Office	Head of Office
3	Khaled Abu Yahia	Local Authority	Member of Local Council

Village: Bani Shihab

No.	Name	Affiliation	Post
1	Muhsen Al Kamee		Farmer
2	Adel Mufreh		Farmer
3	Ibrahim Jahash		Farmer
4	Abdulla Ali Jamil		Farmer
5	Ameen Ali Jamil		Farmer
6	Ali Hizam		Farmer
7	Muhammad Ali Jamil		Farmer
8	Sameer Muhammad Ali		Farmer
9	Ahmad Muhammad Ali		Farmer
10	Adel Ali Jamil		Farmer
11	Khalil Ali Muhammad		Farmer
12	Yasmeen Ali Jamil		Female farmer and house wife
13	Arwa Ahmad Al Haimee		Female farmer and house wife
14	Samar Muhammad Ali Jamil		Female farmer and house wife
15	Rahma Saleh Al Khaisi		Female farmer and house wife
16	Bilqis Ahmad Ali Jamil		Female farmer and house wife
17	Zakia Hizam Munes		Female farmer and house wife

Governorate: Ibb

District: As Saddah

Agriculture office and Local Authority

No.	Name	Affiliation	Post
1	Nabil Al Awadhi	Local Authority	Director of Local Council
2	Abdul Salam Al Aghbari	Local Authority	General secretary of Local Council
3	Abdul Wahab Abdul Mughni	Agricultural Office	Head of Office

Villages: Dhil Gharf, Al-Misqah

No.	Name	Affiliation	Post
1	Kassim Muhammad Musleh Al Sakhi		Farmer
2	Ahmad Muhammad Saleh Gahaf		Farmer
3	Abdulla Saleh Salad		Farmer
4	Naji Saleh Naji		Farmer
5	Naji Muhammad Abdulla		Farmer
5	Anwar Ismaeel Al-Dailami		Farmer (Misqah village)
6	Hamoud Musleh Ali Hashem		Farmer
7	Saleh Muhammad Ali		Farmer
8	Muhammad Naji Aidana		Farmer
9	Ali bin Ali		Farmer

District: Ba’adan

Agricultura office

No.	Name	Affiliation	Post
1	Muhammad Abdu Saeed	Agricultural Office	Head of Office

Villages: Alma’abar, Al-Irshad

No.	Name	Affiliation	Post
1	Mute’e Muhammad Abdullah		Farmer
2	Ibrahim Abdu Muhammad		Farmer
3	Zaid Muhammad Hassan		Farmer
4	Abdu Muhammad Yahia		Farmer
5	Khaled Abdulla Dahan		Farmer
6	Hilal Ismaeel		Farmer
7	Abdu Muhammad Hassan		Farmer
8	Khaled Muhammad Ali		Farmer
9	Muhammad Abdu Saeed		Farmer (Al-Irshad village)
10	Abdu Muhammad Thabit		Farmer (Al-Irshad village)
11	Muhammad Mahdi Naji		Farmer (Al-Irshad village)
12	Abdul Bari Fadhel		Farmer (Al-Irshad village)
13	Abdul-Wahab Hatrash		Farmer (Al-Irshad village)
14	Abdul Rakeeb Na’aman		Farmer (Al-Irshad village)

Governorate: Taiz

District: Saber Al-Mawadem
Agriculture office and Local Authority and NGO

No.	Name	Affiliation	Post
1	Ahmad Ali Gamel	Local Authority	Director of Local Council
2	Ameen Muhammad Thabit	Local Authority	General secretary of LC
3	Abdul Ra'awf Al-A'zani	Local Authority	Member of Local Council
4	Muhammad Haza'a Ali	Local Authority	Member of Local Council
5	Muhammad Bagash	Agricultural Office	Head of Office
6	Abdul Rahman Bishr	YASAD (NGO)	Agriculture Engineer
7	Hanan Al Sabri	YASAD (NGO)	Head women department

Villages: Allukhaima, Al-Ma'ain, Al-Meeqab, Al-U'amaiqah

No.	Name	Affiliation	Post
1	Abdulla Muhammad Yahia		Farmer (Allukhaima village)
2	Ali Ahmad Abdulla		Farmer (Al-Ma'ain village)
3	Ali Mahyoub A'qlan		Farmer (Al-Meeqab village)
4	Abdulla Ghaleb Ahmad		Farmer (Al-Meeqab village)
5	Muhammad A'aqlan		Farmer (Al-Meeqab village)
6	Muhammad Ahmad Al –Habili		Farmer (Al-Meeqab village)
7	Hasan Hamoud A'aqlan		Farmer (Al-Meeqab village)
8	Abdul Fattah Ahmad Hassan		farmer (Al-U'amaiqah village)

District: Al-Mawaset
Agriculture office

No.	Name	Affiliation	Post
1	Ali Abdul Rahman Al Soofi	Agricultural Office	Head of Office

Villages: Al-Bahri, Al-Zera'a

No.	Name	Affiliation	Post
1	Ali Muhammad Nasser		Farmer
2	Fadhel Ali Abdul Wahab		Farmer
3	Zaki Ghailan Muhammad		Farmer
4	Muhammad Sufian Kasim		Farmer
5	Ahmad Sultan Abdullah		Farmer
6	Abdul Rahman Abdo Ahmad		Farmer
7	Na'aman Saeed Ahmad		Farmer
8	Muhammad Abdullah Muhammad		Farmer
9	Abdullah Muhammad A'agan		Farmer
10	Saif Mukbel Malek		Farmer
11	Saeed Ghanem Al Aser		Farmer

Appendix IV
Record of Meetings and Public Consultations

Record of Meetings and Public Consultations

Governorate: Sana'a

District: Bani Matar
Villages: Matna and Bait Kahen, Al Batha, Bait Awad, Bait Kharab

Land Use Management

- Organic matter (Dhabel) is used to enhance soil fertility and conserve soil moisture in the soil.
- Using ash as fertilizers
- Traditional processes are used to conserve the soil moisture.
- Usually farmers maintain their own terraces on individual basis.

Water Management

- Old cisterns exist and usually use for cattle and require rehabilitation.
- There exist some small dams in the area but not used properly.
- Water channels for irrigation have water rights that everybody agrees with.
- Insufficient waters in the wells have resulted in social disputes.

Crop management

- Peanut trees have been cultivated since 2004.
- Local wheat and barley are cultivated due to their less water requirements
- Crop production costs are high due to the immigration of labour from the area.
- Agricultural planting seasons did not change even though rainfall seasons have changed which results in abandoning agriculture in some seasons.
- In some seasons rain starts to fall on time and farmers starts cropping and suddenly during the season rain stops causing great crop loss to the farmers
- Seeds are preserved in barrels, bags, or inside rooms (Huqab).
- Specific crops such as tomatoes can be planted in the winter seasons under green houses

Women

- Woman has suffered a lot due to lack of rain.
- Women are doing most of the men's work in the fields during their absence.
- During the presence of the men, women share equally the field work and do the house work by herself
- Women have weak or even no educational capacity and lack awareness in water issues

Remarks

- The district is characterised with low rainfall
- The provision of agricultural machines would result in social disputes unless proper organizational entities have been developed and well trained in the skills of community participation
- Recently cattle owners from other districts reached the district and used it as pasture for their animal, however they have been prevented.
- There is no metrological information available. Farmers suggest that if such information is available, it would help them to adapt by getting better preparations for the climatic changes.
- Rehabilitation and increase the capacity of cistern and introduce new ones would reduce social conflicts and provide water for cattle and supplementary irrigation

especially for less water consumption crops. Lands can be provided to new systems and farmers are ready to make these lands as endowment.

- Increase awareness amongst farmers on water conservation and their rights in the utilization of water resources such as common cisterns and dams
- Establish community management groups and association involving local councils to manage these water resources which would be an asset to the social welfare of the communities.
- Water supply projects and wells used for irrigation would encourage farmers to settle in their villages and cultivate their lands.
- The framers have the desire to acquire agricultural machines if they are used equally and just between them.
- Cordwood usage has resulted in disappearance of trees.
- Due to the high production costs and low production income of agriculture, farmers are mainly dependant on jobs (civil and military) and skilled crafts they might do such as in the construction side.
- Emigration is apparent in the area where farmers leave to cities for other jobs.

District: Bilad Ar Roos
Villages of Wa'alan, Wadi Adduba˜A'athar

Land Use Management

- Farmers are enhancing soil fertility by:
  - Adding organic fertilizers
  - Leaving roots and leafs on the soil after harvesting to decompose
- They conserve soil moisture by tillage and turning the soil after rain.
- Terraces are abandoned due to the high maintenance costs and the harsh terrain.

Water Management

- Water channels are well maintained
- There exist limited old cisterns used only for cattle
- Small dams and big cisterns built by the government are not benefited from and are a source of disputes between farmers
- Grounder water is highly exploited

Crop management

- Seeds are preserved in barrels and bags
- Best seeds are selected from the harvest according to standards known to farmers through ages
- Farmers start planting summer crops when rain falls
- Farmers do intercropping
- Farmers increasingly cultivating barely due to its dry resistance character
- New improved dry resistance wheat has been introduced to the area

Women

- Social Fund for Development (SFD) started forming Agricultural Women Groups.
- Women carry big farm and household loads
- Women share farming activities with the man and during his absence she does most of the men's work.
- She cares about animals, collects cordwood, water and does all household activities.

- High illiteracy rates amongst women and awareness in water issues is missing
- During fetching water from wells, disputes rise among women which sometimes result with social unrest in the community

Remarks

- Farmers recently noticed that temperature rises during the summer period and fall during the winter period which was the same previously.
- More cisterns are required for cattle and supplementary irrigation
- Women require water supply projects
- Women are doing more work
- Farmers are joining the civil and military jobs
- Most farmers stop growing cattle due to lack of pasture
- Some cattle die because of thirst and hunger

Governorate: Al-Mahweet

District: Al-Mahweet
Villages: Na'aman, Al Tiari, Al Kuroon and Al Ma'aina

Land Use Management

- Farmers enhance soil fertility by adding organic matters and when rain falls heavily they add also chemical fertilizers
- Farmers cover the soil with fertilizer to preserve the soil moisture
- Due to short of rain and unavailability of labour, Farmers do not spend much effort or money on the land
- Terraces are the predominant landscape in the area and require great maintenance

Water Management

- To some extent farmers rebuilt water channels
- Some communities in the area have excellent experience and success in managing water supply projects, water harvesting systems and agricultural machines
- Some farmers introduced drip irrigation for coffee plantations

Crop management

- Farmers preserve seeds in barrels
- Seder and mango trees are new comers in the area
- Cultivation starts when rain falls and the same traditional crops planted each season
- New type of maize that consumes less water has been introduced in the area
- Peanuts also has been introduced as new cash crop which consumes less water
- Farmers do intercropping during crop rotations

Women

- Women are divided as follows:
  - either being part of a family of land lords or
  - Part of a farming family.
- The majority of women are farming families and working in the fields and the house
- Gas cookers are widespread in most areas, however when there is shortages women take the lead in collecting cordwood.
- Illiteracy is spread amongst farming families and awareness in water issues is missing
-

Remarks

- 95% of the land in these villages is owned by Hubaish family
- Biogas technique is remarkably widespread in the villages
- A few sub districts have immigrated from the area
- There exist social problems due to shortages of rain
- Farmers noticed rise in temperatures.
- Recently termite has spread and it was not
- Insect termites were not found in the past and are currently widespread

District: Ar Rujum
Villages: Bani Shihab

Land Use Management

- Farmers enhance soil fertility by adding organic matters and when rain falls heavily they add also chemical fertilizers
- Farmers understands that adding traditional fertilizers help preserve soil moisture
- Up to 30% of the land was abandoned due to shortages of rain and immigration of labour
- Rehabilitation of terraces always take place at the beginning of the new season

Water Management

- Water channels are maintained on an individual basis
- The existing small dams are causing social disputes due absence of suitable community management
- Farmers realize the importance of community management of small dams
- Traditional water harvesting systems are not well maintained
- Rural Water supply projects are widespread in the area

Crop management

- Barrels are used to preserve seeds
- A three months season of maize type has been introduced in addition to the traditional five months maize
- Peanuts trees have been planted in spring areas
- Summer cropping season is important for the farmers
- Disappearance of some winter crops such as˜ fenugreek, local beans, peas, lentils, local wheat, alfalfa, and Mustard

Women

- Work pressure increases during dry spells
- Women work in the farm with men.
- She cares collects cordwood when there is shortages of cooking gas
- Most women and girls are illiterate and awareness in water issues is missing
-

Remarks

- There are families immigrated into the nearby cities
- Communities get frustrated when there is no rain which results in social problems
- Rehabilitation water harvesting systems can be used fro cattle and supplementary irrigation especially when rainfall comes late or stops before cropping season ends

Governorate: Ibb

District: As Sadah
Village: Dhil Garf

Land Use Management

- Farmers use traditional organic fertilizers and silt accumulated in irrigation channels
- Chemical fertilizers are used after rainfalls
- Traditional organic fertilizers are applied heavily to the soil after maize cultivation season to allow the soil regains its fertility.
- Farmers rebuilt and maintain Terraces individually

Water Management

- The water channels- which are deeper than usual- are maintained by group of farmers whose their farms irrigated from these channels. These channels accumulate silt that is used as natural fertilizers. The silt is distributed to farms according to common rights accepted by farmers.
- Water left in the channels below the farm levels used later as supplementary irrigation when rainfall stops
- Rain water is harvested in small common and private traditional cisterns used for cattle and can be for supplementary irrigation , but require expansion
- Farmers are ready to manage these cisterns
- There are some small dams fro irrigation and groundwater recharge especially for springs, but need community management
- There is a metrological station in the district, however data are not analysed and no feedback to the farmers

Crop management

- Seeds are carefully selected from the harvest and preserved in barrels and Kiute (Huqab) or kept in a small room below the stairs
- There is crop rotation between wheat and barely
- Even though rainfall seasons changed slightly, farmers kept farming their crops according to these changes which affected the crops growth and reduced its diversity
- Farmers grow wheat, barley, lentils, fenugreek and maize
- Some crops have not been planted anymore such as local beans, peas, and mustard,
- New trees introduced to the area such as Russian jonquil.

Women

- Women carry big farming loads
- Rural water supply projects and cooking gas resulted in reduction of household loads
- Women lack awareness in water issues and have low educational capacity

Remarks

- Immigration into nearby towns and cities has increased between men to cove livelihood expenses
- Different types of trees grown in the area such as alosrb, Camphor and sider.
- There is a great need for water harvesting cistern to be used during dry spells
- There is a great need for agricultural machines to increase production an reduce burden on men and women farmers
- Farmers are ready to develop community management groups
- Farmers need improved crops that withstand dry spells

District: Ba'adan
Village: Al-Ma'abar

Land Use Management

- Farmers use traditional organic fertilizers in addition to human wastes due to lack of cattle
- Framers rent agriculture machines with high costs
- Framers rehabilitate their terraces individually
- Soil moisture is usually preserved by leaving roots and leafs of wheat and barley on the soil to decompose after harvesting which also fertilizes the soil

Water Management

- Water channels are maintained by individual farmers
- There are no small dams
- Waters from springs are collected for drinking in small cisterns and distributed through pipe network to households.
- Water spilled over collected cisterns are directed through channels to be used for supplementary irrigation and for cattle according to traditional water rights

Crop management

- Seeds and harvested crops are preserved in barrels
- Olive trees are introduced as new crop which take less water and produces more income
- Cropping seasons did not change
- Farmers do intercropping during crop rotations
- Crops cultivated in the area are wheat, sorghum, barely and potatoes

Women

- Women take care of cattle and share harvesting activities with men
- She does all household activities
- When springs get dry, she fetches water from long distances
- In some villages, women do cordwood
- Educational levels are low and awareness in water issues is missing

Remarks

- Farmers need crops that withstand dry spells and produce better income such as improved wheat and olive trees
- Increase the cultivation of olive trees
- Provide agricultural machines which would reduce cost, effort and time for both men and women farmers
- Build big cisterns in the highlands to recharge springs during dry seasons would ease social unrest
- Wild herbalism spread in the area and needs to be utilized as economical good fro the farmers
- Rainfall shortages affects cattle
- Farmers noticed that there are changes of temperatures in summer and winter which was felt previously
- Immigration is a key issue in the area which resulted in increase costs of labour and leave other farms without cultivation

- Build water harvesting systems nearby farms as supplementary irrigation especially when rainfall comes late or stops before cropping season ends
- Introduce awareness campaigns on water issues and community management of water harvesting systems and agricultural machines

Governorate: Taiz

District: Saber Al-Mawadem
Villages: Allukhaima, Al-Ma'ain, Al-Meeqab, Al-U'amaiqah

Land Use Management

- Farmers rehabilitate terraces and protect them from erosion on individual basis
- Traditional organic fertilizer is used
- Farmers cultivate crops interchangeably, i.e. they cultivate 50% of the land in summer and leave the rest without cultivation and to be cultivated in winter. The purpose of this process is to reduce pressure on the land without exhausting its fertility.˜
- To keep the water moisture in the soil, farmers plough the land in January and keep it intact until the start of the summer season which has the effect of airing the soil and kills the insects
- Low percentage of farmers sue chemical fertilizers
- Some farmers use bulls for ploughing in small farms and some use machines in bigger farms
- Deteriorated terraces are abandoned due to the high maintenance costs and unavailability of labour

Water Management

- Water channels are maintained by individual farmers
- Water channels are maintained
- Rooftop harvesting spread in the area
- No metrological data available and farmers do not know their benefits
- Awareness on water issues does not exist

Crop management

- Cropping seasons start when rainfalls
- Seeds are kept in steel tanks and potatoes seeds are kept in bags
- Best seeds of potatoes and maize are selected from the harvested crop. Seeds for other cops are selected directly from the harvest without any election.
- Crops cultivated in the area are wheat, sorghum, barely, beans, lentils, fenugreek and potatoes and some fruits such as pomegranate, joava, fig and blueberry
- There are two cropping seasons, summer and winter that parts of the land cultivated interchangeably
- New crops introduced such as improved seeds that consumes less water, barely and peanuts
- Some herbal trees appeared in the area

Women

- Women share most parts of the farm activities with men
- Women collect traditional organic fertilisers into un-aerated halls covered with sand for 3-4 months in order to decompose then transport it in bags to the farms and mixed with the soil
- In case of water shortages in the house, she fetches water from longer distances
- Women bring fodder for cattle
- High level of illiteracy among women

Remarks

- The area needs veterinary specialists I order to avoid loss of cattle which the case I recent period
- Shortages of water in dry seasons cause social unrest within the community
- Farmers realized that after two years of application of chemical fertilizers , land production drop
- The need to build water harvesting systems as supplementary irrigation and fro cattle
- There some crops diapered from the area such as garlic and some type of local wheat due to low rainfall
- The need to rebuilt the deteriorated terraces

District: Al-Mawaset
Villages: Al-Bahri, Al-Zera'a

Land Use Management

- Terraces are maintained on individual basis
- Organic and chemical fertilizers are used together to increase soil fertility
- Due to lack of bulls and high costs of labour, land is not well served
- Ploughing before the start of the cropping season keeps its moisture

Water Management

- The area has good traditional experience in water harvesting used for households and cattle
- There is a common well used for irrigation after rainy seasons but become dry.
- There is a rural water supply project in the area
- Farmers maintain water channels
- Complete the construction of the dam would allow using its water as supplementary irrigation.
- No metrological data available

Crop management

- Cropping season starts when ran falls
- No introduction of new improved crops
- Crops cultivated are, several types of sorghum, corn and millet

Women

- Women share farm activities with men
- Women take care of soil fertility by managing the traditional organic matter
- Women collects fodders fro the animal
- Women collects cordwood for cooking when cooking gas is short
- Women is responsible about the household activities
- Low educational capacity among women

Remarks

- Men immigrate to nearby towns and cities to look fro better income
- The area needs veterinary specialists in order to avoid loss of cattle
- Farmers tend to sell their cattle due to dry spells
- Water harvesting cisterns need maintenance
- Farmers observed an increase and decrease of temperatures in summer and winter respectively.

Appendix V
Description of Stakeholders and Beneficiaries

This section describes the stakeholders as has been outlined in the ACAP draft PAD documents (World Bank, December 2009). The stakeholders of the ACAP project areas include national and local institutions directly involved in the agriculture and livestock sector under the MAI in its governorates and district offices. Additionally, local councils, national or local associations and NGOs that are situated in the project areas. The beneficiaries themselves: men and women farmers and livestock owners, their families and the local populations. The ESIA team met with various representatives of most of these stakeholder and beneficiary groups to discuss environmental and social aspects of the project (see Appendices III and IV for the lists of stakeholders met and records of meetings respectively). The following are brief description of these relevant stakeholders that the **ACAP will** be involved with:

Farmers and Livestock Owners

The intended beneficiaries of the **ACAP** are farmers and livestock owners whose productivity and economic well-being will be improved by the interventions of the project. They will see the direct benefits of the enhanced seed preservation, improved crop resistance varieties, establishments of WHS and flood protection structures, and income generation activities in addition to enhancement of soil management and water conservation. In addition to the farmers and livestock owners, their families (women and children), their neighbours and local communities should also benefit from the project in terms of improved living conditions and incomes and expanded economic opportunities. Women in rural areas, whom Yemeni cultural traditional have kept at a lower status and prevented from gaining control over important household resources, particularly stand to benefit from the project. More opportunities will provided to women to empower its situation and ease burden from her shoulder. There are educated and active women in many villages in the project areas whose roles in local development will be enhanced by the project. The ESIA team met with a number of farmers and livestock owners, villagers and other locals in the project areas visited in both formal and informal settings. Meetings with women were also conducted through environmental and social female experts. ACAP is mainly concentrated its activities to provide mechanisms, tools and coping measures to adapt to the climate change Yemen is facing.

Civil society

The civil society stakeholders for the **ACAP** include associations, tribes and NGOs on the national and local levels. The principal associations that are relevant in the context of the project is the Agricultural Cooperative Union (ACU) and Yemen Women Association (YWA) in addition to YASAD, IDDEALES and Community Water Users Associations (WUAs) established in the villages by Sana'a Basin Water Management Project (SBWMP), Groundwater Soil Conservation Project (GSCP) and Community Based Water Management Project (CWMP). Both the ACU and YWA aim to establish cooperatives and women's branches at district and village levels in order to participate in the project. The tribes constitute the traditional social organization of Yemen, the tribe being the primary social unit in Yemen's social structure. Tribal influence remains strong in spite of ongoing efforts to decentralize the governing system, to a large extent because the central government has always been weak outside the main urban areas. The tribes and the values that underpin them are of major importance to the success of the project. The CBOs, which include charitable associations, development associations, committees and groups, are considered NGOs. The charitable associations are the only traditional and grassroots CBOs found in Yemen; the development associations, committees and groups are all established as a result of outside

intervention in the form of development projects, and are typically organized around specific on-farm or off-farm productive activities.

Local council representatives

At the district level, the Local council (LC) is the most important body in the decentralized structure. LCs is well organized and control crucial strategic resources. LCs should become important collaborators and partners for the project, so developing close alliances with LCs will be beneficial for the project. The LC representatives are elected from villages through general elections. LC representatives could well be of crucial importance for the success of the project. In their official capacity, LC representatives will likely have expectations for the project's impact at the local level. The ESIA team met with a number of MAI officials and several LC representatives in districts where the project will be implemented. The LC representatives should be trained and their capacities built in order to be involved positively the implementation of the ACAP.

Private sector

The private sector stockholders for the ACAP include the firms and shops that cater to the needs of the agriculture and livestock sector, usually located at regional markets, which may cover one or more districts, at intermediate markets, which typically serve one or more uzlas, or at local markets in the villages. There are two general types of firms and shops in terms of the services they provide: agricultural inputs and veterinarian services for livestock. These stakeholders are not organized in any way. They clearly control strategic resources, including insecticides and veterinary supplies. They have influence with the Agricultural Offices, with sheikhs, with Local Council representatives and with local people. It is not clear what they expect of the project but it is important to align their services with the projects objectives. They do not stand to receive any direct benefits from the project and have few or no resources they might be willing to mobilize. The EIA team met with several representatives of the private sector in its field work.

Public sector

At the national level, the primary GOY stakeholder for the ACAP is the MAI and CAMA, which will serve as implementing agencies for the project. The MAI will liaise with its Agricultural Offices at the governorate and district levels. These entities are important to the success of the project in the roles they will play in its implementation. MAI's Agricultural Offices have major influence on all agricultural and livestock activities at the local level, but due to lack of resources, inefficiency, lack of trained staff, incorrect priorities and corruption, the influence is minimal. The ESIA team met with a number of MA1 officials at the governorate and district levels. They are well related to farmers in their areas of work and gained their confidence. Involving the agricultural staff in the coordination, monitoring and extension services with farmers will be an added value to the project with additional training and capacity building to them.

Appendix VI Banned Pesticides

REPUBLIC OF YEMEN

MINISTRY OF AGRICULTURE & IRRIGATION

GENERAL DIRECTORATE OF PLANT PROTECTION

MARCH, 2007

LIST OF THE BANNED & SEVERELY RESTRICTED PESTICIDES IN THE REPUBLIC OF YEMEN

GENERAL DIRECTORATE OF PLANT PROTECTION

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First Part: the banned pesticides Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
1	2,4,5-T and its salts	93-76-5	$C_8H_5Cl_3O_3$	Herbicide عشبي	Banned
2	1,3-dichloropropene	542-75-6	$C_3H_4Cl_2$	Fumigant & Nematicide مادة تبخير و نيماتودي	Banned
3	Acetochlor	34256-82-1	$C_{14}H_{20}ClNO_2$	Herbicide عشبي	Banned
	Acifluorfen	62476-59-9	$C_{14}H_6ClF_3NNaO_5$	Herbicide عشبي	Banned
	Acrolein	107-02-8	C_3H_4O	Algicide مبيد طحالب	Banned
	Acrylonitrile	107-13-1	C_3H_3N	Fumigant & Insecticide مادة تبخير و حشري	Banned
	Alachlor	15972-60-8	$C_{14}H_{20}ClNO_2$	Herbicide عشبي	Banned
	Aldicarb	116-06-3	$C_7H_{14}N_2O_2S$	Insecticide حشري	Banned
	Aldoxycarb	1646-88-4	$C_7H_{14}N_2O_4S$	Insecticide & Nematicide حشري و نيماتودي	Banned
–ž	Aldrin (HHDN)	309-00-2	$C_{12}H_8Cl_6$	Insecticide حشري	Banned
––	Allyl alcohol	107-18-6	C_3H_6O	Herbicide عشبي	Banned
–	Aminocarb	2032-59-9	$C_{11}H_{16}N_2O_2$	Insecticide حشري	Banned
–	Amitrole	61-82-5	$C_2H_4N_4$	Herbicide عشبي	Banned
14	Aramite	140-57-8	$C_{15}H_{23}ClO_4S$	Acaricide عناكبي	Banned
15	Arsenic (acid, pentoxide and arsenate, sodium)	12002-03-8, 75-60-5, 1327-53-3,7778-39-4,7778-44-1&7784-40-9	-	Fungicide فطري	Banned
16	Arsenous oxide	1327-53-3	As_4O_6	Rodenticide قوارض	Banned
–	Azinphos- ethyl	2642-71-9	$C_{12}H_{16}N_3O_3PS_2$	Insecticide حشري	Banned
18	Azinphos methyl	86-50-0	$C_{10}H_{12}N_3O_3PS_2$	Insecticide حشري	Banned
19	Azobenzene	103-33-3	$C_{12}H_{10}N_2$	Acaricide عناكبي	Banned
20	Bendiocarb	22781-23-3	$C_{11}H_{13}NO_4$	Insecticide حشري	Banned
21	Benfuracarb	82560-54-1	$C_{20}H_{30}N_2O_5S$	Insecticide حشري	Banned
22	Benomyl	17804-35-2	$C_{14}H_{18}N_4O_3$	Fungicide فطري	Banned
23	Bifenthrinm	82657-04-3 (Cis)	$C_{23}H_{22}ClF_3O_2$	Insecticide & Acaricide	Banned

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		83322-02-5 (Trans)		حشري و عناكبي	
24	Binapacryl	485-31-4	$C_{15}H_{18}N_2O_6$	Acaricide & Fungicide عناكبي و فطري	Banned
25	Blasticidin-S	2079-00-7	$C_{17}H_{26}N_8O_5$	Fungicide فطري	Banned
	Bronopol	52-51-7	$C_3H_6BrNO_4$	Bactericide بكتيري	Banned
27	Butoxycarboxim	34681-23-7	$C_7H_{14}N_2O_4S$	Insecticide & Acaricide حشري و عناكبي	Banned
28	Butylate butachlor	23184-66-9	$C_{11}H_{23}NOS$	Herbicide عشبي	Banned
29	Cadmium and its compounds	12001-20-6 &7784-40-9	-	Insecticide حشري	Banned
ž	Calcium arsenate	7778-44-1	$As_2Ca_3O_8$	Insecticide حشري	Banned
–	Calcium cyanide	592-01-8 & 74-90-8	C_2CaN_2	Insecticide & Fumagation حشري و مادة تبخير	Banned
	Captafol (Difolatan)	2425-06-1; 2939-80-2	$C_{10}H_9Cl_4NO_2S$	Fungicide فطري	Banned
	Captan	133-06-2	$C_9H_8Cl_3NO_2S$	Fungicide فطري	Banned
	Carbaryl	63-25-2	$C_{12}H_{11}NO_2$	Insecticide حشري	Banned
	Carbofuran	1563-66-2	$C_{12}H_{15}NO_3$	Insecticide, Acaricide & Nematicide حشري و عناكبي و نيماتودي	Banned
	Carbon tetrachloride	56-23-5	CCl_4	Fumagation & Insecticide مادة تبخير و حشري	Banned
	Carbophenothion	786-19-6	$C_{11}H_{16}ClO_2PS_3$	Insecticide حشري	Banned
	Carbosulfan	55285-14-8	$C_{20}H_{32}N_2O_3S$	Insecticide حشري	Banned
	Chinomethionat	2439-01-2	$C_{10}H_6N_2OS_2$	Acaricide & Fungicide عناكبي و فطري	Banned
ž	Chlordane	57-74-9	$C_{10}H_6Cl_8$	Insecticide حشري	Banned
–	Chlordecone	143-50-0	$C_{10}Cl_{10}O$	Insecticide حشري	Banned
	Chlordimeform	6164-98-3	$C_{10}H_{10}ClN_2$	Acaricide عناكبي	Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
43	Chlorethoxyfos	54593-83-8	$C_6H_{11}Cl_4O_3PS$	Insecticide حشري	Banned
44	Chlorfenvinphos	470-90-6	$C_{12}H_{14}Cl_3O_4P$	Insecticide حشري	Banned
45	Chlormephos	24934-91-6	$C_5H_{12}ClO_2PS_2$	Insecticide حشري	Banned
46	Chlorobenzilate	510-15-6	$C_{16}H_{14}Cl_2O_3$	Acaricide عناكبي	Banned
	Chlorophacinone	3691-35-8	$C_{23}H_{15}ClO_3$	Rodenticide مبيد قوارض	Banned
	Chlorothalonil	1897-45-6	$C_8Cl_4N_2$	Fungicide فطري	Banned
	Chlorthiophos	60238-56-4	$C_{11}H_{15}Cl_2O_3PS_2$	Insecticide حشري	Banned
ž	Chromium VI compounds	-	-	Insecticide & Fungicide حشري و فطري	Banned
–	Cloethocarb	51487-69-5	$C_{11}H_{14}ClNO_4$	Insecticide & Nematicide حشري و نيماتودي	Banned
	Coumaphos	56-72-4	$C_{14}H_{16}ClO_5PS$	Insecticide حشري	Banned
	Crotoxyphos	7700-17-6	$C_{14}H_{19}O_6P$	Insecticide حشري	Banned
	Cyanazine	21725-46-2	$C_9H_{13}ClN_6$	Herbicide عشبي	Banned
55	Cyanophos	2636-26-2	$C_9H_{10}NO_3PS$	Insecticide حشري	Banned
	Cycloheximide	66-81-9	$C_{15}H_{23}NO_4$	Fungicide فطري	Banned
	Cyhexatin	13121-70-5	$C_{18}H_{34}OSn$	Acaricide عناكبي	Banned
	Cypermethrin beta-Cypermethrin	52315-07-8 65731-84-2	$C_{22}H_{19}Cl_2NO_3$	Insecticide حشري	Banned
59	alpha&theta - Cypermethrin	71697-59-1 67375-30-8	$C_{22}H_{19}Cl_2NO_3$	Insecticide حشري	Banned
60	zeta-cypermethrin	52315-07-8	$C_{22}H_{19}Cl_2NO_3$	Insecticide حشري	Banned
61	Cyproconazole	94361-06-5	$C_{15}H_{18}ClN_3O$	Fungicide فطري	Banned
62	Daminozide	1596-84-5	$C_6H_{12}N_2O_3$	Plant Growth Regulator منظم النمو	Banned
63	DDT and metabolite	50-29-3	$C_{14}H_9Cl_5$	Insecticide حشري	Banned
64	Demephion	682-80-4	$C_5H_{13}O_3PS_2$	Insecticide حشري	Banned
	Demephion-O and –S	2587-90-8 8065-62-1	$C_5H_{13}O_3PS_2$	Insecticide & Acaricide	Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
				حشري و عناكبي	
	Demeton	8000-97-3	$C_8H_{19}O_3PS_2$	Insecticide & Herbicide حشري و عشبي	Banned
	Demeton-O and –S	298-03-3 126-75-0	$C_8H_{19}O_3PS_2$	Insecticide & Acaricide حشري و عناكبي	Banned
	Dibromochloro-propane (DBCP)	96-12-8	$C_3H_5Br_2Cl$	Herbicide عشبي	Banned
69	Dichlorovos (DDVP)	62-737	$C_4H_7Cl_2O_4P$	Insecticide حشري	Banned
ž	Dicofol	115-32-2	$C_{14}H_9Cl_5O$	Acaricide عناكبي	Banned
–	Dicrotophos	141-66-2	$C_8H_{16}NO_5P$	Insecticide حشري	Banned
	Dieldrin	60-57-1	$C_{12}H_8Cl_6O$	Insecticide حشري	Banned
73	Dimefox	115-26-4	$C_4H_{12}FN_2OP$	Insecticide & Acaricide حشري و عناكبي	Banned
	Dimethoate	60-51-5	$C_5H_{12}NO_3PS_2$	Insecticide حشري	Banned
	Dimetilan	644-64-4	$C_{10}H_{16}N_4O_3$	Insecticide حشري	Banned
	Dimeton-S-methyl	919-86-8	$C_6H_{15}O_3PS_2$	Insecticide حشري	Banned
	Dimeton-S-methylsulphon	17040-19-6	$C_6H_{15}O_5PS_2$	Insecticide حشري	Banned
	Dinoseb and its salts	88-85-7	$C_{10}H_{12}N_2O_5$	Herbicide عشبي	Banned
	Dinoterb acetate	3204-27-1	$C_{12}H_{14}N_2O_6$	Herbicide عشبي	Banned
ž	Dioxathion	78-34-2	$C_{12}H_{26}O_6P_2S_4$	Herbicide عشبي	Banned
–	Disulfoton	298-04-4	$C_8H_{19}O_2PS_3$	Insecticide & Acaricide حشري و عناكبي	Banned
82	DNOC and its salts	534-52-1	$C_7H_6N_2O_5$	Insecticide حشري	Banned
	Edifenphos (EDDP)	17109-49-8	$C_{14}H_{15}O_2PS_2$	Fungicide فطري	Banned
	Endosulfan	115-29-7	$C_9H_6Cl_6O_3S$	Insecticide حشري	Banned
85	Endrin	72-20-8	$C_{12}H_8Cl_6O$	Insecticide حشري	Banned
86	EPN	2104-64-5	$C_{14}H_{14}NO_4PS$	Insecticide حشري	Banned
87	Epoxiconazole	106325-08-0	$C_{17}H_{13}ClFN_3O$	Fungicide فطري	Banned
88	Ethiofencarb	29973-13-5	$C_{11}H_{15}NO_2S$	Insecticide	Banned

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				حشري	
	Ethylene dibromide	106-93-4	$C_2H_4Br_2$	Fumagation& Herbicide مادة تبخير و عشبي	Banned
ž	Ethylene dichloride	107-06-2	$C_2H_4Cl_2$	Fumagation & Insecticide مادة تبخير و حشري	Banned
–	Ethylene oxide	75-21-8	C_2H_4O	Fumagation مادة تبخير	Banned
	Etrimfos	38260-54-7	$C_{10}H_{17}N_2O_4PS$	Insecticide حشري	Banned
	Fenamiphos	22224-92-6	$C_{13}H_{22}NO_3PS$	Nematicide & Insecticide نيماتودي و حشري	Banned
	Fenthion (MPP)	55-38-9	$C_{10}H_{15}O_3PS_2$	Insecticide حشري	Banned
	Fensulfothion	115-90-2	$C_{11}H_{17}O_4PS_2$	Nematicide & Insecticide نيماتودي و حشري	Banned
	Fenitrothion	122-14-5	$C_9H_{12}NO_5PS$	Insecticide حشري	Banned
	Fensulfothion	115-90-2	$C_{11}H_{17}O_4PS_2$	Nematicide & Insecticide نيماتودي و حشري	Banned
98	Flucythrinate	70124-77-5	$C_{26}H_{23}F_2NO_4$	Insecticide حشري	Banned
99	Fluometuron	2164-17-2	$C_{10}H_{11}F_3N_2O$	Herbicide عشبي	Banned
100	Fluoroacetamide	640-19-7	C_2H_4FNO	Rodenticide & Insecticide مبيد قوارض و حشري	Banned
101	Fluvalinate Tau-fluvalinate	69409-94-5 102851-06-9	$C_{26}H_{22}ClF_3N_2O_3$	Insecticide حشري	Banned
102	Folpet	133-07-3	$C_9H_4Cl_3NO_2S$	Fungicide فطري	Banned
–ž	Fonofos	944-22-9	$C_{10}H_{15}OPS_2$	Insecticide حشري	Banned
–ž	Formaldehyde	50-00-0	CH_2O	Fumagation , Fungicide & Acaricide مادة تبخير و فطري و عناكبي	Banned
–ž	Formetanate	2259-30-9	$C_{11}H_{15}N_3O_2$	Acaricide عناكبي	Banned
–ž	Fosetyl-Al	39148-24-8 9148-2408	$C_6H_{18}AlO_9P_3$	Fungicide فطري	Banned
–ž	Fosmethilan	83733-82-8	$C_{13}H_{19}ClNO_3PS_2$	Insecticide حشري	Banned
–ž	Furathiocarb	65907-30-4	$C_{18}H_{26}N_2O_5S$	Insecticide حشري	Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
–ž	Furmecyclox	60568-05-0	$C_{14}H_{21}NO_3$	Fungicide فطري	Banned
––ž	Haloxyfop-P	72619-32-0	$C_{16}H_{13}ClF_3NO_4$	Herbicide عشبي	Banned
–––	Heptachlor epoxide	76-44-8	$C_{10}H_5Cl_7$	Insecticide حشري	Banned
––	Heptenophos	23560-59-0	$C_9H_{12}ClO_4P$	Insecticide حشري	Banned
113	Hexachlorobenzene	118-74-1	C_6Cl_6	Fungicide &Insecticide فطري و حشري	Banned
––	Hexachlorobutadiene	87-68-3	C_4Cl_6	Fungicide فطري	Banned
––	Hexaconazole	79983-71-4	$C_{14}H_{17}Cl_2N_3O$	Fungicide فطري	Banned
116	Isazofos	42509-80-8	$C_9H_{17}ClN_3O_3PS$	Insecticide & Nematicide حشري و نيماتودي	Banned
––	Isofenphos	25311-71-1	$C_{15}H_{24}NO_4PS$	Insecticide حشري	Banned
––	Isoprocarb	2631-40-5	$C_{11}H_{15}NO_2$	Insecticide حشري	Banned
––	Isothioate	36614-38-7	$C_7H_{17}O_2PS_3$	Insecticide حشري	Banned
– ž	Isoxathion	18854-01-8	$C_{13}H_{16}NO_4PS$	Insecticide حشري	Banned
– –	Lactofen	77501-63-4	$C_{19}H_{15}ClF_3NO_7$	Fungicide فطري	Banned
–	Lead arsenate	7784-40-9	$AsHO_4Pb$	Insecticide حشري	Banned
–	Leptophos	21609-90-5	$C_{13}H_{10}BrCl_2O_2PS$	Insecticide حشري	Banned
–	Lindane, BHC, Beta & alph BHC& HCH	58-89-9, 319-85-7,319-84-6 & 608-73-1	$C_6H_6Cl_6$	Insecticide˜& Rodenticide حشري و مبيد قوارض	Banned
125	Malathion	121-75-5	$C_{10}H_{19}O_6PS_2$	Insecticide حشري	Banned
126	Maneb	12427-38-2	$C_4H_6MnN_2S_4$	Fungicide فطري	Banned
–	Mercury and mercury compounds: Mercuric oxide (mercury oxide) Mercurous chloride (calomel) Other inorganic mercury compounds Alkyl mercury compounds Alkoxyalkyl and aryl mercury compounds	7439-97-67, 487-94-7, 21908-53-2, 7564-30-7, 7784-40-, 7487-94-7	-	Fungicide فطري	Banned
–	Metam sodium and its dihydrate (Vapam)	137-42-8 6734-80-1	$C_2H_4NNaS_2$	Fungicide فطري	Banned

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–	Methamidophos	10265-92-6	$C_2H_8NO_2PS$	Insecticide حشري	Banned
– ž	Methidathion	950-37-8	$C_6H_{11}N_2O_4PS_3$	Insecticide حشري	Banned
– –	Methiocarb	2032-65-7	$C_{11}H_{15}NO_2S$	Insecticide حشري	Banned
–	Methomyl	16752-77-5	$C_5H_{10}N_2O_2S$	Insecticide حشري	Banned
–	Methoxychlor	72-43-5	$C_{16}H_{15}Cl_3O_2$	Insecticide حشري	Banned
–	Methyl parathion	298-00-0	$C_8H_{10}NO_5PS$	Insecticide حشري	Banned
135	Methyl bromide	74-83-9	CH_3Br	Fumagation & Insecticide مادة تبخير و حشري	Banned
–	Methyl isothiocyanate	556-61-6	C_2H_3NS	Insecticide حشري	Banned
137	Mevinphos	26718-65-0	$C_7H_{13}O_6P$	Insecticide حشري	Banned
138	Mirex	2385-85-5	$C_{10}Cl_{12}$	Insecticide حشري	Banned
139	Monocrotophos	6923-22-4	$C_7H_{14}NO_5P$	Insecticide حشري	Banned
140	Naled	300-76-5	$C_4H_7Br_2Cl_2O_4P$	Insecticide حشري	Banned
– –	Nicotine	54-11-5	$C_{10}H_{14}N_2$	Insecticide حشري	Banned
–	Nitrofen	1836-75-5	$C_{12}H_7Cl_2NO_3$	Herbicide عشبي	Banned
–	Omethoate	1113-02-6	$C_5H_{12}NO_4PS$	Insecticide حشري	Banned
–	Orthophenylphenol and Na salt	90-43-7 132-27-4	$C_{12}H_{10}O$ $C_{12}H_9NaO$	Fungicide فطري	Banned
–	Oxamyl (Thioxamyl)	23135-22-0	$C_7H_{13}N_3O_3S$	Insecticide & Nematicide حشري و نيماتودي	Banned
–	Oxydemeton-methyl	301-12-2	C6H15O4PS2	Insecticide حشري	Banned
–	Oxydeprofos (ESP)	2674-91-1	$C_7H_{17}O_4PS_2$	Insecticide حشري	Banned
–	Paraquat	4685-14-7	$C_{12}H_{14}N_2$	Herbicide عشبي	Banned
–	Parathion (Thiophos)	56-38-2	$C_{10}H_{14}NO_5PS$	Insecticide حشري	Banned
– ž	Paris green	12002-03-8	$C_4H_6As_6Cu_4O_{16}$	Insecticide حشري	Banned
151	Pentachlorophenol	87-86-5	C_6HCl_5O	Insecticide & Fungicide حشري و فطري	Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
152	Phenthoate	2597-03-7	$C_{12}H_{17}O_4PS_2$	Insecticide حشري	Banned
153	Phenylmercury acetate	62-38-4	$C_8H_8HgO_2$	Fungicide فطري	Banned
–	Phenylmercury nitrate	8003-05-2	$C_{12}H_{11}Hg_2NO_4$	Fungicide فطري	Banned
–	Phorate (Timet)	298-02-2	$C_7H_{17}O_2PS_3$	Insecticide & Acaricide حشري و فطري	Banned
–	Phosalone	2310-17-0	$C_{12}H_{15}ClNO_4PS_2$	Insecticide حشري	Banned
–	Phosfolan	950-10-7	$C_8H_{16}NO_3PS_2$	Insecticide حشري	Banned
–	Phosphamidon	13171-21-6	$C_{10}H_{19}ClNO_5P$	Insecticide حشري	Banned
–	Phoxim	14816-18-3	$C_{12}H_{15}N_2O_3PS$	Insecticide حشري	Banned
– ž	Phoxim-methyl	14816-16-1	$C_{10}H_{11}N_2O_3PS$	Insecticide حشري	Banned
– –	Pirimicarb	23103-98-2	$C_{11}H_{18}N_4O_2$	Insecticide حشري	Banned
–	Pirimiphos- ethyl	l23505-41-1	$C_{13}H_{24}N_3O_3PS$	Insecticide حشري	Banned
–	Polychloroterpenes	8001-50-1	$C_{10}H_{11}Cl_7$	Insecticide & Acaricide حشري و عناكبي	Banned
164	Procymidone	2809-16-8	$C_{13}H_{11}Cl_2NO_2$	Insecticide & Acaricide حشري و عناكبي	Banned
165	Pronamid(Propyzamide)	23950-58-5	$C_{12}H_{11}Cl_2NO$	Herbicide عشبي	Banned
166	Propaphos	7292-16-2	$C_{13}H_{21}O_4PS$	Insecticide حشري	Banned
167	Propargite	2312-35-8	$C_{19}H_{26}O_4S$	Acaricide عناكبي	Banned
168	Propetamphos	31218-83-4	$C_{10}H_{20}NO_4PS$	Insecticide حشري	Banned
–	Propoxur	114-26-1	$C_{11}H_{15}NO_3$	Insecticide حشري	Banned
– ž	Prothoate	2275-18-5	$C_9H_{20}NO_3PS_2$	Insecticide حشري	Banned
– –	Scilliroside	507-60-8	$C_{32}H_{44}O_{12}$	Rodenticide مبيد قوارض	Banned
172	Sodium arsenite	7784-46-5	$AsNaO_2$	Insecticide & Herbicide حشري و عشبي	Banned
173	Sodium cyanide	143-33-9	CNNa	Insecticide& Fumagation حشري و مادة تبخير	Banned
174	Sodium fluoroacetate	62-74-8	$C_2H_2FNaO_2$	Rodenticide	Banned

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
				مبيد قوارض	
175	Sulfallate	95-06-7	$C_8H_{14}ClNS_2$	Herbicide عشبي	Banned
176	Sulfotep	3689-24-5	$C_8H_{20}O_5P_2S_2$	Insecticide حشري	Banned
177	Sulprofos	35400-43-2	$C_{12}H_{19}O_2PS_3$	Insecticide حشري	Banned
–	Tebupirimfos	96182-53-5	$C_{13}H_{23}N_2O_3PS$	Insecticide حشري	Banned
–	Tefluthrin	79538-32-2	$C_{17}H_{14}C_lF_7O_2$	Insecticide حشري	Banned
– ž	TEPP	107-49-3	$C_8H_{20}O_7P_2$	Acaricide عناكبي	Banned
– –	Terbufos	13071-79-9	$C_9H_{21}O_2PS_3$	Insecticide & Nematicide حشري و نيماتودي	Banned
–	Terrazole (Etridiazole)	2593-15-9	$C_5H_5Cl_3N_2OS$	Fungicide فطري	Banned
–	Thiodicarb	59669-26-0	$C_{10}H_{18}N_4O_4S_3$	Insecticide حشري	Banned
–	Thiofanox	39196-18-4	$C_9H_{18}N_2O_2S$	Insecticide حشري	Banned
–	Thiometon	640-15-3	$C_6H_{15}O_2PS_3$	Insecticide & Acaricide حشري و عناكبي	Banned
186	Thionazin	297-97-2	$C_8H_{13}N_2O_3PS$	Insecticide & Nematicide حشري و نيماتودي	Banned
–	Thiram	137-26-8	$C_6H_{12}N_2S_4$	Fungicide فطري	Banned
–	Toxaphene (Camphechlor)	8001-35-2	$C_{10}H_{10}Cl_8$	Insecticide حشري	Banned
189	Triamiphos	1031-47-6	$C_{12}H_{19}N_6OP$	Acaricide, Nematicide & Insecticide عناكبي و نيماتودي و حشري	Banned
190	Triazophos	24017-47-8	$C_{12}H_{16}N_3O_3PS$	Insecticide حشري	Banned
191	Trichlorfon	52-68-6	$C_4H_8Cl_3O_4P$	Insecticide حشري	Banned
192	Trichloronate	327-98-0	$C_{10}H_{12}Cl_3O_2PS$	Insecticide حشري	Banned
–	Trimethacarb	12407-86-2	$C_{11}H_{15}NO_2$	Insecticide حشري	Banned
–	Triphenyltin hydroxide	76-87-9	$C_{18}H_{16}OSn$	Fungicide فطري	Banned

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–	**Vamidothion**	**2275-23-2**	$C_8H_{18}NO_4PS_2$	**Insecticide** حشري	**Banned**

***BANNED PESTICIDES: The Pesticides Banned of importation and use in the Countr**y. Severely restricted

Second Part: The Severely Restricted Pesticides الجزء الثاني ~ المبيدات المقيدة بشدة

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
–	**1,1,2,2-Tetrachloroethane**	**79-34-5**	$C_2H_2Cl_4$	**Insecticide** حشري	Severely restricted
2	**2,4-D**	**94-75-7**	$C_8H_6Cl_2O_3$	**Herbicide** عشبي	Severely restricted
3	**Acephate**	**30560-19-1**	$C_4H_{10}NO_3PS$	**Insecticide** حشري	Severely restricted
4	**Acetaldehyde**	**108-62-3**	$C_8H_{16}O_4$	**Molluscicide** مبيد قواقع	Severely restricted
	Aluminium phosphide	**20859-73-8**	**AlP**	**Fumigant & Insecticide** مادة تبخير و حشري	Severely restricted
	Ametryn	**834-12-8**	$C_9H_{17}N_5S$	**Herbicide** عشبي	Severely restricted
	Amidithion	**919-76-6**	$C_7H_{16}NO_4PS_2$	**Acaricide & Insecticide** عناكبي و حشري	Severely restricted
	Amitraz	**33089-61-1**	$C_{19}H_{23}N_3$	**Acaricide** عناكبي	Severely restricted
	Antu	**86-88-4**	$C_{11}H_{10}N_2S$	**Rodenticide** مبيد قوارض	Severely restricted
–ž	**Asulam**	**3337-71-1**	$C_8H_{10}N_2O_4S$	**Herbicide** عشبي	Severely restricted
––	**Atrazine**	**1912-24-9**	$C_8H_{14}ClN_5$	**Herbicide** عشبي	Severely restricted
12	**Aziprotryne**	**4658-28-0**	$C_7H_{11}N_7S$	**Herbicide** عشبي	Severely restricted
13	**Azothoate**	**5834-96-8**	$C_{14}H_{14}ClN_2O_3PS$	**Insecticide & Acaricide** حشري و عناكبي	Severely restricted
14	**Benazolin**	**3813-05-6**	$C_9H_6ClNO_3S$	**Herbicide** عشبي	Severely restricted
15	**Benodanil**	**15310-01-7**	$C_{13}H_{10}INO$	**Fungicide** فطري	Severely restricted
16	**Bensultap**	**17606-31-4**	$C_{17}H_{21}NO_4S_4$	**Insecticide** حشري	Severely restricted
17	**Benzoximate**	**29104-30-1**	$C_{18}H_{18}ClNO_5$	**Acaricide** عناكبي	Severely restricted
18	**Bioresmethrin**	**28434-01-7**	$C_{22}H_{26}O_3$	**Insecticide**	Severely restricted

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				حشري	
19	Brodifacoum	56073-10-0	$C_{31}H_{23}BrO_3$	Rodenticide مبيد قوارض	Severely restricted
20	Bromacil	314-40-9	$C_9H_{13}BrN_2O_2$	Herbicide عشبي	Severely restricted
21	Bromadiolone	28772-56-7	$C_{30}H_{23}BrO_4$	Rodenticide مبيد قوارض	Severely restricted
22	Bromethalin	63333-35-7	$C_{14}H_7Br_3F_3N_3O_4$	Rodenticide مبيد قوارض	Severely restricted
23	Bromocyclen	1715-40-8	$C_8H_5BrCl_6$	Acaricide & Insecticide عناكبي و حشري	Severely restricted
24	Bromofenoxim	13181-17-4	$C_{13}H_7Br_2N_3O_6$	Herbicide عشبي	Severely restricted
25	Bromophos-ethyl	4824-78-6	$C_{10}H_{12}BrCl_2O_3PS$	Insecticide حشري	Severely restricted
	Bromoxynil	1689-84-5	$C_7H_3Br_2NO$	Herbicide عشبي	Severely restricted
27	Bufencarb	8065-36-9	$C_{13}H_{19}NO_2$	Insecticide حشري	Severely restricted
28	Butocarboxim	34681-10-2	$C_7H_{14}N_2O_2S$	Acaricide & Insecticide عناكبي و حشري	Severely restricted
29	Cacodylic acid	75-60-5	$C_2H_7AsO_2$	Herbicide عشبي	Severely restricted
30	Cadusafos	95465-99-9	$C_{10}H_{23}O_2PS_2$	Nematicide & Insecticide نيماتودي و حشري	Severely restricted
–	Calciferol	50-14-6	$C_{28}H_{44}O$	Rodenticide مبيد قوارض	Severely restricted
32	Chloramben	133-90-4	$C_7H_5Cl_2NO_2$	Herbicide عشبي	Severely restricted
	Chloranil	118-75-2	$C_6Cl_4O_2$	Fungicide فطري	Severely restricted
34	Chloroform	67-66-3	$CHCl_3$	Fumagation مادة تبخير	Severely restricted
	Chloropicrine	76-06-2	CCl_3NO_2	Fumagation مادة تبخير	Severely restricted
	Chlorpyrifos	2921-88-2	$C_9H_{11}Cl_3NO_3PS$	Insecticide حشري	Severely restricted
	Chlorpyrifos-methyl	5598-13-0	$C_7H_7Cl_3NO_3PS$	Insecticide & Acaricide حشري و عناكبي	Severely restricted
	Chlorthal-dimethyl (DCPA)	1861-32-1	$C_{10}H_6Cl_4O_4$	Herbicide عشبي	Severely restricted
	Chlorthiamid	1918-13-4	$C_7H_5Cl_2NS$	Herbicide عشبي	Severely restricted
ž	Clofencet	129025-54-3	$C_{13}H_{11}ClN_2O_3$	Inhibits pollen formation	Severely restricted
–	Clofentezine	74115-24-5	$C_{14}H_8Cl_2N_4$	Acaricide	Severely restricted

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				عناكبي	
	Coumachlor	**81-82-3**	$C_{19}H_{15}ClO_4$	**Rodenticide** مبيد قوارض	Severely restricted
	Coumatetralyl	**5836-29-3**	$C_{19}H_{16}O_3$	**Rodenticide** مبيد قوارض	Severely restricted
	Cyhalothrin	**68085-85-8**	$C_{23}H_{19}ClF_3NO_3$	**Insecticide** حشري	Severely restricted
	Dialifos	**10311-84-9**	$C_{14}H_{17}ClNO_4PS_2$	**Insecticide** حشري	Severely restricted
	Diazinon	**333-41-5**	$C_{12}H_{21}N_2O_3PS$	**Insecticide** حشري	Severely restricted
	Dicamba-sodium	**1982-69-0**	$C_8H_5Cl_2NaO_3$	**Herbicide** عشبي	Severely restricted
	Dichlobenil	**1194-65-6**	$C_7H_3Cl_2N$	**Herbicide** عشبي	Severely restricted
	Dichlofenthion	**97-17-6**	$C_{10}H_{13}Cl_2O_3PS$	**Nematicide** نيماتودي	Severely restricted
ž	**Dichlone**	**117-80-6**	$C_{10}H_4Cl_2O_2$	**Fungicide** فطري	Severely restricted
–	**Dichlorprop**	**120-36-5**	$C_9H_8Cl_2O_3$	**Herbicide** عشبي	Severely restricted
52	**Difenacoum**	**56073-07-5**	$C_{31}H_{24}O_3$	**Rodenticide** مبيد قوارض	Severely restricted
53	**Difethialone**	**104653-34-1**	$C_{31}H_{23}BrO_2S$	**Rodenticide** مبيد قوارض	Severely restricted
54	**Dimethenamid**	**87674-68-8**	$C_{12}H_{18}ClNO_2S$	**Herbicide** عشبي	Severely restricted
55	**Dimethipin**	**55290-64-7**	$C_6H_{10}O_4S_2$	**Plant Growth Regulator** منظم نمو	Severely restricted
	Dinocap	**39300-45-3**	$C_{18}H_{24}N_2O_6$	**Fungicide & Acaricide** فطري و عناكبي	Severely restricted
	Dioxabenzofos	**3811-49-2**	$C_8H_9O_3PS$	**Insecticide** حشري	Severely restricted
	Diphacinone	**82-66-6**	$C_{23}H_{16}O_3$	**Rodenticide** مبيد قوارض	Severely restricted
	Ditalimfos	**5131-24-8**	$C_{12}H_{14}NO_4PS$	**Fungicide** فطري	Severely restricted
60	**Ethalfluralin**	**55283-68-6**	$C_{13}H_{14}F_3N_3O_4$	**Herbicide** عشبي	Severely restricted
61	**Ethion**	**563-12-2**	$C_9H_{22}O_4P_2S_4$	**Insecticide** حشري	Severely restricted
	Ethiozin	**64529-56-2**	$C_9H_{16}N_4OS$	**Herbicide** عشبي	Severely restricted
	Ethofenprox	**80844-07-1**	$C_{25}H_{28}O_3$	**Insecticide** حشري	Severely restricted
	Ethoprophos	**13194-48-4**	$C_8H_{19}O_2PS_2$	**Nematicide** نيماتودي	Severely restricted
	Ethyl dipropylthiocarbamate (EPTC)	**759-94-4**	$C_9H_{19}NOS$	**Herbicide** عشبي	Severely restricted

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	Ethylan	**72-56-0**	$C_{18}H_{20}Cl_2$	**Insecticide** **حشري**	Severely restricted
	Fenbuconazole	**114369-43-6**	$C_{19}H_{17}ClN_4$	**Fungicide** **فطري**	Severely restricted
68	**Fenoprop**	**93-72-1**	$C_9H_7Cl_3O_3$	**Herbicide** **عشبي**	Severely restricted
	Ferbam	**14484-64-1**	$C_9H_{18}FeN_3S_6$	**Fungicide** **فطري**	Severely restricted
70	**Flocoumafen**	**90035-08-8**	$C_{33}H_{25}F_3O_4$	**Rodenticide** **مبيد قوارض**	Severely restricted
71	**Flumethralin**	**62924-70-3**	$C_{16}H_{12}ClF_4N_3O_4$	**Plant growth regulator**	Severely restricted
72	**Fluorodifen**	**15457-05-3**	$C_{13}H_7F_3N_2O_5$	**Herbicide** **عشبي**	Severely restricted
73	**Fomesafen**	**72178-02-0**	$C_{15}H_{10}ClF_3N_2O_6S$	**Herbicide** **عشبي**	Severely restricted
	Formothion	**2540-82-1**	$C_6H_{12}NO_4PS_2$	**Insecticide** **حشري**	Severely restricted
	Furalaxyl	**57646-30-7**	$C_{17}H_{19}NO_4$	**Fungicide** **فطري**	Severely restricted
	Hexazinone	**51235-04-2**	$C_{12}H_{20}N_4O_2$	**Herbicide** **عشبي**	Severely restricted
77	**Hydramethylnon**	**67485-29-4**	$C_{25}H_{24}F_6N_4$	**Insecticide** **حشري**	Severely restricted
78	**Hydrogen cyanamide**	**420-04-2**	CH_2N_2	**Herbicide** **عشبي**	Severely restricted
79	**Imazapyr**	**81334-34-1**	$C_{13}H_{15}N_3O_3$	**Herbicide** **عشبي**	Severely restricted
80	**Iminoctadine**	**13516-27-3**	$C_{18}H_{41}N_7$	**Fungicide** **فطري**	Severely restricted
81	**IPSP**	**5827-05-4**	$C_9H_{21}O_3PS_3$	**Insecticide** **حشري**	Severely restricted
82	**Isobenzan**	**297-78-9**	$C_9H_4Cl_8O$	**Insecticide** **حشري**	Severely restricted
	Isoxaben	**82558-50-7**	$C_{18}H_{24}N_2O_4$	**Herbicide** **عشبي**	Severely restricted
	Karbutilate	**4849-32-5**	$C_{14}H_{21}N_3O_3$	**Herbicide** **عشبي**	Severely restricted
	Kasugamycin	**6980-18-3**	$C_{14}H_{25}N_3O_9$	**Fungicide & Bactericide** **فطري و بكتيري**	Severely restricted
	Linuron	**330-55-2**	$C_9H_{10}Cl_2N_2O_2$	**Herbicide** **عشبي**	Severely restricted
	Lythidathion	**2669-32-1**	$C_7H_{13}N_2O_4PS_3$	**Insecticide** **حشري**	Severely restricted
88	**Magnesium phosphide**	**12057-74-8**	Mg_3P_2	**Fumigant Insecticide** **مادة تبخير حشرية**	Severely restricted
89	**Mancozeb**	**8018-01-7**	$[C_4H_6MnN_2S_4]_xZn_y$	**Fungicide** **فطري**	Severely restricted
90	**MCPA**	**94-74-6**	$C_{11}H_{13}ClO_3$	**Herbicide**	Severely restricted

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				عشبي	
91	Mecarbam	2595-54-2	$C_{10}H_{20}NO_5PS_2$	Insecticide & Acaricide حشري و عناكبي	Severely restricted
	Mecarphon	29173-31-7	$C_7H_{14}NO_4PS_2$	Insecticide حشري	Severely restricted
	Methyl arsonic acid MSMA	2163-80-6	CH_4AsNaO_3	Herbicide عشبي	Severely restricted
	Metolachlor	51218-45-2 &87392-12-9	$C_{15}H_{22}ClNO_2$	Herbicide عشبي	Severely restricted
	Metribuzin	21087-64-9	$C_8H_{14}N_4OS$	Herbicide عشبي	Severely restricted
	Metsulfovax	21452-18-6	$C_{12}H_{12}N_2OS$	Fungicide فطري	Severely restricted
97	Molinate	2212-67-1	$C_9H_{17}NOS$	Herbicide عشبي	Severely restricted
98	Monolinuron	1746-81-2	$C_9H_{11}ClN_2O_2$	Herbicide عشبي	Severely restricted
99	Nabam	142-59-6	$C_4H_6N_2Na_2S_4$	Fungicide فطري	Severely restricted
100	Naphthalene	91-20-3	$C_{10}H_8$	Insecticide حشري	Severely restricted
–ž–	Naptalam	132-66-1	$C_{18}H_{13}NO_3$	Plant Growth Regulator منظم نمو	Severely restricted
–ž	Norflurazon	27314-13-2	$C_{12}H_9ClF_3N_3O$	Herbicide عشبي	Severely restricted
–ž	Oryzalin	19044-88-3	$C_{12}H_{18}N_4O_6S$	Herbicide عشبي	Severely restricted
–ž	Oxadiazon	19666-30-9	$C_{15}H_{18}Cl_2N_2O_3$	Herbicide عشبي	Severely restricted
–ž	Oxadixyl	77732-09-3	$C_{14}H_{18}N_2O_4$	Fungicide فطري	Severely restricted
106	Pebulate	1114-71-2	$C_{10}H_{21}NOS$	Herbicide عشبي	Severely restricted
107	Pendimethalin	40487-42-1	$C_{13}H_{19}N_3O_4$	Herbicide عشبي	Severely restricted
108	Pentachloronitrobenzene	82-68-8	$C_6Cl_5NO_2$	Fungicide فطري	Severely restricted
109	Perfluidone	37924-13-3	$C_{14}H_{12}F_3NO_4S_2$	Herbicide عشبي	Severely restricted
110	Permethrin	52645-53-1	$C_{21}H_{20}Cl_2O_3$	Insecticide حشري	Severely restricted
–––	Phosmet	732-11-6	$C_{11}H_{12}NO_4PS_2$	Insecticide حشري	Severely restricted
––	Pindone	83-26-1	$C_{14}H_{14}O_3$	Rodenticide مبيد قوارض	Severely restricted
113	Piperonyl butoxide	51-03-6	$C_{19}H_{30}O_5$	A synergist for pyrethrins	Severely restricted

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
––	Pirimiphos-methyl	29232-93-7	$C_{11}H_{20}N_3O_3PS$	Insecticide حشري	Severely restricted
115	Prodiamine	29091-21-2	$C_{13}H_{17}F_3N_4O_4$	Herbicide عشبي	Severely restricted
116	Profenofos	41198-08-7	$C_{11}H_{15}BrClO_3PS$	Insecticide حشري	Severely restricted
117	Prometryne	7287-19-6	$C_{10}H_{19}N_5S$	Herbicide عشبي	Severely restricted
118	Propazine	139-40-2	$C_9H_{16}ClN_5$	Herbicide عشبي	Severely restricted
––	Propham	122-42-9	$C_{10}H_{13}NO_2$	Plant Growth Regulator	Severely restricted
– ž	Propiconazole	60207-90-1	$C_{15}H_{17}Cl_2N_3O_2$	Fungicide فطري	Severely restricted
– –	Prothiofos	34643-46-4	$C_{11}H_{15}Cl_2O_2PS_2$	Insecticide حشري	Severely restricted
–	Pyrazophos	13457-18-6	$C_{14}H_{20}N_3O_5PS$	Fungicide فطري	Severely restricted
–	Pyridaphenthion	119-12-0	$C_{14}H_{17}N_2O_4PS$	Insecticide حشري	Severely restricted
–	Pyrimethanil	53112-28-0	$C_{12}H_{13}N_3$	Insecticide حشري	Severely restricted
–	Pyrithiobac-sodium	123343-16-8	$C_{13}H_{10}ClN_2NaO_4S$	Herbicide عشبي	Severely restricted
–	Quinalphos	13593-08-3	$C_{12}H_{15}N_2O_3PS$	Insecticide حشري	Severely restricted
–	Quintozene	82-68-8	$C_6Cl_5NO_2$	Fungicide فطري	Severely restricted
–	Resmethrin	10453-86-8	$C_{22}H_{26}O_3$	Insecticide حشري	Severely restricted
–	Sethoxydim	74051-80-2	$C_{17}H_{29}NO_3S$	Herbicide عشبي	Severely restricted
– ž	Siduron	1982-49-6	$C_{14}H_{20}N_2O$	Herbicide عشبي	Severely restricted
131	Simazine	122-34-9	$C_7H_{12}ClN_5$	Herbicide عشبي	Severely restricted
132	Strychnine	57-24-9	$C_{21}H_{22}N_2O_2$	Rodenticide مبيد قوارض	Severely restricted
133	Sulfuryl fluoride	2699-79-8	F_2O_2S	Fumagation مادة تبخير	Severely restricted
134	TDE	72-54-8	$C_{14}H_{10}Cl_4$	Insecticide حشري	Severely restricted
135	Tebuconazole	107534-96-3	$C_{16}H_{22}ClN_3O$	Fungicide فطري	Severely restricted
–	Terbutryn	886-50-0	$C_{10}H_{19}N_5S$	Herbicide عشبي	Severely restricted
–	Tetrachlorvinphos	22248-79-9	$C_{10}H_9Cl_4O_4P$	Insecticide حشري	Severely restricted
–	Thallium sulfate	7446-18-6	$SrSO_4$	Rodenticide مبيد قوارض	Severely restricted
–	Thiazopyr	117718-60-2	$C_{16}H_{17}F_5N_2O_2S$	Herbicide	Severely restricted

م No	الاسم العام للمادة الفعالة Common Name	الرقم الكيميائي CAS No.	التركيب الكيميائي Formula	نوع المبيد Type of Pesticide	نوع القيد Type of Restriction
				عشبي	
– ž	Thiophanate- ethyl	23564-06-9	$C_{14}H_{18}N_4O_4S_2$	Fungicide فطري	Severely restricted
– –	Triadimefon	43121-43-3	$C_{14}H_{16}ClN_3O_2$	Fungicide فطري	Severely restricted
142	Triallate	2303-17-5	$C_{10}H_{16}Cl_3NOS$	Herbicide عشبي	Severely restricted
143	Tribenuron methyl	101200-48-0	$C_{15}H_{17}N_5O_6S$	Herbicide عشبي	Severely restricted
144	Tridiphane	58138-08-2	$C_{10}H_7Cl_5O$	Herbicide عشبي	Severely restricted
145	Trifenmorph	1420-06-0	$C_{23}H_{23}NO$	Molluscicide مبيد قواقع	Severely restricted
146	Trifluralin	1582-09-8	$C_{13}H_{16}F_3N_3O_4$	Herbicide عشبي	Severely restricted
–	Triflusulfuron-methyl	126535-15-7	$C_{17}H_{19}F_3N_6O_6S$	Herbicide عشبي	Severely restricted
–	Triforine	26644-46-2	$C_{10}H_{14}Cl_6N_4O_2$	Fungicide فطري	Severely restricted
–	Uniconazole	83657-22-1	$C_{15}H_{18}ClN_3O$	Plant growth regulator	Severely restricted
– ž	Vernolate	1929-77-7	$C_{10}H_{21}NOS$	Herbicide عشبي	Severely restricted
– –	Vinclozolin	50471-44-8	$C_{12}H_9Cl_2NO_3$	Fungicide فطري	Severely restricted
–	Warfarin	81-81-2	$C_{19}H_{16}O_4$	Rodenticide مبيد قوارض	Severely restricted
–	Zinc phosphide	1314-84-7	P_2Zn_3	Fumagation & Insecticide مادة تبخير و حشري	Severely restricted
–	Zineb	12122-67-7	$C_4H_6N_2S_4Zn$	Fungicide فطري	Severely restricted

***SEVERELY RESTRICTED PESTICIDE: The Pesticides which the ministry of Agriculture & Irrigation can allow to import them for emergency cases if there are not other alternatives equivalent available in local market and should be use under it's direct supervision.**

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