PRO-POOR INTERVENTION STRATEGIES IN IRRIGATED AGRICULTURE: A CASE STUDY ON NRSP

Rashid Bajwa[1]

Abstract

Declining growth rates, fiscal imbalances and weak social security nets have led to the worsening of the poverty situation in Pakistan, with more people experiencing both absolute and relative poverty. The National Rural Support Program (NRSP) forms a bridge between the rural poor, the majority of whom depend entirely on agriculture for subsistence and income, and the Government agencies and departments responsible for water-delivery infrastructure and management. This paper gives a list of NRSP's interventions in the water sector, all of which are focused on minimizing water losses and improving agricultural productivity for the rural poor. The paper presents the case for 'social mobilisation' as a critically important tool in the establishment of efficient and sustainable responses to water problems. Case studies provide examples of the effectiveness of these interventions.

Introduction

Pakistan's economy in the 1990s was marked by a declining growth rate, fiscal imbalances and weak social security nets. This led to the worsening of the poverty situation, with more people experiencing absolute and relative poverty. According to official sources, the number of people below the poverty line rose from 18 million in 1987/88 to 45 million in 1998/99.

One important indicator of poverty is the incidence of food poverty. The food poverty line is defined on the basis of a minimum calorie requirement for active participation in economic activity[2]. At the national level, the incidence of food poverty was approximately 33 percent in 1998-99, which means that about one-third of all households were living below the food poverty line and unable to meet their nutritional requirements. The incidence of food poverty was even higher in rural areas, at about 35 percent. The incidence of food poverty increased from 24 percent in 1993–94 to 33 percent in 1998-99. This development coincided with the precipitous decline in the economic growth rate (from 6.1% in the 1980s to 4.6% in the 1990s) indicating a close connection between economic growth and poverty incidence. The impact of the decline in the growth rate on poverty was more severe in rural areas (a 5.4% increase) than in urban areas (a 1.4% increase).

In Pakistan, the incidence of food poverty is very closely related to the physical and managerial infrastructure of irrigated agriculture. The extended drought, which has devastated large areas of rural Pakistan, is also a factor. The irrigation sector continues to be challenged with adverse demand/supply ratios. In addition, supply deficiency or apparent resource depletion exists because of poor innovations on the part of both the

[1] Chief Executive Officer,National Rural Support programme
[2] Pakistan Human Condition Report 2002

formal and informal sectors in developing new and efficient water strategies in irrigation.

However, beyond food poverty, one observes a disturbing paradox in recent developments. This is the 'existence of pervasive malnutrition in a world of abundant food supplies'[3]. Growth in global food production has more or less kept pace with growth in population. However, commodity prices have shown a spectacular decline as a result of productivity gains, according to IFPRI & WRI reports[4]. Agriculture provides more than 43 percent of jobs in the labor market with irrigated agriculture playing a predominant role. Declining agriculture prices, therefore, have a direct effect on incomes, and affordability rather than availability becomes the core issue.

The Pakistan picture also seems to follow these global trends. Pakistan has emerged as a 'food secure' country at the macro level. However, it has also emerged as a highly 'food insecure' country at the household level. Food insecurity at this level has increased since 1992-93. Incomes and food prices are two essential elements in determining the affordability of food by poor households. According to Qureshi and Khan[5] (2002), 'balancing the government budget at the cost of unbalancing the life of the absolute poor is not only bad politics, it is bad economics as well. Helping the hungry to survive and be active members of the labor force is a good investment in people in the long run'.

According to Alderman[6] (2001), poverty is primarily a rural phenomenon and approximately 75 percent of the poor reside in rural areas. This has important implications for both public policy and the design of strategies for poverty reduction. For Pakistan, irrigated agriculture offers the largest share of jobs in the country and will continue to do so in the foreseeable future. Technological interventions, therefore, will be needed, and investments must be made to improve the management of water quantity and quality within a watershed management context (upstream-downstream demand components), as well as investments in the development of additional water resources. In addition, the issue of poverty will need to be addressed in a holistic and multifaceted manner.

It is vitally necessary to take a fresh look at traditional crop cycles, and include processing and marketing as part of the crop cycle ('from crop to the plate'). We would also look at the needs of everyone involved in this extended production cycle, from labor (throughout the entire crop cycle) to middlemen, processors and marketing agencies and firms. We would also need to address the needs of the farmer as the hub of all these activities and see how his/her income can be increased, in both the on-and off-farm sectors. In addition, we would also need to consider addressing his/her need for basic services such as education and health, the lack of which make rural men and women particularly vulnerable to poverty shocks.

The major concern is how best to address these issues and devise, in response, a holistic and multi-sectoral strategy for poverty alleviation in irrigated agriculture. The hypothesis is that no single agency has the capability to address these multi-sectoral

[3] Rural Development Strategy, 2003. The World Bank Group
[4] IFPRI & WRI, 2001
[5] Pakistan Human Condition Report p. 164
[6] Rural Development Strategy, 2003. The World Bank Group

issues under one umbrella. Clearly there is a role for all stakeholders including all tiers of the government, support organizations like the Rural Support Programs, relevant NGOs and the huge untapped private agriculture processing sector, as well as donors. Has this worked anywhere in Pakistan? The case study of the National Rural Support Program, the largest NGO in Pakistan[7] is presented here as evidence of how the rural poor in the irrigated areas of Pakistan have been able to come out of the economic, food and opportunity poverty which they face.

Social Mobilization

NRSP, in implementing its strategy of 'harnessing the people's potential' and invoking the sense of motivation and self-help among rural men and women, plays a leading role in the reduction of rural poverty. NRSP's approach has as its central theme, "social mobilization": NRSP stands on the pillars of identifying the rural poor, organizing them into properly functioning bodies, marshalling local resources and building people's capacities to become involved in the development of their own communities.

The difference between NRSP's methodology and that of traditional development programs is the realization that the 'household is the last unit and indeed the engine of development' as opposed to the traditional view of taking the village as the smallest unit of development. This concept and the practice that follows from it offer an entirely new development paradigm. Social mobilization is the foundation of that paradigm.

Social mobilization is the process of organizing rural men and women into groups, called Community Organizations (COs) for the purpose of identifying and prioritizing their own development opportunities. The foundation of NRSP's approach and method is that only informed and engaged community members, acting for the common good, can plan and undertake sustainable community development. The CO is a forum for marshalling resources, for good governance, and transparent and accountable operations. There are currently 18,154 COs, of which 1,289 are Water Users' Associations. The CO membership, countrywide, is 372,800.

The social mobilization process begins with a series of dialogues with community members. The next stage is Situation Analysis, which provides a comprehensive profile of the area's demography, economic and employment data, institutions, ecology, physical and communication infrastructure and the agricultural economy. A 'Poverty Profile' is then conducted, in which villagers are asked to categorize their households' economic status. This gives NRSP a good idea of the scale of the poverty in the area.

The end product of NRSP's social mobilization is a 'Micro Investment Plan' that threads in all the stakeholders, and defines the role of each one in working together for poverty reduction. It factors in the role of water resource development and management and its integration in poverty reduction, but looks beyond it. According to Khan 2003[8], the support organization (e.g. NRSP) acts as a catalyst in the process of development of the Community Organization (CO): it extends technical and material assistance according to the expressed needs of the rural poor to enhance their capacity to become self-reliant. More specifically, the Support Organization focuses on preventing losses of

[7] Human Development in South Asia 2002. Mahbub ul haq Human Development Centre p.90
[8] The RSPs in Pakistan: Methods of Assessment of Cost and Impact. Mahmood Hasan Khan, 2003

crops, animals and people; it increases the productivity of natural resources and enterprises; it reduces people's dependence on external service systems; and it enables physical and social capital formation. NRSP has not limited its support to income generation or production activities of the rural community. Instead, it has adopted a broader approach which includes small commercial enterprises, social sector services and infrastructure development.

Portfolio of Opportunities:
The Micro Investment Plan

Levels	Plans Identified	Interventions
Household	Income Generation	- Line of Credit - Training
Group	Land Improvement Joint Enterprises Collective Supplies	- Line of Credit - Training - Technical Assistance and Marketing
Village	Social Sector Needs: -- Drinking water -- Sanitation -- Other small infrastructure -- Health & Family Planning	- Productive Linkages

A recent study (Khan 2001) has estimated the economic impact of NRSP's activities on rural households[9]. The results show that partnership with NRSP over time has had a positive impact on member households of COs in terms of their total and farm income, total expenditure, savings, consumer durable goods, and number of children in school. Khan's study shows, for example, that the annual household income would be lower by 7.5 percent where this program was not available to a household. The program has been able to increase the incomes of its clients by about 50 percent in real terms over a six-year period. What is perhaps more important, but not quantifiable, is that the support program has mobilized, through the COs, the latent energies and resources of individuals and communities enabling them to overcome many constraints.

The work done by NRSP in developing water resources for agriculture, in both subsistence and cash crops is detailed in Section 2.

[9] A detailed description of this method and its use in different contexts is given by Mahmood Hasan Khan, *Community Organisations and Rural Development: Experience in Pakistan*, *op.cit.*, Chapter 7.

Water for Agriculture

Along with the right soil conditions, good agri-inputs and appropriate cropping technologies, the development of agriculture primarily depends on enough water available at the right time in the crop cycle. In case of sufficient precipitation, the water requirement is fulfilled without any additional requirement of irrigation water. However, irrigation becomes critically important when rainwater is either insufficient for the growth of crops or does not fall at the required time. In Pakistan, the majority of agricultural land is dependent on one form of irrigation or another.

The water schemes supplementing the agriculture and irrigation systems are of paramount importance for optimal agriculture output. Pakistan's irrigation system is one of the best systems in the world in terms of its efficiency. However, in recent years the efficacy of the existing system has been compromised, in part because of expanded cropping areas (much of it not supported by the expansion of irrigation) coupled with improper maintenance. The agriculture sector is the economic backbone for a country like Pakistan, with 65 percent of the population living in the rural areas. In this regard innovations are critically important for the agri-sector to the extent that they enhance the rural economy.

The sources of water for irrigation and agriculture purposes may be divided into two broad categories: surface water and groundwater. The working of different agri / irrigation schemes facilitating the supply of water to the agriculture sector and supporting the irrigation system operative in different regions of Pakistan are discussed below.

Surface Water

Surface water sources include rivers, canals, lakes and natural and artificial reservoirs. The water schemes supporting the agriculture sector derived from the surface water resources in Pakistan include the following

The Karez

The karez system is mainly used in Baluchistan, where it serves the dual aim of supplying water for irrigation and drinking purposes. The karez system consists of wells and underground water channels. In this system, two or more 'mother wells' (some reaching a depth of 200 ft.) are constructed to reach the aquifer zone. Discrete aquifers are then interconnected through a horizontal channel in such a way that yield of each well augments that of the other wells. The slope of the channel all along the alignment is maintained so that at the outlet point it facilitates irrigation through gravity flow. At the outlet point, a karez can discharge water at the rate of 0.25 to 0.75 cusecs.

NRSP has contributed to the improvement, extension and rehabilitation of the karez system, particularly in the Turbat region, as the following example shows.

Case Study 1. A karez in Peerani Lomb, District Turbat is a good example of the benefits that can accrue when people's potential is harnessed through social mobilisation. The villagers of Sari Kahan entered into agreement with NRSP to rehabilitate an old karez that had been non-functional for fifteen years. The lack of water meant that the village's agricultural system was suffering, with thousands of date

trees withering. Most of the rehabilitation work undertaken previously had been damaged beyond repair in the 1998 floods. Only a few well-to-do people in the village could afford to irrigate their land through tubewells but this was very expensive and it resulted in lowering of the watertable.

When the villagers formed a CO to work with NRSP, its first priority was the rehabilitation of the karez. The cost was estimated to be Rs. 418,000. NRSP facilitated the project by getting a UNDP grant of Rs. 182,000 and the villagers contributed the remainder. They also contributed their labor to the construction work and were completely responsible for supervising the work. Their personal supervision ensured that the work was of the highest quality. Since the successful completion of the karez an additional 85 acres of land has come under cultivation, greatly increasing the productivity and value of economic activity. In absolute terms, the amount involved is quite small but it has helped to solve the problems of an entire village.

Watercourses / Irrigation Channels

Watercourses and channels are the secondary source of water used mainly for irrigation. The primary sources of these channels are link canals, although in the absence of a link canal rivers act as the main water source. The watercourses may be further categorized as *pucca* (lined) and *katcha* (unlined earthen) channels. These channels are associated with the problems of silting, scouring, and leakage. The *pucca* water channels are more effective in providing water because the interior lining prevents water losses (especially common in areas with sandy soils) and protects against waterlogging. Earthen embankments protect the land from overflows and periodic floods. The conveyance capacity of a watercourse/irrigation channel ranges from 1-3 cusecs. (3- 4 cusecs of water is allocated to irrigate 1,000 acres in canal-irrigated areas).

NRSP has utilised its own resources and collaborated with UNDP in developing, improving and lining watercourses/channels in Attock, Chakwal and Khushab.

Case Study 2: Conflict Resolution and Increased Productivity Through Water-Delivery CPls. Villages Katha and Misral are neighbouring villages located at the foot of the Katha Range in Khushab district. Both villages access water from a stream emanating from natural springs in the Katha Mountains. Over the years, the villagers had adopted a system of conveying water to a central point and sharing it according to elaborately laid down riparian rights. However, on more than one occasion there was a disruption of water due to flood or drought. Since the channel was essentially a temporary one, constant repairs requiring resources from both villages were required to keep it operational. Needless to say, water sharing was a source of tension between the villages.

In April 1993, a CO was formed with a membership of 23 persons. When the CO approached NRSP for assistance in finding a permanent solution to this problem, NRSP's technical team proposed that a channel be built which would convey water from its source in an aqueduct and divide water equally for the two villages. Realising the importance of the project, the villagers immediately agreed to its construction and committed themselves to contributing approximately 30 percent of the costs.

The watercourse was constructed in two phases. In the first, NRSP provided technical support in preparing project estimates and technical drawings. Funding was provided by (Trust for Voluntary Organization) TVO. The second phase was fully supported by NRSP and PPAF, both technically and financially. The total length of the

watercourse/aqueduct is close to 6,400 feet. The CO members have contributed approximately Rs. 400,000 out of the total cost of Rs. 1.4 million.

This project has demonstrated the value of joint action. It has resulted in social cohesion amongst the villagers and is providing direct benefits to over 280 families with a population of nearly 2,000 persons. Due to the constant availability of water there has been a steady increase in agriculture production, especially of vegetables, increasing the income of the families living in the village.

Case Study 3: Preventing Water Losses and Increasing Productivity in Khushab. In the Khushab and Bhakkar districts of the Punjab, the loss of irrigation water in the sandy soil is a pressing problem. Water pumped from tubewells seeps from unlined watercourses before it reaches the fields. Some estimates place the loss at close to 40 percent of the total. Time and money are lost as fuel and electricity costs increase, and returns diminish as cultivation areas are reduced and per acre yields decline.

In order to overcome this problem, NRSP devised a scheme for brick-lining watercourses, and providing prefabricated concrete water outlets at designated points. More than 45 households have benefited from each scheme. The schemes have been a boon for this area. Farmers are now able to cultivate more land with the same amount of water and the savings have meant increased incomes and more ecologically sustainable agricultural practices. There are many other direct benefits of these schemes:

- The farmers save diesel or electricity (in case of tubewell irrigation) costs.
- The command area of a minor canal or tubewell has increased. It is estimated that the 35 brick-lining projects have brought an additional 700 acres under irrigation.
- The water-carrying capacity of the channels has increased.
- Soil productivity has increased due to the timely availability of water.
- Late sowing has been eliminated, since farmers do not have to wait their turn to receive water.
- Social cohesion has greatly increased among those who contribute to the project and share its benefits.

Mini/Mud Dams and Check Dams

Mini dams and check dams are earthen structures used to store water either accumulated during the rainy season or supplied from the link canal. The stored water is used for irrigation, and acts as a backup or emergency supply in times of shortage.

NRSP has facilitated the construction of numerous mini dams and check dams in Attock, Badin and Rawalakot.

Water Harvesting Structures

In hilly areas, where annual rainfall is as high as 1500milli meters, local residents construct rainwater harvesting structures for irrigation, livestock and household purposes. The average cost of these structures is Rs. 50,000/-. Some of these structures, which are usually in the form of large tanks, are also used for fish farming. Each structure contains enough water to irrigate about 20 kanals, typically used to cultivate vegetable and cereal crops. These structures are environmentally beneficial, as they control surface run-off, soil erosion and silting.

It is seldom possible to depend entirely on these water supplies but they are valuable where and when water from conventional sources is scarce. The current method of water collection and storage is relatively unsophisticated, but with improvements, the quality and quantity of water, and the system of delivery can be made more reliable and productive.

NRSP has collaborated with UNDP in the construction of these water harvesting structures through linkages with the Northern Resource Management Project, AJK in Kotli, Hajera, and Rawalakot.

Sprinkle Irrigation

This method, which may use either surface or groundwater, is used to ensure the uniform application of water in a number of situations: sandy soils, irregular terrain and areas endangered by waterlogging. Its use is limited to situations where the water requirement is relatively small, so is mainly used for horticulture rather than for cropping. This method saves water and reduces the application of fertilizers. One sprinkler has a coverage area of 50 square feet. Water is applied through three methods:

1. Central pivot system: water is sprinkled by rotation from a central pivot.
2. Fixed pipe system: water is sprinkled through the rotation of pipes.
3. Portable system: the sprinkler is mounted on a trolley, which allows water to be delivered where it is needed.

NRSP has facilitated the use of sprinkler irrigation through linkages with ABAD and the Water Management Department in Chakwal. NRSP has also developed a model of sprinkle irrigation in Noorpur Thal, Khushab.

Groundwater

Groundwater may be drawn through lift irrigation, open wells, infiltration galleries and natural springs. In this regard, the groundwater schemes supplementing the agriculture / irrigation system of Pakistan are as follows:

Lift Irrigation

In lift irrigation a number of techniques are used to lift underground water from shallow and deeper strata of the earth. These are:

Tubewells

Tubewells lift water from deep below the earth, sometimes as far as 200-300 feet. Tubewells are used for irrigation and drinking purposes, as water from deep aquifers is usually free of bacteria. If the level of dissolved solids is also within acceptable limits, then groundwater is an ideal source for community water supply systems. The yield of a tubewell ranges from 0.25-0.5 cusecs, meaning that water from a single tubewell can irrigate as much as 600 acres.

A properly designed and constructed tubewell can give long and trouble free service. Pumps and electric motors manufactured in Pakistan can meet most of the design requirements for community water supplies. However, the maintenance cost of these systems is high due to motor and pump failure and fuel cost. NRSP has contributed

finance and expertise in the installation of tubewells in the Islamabad Capital Territory, Attock, Chakwal, Khusab, and D.G. Khan.

Peter Engine

The working of a 'Peter Engine' is similar to that of the tubewell, but it draws water from sources closer to the surface (typically 30-150 feet). The majority of Peter Engines have been installed by NRSP through its credit policy in the Islamabad Capital Territory, Chakwal, Attock, Rawalpindi, Rawalakot, Khushab and Badin.

Hydra Ram Pump

This method of lift irrigation is not in common practice because it requires an ideal location and a natural slope to facilitate its operation. However, in the right circumstances, a hydra ram pump meets the water requirements of one or two households. The method involves water falling some 20-30 feet under gravity action, then being lifted by a small pump. The advantages are twofold: the water's energy is dissipated and erosion is minimized, thus ensuring a smooth flow of water onto the fields.

NRSP has tried the method in Rawalpindi Region at Attock and Chakwal, but so far has considered it only relatively successful, as the costs incurred were judged to be greater than the benefits accrued. However, the potential exists for further development.

Turbine. In some places a turbine is the most efficient method of lifting water, which is then used for irrigation purposes. NRSP has installed turbines in Rawalpindi and Rawalakot regions.

Wells for Irrigation. Where dug wells are in common use, these are also used for irrigation. NRSP has helped in the construction of these wells through linkages with government organizations such as ABAD in Attock and Islamabad Capital Territory.

Conclusion

It is clear that integrated responses are required, if the problems of water availability, quality, timeliness and cost are to be addressed in a sustainable manner, and if rural poverty is to be alleviated in a structural and sustainable manner. NRSP's approach to poverty alleviation, based on social mobilisation, focused on community-identified and prioritized needs and opportunities, and with productive linkages in place between government and private-sector actors, is demonstrably able to provide such an effective and integrated response.