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Stream: Governance

INDIGENOUS IRRIGATION IN SOUTH BIHAR, INDIA: A CASE OF CONGRUENCE OF BOUNDARIES.

THEORETICAL DEBATE:

The literature pertaining to hydraulic agriculture is subject to various types of theoretical propositions which sometimes are of opposite nature. The major controversy centers around the centralised / decentralised authority structure for irrigation management. The centralists led by Steward (1949) and Wittfogel (1957) posited that large-scale irrigation required centralised co-ordination and direction of efforts, which in turn, led to greater political integration. Wittfogel thought that the management of irrigation water required a high degree of discipline and that in turn implied central control and an all powerful bureaucracy. Wittffogel, thus, propounded the tendency of centralised organisation as unavoidable, as generated and required by imperatives of physical system and its technology.

The inevitability of a "topdown" structure has been questioned by a large number of researchers. Millon (1962), for instance finds, "no clear relationship between degree of centralisation of authority and the size of irrigation system or the number of persons it supports". Similarly, Leach (1959) argues that although there were large irrigation works in Sri Lanka, there is no evidence that such irrigation works produced the hydraulic bureaucracy envisaged by Wittfogel. Eva and Robert Hunt (1974) support Leach's contention. The inevitability of centralised organisation thesis has been challenged by Thornton (1976) at another level. After considering the physical acquisition and transport of water, Thornton points out that it is with distribution of irrigation water that "the largest number of organisational alternatives occur".

In recent years, there is an ever increasing evidence all over the world that irrigation farmers organisations have been very effective in irrigation management process both at project and farm levels. One of the most powerful conclusions which emerges from Mass and Anderson's study of irrigation systems in South Eastern Spain and Western United States (1978) is that farmers of each settlement, acting collectively, rather than the central government, have determined both the procedures for distributing a limited water supply and resolution of conflicts with other groups over the development of additional supplies.

Closely linked to the concept of decentralised managed irrigation systems is the ecological perspective which emphasizes "the role of physical - environmental factors in shaping, limiting or determining various forms of group-shared behaviour and the regularities which lie behind them" (Berry 1976). It is agreed that physical and natural habitat are not the only factors that shape institutional and organisational patterns, but the important role such factors play need not be overlooked (Bennet 1969). An important premise of the ecological perspective is that social groups relate to the environments in which they operate - both the physical and natural habitat and the socio-political milieu - through the mediation of socially organised activities which aim at satisfying the requirements of collective survival (Micklin 1973). As Yehudi Cohen (1974) notes, it is this socially organised relationship between the group and its environment that ecologists refer to as the group's adaptation.

The ecological perspective is most visible at the micro level. Here it suggests that overtly irrational, unarticulated, or random activities in a particular irrigation system may be unraveled and made intelligible, if such activities are examined in relation to the habitat and socio-political context in which they occur (Downing 1974). It is this perspective which leads ecologists to profess that certain environments are most congenial to collective action. It is said that an essential feature of farmer - managed irrigation systems is that such systems are found only in those irrigation environments where the topography has been such as to allow relatively small communities to harness and distribute water with the available local material and the technical and human resources. Consequently, most of such systems tend to be associated with certain types of physical environments (Oxby & Bottrall 1983). Therefore, smaller systems when aided by favourable topography, scarcity of available water and homogeneity in farm size provide the most congenial condition for farmer co-operation in acquisition, transport and distribution of water (1).

In spite of favourably disposed ecology, unless human groups actively participate in the endeavour collective action will not be forthcoming. Doherty's (1982) comparative examination of the organisaiton in three societies in which localised systems, were traditionally operated shows that most organisational functions were carried out efficiently on a village or a local residential group basis, without active intervention from outside but with active involvement of local population. The findings suggest that for localised irrigation systems participation is at least as important as authoritarianism. Collective action means a joint and concerted move on the part of one or several groups for achieving some common end. Mancur Olson (1965, 1982) and his followers argue that collective action is likely to be more feasible (I) The smaller the groups, (II) the more homogenous the origin of the group (III), the longer the members of the group have been associated with one another or the group has been in existence, (IV)the closer the social and

physical proximity among group members, (V) the more differentiated (in a complementary way) the goals of different members of subgroups, (VI) the greater the sensitivity of the group to a threatened loss due to inaction and (VII) the more unequal the distribution of wealth and power among members.

AHAR-PYNE SYSTEM

On the basis of its physical features, the Bihar state of India can be divided into three regions - the North Bihar plains, the South Bihar plains (the area north and south of Ganges respectively) and the Bihar plateau also known as Chotanagpur plateau. The total area covered by South Bihar is about 40 thousand square Kms. which is slightly less than a fourth part of the total area of about 174 thousand square Kms. of the state of Bihar. Ahar-pyne system of indigenous irrigation is historically the most important source of irrigation in South Bihar and even today provides a shining example of participatory irrigation management. "This indigenous system is the outcome of the natural conditions and physical configuration of the country, and has been evolved to meet the obstacles which they place in the way of cultivation." (O'Malley 1919: 144). There are three factors which are responsible for the wide prevalence of this mode of irrigation in this region. The region is characterized by (I) scanty rainfall, (II) a rapid slope off which the water quickly runs, and (III) a soil which is either a stiff clay or a loose sand equally unretentive of moisture.

Most of the places in the South Bihar region receive an average annual rainfall of about 1000 mm which may be just sufficient for the rainfed agriculture but not adequate for cultivating paddy. In addition, the rainfall is conditioned by two constraints. First, there is a shortfall in the rains almost every third year. Second, there is an urgent requirement of water for paddy during the crucial period of hathia (2) in case the rain fails.

Bounded by the Bihar plateau in the South and the Gangetic valley in the north, South Bihar has a marked slope from south to north towards the Gangetic valley and is comparatively rapid, the average fall northwards being about 1.13 to 0.76 meter per km. A number of rivers debouch from the southern hills and intersect the region as they flow across it from south to north. Since these rivers are rainfed, following the incidence of rainfall in their catchment basins, the rivers swell up into rushing torrents and discharge the rain water very quickly within hours through their sloping beds. As a result, the water is either rapidly carried through the area (in case the soil is stiff clay) or it percolates down through the land (in case the soil is sandy).

On casual examination, the area would seem utterly unsuited for rice cultivation, both from the nature of the surface and the comparative scantiness of the rainfall. But both difficulties have been overcome by the ingenuity and industry of its inhabitants, who have devised a system by which the natural drainage is blocked and the water impounded for use and have also brought rivers into their services by diverting the water they bring down.

Therefore, in order to prevent the water being wasted, long narrow artificial canals called pynes are led off from the rivers by means of which the river water is transmitted to the fields. Further, the same rapid slope would facilitate the wastage of the water if it were not impounded - in

extensive reservoirs called ahars, which are formed by constructing a series of retaining embankments across the line of drainage.

Ahars are reservoirs and consist of a major embankment across the line of the drainage with two side embankments running backwards up to the line of the drainage gradually losing their heights because of the gradient of the surface. Thus, an ahar resembles a rectangular catchment basin with only three embankments, and the fourth side left open for the drainage water to enter the catchment basin following the natural gradient of the country. These are very different from the regular tanks in that neither their beds are dug out nor do the regular tanks have elevated embankments as do ahars. Water supply for an ahar comes either from natural drainage after rainfall (rainfed ahars) or through pynes where necessary diversion works are carried out. Water for irrigation is drawn out by opening outlets made at different heights in the embankment. Ahars, with sides that are more than a km. long, irrigating more than 400 ha are not rare, though smaller ones are more common (Sengupta 1996). However, the average area irrigated per ahar during the early twentieth century was said to be 57.12 ha (Tanner 1919:145).

Pyne is the local name for the diversion channels. These channels may be of various sizes. The small ones are those found originating in ahars and carrying the water of the ahars to cultivable plots. The large ones have their origins in rivers from which water is diverted through these artificial channels by erecting embankment in the river beds. They are led some way upstream above the level of the land they are intended to irrigate. It is often 3 to 5 kms before the water of the pynes reaches the level of cultivation. Some of the biggest pynes are 16 to 32 kms. In length, and some of the them known as dasian pynes (pynes with 10 branches) irrigate many thousand acres of lands of hundreds of villages (O' Malley 1919:145).

Apart from irrigation, another useful purpose served by ahar-pyne system is to minimize the floods. Writing in the context of the then Gaya district, the collector (1947-49) observed that as long as these minor irrigation works were kept in a reasonable state of repair, floods in lower regions were well under control (Roy Choudhry, 1957).

EXTENT OF IRRIGATION

The ahar-pyne system of irrigation was overwhelmingly more important in South Bihar, where it was irrigating about 35% of 2.5 mh of cropped land during the first two decades of twentieth century. Compared to it, the irrigation in North Bihar was a mere 3% of 3 mha cropped area. During this period, of the 0.98 mh ara irrigated by ahar-pyne, 0.88 mha area was irrigated in South Bihar, while only 0.1 mha was irrigated in North Bihar (Tanner 1919:136). The area irrigated by this indigenous source has witnessed a constant decline. The extent of decline can be gauged by the fact from 0.94 mha in 1930s in South Bihar, the area declined to 0.64 mha in 1971 and to 0.55 mha by 1975-76(3). Today the area irrigated by ahar-pyne system in whole of Bihar has come down to about 0.53 mha constituting about 12% of all irrigated sources (Govt. of Bihar 1997), compared to about 18% in South and North Bihar alone during the first two decades of twentieth Century.

REASONS OF DECLINE

There are three important reasons for the decline of ahar-pyne system: First, till the abolition of zamindari system(4), the zamindars used to maintain these systems because they had the capital resources and had a vested interest in doing so. Tenants were required to pay gilandazi (improvement of irrigation works) charges. "Gilandazi is an excellent form of investment as the capital spent on it returns a dividend of 40 to 50 percent in the first year itself, in some cases 100 percent if the landlord even received only half of the produce of the land irrigated by these works, they would get a very good return on their capital outlay" (O'Malley 1919:158). After the zamindari abolition there are no regular budgeted funds for the repair of these system. The only possible avenues of repair are: hard manual labour during drought period, JRY, some relief schemes, food for work programme and also MI department which can spend some planned funds in the name of renovation of these systems.

The second, a large number of alternatives have come before the farmers during the post independence period in the form of new canal schemes and tubewells. The growth of tubewells, particularly during the post green revolution period is phenomenal. This has been aided by high doses of government subsidies in case of provate tubewells. Even in 1970-71, the area irrigated by tubewells in Bihar was about 17%, this reached above 48% in 1994-95 (Government of Bihar 1972 and 1997).

The third reason for the diminishing the role of ahar-pyne system in irrigation of South Bihar is non-integration of these systems in the new diversion schemes undertaken by the Irrigation Department of Bihar after the independence. The problem got accentuated on account of not taking over these systems formally and legally.

NEED OF INTEGRATION BETWEEN NEW AND OLD SCHEMES

In the decade of 1950's, particularly during the first and the second five year plans, a number of diversion schemes were undertaken in South Bihar. In most of the cases, the area brought under the command of these schemes had very elaborate system of indigenous irrigation network through ahars and pynes, particularly in the upper reaches. The planners realizing the valuable contribution of this indigenous system in subsidiary storage and water distribution, dovetailed it in their plan and thereby increased the capability of the run-of-the-river scheme on a rainfed river proposed to serve an area subject to fitful monsoon. They relied on the contribution of the existing ahars so much that they planned about two-third of the command was to be irrigated during the critical hathia period through the ahars which were to be filled up from canal networks by drawing maximum possible water during favourable period of river flow.

However, the envisaged integration of ahar-pynes with the new schemes could not be done in a large number of cases and this indigenous system was made to languish over time. A recent study shows that the number of ahars in the command of Upper Mohar Irrigation Project covering the districts of Gaya and Aurangabad had dwindled to 44 in post project period from 109 in pre-

project period (Metaplanner 1994), consequently affecting the irrigation in an adverse manner. Had due attention been given to proper maintenance of these indigenous systems and integrated management of new canal networks and old ahar-pynes was devised, all these new diversion schemes would have been grand success stories.

Considering the fact that today's per ha cost of irrigation comes to about Rs. 80,000 (1 US $ = Rs. 40) and 46% of the total annual precipitation of 350 mhm in India is lost to the sea as river flow, the rejuvenation, development, and integration of ahar-pynes system with new diversion schemes present wide scope. The reason being, it mainly involves mobilisation of local material and man power resources with very little financial requirement (about Rs. 1000 per ha). This is specially important at present times when financial crunch surrounds Bihar government from all sides and participatory irrigation management is the rhetoric quick-fix.

MACHALA AHAR: A CASE STUDY

Machala ahar is located in Kalpa Village of block and district Jehanabad of Bihar State. Kalpa is a panchayat (lowest tier of rural local self government) village. It consists of the main village Badi Kalpa, the smaller village Chhoti Kalpa and 17 other hamlets. Badi Kalpa village is just adjacent to the place from where north west side of the ahar starts and where it's inlet pyne and the escape channel are located. As indicated in Figure-1, this point as well as Badi Kalpa village is about 3 Kms. From Jehanabad railway station. To reach there, three fourth of the route consists along the main embankment of the ahar which also constitutes the Southern boundary of the village Kalpa(5). Machala ahar is one of the biggest and the oldest ahars not only in Jehanabad but also in whole of South Bihar. The catchment reservoir of the ahar is spread in an area of 552 ha. It used to and still does irrigate about 1200 to 1300 ha of land of about 35 to 40 villages. In case of village Kalpa, it irrigates about 300 ha of land of which about 160 ha belongs to the main village - Badi Kalpa which is closest to the ahar.

SOCIO-ECONOMIC STRUCTURE OF BADI KALPA VILLAGE

In Indian rural setting, social rankings are largely determined by caste compositions, while economic rank is judged in relation to the extent of land owned by an individual. The essence of caste is the arrangement of hereditary groups in a hierarchy. The popular impression of the hierarchy is a clear-cut one derived from the idea of varna, with Brahmins (priests) at the top and Harijans (scheduled castes) at the bottom. But as a matter of fact only the two opposite ends of the hierarchy are relatively fixed, in between and specially in the middle regions, there is considerable room for debate regarding mutual positions (Srinivas 1969). Keeping this in mind, all the 18 castes that obtain in the village have been regrouped into three categories - high castes, backward castes and scheduled castes. The first denoting the highest category and the last the lowest category.

The village has about 200 households and a population of about 1200. The village, as already indicated, is a multicaste village with 5% Muslims. The high castes consists of three castes and

constitute 31%. The backward castes have eight castes and contain 28% of the village households. The scheduled castes have six castes and constitute 36% households. Apart from these Hindus, there are 5% Mulsim households and all of them belong to Julaha (weaver) caste, which is treated as a backward caste among Muslims.

The village has about 283 ha of cultivable land, 50% of which is owned by Bhumihars (high caste), who constitute 25.5% households of the village. Then 20% of village land is owned by Lalas / Kayastha (high caste) who consititute a mere 5% of the village households. Another 20% of the land is owned by Kahars (backward caste) who constitute 10% of the total households. The rest of 59.5% households own just 10% of the remaining village land. These 59.5% households consists of 36% scheduled castes, 18% backward castes, 5% Muslims and 0.5% of high castes. This indicates a coincidence of caste and class in terms of rank categorisation.

CULTIVATION AND IRRIGATION

The two main staple food crops grown in the village are paddy and wheat. Paddy is cultivated during late June to early November, covered mainly by the monsoon. Wheat, on the other hand, is cultivated during early December to early April. In addition to these two crops, farmers also grow sugarcane, potato, dals (pulses) and oilseeds, mainly for self-consumption. During the remaining period of summer, those who own pumping sets grow vegetables and green animal fodder.

There are two sources of irrigation. The one is surface - Machala Ahar and the other is ground water. Two decades ago, the village had about 20 electric tubewells but at present just one or two remain in operation, mainly on account of acute shortage and uncertainty of the availability of electric power. In the past, there were no diesel borings in the village. However, over the years electric tubewells were replaced by diesel borings so much so that at present there are about 100 diesel pumping sets. These 100 sets are owned by 82 households (41%), who own major portion of village land, while 118 households (59%) hire pumpsets for irrigation. The rates come to Rs. 22 per hour (Rs. 10 for the pumping sets and Rs. 12 for the diesel).

The total cultivable land in the village is about 280 ha, of which about 160 ha (57%) is irrigated by Machala Ahar. The rest of the land, particularly the high land is irrigated by pumpsets. In addition, pumpsets are also put into service when irrigation is not available and water is urgently needed by the crop. As mentioned in the preceding about 300 ha land belonging to village Kalpa and its hamlets gets irrigated by Machala ahar. However, the Census (1981) records do not show any village land irrigated by the ahar. These records mention that of 544 ha cropped area in the village, 133 ha (24 %) gets irrigated (85 ha by wells with electric motors, 30 ha by electric tubewells, 2 ha by diesel borings and 10 ha by well water). The omission may be on account of the fact that there is no water charge for ahar irrigation, hence no formal recording of irrigation is done.

In case of paddy and other Kharif crops, farmers depend on rains (which are recorded at 920 mm per year on an average for Jehanabad) and on ahar irrigation. As an insurance against both, diesel

borings are used. However, for wheat and other Rabi crops and also for summer crops, the dependence on groundwater is overwhelming as rains are limited and no ahar irrigation is available. Although at the district level, 78 % of the cropped area is occupied by paddy and only 13 % area is cultivated with wheat (Economic Intelligence Service, 1993), in case of village Badi Kalpa wheat also occupies above 50% of the cropped area.

MANAGEMENT OF AHAR-PYNE SYSTEM

Machala ahar formed part of the erstwhile Tikari zamindari (estate), which was the biggest estate of Gaya district and one of the biggest of South Bihar. On account of its bigness, it used to be mentioned as Tikari Raj (kingdom). It was about one-fourth of size of the then Gaya district and was paying an annual rent of 0.9 million rupees to the then British government. The estate had an elaborate system of the assessment and collection of rent in cash and kind(grains). The headquarters of the estate was in Gaya, where an Englishman used to be the Chief Manager, who was assisted by two Indian managers. The whole estate was divided into 18 circles and Jehanabad was one of the circles. Below the circle used to be the Kutchery, at the lavel of Mahal. Each Mahal consisted of 15-20 Mauzas (villages). Kutchery housed land-rent record office and the treasury. Money for minor repairs of ahar-pynes was provided from the Kutchery.

Ahar-pynes work, particularly the one relating to maintenance and overseeing of water distribution was looked after by three functionaries. These were headman, Barahill (supervisor) and Gudait (watchman). A unique feature of ahar-pyne management system in Jehanabad circle was that some posts were associated with particulars castes. For instance only Dusadh scheduled caste persons were hired for the job of the watchman. Similarly, the drum-beaters used to be from the Muslim caste of Dafalis. Dusadhs were selected for the job of watchmen because they used to be physically sturdy and their muscle power used to come handy in matters of inter-village and intra-village disputes. Similarly call for goam (Collective physical action) used to be made by beating of drums and the drum beatings used to be done by dafalis.

ACQUISITION AND TRANSPORT OF WATER.

In the preceding, it was mentioned that some of these indigenous irrigation systems (pynes) were so large that their water conveyance system ran over 30 kms, covering hundreds of villages and irrigating thousands of acres of land. Since the construction of such irrigation works required huge capital investment, only big landlords could do it. In fact, sometimes it required the cooperation of two or more landlords. In such occasions, each co-operating landlord used to appoint his team of officers to look after his interest on the negotiating table during the construction phase. It should, however, be understood that usually the cost involved in the construction of pynes was much higher than the one involved in constructing ahars. The construction of pynes, particularly the large ones, involved excavation of pynes running several kms. In addition, it also involved construction of dams across the river to divert the water to the pynes. In case of ahars, even when such systems were large ones, the work involved construction of embankment of the ahar from three sides, the highest being on the northern side to check the

flow of water from south to north. Writing even in the early part of the present century, O'Malley noted that no new pynes of any considerable size were being constructed in his times. According to him, large pynes were constructed several years ago when larger areas were under the control of the single zamindars (landlords) and their authority to enforce their orders and wishes was more absolute than during O'Malley's times (O'Malley 1919:155).

In case of Machala ahar, the system was constructed by Tikari estate sometimes in the second half of 19th Century. As part of the system, an earthen dam (6) was constructed across river Morhar near village Gopalpur at a distance of about 4 km. from the point where the inlet pyne enters the ahar(7). A pyne was constructed from the eastern bank of the river to take the river water to the ahar. As shown in Figure - 1, the inlet pyne delivered the river water into the ahar from the north western side of the ahar. An escape route was also provided a few meters north of the inlet channel. This is opened to drain out the excess ahar water when it poses the danger of overtapping the embankments.

REPAIR AND MAINTENANCE

The repair and upkeep of the Machala ahar and its water conveyance system is of two types. The one involves major repairs and the other deals with the minor routine upkeep to make the system work. In case of major repairs, in the past, it was done by Tikari estate because the tenant farmers did not have the capital required for major repair. This was a usual practice as in all cases of ahar-pyne construction as well as major repairs. The responsibility in these matters lay with the landlords. This point has been highlighted by both Buchanan (1939) and O'Malley (1919 : 147). No doubt, the amount spent by the estate was later realised from the farmers under the Gilandazi (improvement of irrigation works) about which mention has been made in the preceding. Today also, minor repairs are not done by the farmers and the repairs are done by the Minor Irrigation Department. The only difference is, in the past, farmers had to pay for the repairs as well as for the irrigation, while today they do not pay for any of these two things. The routine upkeep work involves cleaning and desilting of ahar and pyne and maintaining the water conveyance network, while the system is in operation. As a result, ordinary maintenance such as the periodic clearance of silt, the repair of small branches of the ahars and field channels is done by the cultivators themselves under goam system and it starts before the onset of monsoon. In the past, under this system, "at the order of the landlord or his local agent or servant, the cultivators have to supply one man per plough to turn out on these occasion and carry out the work; the peasants come out in a body and this is called goam." (O'Malley 1919: 146). In case of wealthier peasants, they were allowed to send paid labourers but had to be present to supervise the ongoing work. This system of use of community labour for maintenance of irrigation work was also very much in vogue in the then Madras state, where it was legitimized through legislative action (Reddy 1996). Goam was and still is very effective in meeting the emergencies. The call for goam is made by beating of drums. The drum-beater goes from place to place announcing the nature of and location of the emergency. The most common emergencies relate to breaches in embankments and big pynes and breaking, cutting & blocking of pynes in upper reaches. Even blocking or diversion of river water in the upstream is not uncommon during the water scarcity times of drought years. Goam occurs even today every year in hundreds of villages of South Bihar.

Thus, people's collective action finds place in operational as well as in maintenance works. The maintenance work include desilting of ahar and pyne beds, regular repair of embankments. Apart from these routine activities, an important task is to keep constant vigil, particularly during monsoon against sudden damage of protective works which may occur due to natural cause or due to man-made reasons. The operational works include cutting and closing embankments for diversion, erection of bandhs or garandis across the pynes, opening and closing of outlets and at times even resorting to manual water lifts to irrigate uplands.

A few examples of collective action in respect of Machala ahar would be worthwhile to mention. A few years ago, the upstream farmers of Dhana Dihiri and some other neraby villagers had blocked the pyne from which Badi Kalpa gets its irrigation water. The blockade was about 5 feet in breadth and 12 feet in height. Affected down stream farmers, including those of Badi Kalpa complained to the district administration. Since no remedial measure was forthcoming immediately, a goam was announced by beating of drums. About 1000 able bodied men from about 20 downstream villages collected. Among them were about 40 to 50 beldar (diggers) all with a mattock each. They all marched together to the blockade site and dismantled the blockade within two hours to facilitate availability of water in the pyne and thereby to downstream cultivators.

On another occasion (August 1996), a breach had occurred in the western embankment of the ahar on account of overtapping of water. Again, a goam of 500 cultivators from the 4-5 affected villages was on the scene. The first thing they did was to open the escape route of the ahar. Once the water level was reduced, the teaping (cementing) of the breaches with mozar (paddy straw mixed with mud) was started. After teaping was done, the level of the embankment was raised with mozar. However, goam may not be successful always. During September 1997 a breach occurred in the northern main embankment towards the western side. A goam was convened but the ferocity of water was so intense and swift that the breach could not be cemented and the water could not be held. As a result, many villages were flooded with water. The breach has since been repaired by the government but the approach to the village which is along the embankment still remains affected.

ALLOCATION AND DISTRIBUTION OF WATER

Allocation of water, which was managed by the cultivators, was a major source of conflict. Buchanan (1939) wrote that the landlords would "appoint proper persons to divide the water among the tenantry". According to O'Malley (1919 : 146-147), the parabandi System was used to distribute water among the villages from a common source (usually a pyne). Parabandi derived from the term para (turn) and bandi (fixation) meant fixation of turn. Each village had its fixed turns of so many days and hours to avail the water. These turns were assigned by mutual agreements or ancient customs. In case of principal pynes, including the ones irrigating Kalpa village, Tikari estate used to maintain a detailed register called lal bahi (red register). The register specified the irrigation rights of each village. Usually parabandi arrangements began in the month

of Aswin (mid-September), when the demand was acute and supply limited. At other times, all branches of pynes were left open (CSE 1997 : 87).

Disputes, however, frequently occur. One village often tries to get more water than it should, or else when rainfall is scarce, lower reach villages seek to get water before their proper turn, and the disputes sometimes terminate in blows, and occasionally in bloodshed. Eight years ago, during hathia period, there was acute shortage of water and the cultivators of Badi Kalpa blocked the karha (branch of a pyne) which irrigates Badi Kalpa as well as Chchoti Kalpa. This annoyed the chochoti Kalpa farmers and 500 of them arrived at the scene of blockade, armed with sticks. Amid arguments, some one from the side of Badi Kalpa fired, resulting into death of one of the persons instantly. Later 37 persons from Badi Kalpa were made accused in the case and the matter is still pending in the court.

In South Bihar the most common system of water distribution is that the water first goes to the upper reach field which is closest to the irrigation channel and then goes to the next field. This field to field irrigation is resorted to because ahar-pyne irrigation is used mainly for the paddy crop, where even a little extra water does not cause any harm to the crop. In case of Machala ahar and the karha (pyne branch) irrigating Kalpa village lands also the same practice is resorted to.

In case of Kalpa, the lands north east of the village is irrigated by the karha which branches off the pyne which brings water to the ahar. The uplands South West of the village, on the other hand, are irrigated by the outlet originating from the South West corner of the ahar. When rains are good, like during the kharif of 1997, there is not much of a problem and everything goes, on smoothly. However, during extreme drought conditions like the ones prevailing during the Kharif season of 1990 and 1996, many disputes arise. A committee of five members has been constituted by the villagers to resolve disputes arising out of distribution of water and upkeep of water conveyance structures.

A significant fact regarding the village lands is that there is no consolidation of holdings, hence their land holdings are fragmented and scattered in all parts of the irrigation command. As a result, every one has some plots at the head, some plots in the middle and some more in the tail of the irrigating channel. This implies that every one has an interest in irrigating all parts of the irrigation command, hence they have to join hands with cultivators of other villages in the proper upkeep and just distribution of water. Thus, in times of water scarcity, only parts of the irrigation command are irrigated but this does not deprive any one completely. Further, since Machala ahar meets the irrigation requirement of 35 to 40 villages and there is one pyne that feeds the ahar, cultivators of these villages are bound to work together despite multicaste communities residing in these villages.

ISSUES INVOLVED

CENTRALIZED VERSUS DECENTRALISED

It is observed that both Steward (1949) and Wittfogel (1957) have made the generalization that irrigation management requires a high degree of discipline and that in turn implied central control and an all-powerful bureaucracy. They, thus, propounded the tendency of centralised organisation as unavoidable under the imperatives of physical systems and its technology.

Judging ahar-pynes of South Bihar from this angle, it is found that a centralised authority in the form of the landlord did play an important role in respect of construction of ahar-pynes, their major repairs and allocation of water to different villages. However, landlords did not play any role in determining the mechanism relating to how water was distributed among different individuals in each micro irrigation command and how they maintained the micro water conveyances structures. Further, Buchanan (1939:447) mentions that there existed some indigenous irrigation works in South Bihar which were constructed and maintained by tenants and that the landlords had no claims of rents against such works.

Even where findings do indicate a centralised management in certain matters, it is difficult to assume that high level of participation of cultivators in the irrigation management was a natural corollary of the centralised authority. There is every reason to argue that cultivators had their vested interests to participate actively in collective actions like goam. This is particularly true in respect of goam to meet the emergencies such as breaches in embankments, diversion in river and pyne routes etc. If this was not true, hundreds and even thousands of people would not have come forward for goam even today in South Bihar. Today, there is no coercive authority of the landlord or any one to force them to contribute community labour for irrigation management. In other words, the same motivation which works today worked in the past and it was to ward off the danger which threatened their survival. Therefore, the conclusion of this paper is very similar to the one arrived at by Doherty (1982) and cited in the preceding that for localized irrigation systems participation is at least as important as authoritarianism.

1. Small Size and Favourable Topography:

It would be interesting to examine the ahar-pyne irrigation system in the light of the some of the conditions outlined by Mancur Olson (1965-1982) and the ecologists (Oxby and Bottrall 1983). One of the factors which facilitates collective action, according to them, is the small size of the group. The evidence from ahar-pyne disproves this proposition. Communal action for irrigation operation and maintenance referred to as goam consists of large groups. During emergencies the group may consist of thousands of cultivators. Even when routine maintenance and operation work is performed, the group is not small. Further, the large size of the group does not affect the integration and synchronization of efforts.

In addition to small size, some of the ecologists also talk of the prevalence of favourable topography that enables collective action. However, ahar-pynes have been constructed by the extraordinary concerted effort of the human beings against the oddities of nature. It provides a living example of what man can achieve in the most adverse circumstances, thus negating the ecological perspective.

2. Close Social And Physical Proximity:

Close physical proximity no doubt finds evidence in matters of micro watershed. However, in cases where irrigation works involve irrigation of hundreds of villages, the collective action overrides this condition. In case of Machala ahar itself, instances have been cited where 500 to 1000 people come together for collective action, when their own irrigation is threatened or affected.

As regards the social proximity factor, which has also been emphasized by Coward (1980) and many others, finds no supports from ahar-pyne system. According to Coward, "small groups (specially if differences of social status and social class are relatively minor) are able to employ a special mechanism of reciprocity to achieve relative order and conformity." This does not hold good in regard to collective action for irrigation operation and maintenance. Although in South Bihar also, like rest of India, a rigid caste hierachy obtains, this does not deter different caste groups, including scheduled castes to come together for a common good and a common concern. All cultivators, who take water from the same pyne or the same ahar, irrespective of the location of their villages and irrespective of their castes, come together for collective action whenever their irrigation is affected or is likely to be affected. Common interest in safeguarding the irrigation system is an overriding consideration over physical and social proximity for obtaining co-operation among group members.

3. Unconsolidated Holdings:

The land holdings of the farmers of South Bihar in general and those of Aurangabad in particular are small, fragmented and scattered. As a result, generally all farmers have their plots both in advantageous as well as disadvantageous locations - head, middle and tail. Therefore, to optimize their irrigation, they would have to take active participation in all kinds of situations. To safeguard the interest of their tail-end farm, they would work with others so that the water reaches at the tail also. Further, several irrigation commands get benefit from the same ahar or pyne and several ahars may get water from the same pyne. Since cultivators have unconsolidated holdings, they are not left with any choice other than to work collectively for a common good.

4. Cheapest Source of Irrigation:

In the past, ahar-pyne used to be the only source of irrigation; hence farmers had to work collectively. Presently, ground water through diesel based borings is available but the cost of irrigation comes very high. In case of ahar-pyne, all major repairs are done by the government and farmers do not have to pay any water charges. Hence, cultivators do not mind working collectively for small maintenance or to meet emergencies like breach in pyne or embankment etc.

5. Uniformity in Cropping:

All farmers grow the same crop (paddy) all over the irrigation command around the same dates. As a result, agricultural operations undertaken by all cultivators are similar throughout the irrigation command. Such uniformity of operations is essential when cultivators are utilizing the same irrigation channel. Since ahars and pynes have to be used collectively, all farmers have to

synchronize their operations. In such a scheme of things, there is no scope for crop diversity in the same irrigation command. Uniform cropping also facilitates collective action when irrigation system is in the danger of non-functioning.

ALLOCATION IN DISTRIBUTION OF WATER

In Tikari estate, detailed record of rights were prepared and documented in a register which was called lal bahi. Although these records were prepared for the share of communities, no record of rights were prepared for distribution of water among the individuals as is done in case of warabandi and osrabandi in old canal systems of north India. As pynes served many villages, each village had its fixed turn of days and hours to have the water. These turns known as parabandi were most equitable and just modes of water allocation.

The equity aspect of water distribution among individual cultivators which continues even today is obtained because all farmers, rich or poor and big or small, have plots in head and tail positions of the irrigation channel. As a result, adequacy or shortage of irrigation water is equitably shared by all cultivators of the irrigation command.

The reliability and timeliness of ahar irrigation is ensured because water is stored in the reservoir and is utilized when pynes do not have any water left and rains are not forthcoming. This is the likely scenario during the hathia period, when water is critically needed by paddy.

MAINTENANCE, COST AND QUALITY

The cost of ahar-pyne maintenance is quite low compared to canal maintenance which comes to about Rs. 5000 per ha. In case of ahar-pyne, it varies between Rs. 500 to Rs. 1000, depending on the extent to which goam is utilized. Further, the quality of construction is quite good because those who get engaged in the repairs are themselves the beneficiaries. Further, in some of the repairs the material used is the one which is locally and easily available. The author found the use of mozar which is obtained by mixing the wet mud with paddy straw quite effective in the repairs of embankment, including in raising its height.

SUSTAINABILITY

The sustainability of ahar-pyne system can be judged by the fact that these modes of irrigation are in existence for centuries. Writing in the early part of the this century, O'Malley had mentioned that no large such systems had been constructed during his times. This means that all the ahar-pyne systems that exist today are at least nearly hundred years old. The main reason of the sustainability of these indigenous systems is that the advantages emanating from them are two fold. First, these systems utilize water which otherwise would be wasted. Second, these systems, particularly in the past, saved the plains of South Bihar from the recurrent floods which otherwise would have devastated the countryside regularly.

Lastly, if these indigenous systems are properly integrated with the recent canal irrigation schemes, the sustainability of both types of irrigation systems will enhance manifold.

NOTES:

1. An empirical study (Palanisami and Easter 1986) of tanks in Tamil Nadu finds that scarcity of water and homogeneity of farms size are closely associated with farmers' collective efforts.

2. HATHIA NAKSHATRA (asterism) covering the period between September 26 and October 7 refers to the post monsoon rains when water is absolutely essential to fill out the ripening paddy grain.

3. The extent of decline has been worked out on the basis of following records: (I) Census records from 1921 to 1961, (II) Season and Crop Report, Bihar 1971, and (III) Districtwise data available with the Directorate of Statistics, Government of Bihar, 1975-76.

4. During the British period all cultivated lands belonged to Zamindars (feudal landlords) who paid a fixed revenue to the British Government. After independence in 1952 this system was abolished and the land was distributed among the erstwhile tenants.

5. Usually one can reach this point as well as Badi Kalpa village by a hired transport such as cycle rickshaw, horse-carts and taxis but during March 1998 when the author visited the site, he had to walk to the place as the breach that had occurred during September, 1997 was under repair.

6. Sometime in the year 1990, the earthen dam was replaced by a masonry dam across the river. A sluice gate was also installed on the eastern bank of the river along the dam to regulate the flow of water to the pyne filling the ahar.

7. A pyne can be used for (I) transporting the river water to an ahar, (II) to irrigate the field (rarely directly) through branches taking off from it and (III) taking out ahar water for irrigation.

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