

Concept Paper



## **Pilot for Improving On-farm Water Management in Irrigated Agriculture**

**A Concept Paper under the  
Agricultural Production and Productivity Programme  
National Agricultural Development Framework**

**Ministry of Agriculture, Irrigation and Livestock**

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**Ministry of Agriculture, Irrigation and Livestock (MAIL)**

**Agricultural Production and Productivity Programme (APP)**

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## **1. Background**

### **1.1 Key challenges in irrigated agriculture**

Afghanistan has a semi arid to sub-humid climate with high inter-annual variation of precipitation. The average precipitation in some parts of the country is only sufficient to sustain a rainfed winter crop. Even here crop failure is likely during drier years. Therefore irrigation is essential for production of all summer crops. Irrigation has a long tradition in Afghanistan, and utilizes a number of sophisticated methods, such as karez irrigation. However, many systems function sub-optimally or have even ceased to function at all.

The total irrigated area in the 60s and 70s amounted to 3.8 million ha's. As a result of decades of conflict, systematic destruction of productive rural infrastructures, migration, governmental changes and disruptions and despite the rehabilitation efforts in the past years, only 1.8 million hectares are being irrigated at present.

Key challenges in irrigated agriculture are:

- *Shortage of irrigation infrastructures and water management systems.* Most of the modern irrigation systems have been damaged during years of warfare, have been neglected and have been left in disrepair. Of the total 1.8 million ha, only 10% are being irrigated using properly engineered systems. Traditional irrigation methods and low quality hydraulic structures do not allow proper control of irrigation water, which often leads to unnecessarily high losses of water and poor return flows, shortage of water for tail-end users, over-irrigation, increased siltation and flood damage.
- *Disrupted local management of water resources.* The social disruption of rural communities and local governance mechanisms, institutional irregularities and an over dependence on aid assistance, has lead to a weakening of the traditional system for Operation and Maintenance (O&M), poor water management and inability to address many water related problems. Inequitable, unreliable and economically inefficient water distribution often lead to conflict between users and thereby, further degradation of irrigation assets.
- *Over-exploitation of the natural resource base.* Widespread environmental degradation through an unsustainable and uncontrolled exploitation of natural resources by an increased rural population dependent on limited land and water resources. This degradation has lead to soil erosion, more intensive floods and earlier drying of the streams and rivers in the dry season. This, in turn has lead to the destruction of infrastructure, the loss of valuable top soil and agricultural land and cause problems for downstream water users due to less reliable water flow in the river and high silt loads in the plains' irrigation schemes, which further affects irrigation water distribution.

## 1.2 On-farm water management

This concept paper deals with the identified problems in on-farm water management. On-farm is defined as private farmers or farmer groups sharing the same water source in small scale irrigation and farmer groups sharing the same outlet of a tertiary canal in medium and large scale irrigations schemes.

On farm water management problems are both of a technical as well as of an organisational/institutional nature. Most reported problems include:

### A. Technical

- Absence of proper farm level irrigation systems (basins, furrows)
- Water losses due to seepage in earthen canals and lack of control structures
- Lack of proper water distribution systems (continuous versus rotational water distribution)
- Lack of sufficient water storage capacity

### B. Organisational/institutional

- Breakdown of traditional irrigation management organisations and
- Lack of proper water management organisation taking care of operation and maintenance of the irrigation systems;
- Lack of farmer knowledge on crop water requirements and new technologies.

The identified water management problems lead to inefficient water use which in turn results into a decrease of the total effectively irrigated area and thus into a reduction in agricultural production.

In addressing the identified water management problems, the technical and organisational aspects need to be addressed comprehensively in order to achieve the optimal results.

Possible (combination of) water management improvement measures are:

- a. Introduction of appropriate farm level irrigation methods:
  - Basins or furrows in cereal crop systems,
  - Land levelling and/or subdivision of basins,
  - Drip irrigation in horticulture (high value crops),
- b. Addressing the system water losses through lining of canals and construction of water control structures;
- c. Introduction of more efficient water distribution systems;
- d. Introduction of low water requirement crops (rice varieties) and cropping systems;
- e. Training of farmers on crop water requirements, related irrigation gifts and irrigation intervals;
- f. Establishment of proper water management organisation responsible for scheme operation and maintenance;

A limited number of organisations is already involved in on-farm water management:

- The Kunduz River Basin Programme: land levelling, water saving rice varieties, water user organisations
- AWATT: laser land levelling, mulching, bed & furrow irrigation, drip irrigation
- USAID/ASAP: ???
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- Various NGOs

There is however no coordination between these initiatives and the activities are not part of an overall strategy in addressing the on-farm water management issues.

## **2. Objectives**

### **Goal:**

To increase the agricultural production and productivity by improving on-farm water management in irrigated agriculture.

### **Project Objectives**

- a) To assess the key on-farm water management constraints in major cropping systems (cereals, horticulture) and irrigation systems (small, medium large);
- b) To identify suitable (packages of) on-farm water management improvement measures;
- c) To assess ongoing and planned activities on on-farm water management and establish coordination links;
- d) To test, monitor and demonstrate the identified the on-farm water management improvement measures on selected pilot sites;
- e) To train agricultural extension officers on on-farm water management;
- f) To disseminate the successfully tested on-farm water management measures through the extension network;
- g) To evaluate the pilot and formulate a programme for expansion.

## **3. Outputs**

- I. Project objectives a), b) and c) will result in an Assessment Report containing:
  - a. Identification and prioritisation of on-farm water management problems;
  - b. Identification and prioritization of suitable packages of water management improvement measures for different irrigation systems and cropping systems;
  - c. A detailed pilot programme, including clearly defined coordination links with ongoing activities on on-farm water management.
- II. Tested improved on-farm water management measures on maximum 10 pilot sites;
- III. X number (to be defined) of trained extension staff ;
- IV. Y number (to be defined) training of farmers;
- V. A final report containing the lessons learned from the pilot and a detailed outline for the expansion of the programme.

## **4. Implementation Strategy**

For the implementation of the pilot programme a Supervision and Monitoring Team (SMT) will be formed within MAIL consisting of : (i) irrigation engineer, (ii) water management specialist, (iii) agronomist and (iv) institutional specialist with experience in water management organisation. This Team assisted by a senior TA experienced in on-farm water management.

The SMT is responsible for the assessment, the design of the pilot programme, the monitoring of the programme and the internal evaluation.

Where possible pilot sites will be implemented through ongoing programmes and projects dealing with on-farm water management; other sites may be established within the direct control of MAIL and implemented by provincial MAIL staff.

The pilot is envisaged for a period of 2.5 years and is divided over 3 phases:

- I. a six month preparation phase,
- II. Establishment of the pilots, training of staff and dissemination of results during 2 agricultural seasons,
- III. Evaluation of the pilot results and formulation of the programme expansion.

#### 4.1 Preparation

In the preparation phase the assessment of the main water management problems as well as the identification of suitable improvement measures will take place. The assessment will be conducted by the SMT. The following activities are envisaged:

- collection of secondary information at Kabul level;
- meet with organisations active in on-farm water management;
- Site visits to ongoing activities; identify best practices;
- Identify gaps in available information; and
- Conduct additional field visits;
- Regional study tour to Pakistan, India to identify best practices;
- Prepare Assessment Report including a work plan for the pilot programme.

The assessment will take a maximum period of 3 months.

After approval of the Assessment Report, a 3 months period is foreseen to prepare the pilot: identification of the sites and staff, training of staff, purchase of equipment, etc.

#### 4.2 Pilots

##### *Selection of sites*

Site selection will be defined in the preparation phase, but the pilots should preferably cover: the different cropping systems (horticulture, cereals) and have a geographical spread covering the main irrigation areas. Where possible, ongoing successful on-farm water management activities should be included in the sites or agreements should be made on the information flow using an overall uniform set of monitoring parameters.

In order to test the measures in the reality of the farmer system, the sites should be preferably on-farm. Other selection criteria are accessibility (security) and proximity to Agricultural Extension Centres.

In order to be able to properly monitor the sites, the maximum number of sites should not exceed ten.

##### *Monitoring*

A monitoring system will be established to measure the effects of the water management measures. Main parameters to be monitored are: (i) water use, (ii) irrigated area (iii) crop yields, (iv) costs and benefits, (v) farmer's opinion.

At the start of the pilot, these parameters will be measured to assess the baseline situation.

##### *Training and Dissemination*

The pilot sites will – after successful testing of the pilot – be used as demonstration sites.

- Extension officers will be exposed to the pilot and trained in the introduction of the tested methodologies to other farmers;
- Farmers will be exposed to the demonstrations and trained to implement the methodologies in their farms

After the 2 year pilot, successfully tested methodologies will be reported and included in the regular training of the extension staff.

#### 4.3 Evaluation and Formulation of Expansion of the Programme

After the testing period during the two agricultural seasons, the SMT will prepare an internal evaluation report consisting of an analysis of the test results and a selection of promising water management measures to be implemented at a larger scale.

The report will further contain an outline for a strategy for (i) the dissemination of test results and (ii) further research on on-farm water management.

### 5. Inputs

See para 6

### 6. Budget

	Inputs	Quantity	Unit	Phase			Total	Cost/Unit	Costs
				Preparation	Pilot	Evaluation			
1.	<u>Supervision &amp; Monitoring Team</u>								
	Consultant	1	Month	3	4	2	9	18.000	162.000
	Mail Staff	4	Month	6	24	3	132	2.000	264.000
	Computer Data Analyst	1	Month		24	3	27	1.000	27.000
	Regional Study Tour	1							20.000
	National travel		lumpsum						20.000
	Per diem	750	days				750	25	18.750
	Computer Equipment	3					3	1.500	4.500
	Stationary		lumpsum						20.000
									<b>536.250</b>
2.	<u>Pilots (10 sites)</u>								
	Staff								
	Site Supervisor	10	months	3	24	3	300	1.000	300.000
	Assistants	20	months	3	24	3	600	500	300.000
	Transport Rent	10	days		400		4000	100	400.000
	Irrigation Equipment	10	lumpsum		1		10	10.000	100.000
									<b>1.100.000</b>
3.	<u>Training</u>								
	Extension staff training	10	Train.Day		50		500	50	25.000
	Farmer training	10	Train.Day		250		2500	10	25.000
	Training Materials	10	Train.Day				3000	5	15.000
									<b>65.000</b>
4.	<u>Contingencies (10%)</u>								<b>170.125</b>
	<b>TOTAL</b>								<b>1.871.375</b>