Cooperation Fund for the Water Sector
Pilot Demonstration Activity
Request Form

Activity Title: Sustainable Management of Water Resources in the Barani Areas of Punjab			
Proposer (Name, Div/Dept): Director General, Agency for Barani Area Development (ABAD)			
Request Date: 21st April, 2004			
Region: South Asia		**Country**: Pakistan	
Activity Start Date: 1st June 2004		**Activity End Date:** 30th June, 2005	
Cost Estimate: 50,000 US$			
Implementing Organization Contact: Director General, Agency for Barani Area Development, (ABAD) Murree Road, Rawalpindi			
Consultant Identified? No		**If so, Consultant(s) Contact:** NA	

Short Description:

1. Background and Rational:

The barani agriculture contributes only 10% of the total agricultural production and merely depends on the rainfall. In the context of crop production, barani lands have often been underestimated. However, more than 1200 kg/acre of wheat have been produced in these areas under rainfed conditions (Ashraf and Mian, 1979) which reveals a high potential for maximum crop production. Water is a limiting factor for agriculture development in barani areas. The occurrence of rainfall in barani areas is erratic and its spatial and temporal variation is high. Most of the rainfall occurs during monsoon (July to September). It has been estimated that about 6 million-acre feet (MAF) of water is lost as surface runoff from these regions annually (Latif, 1979). Therefore, much of the summer rain is not available for agriculture because of the surface runoff. Due to the uncertainty of rainfall, farmers normally minimize inputs to reduce the risk of loss in the event of drought and mainly depend on off-farm income.

Nevertheless, there is high potential for the development and management of water resources and therefore crop yield could be increased many folds by adopting proper water resource development and management practices.

The conservation/collection of runoff and its optimal utilization is of paramount importance in this area. Therefore, the surface runoff if trapped and stored at proper locations could help to achieve the goal of self-sufficiency in food. Water resource development and management are concomitant. Otherwise, the water resource developed would be lost without playing a significant role in the crop production. In Pothwar, there is potential for both water resource development (surface and subsurface) and its management (to improve the efficiency of the existing systems).

Soil is the most important natural resources since it provides the basis for crop and livestock production besides regulating the storage and flow of surface and groundwater resources. Nevertheless, this component is the most affected by erosion. In Pakistan, soil affected by water erosion contributes to 11.171 million hectares (mha) and by wind erosion, the area affected is 4.76 mha (Cheema, 1999). Only in Punjab, twelve to thirty thousand hectares of land are being lost annually (Barani Commission Report, 1976). About 9 million-acre feet (MAF) of water is lost as surface runoff from these regions annually without contributing for any productive use. The conservation and management of soil and water resources are of crucial importance for sustainable agriculture development and environment protection. The barani areas of the country have high potential for water resource development and crop production to gain self-sufficiency in food. With assured water availability, farm income can be maximized and the migration of people to the cities can be mitigated. This will contribute in the socio-economic uplift of the dry lands.

2. Objectives:

The project envisages undertaking research and demonstration activities in Pothwar area with following objectives:

- To evaluate and disseminate rainwater harvesting techniques in water scarce areas to combat water shortage.
- To introduce efficient water management techniques and utilize available water using high efficiency irrigation systems for socio-economic uplift

3. Scope of Work/Description of Activities:

In the barani areas, water is scarce, and inefficient surface irrigation schemes are not practicable. The following activities help to make the best use of the water, depending upon the water resource available, soil type, topography, distance from the source to filed, the land holdings and the capability of the farmers to adopt these technologies:

Pressurised Irrigation System

a. The sole source of irrigation in barani areas is rain, streams, and dug wells. Due to scarcity of water, merely 25% of total area is under cultivation. The farmers use obsolete methods of irrigation resulting in poor application and distribution efficiencies. In most of the area, the land is highly undulated and precision land levelling is, therefore, not a feasible option. As such, gravity irrigation is not possible in these areas. Moreover, cost of pumped/exploited water is quite high and the available water is not only un-adequate but also unreliable. Therefore, it is of utmost importance that this scarce resource should be utilised most aptly and efficiently.

b. Small-scale sprinkler and drip irrigation techniques have been successfully introduced in Pakistan, and are particularly well suited to the water scarce barani areas. Application efficiencies can be very high, in the order of 75 to 85%, permitting almost full use of the scarce available water supplies. An additional advantage as compared with surface irrigation is that efficient irrigation can be carried out even where topography is undulated and soil is of light texture as is the case in much of the barani areas. Raingun sprinkler and drip irrigation

systems have been locally developed which are comparatively cheap (PARC, 1992).

Water Conveyance Network

c. There are certain sites in the area where some sort of water resources (surface and/or groundwater) such as dugwells, mini dams/ponds etc. has been developed by various government agencies and the farmers themselves. Due to un-even/undulated topography of the area, it is not possible to convey this precious irrigation water from the source to its point of use by conventional gravity methods. Since the cost of developing water supply is high, it should not be wasted through unlined watercourses during conveyance. It is, therefore, important to provide suitable conveyance network at these sites for efficient utilisation of this limited supply of water. The network normally consists of a pump, engine, suction & delivery pipe and other pipe fitting accessories i.e., gate valve, sockets etc.

Water Harvesting Techniques

d. Any practice that reduces the surface runoff reduces the risk of erosion and improves the moisture reserves in the soil. The moisture availability can be improved by adopting conservation practices. The most important are proper bunding, levelling and deep ploughing. Proper bundling, and deep ploughing help hold water so that most of the water infiltrate into the soil, while levelling ensures the equal distribution of moisture over the whole field. Each millimeter of saved water could increase yield of wheat by an average of about 10 kg/ha (Marshall and Holmes, 1988). The adoption of these conservation practices for a *kharif* season increased the crop yield by 14% (Halcrow, 1997). However, for light-textured and sandy soils, the water harvesting technique is to increase the surface runoff and collect it at appropriate places to meet domestic, livestock and agricultural needs. Seepage and evaporation losses are the major concerns under such conditions. Therefore appropriate practices should be adopted to reduce the seepage and evaporation losses. Lining the ponds, by using

polyethylene sheets or by using bentonite clay etc, may reduce seepage from bottom and sides of the ponds.

Rooftop Rainwater Harvesting

e. The rooftop rainwater harvesting is more appropriate technique in urban areas to store water which could be used to recharge groundwater aquifers or for direct use for watering lawns and irrigating small gardens. In rooftop harvesting there is minimum chance of sediment. This technique is being successfully being used in many developed and developing countries to meet water demand for various uses. It is however, pre-requisite to evaluate the prospects of rainwater harvesting. This is important for managing water supplies in areas where water shortages are growing causing unrest among masses.

4. Implementation Schedule, Institutional Management Arrangements, and Proponent Qualifications:

The project will be implemented by Agency for Barani Areas Development (ABAD) and its line departments / projects support structure.

Activities	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Selection of sites and problem identification				
Research and demonstration on rooftop rainwater harvesting				
Research and demonstration on pressurized irrigation systems				
Research and demonstration on water management activities such as improving farm layouts, precision land levelling, watercourse improvements etc.				
Research and demonstration for watershed management activities				
Farmers/field days and seminar to disseminate the results				

Report writing				

5. Expected Results (Outputs / Outcomes / Impacts):

The project would help identify soil and water related issues and would provide possible solutions to the soil and water management related problems to increase water productivity in the barani areas. Since the research will be conducted at farmer fields and a package of technologies will be introduced, it would help disseminate the outputs rapidly. The adoption of high efficiency irrigation system would help increase water productivity and would help fill gap between water demand and supply. This will directly contribute in the economic development of the area leading to self-reliance in food and fibre.

6. Measurable Performance Indictors:

- Increased crop yield
- Improvement in water productivity
- Human resource development
- Improvement in socio-economic conditions
- Sustainable management of soil and water resources

7. Stakeholder Participation:

At each site farmers water use association will be formed. The research will be conducted at farmers' fields and farmers will be involved in all the day-to-day activities thus ensuring their active participation in the research activities. All kind of labour will be provided by the farmers. For the purpose, agreement will be signed with the farmers for the provision of necessary support and for easy excess of the scientists. The impact of proposed technologies will be demonstrated to the farmers of the other areas through field days/visits. Brochures will be developed for wide scale dissemination of the project activities.

8. Scope for Replication/Use in Other DMCs:

The research results could be applied on other similar areas and sites to sole soil and water related issues.

9. Cost Estimate:

The cost of the project will be Rs 2.88 million (US $ 50,000) for the whole period, the budget detail of which is given below:

S.No.	Activities	Cost (Rs)
1	Research and demonstration on rooftop rainwater harvesting	6,00,000

2	Research and demonstration on pressurized irrigation systems	4,50,000
3	Research and demonstration on water management activities such as improving farm layouts, precision land leveling, watercourse improvements etc.	2,00,000
4	Research and demonstration for site specific watershed management activities	2,00,000
5	Printing/publications	50,000
6	Equipment, field work, training	5,75,000
7	POL charges, maintenance of vehicles	1,50,000
8	Farmers/field days for dissemination/Seminar	2,50,000
9	Technical Consultancy/Honorarium	3,00,000
10	Contingencies	1,00,000
Total (Rs)		**28,75,000**
or Total in US$		**50,000**

10. References

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