

**REPUBLIC OF YEMEN**  
**MINISTRY OF AGRICULTURE AND IRRIGATION**

**IRRIGATION IMPROVEMENT PROJECT**  
**(IDA Credit No. 3412 – YEM)**

**Main Technical Assistance Package for IIP**

**DISCUSSION PAPER**

1.1.1 RESTRUCTURING THE IRRIGATION SECTOR

1.2

October 2003

 **ARCADIS** EUROCONSULT

IN ASSOCIATION WITH





**YEMENI ENGINEERING GROUP**

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## GLOSSARY

CWMU	Central Water Monitoring Unit
FAO	Food and Agricultural Organisation of the UN
GDI	General Directorate of Irrigation
GIA	General Irrigation Authority
GWSCP	Ground Water and Soil Conservation Project
GoY	Government of Yemen
IIP	Irrigation Improvement Project
MAI	Ministry of Agriculture & Irrigation
MWE	Ministry of Water and Environment
NGO	Non-Governmental Organisation
NWRA	National Water Resources Authority
O&M	Operation and Maintenance
ogma	(traditional) earthen diversion weir
PIU	Project Implementation Unit
PMU	Project Management Unit
RAO	Regional Agricultural Office of MAI
RDA	Regional Development Authority of MAI
SC	Steering Committee
TDA	Tihama Development Authority of MAI
ToR	Terms of Reference
UNDP	United Nations Development Programme
WB	World Bank
YR	Yemeni Rials

## 2 INTRODUCTION

This discussion paper is one of the outputs of institutional assessment, undertaken as Component C of the Irrigation Improvement Project. The institutional assessment looks at the mandates of the different organizations in irrigated agriculture. It reviews the extent to which the mandates can be fulfilled and the extent to which they address the major challenges in water resource management.

The Component C will develop proposals for appropriate institutional arrangements, looking particularly at the responsibilities of national and regional/ local organisations in irrigated agriculture and water management. This should lead to action plans that will cover strengthening institutional arrangements, human resource development strategies and financing mechanisms.

### 3 SHORT ANALYSIS OF CURRENT SITUATION

In spite of the importance of ‘water security’ in Yemen and in spite of the importance of irrigated agriculture in water resource management, the irrigation sector is currently very much fragmented:

- there is much investment for water resource development but not for irrigation demand management
- there are no institutional linkage between irrigation agencies at national and local level
- there are no linkages between irrigation development programs and activities in the field of improved water management
- several projects in irrigated agriculture stand on their own and are not linked to existing institutions either in the government or in the private sector
- there is no vision on how to develop the irrigation sector.

The present institutional situation is given in figure 1. Currently all organizations (i.e. GDI, GDI Aden, Regional Agricultural Offices, Regional Development Authorities and the many irrigation related projects) that work in irrigation are loosely connected to the Ministry of Agriculture and Irrigation. There is no coordination point within the Ministry of Agriculture and Irrigation. There is also no link between the agricultural policies and activities of the Ministry and the irrigation policies and activities of the Ministry.

Because of this fragmentation it is difficult to implement irrigation policies, develop an institutional memory, ensure quality and link irrigation development with water resource management. There is considerable funding for irrigation and water resource development projects (such as small dams and diversion structures). Because of the project nature of most activities and because most projects are isolated from mainstream institutions, the capacity to manage irrigation does not develop in the public sector nor in the private sector.

This discussion paper proposes a strategy to integrate the national irrigation sector and to better define the roles at national and local levels, strengthen capabilities. It also proposes to remove some of the bottlenecks in the financing of the sector that affect the quality of the services in the irrigation sector.<sup>1</sup>

The strategy proposed to integrate the national irrigation sector consists of two steps described in the next chapters:

- Step 1: Strengthening GDI in delivering and supporting irrigation services
- Step 2: Integrating the irrigation sector and creating a General Irrigation Authority to coordinate irrigation policies and activities in the country

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<sup>1</sup> A second discussion paper will be prepared as part of the component C. This second paper will discuss local water resource management – building on the scope that exists to manage water locally through the provisions of the Water Law and the Law on Decentralization and on the experiences with farmer management and local management in the two projects areas of the Irrigation Improvement Project (Wadi Zabid and Wadi Tuban).

diagram 1 – current situation

## 4 STEP 1: STRENGTHENING GDI IN IRRIGATION

### 4.1 BACKGROUND

The General Directorate of Irrigation is the main organization at central level within the Ministry of Agriculture and Irrigation responsible for irrigation. In its current programme of work it is however almost exclusively concentrating on the construction of small dams. At present these dams have no irrigation component with the exception of a number of dams, which are funded from foreign sources. The main sections of GDI reflect the emphasis on dam construction. The main sections in GDI follow the four steps in dam construction – Survey, Studies, Design and Supervision. In addition, there is an Administrative Services section.

In implementing the dam programme GDI does most of the work in-house. It only contracts out the geo-technical investigations (if it finds resources for it). In supervision sometimes staff of local irrigation offices is involved, but not systematically. There is not much linkage in the implementation of the programme between GDI and the local irrigation departments. After the construction of the dam is over it is handed over to the local council. The local council is supposed to take care of farmer relations. GDI does not do any maintenance of the small dams.

There has been increasing dissatisfaction with the approach of GDI to dam construction without due consideration of irrigation. There was also dissatisfaction with the overall quality of the work. In the last years a technical assistance project funded by World Bank has addressed the technical weaknesses. However, several problems remain:

- the main source of funding of the small dam programme is the Agricultural and Fishery Promotion Fund. No funds for irrigation development have been allocated from this fund. As a result GDI is very much confined to dam development
- GDI has no funds to adequately and independently select dam locations. In practice GDI receives requests to go and visit certain dam locations and can only visit if someone provides transport. Often the landowner of the dam site provides transport and other support.
- In the budget for the construction of a dam 3% is reserved for supervision. In comparison to other countries this is not a high figure. What makes it worse is that most of the money does not reach GDI.
- GDI is short of basic survey equipment.

The General Directorate also has an Irrigation Policy Unit and a Central Water Monitoring Unit. The Irrigation Policy Unit has its origin in a FAO-assisted project. After the formulation of Irrigation Policy Statements an action plan was made, but this was not funded. No further policy activities are undertaken now. The Central Water Monitoring Unit (CWMU) collects stream flow and meteorological data for four Governates. Late funding has however resulted in discontinuities. In addition the CWMU is engaged in a number of studies (reuse of waste water, impact of dams). Strictly speaking several of the data collecting activities of the CWMU fall outside the official mandate of GDI.

The first step should aim very much at putting the house in order. To strengthen GDI in delivering and supporting irrigation services (step 1) actions are required in the organization, the funding of its programme and in capacity building.

## Diagram 2 – Step 1

## 4.2 ORGANIZATIONAL CHANGES

A number of organizational changes are proposed to strengthen GDI. An overview is given in diagram 2, presenting step 1.

- GDI should develop a strong Irrigation Wing, engaging several former and current staff trained in irrigation management. GDI should use resources under current EU programmes to set up this Irrigation Wing. At the same time GDI should prepare and defend proposals for irrigation components for the Agriculture and Fisheries Promotion Fund. In developing an irrigation programme GDI should keep the following in mind:
  - Develop irrigation systems on dam projects that have been developed 2-4 years before. This will make it possible to realistically estimate how effective the particular dam is and farmers may have come to agreement on using the water from the reservoir.
  - Undertake a short feasibility test – looking at the irrigated area, the effective storage in the reservoir, the distribution of land near the dams (avoid that the irrigation network will only benefit a small number of big landowners) and assess the likelihood of local conflict, making it difficult to implement the work. The feasibility test would determine the best locations to develop an irrigation component.
  - In cases where the water in the reservoir is insufficient to irrigate the area, the dam may mainly work for recharge. In these cases also some modifications to the dam may be made to allow this recharge to take place through the wadi bed. This will require outlets or siphons taking water from the reservoirs. Recharge from the reservoir itself is generally difficult after a number of years, because a fine layer of sediment on the bottom of the reservoir blocks the downward flow of water.
  - Prior to the implementation of the irrigation works a water users association should be formed representing the farmers of the area. The water users association should agree on the distribution of water and indicate the agreed preference for the work to be done – within overall limits determined by the project.
  - The implementation of the irrigation works should be as much as possible done through the farmer groups themselves. This will resolve conflict and will make sure that the farmer groups will handle the irrigation system.
- GDI should strengthen its linkages with the irrigation departments in the regional offices. In the implementation of the irrigation works most activities should be undertaken by the local irrigation department and the local council. The role of GDI should be limited to providing supervision and quality control.
- The Central Water Monitoring Unit and the Irrigation Policy Unit should be merged into one Policy and Monitoring Unit. This Policy and Monitoring Unit should work closely with the Agricultural Policy Unit – rather than undertake studies with uncertain follow-up. The Policy and Monitoring Unit should concentrate on influencing the programs of the entire ministry as it concerns irrigation. There are many issues with respect to better irrigation practices that are best addressed by policies of the Ministry of Agriculture and Irrigation as a whole, for instance:
  - Promoting crops that require less water
  - Promoting drip systems and making them available through the private sector

- Investigating most effective recharge methods – through dams or through smaller diversion/ retention structures – this will allow GDI to design an effective water resource development strategy

It is strongly suggested not to undertake more and more studies to support the development of new policies. Instead it is better to use existing expert knowledge and review of earlier research. The current activities in the field of water monitoring of the CWMU may be transferred to NWRA – but the monitoring unit should provide the liaison with NWRA in requesting good quality data.

Appendix 1 gives a summary task description of the different sections in a strengthened GDI.

### **4.3 FINANCIAL CHANGES**

A number of changes are required to make it possible for GDI to develop an irrigation programme and undertake its activities within the framework of water resource management.

- The budget allocations under the Agricultural and Fishery Promotion Fund should be changed and should include a substantial proportion of irrigation development and improvement. These irrigation improvements should be undertaken on dam sites that have been constructed already and that offer scope for irrigation development (sufficient storage, agricultural land, conflict-free areas). In implementing the irrigation component GDI will rely heavily on the local irrigation offices.
- As long as the work on the dams and irrigation systems funded by the Agricultural and Fishery Promotion Fund is largely done in-house, the budget for dam construction and irrigation development projects should include a sufficient proportion for water resource planning, site investigation, farmers consultation, design and supervision. This proportion should be between 8-15%. It should be deposited in an irrigation development fund, administered by GDI. Rules on the management of the irrigation development fund should be developed, specifying for what and how it is used. Furthermore, ways of paying incentive to performance within the current administrative system may be explored.
- Discussion should start between MAI/GDI and international funding agencies, active in the water sector – such as World Bank, different Arab Funds and the compensation fund of USDA to align irrigation projects with existing irrigation sector organizations. Some of these funding agencies have a clear policy on working through existing mandated organization, but do not follow this guidance in the implementation of their projects.

### **4.4 CAPACITY BUILDING**

By its nature irrigation development requires intensive local contact. Unlike dam development it cannot be handled well from a central head quarter. The implementation of an irrigation component will need a close working relationship between GDI and the local offices involved in irrigation development – be it GDI Aden, irrigation departments of the Regional Agricultural Offices or water sections of the Regional Authorities.

In capacity building the priority should be the local offices. Under the EU Food Security Programme a workshop was organized on 15-16 September with the local offices to identify capacity building needs. The capacity building programme should build on these results. It should also include training and coaching on supporting farmers irrigation development and on water resource management at basin level – involving the staff of the Irrigation Wing as

trainers as far as practical. Funding possibilities for capacity building under the Food Security Programme should be explored by GDI. Much of the capacity building will revolve around developing a practical system of irrigation development with a leading role of farmers and local irrigation offices.

Capacity building is further required in improving feasibility procedures and basin water planning – as part of the identification of new sites and irrigation improvement projects. Sources should also be identified to procure additional basic survey equipment.

## **5 STEP 2: INTEGRATING THE IRRIGATION SECTOR**

### **5.1 BACKGROUND**

As mentioned in the introduction, the irrigation sector is at present highly fragmented. As long as this continues, it is difficult to implement water resource management policies in irrigation. It is proposed to integrate the irrigation sector and strengthen coordination of irrigation programmes within the Ministry of Agriculture at national level.

This needs to be in line with the Law on Decentralisation. Under the Law on Decentralisation the role of national organisations is seen as the ‘formulation of general policy, enactment of organisational regulations, control, qualification and training and implementation of projects, which are difficult to implement, by the local councils’ (article 14 (a) of Law 4/2000).

Proposed is to come to a General Irrigation Authority (GIA). GIA will undertake master planning, will do quality control and will undertake projects and programmes of national scale. Implementation will be done largely by local offices.

### **5.2 ORGANIZATIONAL CHANGES**

The picture as it is proposed to emerge is given in figure 3: step 2 (see next page). The following organizational changes are proposed.

- Establishment of the General Irrigation Authority
- Coordination of Irrigation Projects and Programmes through an Office of Project Coordination that is part of the General Irrigation Authority
- Establishing Irrigation Offices as Branches or Nodal Offices of the General Irrigation Authority

#### **5.2.1 ESTABLISH A GENERAL IRRIGATION AUTHORITY**

It is proposed to create a new central coordination body by bringing the various organizations and projects related to irrigated agriculture operating a central level under one umbrella.

In various earlier documents, initiated by the General Directorate of Irrigation, it has been suggested to upscale the current General Directorate of Irrigation to a General Authority of Irrigation. Instead of upgrading the existing General Directorate of Irrigation as such, it is proposed to form the new General Directorate of Irrigation by bring the different organizations and projects related to irrigated agriculture within the Ministry of Agriculture under one umbrella.

This new organization should focus on promoting efficient use of water resources in agriculture. Agricultural water resource management (rather than civil engineering) should be the major focus of the new organization. This should be reflected in the composition of senior management.



## Diagram 3 – step 2

The mandate of the organization should be irrigated water resource development and management in irrigated agriculture – not civil engineering. The proposed mandate of the new organization is:

- prepare and ensure the implementation of irrigation policies within and outside the Ministry of Agriculture and Irrigation
- together with national and international funding agencies initiate projects and programmes, that will:
  - maximise benefit of agriculture's sector share of water and
  - make sure that agricultural water use in line with sustainable use of water resources in the country
- coordinate the implementation of such projects and programs through local organizations
- in case of large projects of national scale, directly coordinate the implementation of such projects
- work with the Ministry of Water and Environment to prepare water resource plans for selected parts of the country and prepare master plans for water resources development on the basis of such water resource plans
- in general serve as the point of coordination of agricultural water use-related policies – for instance in the fields of urban waste water reuse in agriculture
- provide technical support to local organizations in water resource development (including dam building) and irrigation development
- ensure that adequate dam safety measures are in place
- initiate and prepare flood emergency and flood control measures and wadi encroachment

As such it will be the main point of contact with the Ministry of Water and Environment and the National Water Resource Authority<sup>2</sup>. This mandate is a summarized version of the role defined for the MAI in the Water Law. In this mandate the initiation and preparation of flood emergency and wadi development measures has been retained, although at the moment no organization within MAI is engaged in this activity. It is retained in the mandate of the proposed GIA to avoid that a gap occurs in the mandates.

The GIA will consist of a Policy and Monitoring Unit, Water Resources and Development Unit and an Office of Project Coordination.

As the range of activities of the GIA increases the scope of work of the Policy and Monitoring Unit and the Water Resources Development and Irrigation Section will broaden. The Policy and Monitoring Unit will for instance develop guidelines on the siting and construction of recharge and irrigation dams. It will ensure that the various local offices will follow such guidelines and provide necessary assistance.

The Policy And Monitoring Unit can also be the main point of contact with the various training institutes in irrigation development – assessing the requirement for skills in water management and suggestion curricula to the national training institutes.

The Water Resources Development and Irrigation Unit will also change the nature of its activities. In line with the law of decentralization it will be less involved in the direct implementation of construction projects, will concentrate on water resource planning and on

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<sup>2</sup> At present the decision is that GDI will for the time being remain part of the MAI. The coming period will allow the building up of an integrated sector. This will make it possible to more effectively coordinate irrigation development and water resource planning, as initiated by the Ministry of Water and Environment.

supervision and support. It will develop guidelines on dam safety – including the environmental effects of water storages. It will cause dams to be inspected and may use the services of a third party for it. Together with the Ministry of Water and Environment it will take part in the preparation of water resource management plans for selected basins, taking care of the irrigation master planning components

According to the Water Law, the Ministry of Agriculture and Irrigation also has task in flood management, bank protection and wadi encroachment. It is not clear who undertakes this task – within or outside the Ministry of Agriculture and Irrigation. It is proposed that this task is put on the agenda of the General Authority Irrigation, once it is established.

### **5.2.2 ESTABLISH AN OFFICE OF PROJECT COORDINATION WITHIN GIA**

Several of the activities of the GIA will be undertaken as projects. In the current setting in Yemen this will remain a necessity for the time being, as regular staff payment is low. This makes it difficult to effectively implement projects and programmes. Working in project mode moreover makes it possible to operate flexibly. However, in the current situation projects are often practically disconnected from government operations. This results in reinvestment, loss of memory and loss of interaction. It is observed that projects are often not only having little to do with government, but similarly have not many relations with the local private sector.

The Office of Project Coordination will:

- Facilitate smooth implementation of projects and ensure adequate technical and financial reporting;
- Ensure linkage of project activities with other organizations in the MAI working in related fields;
- Act as a secretariat to Project Steering Committees;
- Design entry and exit strategies for irrigation related projects;
- Review reports and maintain a documentation centre;
- Initiate – together with the Policy and Monitoring Unit – new projects and programmes in irrigated agriculture; and
- Create Project Management Units for large projects of national scale.

### **5.2.3 LOCAL IRRIGATION DEPARTMENTS TO BECOME GIA BRANCH OFFICES**

To integrate the programmes in irrigation, the linkages between the GIA and the various organizations involved in irrigation in the Governates need to be strengthened. This is all the more important, as with the decentralization budget may ultimately come through the Governates. This makes it important that linkages at technical level remain strong to retain a common programme of promoting proper irrigation practices and policies.

The capacity of the different organizations at the Governate level varies largely. The Tihama Development Authority has well-established engineering and hydrology sections. The General Directorate Irrigation in Aden similarly has a long track record of implementing various water related project, though the Directorate is currently under-utilised. In both organizations the weakness is more in effective water management and irrigation

improvement – including farmer relations. On the other hand the irrigation staff in the governorates where there is an Agricultural Office usually is limited in number and less well trained (see annex 4).

It is proposed to designate GDI Aden, the Irrigation Directorate Hadramaut and the irrigation offices in the RAOs as branch offices of the GIA. The branch offices will implement all irrigation activities in the governorate with technical support from the General Authority of Irrigation. In case of the Tihama Development Authority, the water-engineering establishment is well established and closely integrated in the rest of the organizations. This makes it not very useful to designate a branch here. Instead the TDA engineering and hydrology departments should become associated bodies to the GIA – with GIA providing guidance and support in the implementation of irrigation improvement and water resource management programmes.

### **5.3 CAPACITY BUILDING**

Capacity building in this stage will be linked to the changing orientation in the irrigation sector at national level. With the establishment of GIA, capacity will need to be built up in a number of new areas – in particular:

- programme management and project management skills and procedures – as part of the establishment of the Office of Project Coordination
- Policy advocacy and communication skills – to support the Policy and Monitoring Unit
- Water resource management planning – to support the Water Resources and Irrigation Unit
- Dam safety procedures – to support the Water Resources Unit.

In all these fields capacity building should be more than training. It will require the development of working methods in these areas.

## A. SUMMARY TASK DESCRIPTIONS GDI (STEP 1)

Section	Summary Task Description
General Director	<p>Overall coordination and progress monitoring of GDIs work program</p> <p>Oversee transition of GDI</p> <p>Fund raising and initiate new programs for GDI</p> <p>Represent GDI and facilitate the work of the different sections</p>
Studies and Planning	<p>Select basins and sub basins – together with NWRA and others – and undertake reconnaissance of project sites,</p> <p>Prepare feasibility reports for water resource development and irrigation projects on the basis of standard formats</p> <p>Initiate special follow up investigations and studies where necessary, such as hydro geological investigations</p>
Survey	<p>Ensure topographical surveys and site investigations are undertaken – either directly or through local irrigation departments</p> <p>Support local offices in undertaking topographical surveys and site investigations by providing guidelines and undertaking spot-checks</p> <p>Collection of necessary field information for assessing dam feasibility – topographical surveys, catchment characteristics, downstream structures, irrigated area/ land</p>
Design	<p>Prepare detailed design for water resource development structures, check them in the field with the water users directly concerned</p> <p>With the irrigation wing prepare irrigation packages for selected sites</p> <p>Keep in touch with latest alternative techniques for water resource development (for instance small water retention structures instead of dams) so to broaden the range of possibilities</p>
Supervision	<p>Ensure adequate supervision arrangements for the projects under control of GDI – directly or – increasingly - through the offices of the local irrigation departments</p> <p>Contract management and financial reporting for water resource development project under control of GDI</p>
Irrigation Wing	<p>Identify with local councils and local irrigation departments existing dam sites most suitable for irrigation development and improved recharge strategies</p> <p>Ensure with local councils and irrigation departments that adequate arrangements between farmers are in place to agree on water sharing, construction and operation and maintenance</p>

	<p>With and through local councils and local irrigation departments identify with farmers – preferably on cost sharing basis see annex 3 – irrigation packages</p> <p>Follow up with local councils on irrigation impact and on effective O&amp;M</p> <p>Progress and financial reporting on the irrigation component</p>
Policy and Monitoring	<p>Work with agricultural policy unit and planning department of MAI to develop improved irrigation policies</p> <p>Keep track of studies and organize regular in house meetings to discuss results of studies</p> <p>Cause selected studies to be undertaken related to main irrigation policy issues – and undertake fundraising for such</p>
Administrative services	<p>Support to General Director</p> <p>Staff administration</p> <p>Logistic services</p> <p>Office inventories</p>

## B. SUMMARY TASK DESCRIPTION GIA (STEP 2)

Section	Summary Task Description
<p>Policy and Monitoring Unit</p>	<p>Work with agricultural policy unit of the MAI and with the Ministry of Water and Environment to develop improved irrigation policies</p> <p>Analyse on a regular basis monitoring data</p> <p>Develop new policies in water management, for instance on urban water reuse in irrigation, on education for irrigation sector and on role of private parties</p> <p>Initiate special studies and pilot projects</p> <p>Keep track of studies and organize regular in house meetings to discuss results of studies</p> <p>Cause selected studies to be undertaken related to main irrigation policy issues – and undertake fundraising for such</p> <p>Communicate new policies and findings throughout branches of GIA and other organization working in water sector</p>
<p>Water Resource Management and Irrigation Wing</p>	<p>Coordinate the implementation of projects and programs in irrigation development directly implement by the GIA through local branches</p> <p>Work with the Ministry of Water and Environment to prepare water resource plans for selected parts of the country and prepare master plans for water resources development on the basis of such water resource plans</p> <p>Provide technical support to local organizations in water resource development (including dam building) and irrigation development</p> <p>Ensure that adequate dam safety measures are in place</p> <p>Initiate and prepare flood emergency and flood control measures and wadi encroachment</p>
<p>Office of Project Coordination</p>	<p>Facilitate smooth implementation of projects and ensure adequate technical and financial reporting</p> <p>Ensure linkage of project activities with other organizations in the MAI working in related fields</p> <p>Act as a secretariat to Project Steering Committees</p> <p>Design entry and exit strategies for irrigation related projects</p> <p>Review reports and maintain a documentation centre</p> <p>Initiate – together with the Policy and Monitoring Unit – new projects and programmes in irrigated agriculture</p> <p>Create Project Management Units for large projects of national scale.</p>

## C. CURRENT STAFF IN IRRIGATION (2000 SITUATION)

	PhD	MA	High Diploma	BA	Secondary School	Intermediate Diploma	Total
General Directorate Irrigation	2	1	2	59	14	3	81
Others	5	8		45	66	7	131
General Directorate Irrigation Aden	5	15	2	7		39	68
Agricultural and Irrigation Office, Lahj		1	1	5		14	21
Agricultural and Irrigation Office, Abyan		3				12	15
Agricultural Office, Hadramaut/ Hajr Valley	1	6	1	1	4	10	23
Agricultural Office, Shabwah		1		6		4	11
Agricultural and Irrigation Office, Taiz		2	4	16		1	23
Agricultural and Irrigation Office, Dhamar				7		7	14
Agricultural and Irrigation Office, Al-Mahweit		1		6	2		9
Agricultural and Irrigation Office, Al-Baydha/ Rada'a		1		3	4		8
Authority for Research and Agricultural Monitoring	1	1		7		6	15
Tihama Development Authority		1	1	29	69		100
Eastern Area Development Authority		4		14	2	2	22
Sana'a, Sa'da'a and Haja Development Corporation				16		5	21
<b>Total</b>	14	45	11	221	161	110	562

Source: Yusuf Fara Report