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Spate Irrigation – Assessment and Cost Effective Development in Sailaba Farming Systems of Balochistan

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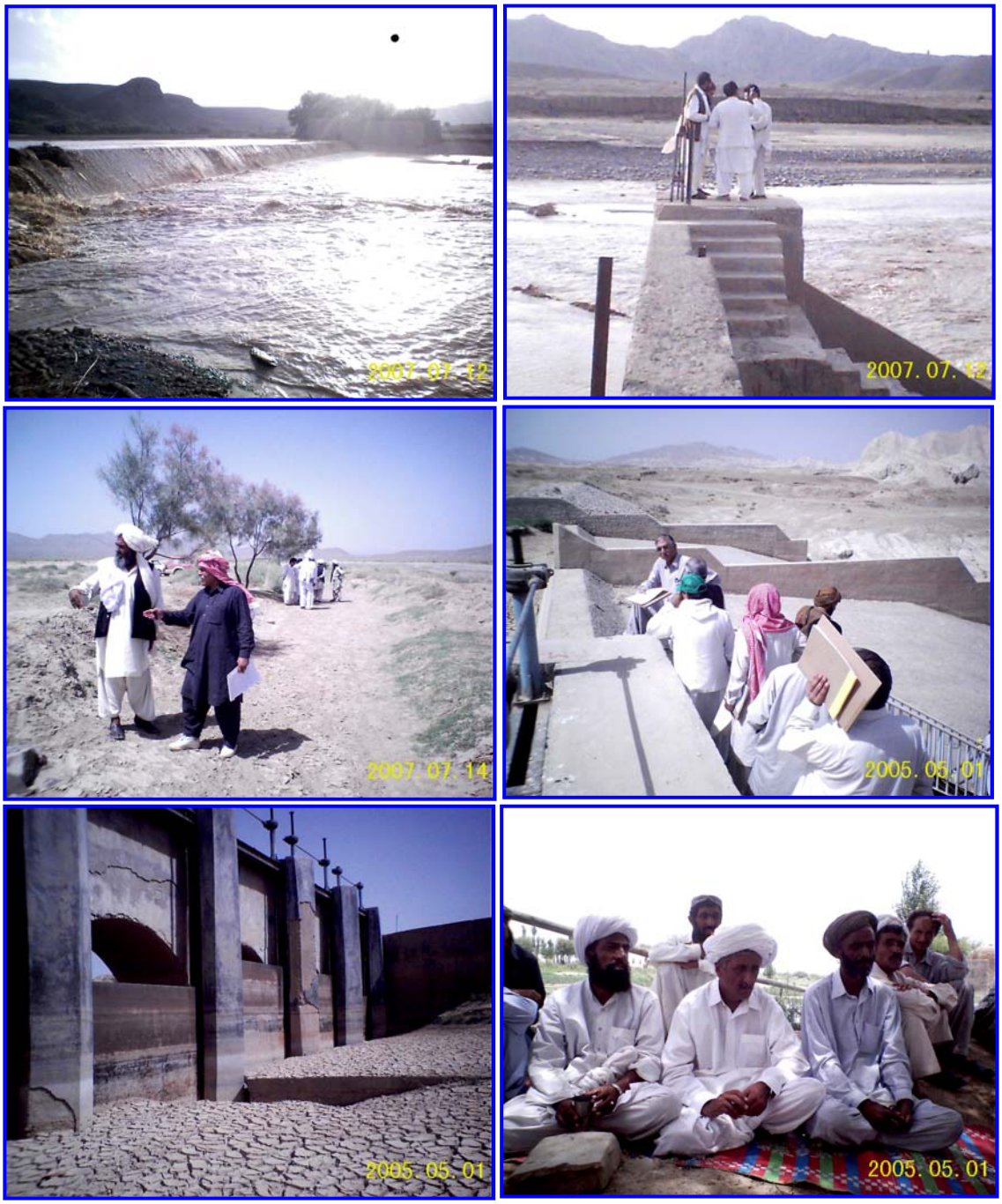

TA-4560(PAK) Project For "Supporting Implementation Of IWRM Policy In Balochistan – Government Of Balochistan – ADB And Royal Government Of Netherlands

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Spate Irrigation – Assessment and Cost Effective Development in Sailaba Farming Systems of Balochistan

Dr. Bagh Ali Shahid [1] ***and Dr. Shahid Ahmad*** [2]

1. Context of the Study

Internally generated floodwater is the largest resource of water in the province, as it constitutes around two-third of the available water resources in an average year. However, lowest priority is assigned to Spate irrigation and Sailaba farming in spite of the quantum of floodwater available.

Sustainability of Sailaba farming systems is essential as the risks are high due to un-reliability of flows because of the stochastic nature of rainfall. The development of Sailaba farming would also provide an opportunity for spreading floodwater and it would also contribute in recharging the groundwater in potential recharge zones. The construction of storage dams would reduce the risk and un-certainties in the availability of water especially during droughts. Therefore, it is necessary to further develop Spate irrigation and Sailaba farming systems in conjunction with the development of storage dams to transfer water of a wet year to the dry year and to enhance groundwater recharge through seepage of ponded water.

Overall objective and purpose of the study was to document potential of expanding Spate irrigated area. The crops of Sailaba area (wheat, sorghum, pulses, etc.) are not economical to grow in the canal and tubewell irrigated areas, as these do not compete with high value crops like cotton, sugarcane, fruits and vegetables.

Farmers of selected Spate irrigation systems were invited representing head, middle and tail reaches of the system for the conduct of Interactive Focus Group Dialogues to document perceptions of water users regarding the current state of Spate irrigation system, water rights, water allocation and distribution, farming practices, water productivity, issues and constraints. Twenty-eight Spate irrigation systems were selected covering the districts having large-scale perennial and non-perennial systems in various ecosystems of Balochistan – highlands, sub-highlands, plains, deserts and coastal areas.

2. Basin Wide Resource Availability

2.1. Probable Rainfall

The Balochistan province is an arid region characterized by low, erratic and uncertain rainfall and wide variations in temporal and spatial distribution of rainfall. The basin-wise rainfall at 25%, 50% and 75% probability was computed. The annual rainfall comes to 210, 144 and 94 mm at 25, 50 and 75% probability, respectively at the level of province (**Table1**).

Table 1. Probable rainfall of various river basins of Balochistan

River Basins	Rainfall in mm at three Probability Levels (%)		
	25	50	75
Dasht	117.97	70.27	38.10
Gwadar	152.40	93.98	45.72
Guj	220.98	146.05	71.12
Hamun-e-Lora	144.78	97.79	53.34
Hamun-e-Mashkhail	107.53	68.58	30.48
Hingol	205.74	144.78	101.60
Hub	209.55	121.92	58.42
Kachhi	143.71	93.22	55.37
Kadanai	251.46	187.96	133.35
Kaha	309.88	229.87	142.24

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River Basins	Rainfall in mm at three Probability Levels (%)		
	25	50	75
Kand	295.91	218.44	153.67
Kunder	278.13	212.09	144.78
Mula	173.99	111.13	75.69
Nari	271.98	211.14	136.57
Pishin	222.54	172.19	138.15
Porali	239.40	93.35	93.98
Rakshan	123.19	78.74	41.91
Zhob	303.95	245.11	180.34
Average	**209.62**	**144.26**	**94.16**

2.2. Aerial Rainfall Depth and Volume

The basin-wide availability of rainfall was estimated using the method of aerial rainfall. The basin area was computed using the GIS software. The average depth of rainfall and area of basin were used to compute rainfall volume. The volume of average rainfall at 50% probability comes to 57 billion m^3, which is almost 5 times the live storage capacity of Tarbela dam (**Table 2**). Similarly, the basin wide availability of floodwater was estimated at 50% probability, which comes to around 10.8 billion m^3 almost equivalent to the live storage capacity of Tarbela dam, which increase to almost 2.5 fold during the wet years at the probability of 25%.

Table 2. Basin wide average annual aerial rainfall in Balochistan

River Basins	Area (Km^2)	Annual Precipitation		
		(mm)	(Billion m^3)	MAF
Pishin	18213	217.67	3.96	3.21
Zhob	24307	242.31	5.89	4.77
Nari	22244	373.55	8.31	6.73
Kachhi	22960	125.47	2.88	2.33
Gwadar	16961	129.03	2.19	1.77
Dasht	27642	110.74	3.06	2.48
Hamun-E-Mashkhail	85205	103.88	8.85	7.17
Hub	8531	178.56	1.52	1.23
Porali	18527	181.1	3.36	2.72
Hingol	35653	161.54	5.76	4.67
Mula	16262	137.41	2.23	1.81
Guj	6024	156.46	0.94	0.76
Rakhshan	12360	102.87	1.27	1.03
Hamun-e-Lora	8350	109.72	0.92	0.74
Kaha	12116	271.52	3.29	2.67
Kadanai	4283	218.69	0.94	0.76
Kand	1117	226.31	0.25	0.20
Kunder	6244	225.55	1.41	1.14
Total	**346999**		**57.04**	**46.22**

**Source: ADB TA 4560 (PAK), Halcrow Pakistan and Cameos Consultant, Asian Development Bank and Irrigation and Power Department, Balochistan (2007).*

2.3. Floodwater Availability

The internally generated floodwater at the basin and province level was assessed in the Package Assignment [ADB TA 4560 (PAK)] on the basis of data provided by the WRPDM-IPD[3]. Balochistan province generates total floodwater of 3.25, 10.79, and 25.23 billion m^3 during dry, average and wet years, respectively. This indicates an increase of 134% during wet year and decrease of 70% during dry year **(Figure 1).**

[3] *Water Resources Planning, Development and Monitoring Directorate of the Irrigation and Power Department, Government of Balochistan.*

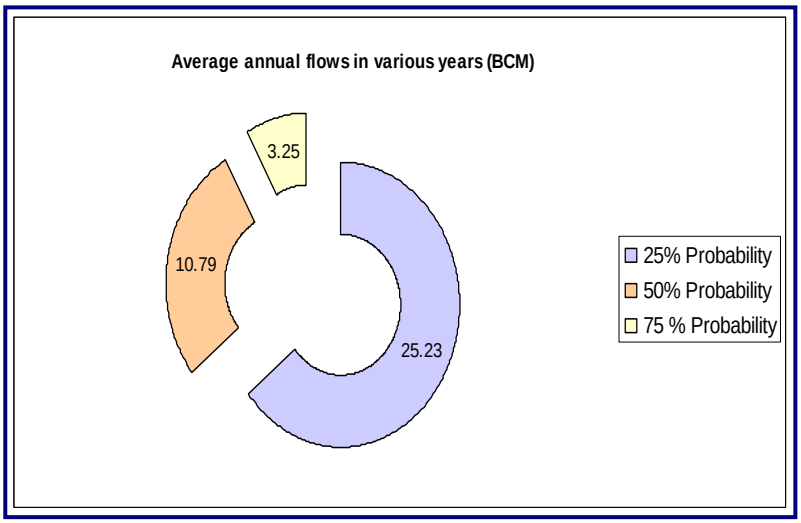

Figure 1. Floodwater availability in Balochistan

3. Spate Irrigation Schemes in Balochistan

3.1. Selection of Spate Irrigation Schemes for Interactive Dialogues

The research tool of "interactive focus group dialogue" was used to conduct assessment of Spate irrigation schemes in Balochistan. There are two distinct Spate irrigation systems in Balochistan – perennial and non-perennial. The criterion was developed to rank basin in terms of current potential of Spate irrigation by enhancing depth of water available per unit of Sailaba area (**Table 3**). The other aspect considered was the ecosystems of Balochistan. Based on these two parameters, 28 schemes were selected for the conduct of interactive focus group dialogues.

Table 3. Basin wide average annual floodwater availability in Balochistan

River Basins	Average Annual Floodwater Availability	
	(million m^3)	(MAF)
Pishin	386.09	0.312
Zhob	268.47	0.217
Nari	817.41	0.662
Kachhi	1842.3	1.493
Gwadar	533.9	0.432
Dasht	670.22	0.543
Hamun-E-Mashkhail	2081.87	1.687
Hub	404.12	0.327
Porali	1197.9	0.971
Hingol	934.16	0.757
Mula	359.81	0.291
Guj	167.76	0.135
Rakhshan	302.24	0.245
Hamun-e-Lora	203.55	0.165
Kaha	444.11	0.36
Kadanai	91.28	0.074
Kand	18.5	0.015
Kunder	101.15	0.082
Total	**10824.84**	**8.768**

**Source: ADB TA 4560 (PAK), Halcrow Pakistan and Cameos Consultant, Asian Development Bank and Irrigation and Power Department,Balochistan (2007).*

Out of total 28 selected schemes, 23 schemes have no court cases registered by the water users regarding conflicts on water distribution. Most of the schemes have no arbitrator appointed for resolving disputes on

water distribution. Only four schemes have arbitrators for resolving disputes on water allocation and distribution. The arbitrator is elected by the water users.

3.2. Development Potential of Spate Irrigation in Balochistan

Digital elevation model (DEM) was used for physiographic characterization of the province. NASA data available at a 90 meters horizontal resolution was used for preparation of the DEM of Balochistan. The province was classified into four physiographic zones (**Table 4**).

Table 4. Distribution of major physiographic regions of Balochistan.

Zones	Area	
	(km^2)	Percent
Coastal	13614	3.92
Plains	57100	16.45
Sub-highlands	158480	45.66
Highlands	117910	33.97

The potential for future development of Spate irrigation in Balochistan is estimated based on floodwater availability per unit of Spate irrigated area (**Table 5**), and is classified into five categories: a) Spate irrigation schemes having very low development potential <5 m/ha; b) Spate irrigation schemes having moderate development potential 10-15 m/ha; c) Spate irrigation schemes having high development potential 15-30 m/ha; and d) >30 m/ha (**Table 6**).

Table 5. Floodwater availability per unit area for various river basins of Balochistan.

River Basins	Floodwater per Unit Area (m/ha)
Dasht	24.510
Gaj	02.791
Gwadar-Ormara	50.697
Hub	03.755
Hamun-e-Lora	383.451
Hamun-e-Mashkhel	08.814
Hingol	12.524
Kachhi Plain	01.670
Kadnai	44.773
Kaha	25.324
Kand	12.593
Mula	04.671
Nari	6.950
Pishin Lora	6.732
Porali	4.366
Rakhshan	12.415
Zhob	10.618

Table 6. Classification of river basins based on development potential

Development Potential	Unit Water (m/ha)	River Basins
Very Low	<5	Kachhi Plain Basin, Gaj River Basin, Hab River Basin, Porali River Basin, Mula River Basin
Low	5-10	Pishin Lora Basin, Nari River Basin, Hamun-e-Mashkhel Basin
Moderate	10-15	Zhob River Basin, Rakhshan River Basin, Hingol River Basin, Kand River Basin
High	15-30	Dasht River Basin, Kaha River Basin
Very High	>30	Kadnai River Basin, Gwadar-Ormara Basin, Hamun-e-Lora Basin

3.3. Case Studies of Selected Spate Irrigation Systems

Three case studies of Spate Irrigation Systems were conducted representing the three major agro-ecological zones of Balochistan. These schemes were studied to document the role of public sector in O&M of the scheme, role of community in O&M and overall performance of the scheme. SWOT analysis describing strengths, weaknesses, opportunities and threats of the schemes was conducted. The data collected in these three case studies are summarized in **Table 7**.

Table 7. Summary of data collected under three Case Studies in Balochistan

Description	Shabo	Jhalwani	Hinjri
District	Pishin Longitude $33^0$18'N Latitude $30^0$07'E	Barkhan Longitude $29^0$37'N Latitude $30^0$70'E	Lasbela Longitude $27^0$12'N Latitude $66^0$22'E
Elevation (m)	1587	1300	1013
Construction year	1888	1880, 2000 (major rehabilitation)	1986
Construction by	IPD	Community	IPD
O&M	IPD	Community	Community+IPD
On farm bunds etc	Community	Community	Community
Command Area (ha)	6512	150	8000
Cultivated area (ha)	2171	300	8000
Cost Rs. Per ha	104 (1888 price level)	3000 (2000 price level) for improvement works done by PARC	7000 (price level 1986)
Main Canal length (km)	38	25	50
Diversion capacity (m^3/sec)	7	4.25	20
Tanks (storage facility)	4	-	-
Average field size (ha)	1.63	1.5	2.5
Average application of flood water (m)	0.61	0.7	0.7
Rabi Cropping intensity (%)	50	100	100
Kharif cropping intensity (%)	80	100	100
Average Annual Farm Income (Rs.)	50000	60000	55000
Crops sown	wheat, water melons, cumin and barley	Wheat, mung, mash, sorghum, fodder, orchard & all kinds of vegetable	All type of vegetable, Guar, Castor, Sesame & all type of tropical fruits
Performance	Vegetative growth and siltation	Satisfactory	Satisfactory
Conflicts of water distribution	No major dispute reported	Some disputes	Some disputes
Opportunities	Fertile lands – an effective FO is needed	More area can be brought under cultivation and groundwater is available for conjunctive water use.	Huge scope for expansion of spate irrigation in the area
Possibility of small dam	Yes	23 check dams exist	A major storage on main Paroli River can be constructed and would bring a green revolution in the area

3.4. Problems and Constraints

Variability of Spate irrigation has direct implications for availability and use of floodwater for the Sailaba farming, because system operates under two extreme hydraulic regimes – too littlr flow and too much flow. Crops grown in non-perennial Spate irrigation systems are of normally low value due to the risk of crop failures. In perennial Spate irrigation systems, users grow high value crops and fruits. Technical, social, institutional and economic issues and constraints of Sailaba farming are:

Technical

- Poor condition of headworks and/or diversion structures due to deferred maintenance;
- Inadequately designed and constructed water conveyance system causing frequent breaches and damages;
- In-appropriately designed diversion structures and water conveyance system led to excessive scouring and sedimentation in water channels and fields;
- Lack of facility to store floodwater in most of the schemes except the Shabo Headworks in Pishin district;
- Hard to identify lands that will receive Spate irrigation during a particular storm or within a season.
- Risks in Spate irrigation are not equally distributed throughout the system. There may be land with high, medium and low probability of floodwater. Thus, there exists internal differentiation based on location and level of the command area.
- Erosion is common due to higher erodability of lands. Sailaba farming is subject to process of active land formation, due to both scour and siltation process. The impacts of these processes differ between systems. Farmers are not passive actors in these scour and siltation processes, because often actively manipulate land formation.

Social and Institutional

- Water rights in Spate irrigation systems are reactive and are not sharply defined. They cope not only with the known proportions of the next floodwater but also with the medium term changes in field morphology, due to scour, siltation and change of floodwater course;
- Co-ordination among farmers is limited due to lack of appropriate organization, which can ensure operation of large system in accordance with established water rights and allocation rules;
- Out-migration is a common response due to persistent drought. In good years, the co-ordination among public-sector institutions is non-existent.
- Formal, informal and tribal institutions of water users for Spate irrigation systems lacks capacity for conflict resolution and other functions.

Economic

- In Sailaba farming system, subsistence and low value cash crops prevail. It is still dominated by drought tolerant crops like sorghum, millet, pulses, wheat, gram, guar and oilseeds. Most of the land is under local cultivars. Even if optimal conditions were to prevail, crop returns would have difficulty competing with alternative sources of income.
- There have been limited investments by the public-sector. Investments in other systems by public-sector institutions tempted farmers to leave Sailaba farming in search of getting perennial irrigated lands or access to perennial irrigation facility.

3.5. Participatory Scheme Development Process

The analysis of secondary data, interactive focus group dialogues and case studies of selected schemes indicated that scheme development or management or rehabilitation process was not either adequately developed or effective participation of water users was not accomplished through a process of social organization. There is a potential to further develop Spate irrigation for expanding Sailaba farming and to enhance groundwater recharge in the process as floodwater constitutes two-third of the available water resources of the province. There is 25% probability to receive over 25 billion m^3 of floodwater, which can be

stored one-out of four years for provision during dry spells. Thus there is a possibility of introducing storage reservoirs or Tanks in Spate irrigation schemes for sustainability and reliability of these schemes. All these developments in future must be based on a participatory scheme development or management process so that all the interventions are fully owned by the water users and their associations.

The socially organized communities have shown that they can manage their systems without any involvement of the public-sector. All the perennial Spate irrigation schemes are managed by the farmers and about half of non-perennial Spate irrigation schemes are also managed by the farmers without any involvement of the public-sector. Therefore, any improvement in Spate irrigation scheme has to be based on the acceptance of the water users with assurance that they will manage and maintain all the improvement work. All the necessary elements of the scheme development process be fully explained to the water users prior to the planning process.

4. Major Findings

4.1. Need for Management of Spate Irrigation Systems

There are three ethnic groups in Balochistan: Pathans in the north; and Brahuvi and Baloch in the south and west. The civil society is stratified and tribal in character. The difference in structure, attitude, character and capability of ethnic groups must be considered, while formulating management plans for the existing Spate irrigation schemes.

Improved O&M of Spate irrigation system is essential for long-term sustainability, otherwise benefits gained at early stages would disappear. The improved performance of Spate irrigation system is not possible without the involvement of farmers.

4.2. Stepwise Participatory Scheme Development Process

Farmers' involvement in planning, design, layout, construction and formulation of rules and regulations is vital for the success of any Spate irrigation scheme. Farmers' involvement leads to more sustainable schemes from a technical, financial, economical and social point of view. The involvement of water users in the development of Spate irrigation schemes and especially in decision making is a pre-requisite. The participatory scheme development process integrates activities related to water development, water management, agriculture development and social organization of farmers would provide mechanisms to have control over essential steps of the scheme development process.

The step-wise participatory scheme development process developed is presented as under:

- ***Reconnaissance Survey***: Select potential locations for the development of Spate irrigation schemes, prepare scheme profile, identify needs and interests of the water users;
- ***Baseline Survey***: Undertake surveys to document the current state of floodwater availability, state of catchment and command area, social fabrics of community, etc.;
- ***Water Users Associations and Farmers' Organizations***: Establish water users' associations at the channel level and Farmers' Organization at the main canal level and prepare plans for development of scheme based on the prioritized needs;
- ***Concurrence of Water Users' Association or Farmers' Organization:*** Build consensus using interactive focus group dialogues with the water users;
- ***Feasibility***: Develop detailed feasibility of the scheme;
- ***Capacity Building:*** Develop capacity of the Water Users' Association and Farmers' Organizations;
- ***Participation through Cost Sharing***: Develop mechanisms for getting upfront financial contribution from water users' associations or farmers' organizations;
- ***Participation in Scheme Development***: Ensure participation of water users' associations and farmers' organizations in planning, design and execution of schemes; and
- ***Scheme Completion***: Taking over the responsibility of O&M by the water users' associations and farmers' organizations.

The participation of water user is essential in the following activities:

- Participation of water users should begin before Spate irrigation scheme is planned;
- Water users should be involved in planning and design of rehabilitation projects;
- Water users' should be involved in the financial management of Spate irrigation schemes;
- Participation is more effective if both the water users and owners are involved;
- Participatory contracts be prepared for the rehabilitation of Spate irrigation schemes to provide systems which are accountable and transparent; and
- Cost-effective participation would lead towards the development of cost-effective schemes.

4.3. Groundwater Use

Use of groundwater in Spate irrigation schemes reduces the risks of crop failure due to the unpredictability of floodwater. Water users' have installed dugwells and tubewells in the command areas to supplement water. This enables them to produce high value cash crops like onions. Over exploitation of groundwater in the three river basins (Pishin-Lora, Nari and Zoab) has caused lowering of water table and resulted in drying of Karezes and shallow wells.

If groundwater is used to supplement supply of floodwater then sustainability of Spate irrigation scheme can be achieved. Storage of floodwater during wet years in dams and tanks would provide opportunity for recharging groundwater and to supplement Spate supplies during the dry seasons.

Kareze irrigation schemes must be designed to ensure sustainability, which would require integration with Spate irrigation schemes and watershed management in the upstream areas. In a number of existing Kareze irrigation schemes, the water users have imposed an informal ban on the development of tubewells in the Kareze catchment area feeding the scheme. A proportion of Spate irrigation water applied to the lands of the command area recharges the groundwater.

The ADB TA 4560 (PAK) has conducted the re-assessment of groundwater resources available at the basin level and identified the potential recharge sites in the three over-drawn river basins (Pishin-Lora, Nari and Zoab).

4.4. Design Considerations

Diagnostic study of 28 selected Spate irrigation schemes has revealed that wherever heavy engineering structures (concrete gated weirs, stone masonry weirs or heavy stone gabions) were constructed, it was very difficult both for the public-sector and the water users to undertake effective O&M. There are instances that after a very high flood the damages could not be restored even after a period of 4 to 5 years due to paucity of maintenance funds. The resource poor water users have to shift to towns to earn their livelihoods. The study also indicated that small-scale Spate irrigation systems having command area of less than 2000 ha with direct off-takes have been very successful.

Sailaba faming is a form of subsistence agriculture. Provision of essential infrastructure (farm to market roads, cold chains, water supply and electricity) must be a part of the design exercise. Introduction of lift irrigation schemes by constructing series of ponds along the banks of rivers wherever feasible would provide a cost effective system of irrigation. The minimum requirements of engineering interventions to improve farmers' managed Spate irrigation schemes are:

- easy for the water users' to have effective O&M of schemes without requiring heavy inputs of labour and/or other resources;
- adequate to control heavy flood flows to avoid system damages;
- effective in distribution of water in line with water rights and allocation rules, while providing flexibility to accommodate future changes in water distribution and Sailaba farming and ensure balance between various sub-sectors of water use (agriculture, domestic water, nature).
- sustainable to function with higher rate of sediments in floodwater and siltation in canal bed and fields; and
- robust to cope with frequent and some times large changes in the levels and alignments of unstable river channels resulting from large floods.

4.5. Cropping Pattern and Rotation

Most common cropping pattern in double cropping system is sorghum mix with beans (mashbeans, mungbeans, moath) and wheat. In certain areas oilseeds or barley are grown instead of wheat. Guar and castor are grown during Kharif. Forest and arid horticulture plants are also grown. The arid horticulture includes almonds, mulberry, pomegranate, olives, etc. Livestock is also dominant part of the farming system, because sorghum, mash and mungbeans provide fodder for livestock. The food legumes fix atmospheric nitrogen and provide opportunity to either have fodder in the dry years and both grain and fodders in average and wet years.

Crop rotation depends on the availability of water. In major part of Balochistan floodwater is available during the Rabi season, where wheat and melons are grown in spring. In areas, where rainfall is prevalent during Kharif season, both Kharif and Rabi crops are grown. Crop diversification is commonly followed to have more reliable Sailaba farming system covering cereals, pulses and fodders. In some areas fodder is the main crop having marketing prospects and drought tolerant than cereals. Farmers normally practice deep drilling of seed to have better crop germination and stand.

4.6. O&M of Spate Irrigation Schemes

Maintenance of Spate irrigation schemes is undertaken by the water users through a combination of self-help and assistance of the public-sector. The assistance of the public-sector consists of largely the provision of bulldozer on subsidized rates. The present allocation of bulldozers is made exclusively from the funds allocated to the members of the Provincial Assembly. The members of the Provincial Assembly are expected to deposit Rs. 400 per hour from their discretionary funds into the account of the Agricultural Engineering Directorate of Agriculture Department. Out of this, Rs. 80 per hour has to be recovered from the water users. The allocations are usually given to one of the village leaders, who were instrumental in collecting votes for the member of the provincial assembly. If farmers obtain bulldozer directly from the Agricultural Engineering Directorate, they have to deposit Rs. 800/hour.

Members of the National Assembly and Senate can get allocation of bulldozer hours after depositing Rs. 620 and the water users have to pay Rs. 80 per hour. The system of allocation of bulldozer hours at the provincial level is highly defective, as the influential can get larger share of allocations and sometime these allocations are used for some other activities.

4.7. Storage Tanks and Reservoirs

Possibility of construction of storage tanks or reservoirs for sustainability of Spate irrigation system must be studied and implemented wherever possible. The possibilities for construction of sand dams along the streams must be evaluated provided the catchments areas contain stones and other building materials. Existing Spate irrigation systems need to be complemented with the impoundment of floodwater by the construction of storage dams. The potential sites are:

- Hingol river site at Aghor (District Lasbela);
- Beji river site upstream of Kacchi plains (District Sibi);
- Bolan river site of Kacchi plains (District Bolan);
- Porali river site at Nigong (Lasbela District);
- Zhob river site at Badinzai (District Zhob);
- Nari river site at Babar Katch (District Dera Bughti);
- Porali river site at Pilar Dot (District Awaran);
- Bullo river site at Bullo (District Dalbandin);
- River Simsori site at Simsori Village (District Turbat);
- River Rakhshan and river Gwarorgo Kaur at Tank-e-Dap (District Panjgor);
- Pishin Lora river site at Kadnai Burj Aziz Khan (District Pishin); and
- Anam Bar river site at Gadibar (District Lora Lai).

4.8. Role of Gender

Women play important role in Sailaba farming and livestock. They are involved in producing handicraft and hand woven clothes for sale. All household work is done by them including fetching of drinking water and collection of fuel wood but they need to be included in the decision making for O&M of Spate irrigation schemes. The women groups can help in planting trees to protect embankments of Spate irrigation canals and can help in Sailaba farming and other income generating activities.

4.9. Spate Irrigation Systems and Poverty

Those who are already poor are the most vulnerable to the effects of drought in Sailaba farming. They have fewer resources for subsistence and fewer assets to sustain households during the droughts. Their social support systems are dominated by people who are also poor, and therefore, unable to help except in limited ways. Many of the poor are rendered dependent on shopkeepers, middlemen, local influential people and the government, when their limited social safety systems are exhausted. Drought also forces more people into poverty and debt as their resources and assets shrink. This is alarming because 35-40% of total population is already living below the poverty line.

4.10. Institutional Framework

Most of the problems in water sector arise from poor governance and lack of political will to introduce and implement policies and programs aimed at reforming the system. Added to this is the lack of capacity of various agencies to execute the planned programs effectively. The lack of involvement of water users' institutions in development and O&M of Spate irrigation schemes is the basic reason for poor performance of these schemes in the province. Users' institutions have to be strengthened at the scheme and basin level. The study further revealed that in all the schemes selected for study the Departments of Forest, Agriculture and Livestock do not have well defined roles.

5. Policy Reforms

Policy reforms for Spate irrigation system are:

- ***Assign priority to Sailaba farming*** as the floodwater constitute around two-third of total water resource available in the province. This would generate employment as un-employment is the major issue faced by the province. The development of Spate irrigation schemes for Sailaba farming would not only provide new sources of livelihood to rural landless but also save infrastructure, which was adversely affected during floods of 2007, where the assessment of damages was over Rs. 40 billions.
- ***Formulate policy to focus Sailaba farming to achieve self reliance*** in wheat, pulses and mutton. The province has a potential for the development of additional 2 million ha of Sailaba farming in the province.
- ***Establish Basin Water Board and Farmers' Organizations*** to initiate implementation of participatory scheme development process for Spate irrigation development in the province.
- ***Link Basin Water Boards with the proposed Balochistan Water Resource Management Authority*** to formulate and implement the policy reforms and initiate the process of development of integrated projects for Sailaba farming.
- ***Development and management of Spate irrigation schemes*** in the province would ultimately reduce the abstraction of deep groundwater in the basins which are over-drawn – Pishin-Lora, Nari and Zoab. This would ultimately help to continue the recent policy put forward under the Balochistan Resource Management Programme where number of tubewells and subsidy was capped in nominal terms.
- ***Encourage private sector*** to take over the role of providing quality inputs to the farmers, whereas the public-sector must provide the regulatory framework.
- ***Provide incentives to the farming community and the private sector*** to initiate sustainable development of Sailaba farming.
- ***Encourage NGOs*** to provide their input for social organization of water users so that the organized groups actively participate in the scheme development process.

- ***Invest in the development of sustainable Spate irrigation and Sailaba farming systems***. Integrated framework must be employed for the development of projects covering the aspects of: a) watershed management; b) diversion of floodwater and delivery to water tanks or storage reservoirs; c) allocation of stored water for Sailaba farming; d) development of Spate irrigation command area; and e) Sailaba farming including the livestock, crops, forestry and arid arid horticulture.
- ***Assign higher priority for smaller and medium size schemes*** which are cost-effective and provides livelihoods for the resource poor farmers.
- ***Introduce innovative interventions*** while constructing new schemes: a) Rubber Dams as diversion structures; b) storage of water in reservoirs and tanks both for irrigation and groundwater recharge; and c) integrated farming system interventions.
- ***Integrate groundwater interventions*** with Spate irrigation to generate new aquifers for providing new sources of livelihoods.
- ***Initiate capacity building programme*** for the agency staff, NGOs and water users so that schemes are sustainable and Sailaba farming is profitable.

The Policy Briefings is a Series of Issues, which will be prepared and circulated to the policy and decision makers in the province of Balochistan and in other provinces of the Country with an objective to synthesize and disseminate the studies outputs under the TA-4560 (PAK).

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http://www.brmp.gob.pk/pbriefings.html
http://www.brmp.gob.pk/tpbriefings.html

Reference: Shahid, B. A. and S. Ahmad. 2008. Spate Irrigation – Assessment and Cost Effective Development in Sailaba Farming Systems of Balochistan. Vol. (4), No. (13), TA-4560 (PAK), Quetta, Pakistan.

The topic to be addressed in the next Issue of Policy Briefings is "Groundwater Resource Availability for the Future Generations in Balochistan – How to Implement the Policy Reforms". The topic includes: a) Motivation; b) Basin-wide Groundwater Availability; c) Basin-wide Groundwater Balance; d) Groundwater Availability for Future Generations; e) Implementation Status of Policy Reforms under BRMP; and f) Way Forward for Effective Implementation of Policy Reforms.