AGRICULTURAL WATER MANAGEMENT SYSTEMS IN THE KHANDESH REGION OF MAHARASHTRA STATE, INDIA

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ABSTRACT

Irrigation water management is an interdisciplinary, multi system science, which was historically developed on a participatory mode. Some of these systems are so old that it is impossible to establish their antiquity. At a later stage, more emphasis was given on creation of physical structures like dams, canals and other on-farm structures. The socio-cultural, organizational and economic aspects of irrigation development were overlooked, resulting in lower performance of such irrigation projects. In this paper an attempt is made to study traditional community managed block irrigation system, popularly known as Phad irrigation system, from the Khandesh region of the Maharashtra State, India. Phad (block) irrigation system of the Maharashtra State is one of oldest community managed irrigation systems in India. These irrigation systems have relevance even today for providing predictable, reliable and equitable water to farming community. Crop rotation, irrigation management by community participation and involvement of farming community etc. are some of the unique features of these irrigation systems. But now this age-old water management system is under threat due to changed environment. However, small farmers can organize themselves and have such systems in small and medium irrigation projects viz. Waghad irrigation project of Maharashtra, India. There is scope to have Phad (Block) irrigation system in this and similar other projects. Also in Kolhapur and Sangli District of Maharashtra there are number of private and co-operative lift irrigation schemes, where farmers are organized. In these schemes also there is scope to have Phad (Block) irrigation system.

Keywords: Community managed irrigation, Phad irrigation system, Regional water management, Participatory irrigation management.

1. INTRODUCTION

The management of water requires a great degree of participation by those who benefit from the productive use of this resource. Irrigation water management is an interdisciplinary, multi system science, fitting to the socio-cultural aspirations. Historically, this has remained a less highlighted dimension in exploitation, development and use of water resources. The earlier participatory efforts were not further expanded and groomed to solve the irrigation water management issues on a larger societal scale. At a later stage, more emphasis was given on creation of physical structure like dams, canals and other on-farm structures overlooking the socio-cultural, organizational and economic aspects in their proper contexts, resulting in lower performance of such irrigation projects. In Indian context, there were certain efforts under-taken in different ways in different states, because development of water resource is the state responsibility. Intermittent efforts for participatory irrigation management were either through social groups, devoted individuals or through the initiative of the state Government and their officials (WALMI 1999).
2. GLOBAL EXPERIENCES IN PARTICIPATORY IRRIGATION MANAGEMENT

Participatory irrigation management (PIM) has gained increasing importance and recognition all over the world in last half century. The trend towards expanded state control over irrigation system has changed and participatory irrigation management is becoming the global trend (Groenfeldt, 1997). Most of the countries had adopted the participatory irrigation management system. Some of the notable countries include USA, Taiwan, France had adopted PIM in early period of 20th century. This was followed by many experiments of PIM in Latin American, European, and Asian countries and others. The examples of countries include Mexico, Chile, Peru, Brazil, Colombia, Zimbabwe, Tanzania, Sudan, Somalia, Vietnam, China, Indonesia, India, Shri Lanka, Bangladesh, Pakistan, Philippines, Egypt, Jordan, Turkey, etc. which have adopted PIM at varying degrees and success.

USA had taken pioneering effort of PIM as early as. Irrigation facilities constructed by the United Bureau of Reclamation and other federal agencies are generally transferred to local water user entity for operation and maintenance (Geoenfeldt, 1998). Certain examples of PIM transfer in the case of USA are, Columbia basin irrigation project in Washington State (1969), King river irrigation system of Fresno, California, Big Thompson irrigation project of Colorado State etc.

Mexico had taken very successful efforts for transfer of management of irrigation to farmer's association. Governments has created National Water Commission in 1989. Top priority is given for transferring public irrigation districts to private organizations. Now more than 75 per cent of transferred area belongs to Water Users Associations (WUA). Several irrigation districts including Alto Rio Lerma had been transferred to various water user’s association. Mexico’s PIM programme has attracted worldwide attention (Geoenfeldt, 1998).

Indonesia had Prepared a policy statement on transfer of small irrigation systems in 1987 (having area of 500 ha each) and actually implemented the same in 1989. Several irrigation schemes were constructed during 18th Century, Such as Penali Canal irrigation systems. Irrigation systems are classified on the basis of management responsibilities, i.e., whether the system is administered by Government or by Non-Government Organization. Four popular irrigation organizations and farm water management exist in Indonesia viz. The Subak Irrigation System, the Village Irrigation System, The Ulu-Ulu Desa Scheme and the tertiary level water management system (Geoenfeldt, 1998).

China had made efforts of reforms in management of irrigation in 1980s. In 1990s, a system of farmer, Stock holding arrangement began.

In Nepal, PIM activities are initiated on direction of irrigation policy of 1992 based on participatory approach of irrigation management. The minor irrigation systems have been entirely transferred to WUAs and large systems are managed by the Government and WUAs. Water Users Groups is the mechanism for farmer’s participation. In the Narayani Irrigation Project, there is a tertiary based, two-tier organization, and the beneficiaries served by each division box from a gross-root water users group. The same organization pattern is followed in the Mahakali irrigation project expect that the organization are registered under the Cooperative Act. In the Kankai Irrigation Projects, there is a complex hierarchical multipurpose organization similar to co-operatives (Geoenfeldt, 1998).

Philippines Government created a body called National Irrigation Administration (NIA) in 1964 for development of irrigation in the country. But due to poor performance of irrigation system, a new scheme of farmers participation in irrigation water management was introduced in 1988. Farmers Irrigation Organizer were employed as
catalysts and assistance of NGOs was taken for formation Association (Geoenfeldt, 1998).

Farmers involvement in the irrigation management in Sri Lanka is from the 11th Century. One of the largest six thousand acres tanks in north-eastern Sri Lanka, Parakrama Samudra near the ancient capital of Pollannaruwa, was built under the guidance of King Parakramababa in the 11th century. Sri Lanka has declared PIM as official Government policy by 1988. The farmers organizing efforts are seen at different levels. Several farmers organizations are formed in the Mahaweli Development Scheme and the Gal Oya Scheme. Operation and maintenance at distributory level are completely looked by farmer’s organization and main canals are managed by project management committees in which farmers representatives are in the majority, while several Government department are also represented. It is recommended by Irrigation Management Policy Support Activity (IMPSA) that there would be no more minor irrigation and major irrigation categories but only farmer managed and joint managed system.

South Korea is also on the lead in the process of farmer’s participation in irrigation water management. Irrigation projects are planned by the Ministry of Agriculture and Fisheries. However irrigation project commands are managed by the Farm Land Improvement Association. General Manager heads the organization of the association, who is elected by the members (farmers) of the association.

In Malaysia, farmer has constructed traditional irrigation facilities such as Brushwood Weirs and Water Wheels in small paddy area. The Drainage and Irrigation Development has undertaken these communal efforts, and provided proper irrigation and drainage facilities. Realizing the role of farmer in managing irrigation water, Drainage and Irrigation Department has encouraged farmer’s involvement and participation in the maintenance and operation of tertiary canal and drainage system. A major experience of farmer’s participation in the process of planning tertiary irrigation and drainage system is seen in Muda Irrigation Project (Geoenfeldt, 1998).

Different terminologies have been used to refer PIM by these countries. Such as turnover (Indonesia and Philippines), management transfer (Mexico and Turkey), Privatization (Bangladesh), Disengagement (Senegal) Post Responsibility System (China), Participatory Management (India and Sri Lanka), Commercialization (Nigeria), Self-Management (Niger) (Geoenfeldt, 1998).

3. PARTICIPATORY IRRIGATION MANAGEMENT IN INDIA

There have been rich historical traditions of participatory irrigation management in India since fourth century till the recent past. Community managed traditional irrigation system are found in all over the India. Some of these systems are so old that it is impossible to establish their antiquity. In the fourth century Chanakya the author of “Arthshastra (Economics)” reported that political and economic treaties were made to assist farmers in giving assistance or incentives to manage irrigation system. In Vijay Nagar Empire of 13-16th Century, now part of modern Karnataka, a practice of farmer’s participation in construction of diversion weirs and canals was prevalent. In Tamil Nadu the Chola King Karikala built annicut on the river cauvery and lower part of irrigation system was managed by the farmers, known as “kudimaramat” (farmer maintenance). Himachal Pradesh had an ancient system called “Kuhi” in which irrigation was managed by the community. In the hilly regions of Uttar Pradesh also found a tradition of farmers managing diversion streams. In Maharashtra a “Phad System” and “Malgujari Tank System” farmers managed irrigation system were exist since last 300 to 400 years ago (Agarwal and Narain, 1997).

At present the participatory irrigation management activities have gained momentum in all the major states of India which include Maharashtra, Karnataka, Andhra Pradesh, Gujrat, Madhya Pradesh, Rajasthan, Tamilnadu etc. by way of formation of Water Users Association (WUA), Water Users Co-operative Societies (WUCS) and
other institutions (Lele and Patil, 1994). The other states also followed suit in this matter.

4. COMMUNITY MANAGED OLD PHAD (BLOCK) IRRIGATION SYSTEM IN INDIA

In the North – West part of the Maharashtra i.e., Khandesh region, there are number of community managed small irrigation schemes in the Tapi basin. These are popularly known as “Phad Systems”, Phad means block. The irrigation scheme consists of diversion weir (Called Bandhara) across a river and irrigation channel commanding area, mainly from one village. A series of weirs were built in this basin on the rivers viz. Panjra, Mosam, Aram, and Girna to divert water for agricultural use. These schemes are prevalent in Nasik and Dhule district, of the Maharashtra State. The Phad irrigation system existed since the time Mouryas ruled over Khandesh (300 BC) (Chitale, 1999). Further, during the seventeenth and eighteenth centuries phad system had received patronage in the tenure of Queen Ahilyabai Holkar and it appears that the true development of equitable water distribution had taken place in this period which has relevance in the 21st century.

5. DIFFERENT COMPONENTS OF THE PHAD SYSTEM

There are different components of the phad system, related to technical aspects of diversion weir, main canals, number of Phads (Blocks), cropping system and management of the Phad system. These aspects are briefly discussed below:

5.1 Weir (Bandhara)

Surface irrigation is boon for this area. A Weir (Bandhara) mostly supplies water to one village. The rights of water have been fixed by tradition, which is strictly adhered to. River wise existing Weirs (Bandharas) and their command areas are shown in Table 1.

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>River</th>
<th>District</th>
<th>No. of Weirs</th>
<th>Command Area (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pangra</td>
<td>Dhule</td>
<td>30</td>
<td>3594</td>
</tr>
<tr>
<td>2</td>
<td>Mosam</td>
<td>Nashik</td>
<td>20</td>
<td>1500</td>
</tr>
<tr>
<td>3</td>
<td>Aram</td>
<td>Nashik</td>
<td>08</td>
<td>275</td>
</tr>
<tr>
<td>4</td>
<td>Girna</td>
<td>Nashik</td>
<td>08</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>66</strong></td>
<td><strong>5569</strong></td>
</tr>
</tbody>
</table>

Source: Approach paper on “Phad system of Irrigation in Maharashtra state”, National workshop on phad system held at Dhule, Jan 3-4, 1991, published by WALMI, Aurangabad (M.S).

There are 66 Weirs irrigating 5569 ha land. Maximum numbers of Weirs across the Pangra Rivers is 30 and Mosam river is 20, commanding 3594 ha and 1500 ha area respectively. The command area of individual weir varies from 4 ha to 192 ha. All Weirs are masonry weir, with height above river bed ranging from 2 m to 10 m. Most of the Weirs are located on the turns of rivers. To take the benefits of this geographic situation, there was a tradition to construct weirs across the perennially flowing rivers. The technique of construction of weirs and diverting the river water for irrigation were developed form the Mourya dynasty (300 BC). Construction of the weir was the
community activity. In some cases the capital cost of these schemes were met by the kings or rulers. But once completed, after farmers operated the systems on their own. The distance between two successive Weirs varied from 2 km to 6 km, depending upon the topography and availability of suitable sites (WALMI, 1991).

5.2 Canals

There is no control structure at the head of main canal. The length of these canals varies from 2 km to 12 km. Each canal has a uniform discharge capacity of about 450 litters per second throughout the length (head to tail). The canals terminate into a natural drain/river. The components of phad irrigation system are shown in Figure 1.

5.3 Number of phads (Blocks)

The irrigated command (Kayam baghayat) is usually divided into four blocks called phads. The size of a phad can vary from 10 ha to 300 ha, with a number of beneficiaries. The division and size of phads depends on topography and physical boundaries. Common layout of the phads is shown in Figure 2.

5.4 Cropping System

The cropping pattern consists of cash crops like sugarcane, groundnut and food crops like wheat, gram, sorghum etc. Only one type of crop is allowed to grow in one phad. Cropping pattern is decided so wisely that, it helps in utilizing the available water efficiently; equality in water distribution and fertility of land is maintained.
Generally sugarcane is grown in one or two phads, depending upon availability of water. In other phads seasonal crops are grown. In the Monsoon rice or sorghum is grown. The irrigated crops are rotated every year among the phads so that after every four years same crop is grown in the same phad. As shown in Table 2.

<table>
<thead>
<tr>
<th>Year</th>
<th>Phad I</th>
<th>Phad II</th>
<th>Phad III</th>
<th>Phad IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Sugarcane (Ratoon)</td>
<td>Sugarcane (New)</td>
<td>Wheat</td>
<td>Gram</td>
</tr>
<tr>
<td>II</td>
<td>Gram</td>
<td>Sugarcane (Ratoon)</td>
<td>Sugarcane (New)</td>
<td>Wheat</td>
</tr>
<tr>
<td>III</td>
<td>Wheat</td>
<td>Gram</td>
<td>Sugarcane (Ratoon)</td>
<td>Sugarcane (New)</td>
</tr>
<tr>
<td>IV</td>
<td>Sugarcane (New)</td>
<td>Wheat</td>
<td>Gram</td>
<td>Sugarcane (Ratoon)</td>
</tr>
</tbody>
</table>

The phad wise rotation of crops helps in maintaining the fertility of the soil and reducing the danger of water logging and salinity as high water consuming crops are rotated (WALMI. 1991).

5.5 Management of the Phad

Every village has an effective system of management. A village level committee is formed by the irrigators. The members of the committee are elected mostly by consensus in the general body meeting. The elections are generally held once in every two to four years. The general body also chose the chair person. The chair person may continue for several years. The number of committee members not fixed. It varies from place to place and village to village.

The phad system of irrigation is entirely managed by the community. It has its own controlling organization. Generally, the command lies in one village boundary only. All the important functions like choice of crops to be grown, water distributions (watering), maintenance of water distribution system etc; are managed by the committee.

5.6 Functions of Committee

The functions of a village level committee are:

(a) Protect, Supervise, and administer the irrigation system.
(b) Employ supervisors, Canal inspectors and water guards for irrigation.
(c) Solve the dispute and impose fine to the offenders.
(d) Decide the cropping pattern
(e) Decide sequence of irrigation of the fields in a Phad.
(f) Call an annual general body meeting.

5.7 Functions of Irrigators

The functions of the irrigators/beneficiaries are:

(a) Elect the committee members and decide the chair person.
(b) Maintain the field channels and distributaries.
(c) The operations like tillage, sowing, removing weeds from the fields, applying fertilizers, applying pesticides and harvesting are to be done by the irrigators.

(d) Take that type of crop as decided by the committee.

6. RELEVANCE OF PHAD IRRIGATION SYSTEM IN THE PRESENT SITUATION

Though the phad irrigation system is very old community managed system but it has relevance in 21st century due to the following grounds:

(a) **Social Environment:** The system is responsive to its changing social environment.

(b) **Flexibility:** The committee memberships are renewed regularly.

(c) **Equity:** Irrigation operations are performed by the staff and farmers are not allowed to interfere. The irrigated crops are rotated every year from one phad to the other so that after every four years same crop is grown in the same phad. Thus equity in water distribution is maintained.

(d) **Farmer-friendly:** The farmers need not worry about the irrigation and guarding the crops in their field. Specially engaged supervisory staff takes care of watch and ward of the standing crops.

(e) **Collective maintenance:** All farmers contribute proportionately both in labours and leadership.

(f) **Sustainability:** The Phad system has survived over the last several centuries.

(g) **Effective participation:** The Phad system shows that small farmers can organize themselves and can form a sustainable irrigation system.

(h) **Productivity of land:** Because of systematically scheduled non irrigation period and crop rotation, the lands neither get water logged nor get saline. Thus fertility and productivity of the lands is maintained.

CONCLUSIONS

1. Phad System is the best historical examples of the participatory irrigation water management in Maharashtra state in India.

2. The Community managed Phad System has worked successfully since last several centuries.

3. This system is a good example of equitable distribution of available water and its proper management.

4. Keeping phads fallow in rotation and crop rotation do not allow damage to the land due to salinity or waterlogging and its fertility is maintained.

5. The system is suitable for small farmers of the small and medium irrigation projects and also in lift irrigation schemes

6. Up-gradation and modernization is needed for the smooth functioning of the phad irrigation systems under changing environment.

7. The threats to the system are due to change d environment, reduced river flow due to construction of dams, establishing sugar factory that encouraged cultivation of high water demanding sugarcane.
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