RESEARCH ARTICLE

Designing Collective Action: Problems of Local Water Management in Tiruchi District

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Abstract: A wide range of factors shapes irrigation institutions and collective action with regard to irrigation. They include the distribution of land across irrigation command areas and across classes, land tenure systems, access to new technology such as bore wells, the availability and cost of electricity and other energy sources for lifting groundwater, and, above all, state policies related to irrigation. Participatory irrigation management is hampered severely by policies in irrigation, such as the unregulated use of bore wells with free electricity provided by the state, that most benefit rich farmers. The paper, which is based on fieldwork conducted in Karur and Tiruchirapalli districts in Tamil Nadu in 1980 and in 2005, argues that the rapid and mostly unregulated development of well irrigation without any concomitant change in the legal framework and costing structure, and the lack of an objective basis for all water users to come together in collective action (given their different and often potentially conflicting interests), are the major causes for weakening collective action in irrigation management.

Keywords: participatory irrigation management, collective action, groundwater, political economy of irrigation, *kudimaramat*, watersheds, governing the commons, tank irrigation.

The Problem

Water management is among the most important issues for the development of agriculture in India. Lack of maintenance of irrigation systems and poor water supply to farmers are key factors that affect water management. Recognising this to be a problem, governments – both Central and State – have sought to "decentralise" water management by handing over the responsibility for it to so-called "water

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users' associations" (WUAs), which consist of farmers. Such responsibility, in some instances, includes the construction and maintenance of local irrigation works, and regulation of water use at the local level.

The fiscal constraints that State governments in India face, given their limited powers to raise resources and their disinclination to do so from the rich, have led them to seek the solution to the problem of water management in what is called participatory irrigation management (PIM) or irrigation management transfer (IMT). This idea is strongly supported by international funding agencies such as the World Bank and the Asian Development Bank (Pant 2008).

In Tamil Nadu the implementation of participatory irrigation management is weak compared, for example, to Maharashtra. In 2000, the State Legislative Assembly passed an Act with the stated objective of involving farmers in the management and change of irrigation systems. This Act, known as the "Tamil Nadu Farmers' Management of Irrigation Systems Act, 2000," has not been effectively used in empowering farmers' organisations (cf. Rajagopal and Janakarajan 2002).

During fieldwork conducted by us in Karur and Tiruchirapalli districts in Tamil Nadu in 2005–06, we interviewed a number of representatives of irrigation associations and watershed committees. These interviews showed that the government had taken steps to involve farmers in water management through the Command Area Development Programme (CADP) and the Watershed Development Programme (WDP). The CADP, though mostly financed by the Central government, relied on 10 per cent self-financing by participating farmers. However, while CADP and WDP were thus put into effect, the Tamil Nadu Farmers' Management of Irrigation Systems Act was not extended to the Cauvery delta area because of the water dispute with the co-riparian state of Karnataka.

Water users' associations are an example of voluntary organisations acting as instruments of public policy. In the case of Tamil Nadu, they are linked to the tradition of *kudimaramat* (or community labour for the maintenance of irrigation), which existed during the pre-colonial, colonial and post-colonial periods, and which catered to minor repair work in tank systems and in branch canals of larger canal systems.[1] Water users' associations thus present a rich field of study for political science and other social sciences, and includes issues of democratic functioning, and power relations within and outside the associations.

The central thesis in this paper is that participatory irrigation management is severely hampered by policies in irrigation such as the unregulated use of bore wells

[1] "Known as *kudimaramat* in the south, it was a widely prevalent practice all over India. Wherever a repair work needed to be attended to, such as cleaning of the supply channel, each family was required to send an able-bodied person to contribute labour for the work. If it was not in a position to do so, it had to send a hired substitute or contribute the money required for it" (Shankari and Shah 1993, p. 28).

with free electricity provided by the state, which most benefit the rich farmers.[2] New technologies in irrigation have weakened the incentives, especially for well-to-do farmers, to seek a collective solution to the problem of adequate water for irrigation.

Before going further into the issue of water management, we give below a brief overview of our fieldwork in Tamil Nadu.

Background Information about the Study Area

This paper is based on a panel study that cover 25 years (1979–80 to 2005–06), of 213 agrarian households in three canal-irrigated and three rainfed-cum-well-irrigated villages in Karur and Tiruchirapalli districts of Tamil Nadu, in south India. Amidst industrialisation and increased trade and services, farming in the State has become more capital-intensive and, despite water scarcity in some years, also more water-dependent, which makes water a basic issue in agricultural development.

Tamil Nadu has experienced fairly stable economic growth over these 25 years. In our panel study of six villages in Karur and Tiruchirapalli, we have documented this development in various ways. Our most important findings were a doubling of average real incomes, rapid growth of non-farm activities, and a reduction of income inequality among agrarian households (Athreya *et al.* 1990, Djurfeldt *et al.* 2008).[3] We have identified industrialisation and its side-effects, and state interventions in social policy, as the two most important factors driving this transformation.

Since they are located close to both the Tiruppur–Karur textile industry belt and the growing city of Tiruchirapalli, the households in the villages studied by us have been able to diversify their economic activity into a number of non-agricultural activities. The number of factory jobs was still small, but we found that the number of workers employed in shops, various services and modern professional occupations, the building industry, etc., was quite significant. Almost 70 per cent of the households had one or more members so employed. Our statistics on income showed that income from these sources had increased faster than farm income over the 25 years. In 2005–06, 34 per cent of household income was derived from the non-farm sector, that is, the secondary and tertiary sectors of the economy. In 1980 this proportion was only 22 per cent.

[2] It is another matter that "free electricity" is often something of a misnomer and can be a misleading term in a context characterised by frequent outages and scarce and unreliable supply. These realities often drive farmers to invest in alternative sources of energy, such as diesel-powered pumps. In the context of the agrarian crisis, a one-sided emphasis on the fiscal consequences of 'free electricity' to agriculture would be somewhat misplaced. However, that is not the issue with which we are dealing here.

[3] We have data for two points in time, and comparisons relate only to these two time points in respect of variables like income. Also, "agrarian households" as defined in our study included all households that derive *some* proportion (strictly positive) of their income from either cultivation or agricultural wage labour or other income from agriculture, and therefore included, to a far greater extent in 2004–05 than in 1979–80, households that were barely agrarian.

The development of rudimentary features of a welfare state was also a part of the story. Despite neoliberal policies at the Centre and financial pressure on the Tamil Nadu State Government to lower spending on social welfare, we still found functioning, state-run low-price shops in all the villages, which supplied basic allocations of rice, kerosene, and sugar to more than three-fourths of the population. There were more and better government schools than earlier in all the villages, and there were also crèches and centres for the care of pregnant mothers and infants (*anganwadis*) in all of them. Thus working parents were freer to engage in full-time work. All the schools and nurseries served a midday meal to all children, which helped raise children's nutritional standards. Since the late 1970s, the provision of certain public services had expanded, and this had enabled some people to get government employment, not just as teachers but also as auxiliary nurses, pre-school assistants, and so on. These, taken together with a somewhat slow but still steady growth of agricultural production, made up the basis for the material improvements we observed.

Study Villages and Methods of Study

Economic and social structures in rural Tamil Nadu, as in rural India, vary widely depending on their ecological setting.

In three of the study villages in Tamil Nadu – Rajendram, Poyyamani, and Nangavaram North – canal-irrigated agriculture dominated, and we call them *wet villages*. Traditionally, Brahmins owned the land in these villages and the cultivators were Scheduled Caste tenants. Over the decades, a large part of the land was taken over by former overseers belonging to the intermediate Muthuraja caste and by Scheduled Caste (or Dalit) cultivators. Other peasant castes also owned land in these villages.

The other three study villages – Naganoor, Kalladai, and K. Periapatti – relied on tanks and wells for irrigation, and had a sizeable proportion of land under rainfed cultivation. We call them *dry villages*. Here, members of the intermediate castes of Udaiyar, Gounder, and Muthuraja still owned almost all the land, which they farmed by employing agricultural wage labourers. A large proportion of these workers belonged to the Scheduled Castes, and discrimination against them was still rampant.

In 1979–80, we interviewed 367 agricultural households in these six villages, of which 238 households constituted the "main sample." In 2005–06, we interviewed substantially the same sample of agricultural households again, except for 5 households which we could not trace, and 20 households that had left agriculture after 1979–80. Thirty one of our sample households of 1979–80 had emigrated, but they had been replaced by an equal number of immigrants. Thus, 213 households made up our sample of resident agricultural households and constituted the main source of statistical analysis in our study of 2005–06. This was a sample of what we

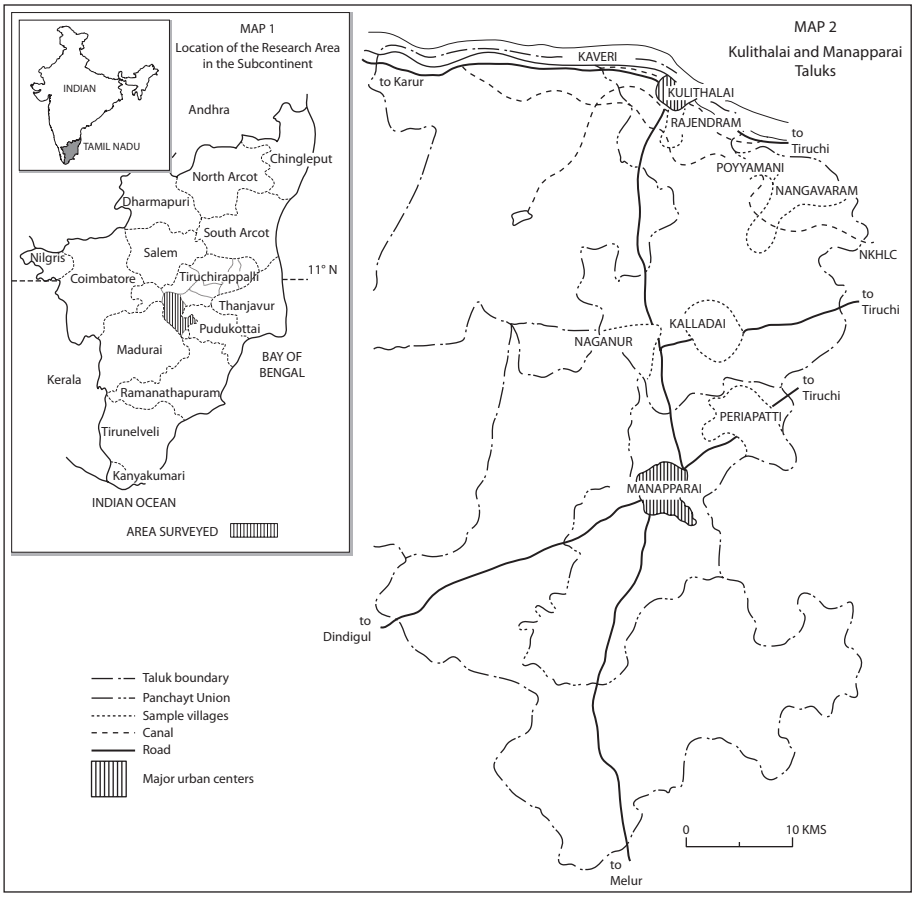

Figure 1 *Kulithalai and Manapparai Taluks, with Tamil Nadu and India insets*
Source: Athreya *et al.* (1990).

defined as the "agrarian" population.[4] The data in our study mainly reflected their situation in 2004–05.

The agrarian population had remained stagnant over the period. Most of the emigrant households were of landless agricultural labourers who had found work elsewhere.

Our observations of the changes and the character of these transformations were based on several methods. The most important was a household socio-economic survey with substantially the same questions asked in 1979–80. We also collected qualitative information from interviews with farmers, officials, politicians, and leaders and members of water users' associations.

[4] Because of the increase of industrial and tertiary sector jobs in and around the villages, there was a sizeable non-agrarian population by 2005–06, which we have not studied.

Irrigation Systems

Agriculture in a semi-arid, sub-tropical region like Tamil Nadu in south India is crucially dependent on water. Monsoon rainfall patterns are erratic and concentrated in short periods of the year. Evapotranspiration rates are high most of the year, which makes irrigation crucial for extending the agricultural season. Without irrigation, there would hardly be any agriculture in the State, other than the cultivation of rain-fed, low-yielding, short-duration crops like millets.

The agricultural landscape of Tamil Nadu is shaped by three distinct types of irrigation: large-scale river systems, isolated ("non-system") tanks and interconnected tank systems, and well irrigation. There are several river-based systems, of which the Cauvery is the biggest. This river is fed by rainfall in the Western Ghats in neighbouring Karnataka. Its irrigation works are ancient and one of the oldest in the world. These include a number of dams built both during the colonial period and after Independence. They are the means by which the Cauvery delta, mainly in what was then Thanjavur district, became the rice bowl of the State. An agreement on water-sharing was reached between the riparian states of Karnataka and Tamil Nadu in 1924. After the agreement lapsed in 1974, tail-enders in Tamil Nadu have faced a situation of increasingly unreliable access to water, especially in years of a poor south-west monsoon, the main source of water in the catchment area.

Within smaller watersheds in the "dry eco-type", irrigation depends on rainwater reservoirs called *eris* (tanks), often interconnected by means of seasonal canals that lead surplus water from head-end tanks to tail-end ones. The tank system in Tamil Nadu is unique in many respects. In Karnataka, for instance, tanks are mainly rainwater harvesting devices used to recharge groundwater and not to irrigate paddy crops below the tanks, as in Tamil Nadu. The history of tank irrigation is closely connected to the political history of the State, with the names of kings and local notables linked to the building of the tanks. Their entrepreneurship in irrigation, as well as their means of mobilising both free and unfree labour in the building and maintenance of tanks, were immortalised on stone inscriptions in neighbouring temples (Mosse 2003, pp. 3, 5).

Tank irrigation in Tamil Nadu is often complemented by wells sunk on irrigated land below the tanks (in what is known as the *ayacut* or command area). This system of conjunctive use of wells with tanks has a long history. It makes it possible to draw on recharged groundwater for a much longer period than when there is water in the tanks. Since groundwater flows at a much slower pace than surface water and also avoids evaporation, groundwater recharged from tanks can be drawn upon for a longer time. This traditional tank system of irrigation did much to compensate for the highly erratic rainfall (Gunnell and Krishnamurthy 2003).

For many years now, bad maintenance by the State of both the river and tank irrigation systems has been the most acknowledged problem faced by the local

administration and village panchayats. Canals are not properly desilted and mud or cement linings often disintegrate, calling for extensive repair. In the tank system, the main problem is accumulation of silt, and poor upkeep of the walls and bunds of the tanks and of irrigation canals that lead from tanks to fields. Another problem is cultivation in the rain catchment area above tanks, which increases the silt amassed in tanks.[5]

Problem of physical infrastructure are compounded by a policy failure relating to the costing of water. Irrigation charges, both for canal- and tank-irrigated land, are bundled with land tax, and the revenue earned covers only a fraction of the cost of running and maintaining the system.[6] Moreover, and equally important, well irrigation is not charged at all.[7]

Changes in the Irrigation System and Collective Action

Our study of the development of the agrarian economy in the fieldwork area as observed at two points in time, 1980 and 2005, revealed that one of the most dramatic changes was the dwindling water supply in the Cauvery river system, a result of the water dispute with Karnataka. This meant that less land was cultivated in the wet areas over the past five to ten years than earlier. However, farmers had also adjusted to scarcity by digging wells to supplement canal irrigation, especially in the second paddy season (from December–January to March–April). The number of wells in the three wet villages had tripled, from 146 in 1980 to 467 in 2005.

The water of the Cauvery can be thought of as being one part over the ground and one part underground. Farmers tapped into the latter to protect themselves against the decreasing dependability of canal water. They did complain about the higher costs of using diesel pumps because authorities did not grant them electricity connections. Still, the farmers considered this practice economically viable, especially those who cultivated banana, as it is a capital-intensive cash crop with high rates of return. Farmers did not want to lose income by not paying for one or two spells of irrigation from wells, which could save the crop. We also found a market for water in the area, which allowed access to groundwater by those who did not have tube wells on payment to those who had appropriated the common pool groundwater.

[5] There is also the problem of encroachment of water courses by, especially, the larger landowners, but we are not looking at this issue here.

[6] This in itself is not an insurmountable problem. Since tank and well irrigation have social benefits extending beyond private benefits that accrue to the users, the State can, in principle, cross-subsidise tank and well irrigation maintenance costs from the general budget. The failure of the State to effectively tax the rich, including the rural rich, is a key constraint in this respect.

[7] It may seem odd to complain that well irrigation has not been taxed, since owners have made investments in wells and water-lifting devices. However, to the extent that groundwater can be seen as a common property resource, and well owners have taken subsidised state loans when making well irrigation-related investments, there is a case for ensuring that the external costs of excessive private use of groundwater by a privileged section is appropriately discouraged.

From a water economy point of view, the aggregate results of these adaptations make a great deal of sense, since farmers moved from an inefficient way of transporting water, i.e. in canals with high rates of evaporation and seepage, to a more efficient way, i.e., to underground transportation where water losses, at least from evaporation, were much lower, and where fluctuations in water yield between years were smoothened. However, the losers were those further downstream, since tapping of water, irrespective of whether it was overground or underground, decreased water availability downstream.

In the dry areas, the number of wells had doubled, from 750 in 1980 to 1,477 in 2005. Though there was also a reduction in the gross cropped area due to three years of drought, the share of net area irrigated to total cultivated area increased from 45 to 55 per cent, and irrigated crops had become more important than rainfed crops. If, in 1980, the income from irrigated crops made up 50 per cent of farm income, in 2005 this proportion was 90 per cent.

Thus, conjunctive use of well water may explain much of our first-hand impression when we returned to the delta and its surroundings in 2005, which was that, agriculturally and landscape-wise not much had changed since 1980, except for the substantial increase in irrigated area in the dry villages.

When we arrived in the field in 2005, we found that farmers in the dry areas were rather desperate since it had not rained much in the last three years. We could see that there had been a sharp reduction in tank irrigation and a corresponding increase in well irrigation. The area irrigated by tank water had further dwindled, from 19 per cent of total irrigated area in 1980 to a mere 5 per cent in 2005, which pointed towards neglect of tank systems.

Another finding was that well irrigation was under severe strain, as predicted in 1980 and corroborated by later research in Tamil Nadu. We also found that resource-rich farmers could rob their neighbours of most of their well water through their financial capacity to deepen wells and buy powerful pumps. However, distribution of land was less unequal in 2005 than in 1980.

Tank Crisis

The crisis in tank irrigation was illustrated during our 2005 visit to the medium-sized tank in Kalladai, one of the dry villages. This tank was part of a series of interconnected tanks. The canal connecting it to the upstream tanks was heavily silted and had not been cleaned for years. "In this village, we cannot agree on such matters," someone said. "We agree only when it comes to arranging the yearly festival of the mother goddess!"

The tank itself was also severely silted. As we were standing on the embankment, a person went into the water and said: "In earlier times, I couldn't reach the bottom

of the tank here. Now the water is only up to my navel!" The storage capacity of the tank had come down drastically. A graphic illustration, one may think, of the poor cooperative spirit in the village. That, however, could be too rash a conclusion.

Turning around, we looked out over the command area with its intensely green paddy plants and counted the number of wells densely dotting the lush fields. There were a large number of whitewashed pump houses to be seen. Once again, we encountered an instance of individual adaptation to tank siltation. To insure themselves against low water levels in the tank, farmers, with own or borrowed resources, had sunk wells – and they used the water not merely as a conjunctive source of irrigation but as a stand-by system. They thus drew on the underground water recharged from the tank.

It required little reflection to realise why farmers who had their own wells lost much of their interest in maintaining the tank. Their water problems were already taken care of. Thus it was not entirely surprising that the farmers were more interested in organizing the temple festival than in arranging for desiltation of the tank, especially since desiltation, in their view, was the responsibility of the government.

David Mosse's book on the tank irrigation system contains an interesting comparison of two types of villages in the old Ramnad district of Tamil Nadu: one where the tanks have gone into disrepair, and the other in which old forms of communal maintenance systems survive. This, again, has to do with soil types, with one type of soil facilitating the individual adaptation exemplified by Kalladai, and the other type making it more important to maintain the tanks (Mosse 2003). This is also the gist of the argument in the well-known study of collective action in south India written by Robert Wade, where he argues that "corporate organisation is found only in villages where common situations have become common dilemmas" (Wade 1988, p. 184).

From an ecologically conservative point of view, there are grounds to rue this transformation. A historically unique landscape is getting lost, and with every year of siltation, the costs of recovering old systems, which are already phenomenal, are increasing. From a water economy point of view, however, evaluation of this transformation is less clear-cut. One might say that we are moving away from a wasteful way of keeping and using water, which involves huge water losses, to a much more efficient way of storing it underground and drawing it when it is needed. But the distributional consequences may not be benign for farmers who lack the resources to invest in wells and to tackle the challenge of competitive deepening of wells.

Not only landscapes, but also flora and fauna, are changing as a result of such transformation. Tragically, nobody seems to be keeping track of the real changes and thus it is impossible to evaluate the end results. Whatever these may be, the development seems irreversible: tanks are an endangered species!

Participatory Irrigation Management in Action

In the three canal-irrigated villages in our study, we found two functioning associations.[8] One of them (example A) had 30 members in 2005, most of them tail-enders (that is, with land far away from the main canal branch). They had contributed Rs 25,000 and had received a government grant of Rs 200,000. The entire amount was deposited in a local bank and the annual interest was used for maintenance of the canals. They also paid a service fee of Rs 15 per acre once every three months, and had to contribute more cash and labour depending on the nature of the repair work required. However, this arrangement met with limited success. There were about 300 farmers with land under this branch canal system. The reasons for not all of them enlisting for collective action, as stated by our respondents, were as follows: the head-reachers (those having land close to the main canal) did not show much interest in the association since they were getting water anyway; many farmers insisted that the association take up the maintenance of the field *bothies* (canals), which in fact was the responsibility of the farmers themselves; and, as a result, there were problems in collecting service fees on a regular basis from all of them.

We studied another association (example B), which covered three branch canals with an command area of about 2,500 acres of land distributed among 300 farmers. Sixty five of these farmers, again mostly tail-enders, had formed an association in 1999 and jointly contributed Rs 45,000. The government grant was Rs 450,000, so that the association had a total of almost Rs 500,000 in a local bank. The annual membership fee was Rs 5. The association used the interest of Rs 45,000 received every year from the capital deposited in the bank to desilt the canals. The farmers themselves were not involved in the desilting, as this work was given to a contractor on tender. In terms of the structure of the association, we found that one very big landlord, who was also the president of the association, had contributed 90 per cent of the membership amount. He had done this primarily to avail of the liberal grant from the government for desilting the canal, a large part of whose command area was held by him. Farmers complained that the association was run by a handful of members and that there were no regular general body meetings. There were also complaints about the efficiency of the desilting work being carried out.[9]

In the third village we studied, no farmers' association for irrigation purposes existed in 2005. A reason for this given by the farmers was that the head-reachers were not interested in such a body, especially not at a time when there was hardly any water in the Cauvery river. Another reason stated was that many of them were tenants and did not want to involve themselves in an association. However, farmers, especially

[8] As mentioned already, the scheme came under the ambit of the Command Area Development Programme (CADP) overseen by the Agricultural Engineering Department.

[9] It is interesting to note that already, in 1979–80, an association of tail-enders existed in this area, described in our first book about the Cauvery delta (Athreya *et al.* 1990, pp. 62–63).

in tail-end areas, had voluntarily organised repair work on the irrigation system by collecting money and asking farmers to contribute labour. Such efforts were generally led by rich farmers who had a strong interest in ensuring maintenance of the irrigation system as they controlled a substantial part of the irrigated land, and also had the necessary resources and influence to carry out the work.

In a nearby town, the headquarters of our fieldwork area, we found a very ambitious attempt being made to form a branch canal association of 500 farmers served by nine branch canals (example C). By July 2005, the leader of this initiative (from a Brahmin landlord family) had managed to enrol 96 farmers with a total deposit of Rs 22,000. However, since the government engineers required a larger enrolment and a deposit of Rs 51,000 before they would release the grant of Rs 450,000, the association existed only on paper and could not carry out any repair work at the time of our study.

We do not know what happened to this particular organisation, but looking at all these attempts at participatory irrigation management in the canal-irrigated villages, one is bound to conclude that they yielded hardly any fruit despite the CADA programme having been functional in the area for a long time. Overall, it appears that the irrigation management organisations were led by big farmers with high stakes in canal maintenance. However, it was observed that small farmers also benefited in the process although they apparently did not take much interest in the work.[10] Presumably, they benefited to a much smaller extent in absolute terms. Their relative lack of interest could also be a reflection of their limited local influence.

It should be noted that as our study area in the Cauvery delta was not covered by the Participatory Irrigation Management Act, official patronage and recognition in terms of financial and administrative support through World Bank funding, given to similar projects in other parts of Tamil Nadu, was lacking here. This may have been one reason for the less active participatory irrigation management efforts in these wet villages.

Tanks and Watershed Development

Other than for large irrigation tanks, which were managed by the Public Works Department, the management of irrigation tanks in the dry villages was organised mainly by the leading farming households around a particular tank via traditional caste or village panchayats. As such, this may be seen as a survival of the so-called *kudimaramat* system in south India, which catered to minor repair works in tank systems.

There is evidence to show that the *kudimaramat* system, which was prevalent in the pre-British *zamindari* period, had fallen into disuse during the British period

[10] This phenomenon of greater interest and efforts in water management among big farmers has been noted in many other studies (see Vaidyanathan 2000, Rajagopal 1991).

due to the introduction of the ryotwari system. The British tried to reintroduce the *kudimaramat* system in order to protect land revenues, but with little success. As a result, irrigation suffered.[11] According to Mosse (1999, based on a number of authoritative sources) the "re-introduced" *kudimaramat* system propagated local community management of natural resources in a manner that did not exist prior to colonial rule. Thus severed from their larger political and cultural basis in society for construction and maintenance, these irrigation systems were "decapitated." This, according to Mosse, was the main reason for the gradual decline of tank irrigation systems in the late nineteenth and twentieth centuries.

Rainfed tanks whose command area was less than 100 acres were under the management of local bodies, viz. panchayats. As these local bodies did not have adequate funds, this function was generally neglected and the maintenance of tanks was left to the care of the local farmers. In one of the local tank systems in the study area, a farmers' irrigation society had evolved with more than 300 members, who took care of desilting and bunding its large irrigation tank. It appeared to have been well organised, with an office of its own, a permanent staff of three workers (watermen), and regular membership contributions. There was also a strong connection to a local unit of the Tamil Nadu Farmers Association, whose activities had peaked around the 1980s with an agitation for low electricity tariffs. However, by 2005, because of recurrent monsoon failure and drought for three years, the activities of the society had come to a stop.

Efforts to organise more active watershed development committees were initiated around 2000. Watershed committees formed with the involvement of the village panchayat boards enlisted farmers around rainwater catchment systems. The farmers were asked to pay a membership fee, for example, of Rs 10 per acre, and the remaining funds were provided by the government along the same lines as for the branch canal associations in the wet villages.

The main purpose behind the formation of the watershed development committees in the dry villages was to improve the recharging of groundwater in the catchment area, and of existing ponds and irrigation tanks. A number of works were undertaken or planned to achieve this end, including desilting of tanks and ponds; construction of check dams and weirs across drains; construction of farm ponds; contour bunding; summer ploughing; provision of common threshing fields; and distribution of saplings. In all these efforts, NGO facilitators were often actively involved, working alongside the committees and engineers from government departments.

As with the branch canal associations, there were problems in getting farmers to participate in this voluntary scheme. Not unexpectedly, head-reachers near the tank showed less interest in watershed development than tail-enders. Various sources

[11] See the Report of the Committee of Kudimaramat, quoted in Rajagopal (1991).

suggested that some of the work undertaken by the committees, like check dams, soil water conservation through contour bunding, and summer ploughing, were beneficial. Some government agricultural engineers informed us that one of the local committees had received a prize from the Government of India for their work.

However, we were not too impressed with some of the works that had been functional for the past three to four years; we found badly engineered schemes designed for water flowing in all directions except downhill![12] Mostly non-functional or dysfunctional, these schemes were not likely to be maintained. In the meantime, they disfigured the landscape and could very well increase erosion and decrease groundwater recharge. The system designs were thus poorly tailored to the task of developing irrigation systems that would be sustainable in the long run.

Conditions for Success of Collective Action

Niranjan Pant (2008), in a broad and interesting overview of participatory irrigation management in India, discusses the conditions for the success of participatory canal irrigation management as well as the major impediments thereto. Interestingly, he points out that "the most important factor identified in making farmers come together and work for the common good was the critical necessity of canal water for the survival of crops grown and even the farmers' own survival" (Pant 2008, p. 31). He also points out that this motivation is strongest among the tail-enders of a collective irrigation system. But he does not really discuss this in detail in his article.[13]

Organisation

Pant emphasises organisational factors in this type of natural resource management. Of these, he finds that administrative commitment on the part of the government officers involved is crucial for the establishment and functioning of a water users' association (WUA). Often, the key persons, that is, the executive engineers, for various reasons, are not at all committed to their work. The rules of the organisation for registration of members, measurement of water utilisation, and accountancy must also be clear. Further, there must be the right type of incentives to motivate farmers to join the association, like grants for the management and maintenance of the irrigation system (*ibid.*). Another crucial set of factors is democratic functioning of the organisation, transparency in transactions, and the type of leadership that is forthcoming. Professional NGOs are also important when it comes to motivating the farmers to join and run the organisation (*ibid.*, pp. 31–3). Pant considers all

[12] One good example is the settlement where the panchayat president had succeeded in getting a rainwater harvesting device located close to her own farm, presumably a demonstration installation. The only problem was that since the farm was located on a hilltop, water would flow from the tank rather than into it. This was an example of the scheme had been utilised for the benefit of influential people.

[13] The phenomenon of strong collective action and organisations among tail-enders has been documented for many irrigation systems in Tamil Nadu and Karnataka (Rajagopal *et al.* 2002).

these important for gaining legitimacy (*ibid.*, p. 33). Hasty, often donor-driven implementation, as well as lack of training of office bearers and members, and the absence of proper systems of monitoring and evaluation, may seriously hamper or even destroy the whole process (*ibid.*, pp. 34–5).

Our case studies clearly illustrate that both the canal associations and the watershed committees were found wanting in many of these respects. We saw very little active intervention in the functioning of these bodies on the part of government officials. There were few, if any, general body meetings, members were not adequately informed about the projects undertaken; and the leadership, in at least two cases, was highly individualised and person-dependent, rather than being characterised by the kind of "multiple leadership" by self-interested farmers that was necessary to sustain the organisations over time. The most striking example of individual control was the big landlord who had paid up almost the entire membership fees on behalf of the members of the association, mostly small farmers, and was running the whole organisation "out of his own pocket."

Even for committed government officers, interaction with farmers could be rigid and formal. Assistance from NGOs was therefore encouraged, to act as catalysts and facilitators in motivating farmers and building organisations. During our own fieldwork, we saw how this NGO model worked well in some instances (and not so well in others), such as in the building of micro-credit organisations among women (Lindberg *et al.* 2010). The model was one in which four, more or less autonomous, social actors interacted: local government officials, an NGO with trained facilitators, the local banks (which are branches of national banks), and self-help groups. This type of arrangement is favoured by some scholars in studies of watershed management (see Farrington *et al.* 1999, Chapter 5). One must note, however, that arguments in favour of such an arrangement are at best a narrative description and a summing-up, and at worst, show a failure to understand the deeper political economy of irrigation under a neoliberal regime which seeks to pass on the costs of social infrastructure to the general user, rather than use fiscal policy to tax the well-to-do and invest in such infrastructure and its maintenance.[14]

As we have noted above, the NGO model was completely absent in the case of the canal associations.[15] In the dry areas, the watershed committees did involve NGOs. However, this turned out to be rather problematic in at least one case. The staff of the NGO that we interacted with included a secretary: a Scheduled Caste person

[14] If nothing further was said than is found in the literature on participatory irrigation management, it would deservedly invite the conclusion that this is an exceptionally uncritical view. This is because it seems to reduce matters to procedures, voluntarism, and good governance. We reiterate the point earlier made that this whole scheme had a reduction of the state's fiscal commitment as its primary intention.

[15] The World Bank programme on participatory irrigation management was extended to the Cauvery delta only in 2009. Prior to this the delta had been excluded from the programme due to the water dispute. Other areas had an NGO component since 1998.

from the village who, after finishing his education, had returned to the village as an employee of the NGO, working on watershed management. Caste discrimination, however, had made his work very difficult. For example, in a meeting with the watershed committee, the Scheduled Caste secretary of the NGO sat on the floor while all the others, including the president, who belonged to the dominant caste in the village, were seated on chairs. When we insisted that the secretary also sit on a chair, there was much discussion before he finally did so. Afterwards, he informed us that this was the first time he had sat on a chair at such a meeting and that he was not likely to do so again. It reminded us of the "two glass system" that was practised in the village. Local teashops still keep two sets of glasses: one for the Scheduled Castes, marked with a red cross on the bottom, and one set for the others.

Caste hierarchy is an example of how a traditional social structure may seriously obstruct efficient and democratic functioning of a body. It is interesting, therefore, to encounter the strongly stated view that historical ways of organising irrigation management in and by the community, viz. the *kudimaramat* system, could potentially support efforts at collective organising. As we have noted above, this notion rests on a false idea of what was historically an "efficient" method of local irrigation management. According to Mosse (1999, 2003), the "efficient" pre-colonial system was managed by the state, not by autonomous village communities.

But there are many more problems with traditional irrigation management methods besides this. In a series of studies, Platteau has pointed out that traditional organisations have two major drawbacks in providing models for participatory management of common-pool resources. First, traditional organisations worked in a situation of abundant natural resources and subsistence production, but tended to fail under conditions of scarce natural resources and rapid commercialisation. Secondly, these organisations were grounded in hierarchical social structures and moral norms of unequal redistribution that are hardly compatible with modern democratic participatory bodies (Platteau 2000, Chapter 5; Abraham and Platteau 2001).[16] What is required, according to Platteau, is strong state intervention to bring about institutional reform at the local level, which can break the power of the elites and of unequal norms of redistribution.[17]

Governing the Commons

It is noteworthy that much of the analysis of irrigation management has focused on organisational factors. There is no doubt that an institutional analysis is useful for understanding the functioning of local irrigation associations of various kinds, and

[16] The argument that "modern democratic participatory bodies" are devoid of inequality in distribution is difficult to sustain. All that can really be said is that there is at least formal equality in modern bodies that are created by a formally democratic process.

[17] The implicit presumption that the Central/State government is class-neutral or democratic in intent is of course open to question.

for changes in government policy in the future. A very well-known and elaborate such analysis is by the Nobel laureate Elinor Ostrom in her famous book, *Governing the Commons* (1990). In a series of later publications (1990, 2000a, 2000b), she developed a set of characteristics or *design principles* for successful local management of common pool resources, which she summarised in the following way (cf. Lindberg and Pettersson-Löfquist 2001, p. 9).

> When the users of a resource design their own rules (Design Principle 3) that are enforced by local users or accountable to them (Design Principle 4) using graduated sanctions (Design Principle 5) that define who has the rights to withdraw from the resource (Design Principle 1) and that effectively assign costs proportionate to benefits (Design Principle 2), collective action and monitoring problems are solved in a reinforcing manner. (Ostrom 2000b, p. 19)
>
> The operation of these principles is then bolstered by the sixth principle, which points to the importance of access to rapid, low-cost, local arenas to resolve conflict among users or between users and officials. (*ibid.*, p. 20)
>
> The capability of local users to develop an ever more effective regime over time is affected by whether they have at least minimal recognition of the right to organize by a national or local government (Design Principle 9). (*ibid.*, p. 20)
>
> When common-pool resources are somewhat larger, an eight-design principle tends to characterize successful systems – the presence of governance activities organized in multiple layers of nested enterprises. (*ibid.*, p. 21)

A key point in this framework is the interplay between local-level management bodies and regional and national governments and administrations, which is discussed in Design Principles 8 and 9. "A polycentric government structure that 'distributes circumscribed but independent rule-making and rule-enforcement authority in numerous jurisdictions' is considered to be the best solution" (Ahmad 2000, p. 4, quoting Ostrom, Schroeder and Wynne 1993). "Polycentric" here entails several levels of decision-making, from the State down to local villages and associations.

Using this framework to understand the organisations in the Cauvery delta, we find that only Design Principles 8 and 9 were really present, albeit in an imperfect way. All the other principles were tampered with. Rules were made by the government bodies, not by the local users, and there was very little of graduated sanctions. There was no clear-cut "rapid, low-cost, local" arena for conflict resolution among users, or between users and officials.

Most crucially, the definition of who had the right to withdraw from the resource and the assignment of costs proportionate to benefits did not cover the entire range of how the natural resource was actually used (Design Principles 1 and 2). As we shall see below, the free use of individual wells dependent on recharge of water from

the canal or tank system more or less quashed attempts at organizing comprehensive full coverage.

Free-Riding?

The main argument in this paper is as follows. Rapid development of well irrigation without any concomitant change in the legal framework and costing structure, and the lack of an objective basis for all water users to come together in collective action given their different and often conflicting interests, were the major causes for the weak development of water users' associations in the area under study.[18] As long as farmers had the option of digging their own wells and of exploiting groundwater individually, their motivation to come together to manage the overall irrigation system was weak. They simply ignored the fact that even their own wells depended, in the long run, on recharge of the groundwater level – whether through canals or systems of tank irrigation.[19] They did not consider it their problem that tail-enders were robbed of much of the water through the use of wells located upstream or closer to the tanks.

It is important to underline that having his/her own means of lift irrigation gives the farmer far greater control over irrigation, thus making it both more desirable and more efficient from the standpoint of the individual farmer. Hence, the decision to opt for own access to lift irrigation has its own independent rationale, though an unintended consequence of widespread recourse to lift irrigation may well be to undermine collective welfare by overmining groundwater!

One strong evidence of the importance of the individually owned well as an alternative to joint management of water resources was found in the interview with the president of the water users' association in example B above, who, when asked about wells as an alternative source of irrigation, told us that because of the thick level of clay it was very difficult to bore wells in the area, which is why farmers were so dependent on the irrigation canals. Thus, in his area, there was certainly a need for managing the local canal irrigation system, which may have been absent in other parts.

Our analysis is supported by the field research in Ramanathapuram, Sivagangai, and Virudhunagar districts in Tamil Nadu carried out by Balasubramanian and Selvaraj (2003). With the help of a survey, they showed that ownership of private wells had a strong negative effect on collective tank management (*ibid.*, p. 25). (See also Janakarajan 1991, Vaidyanathan 1999)

[18] One may also add that the distributional consequences will not be benign for resource-poor farmers without appropriate state intervention, which in turn requires a struggle in the terrain of the state to force it to undertake pro-poor interventions. The issue is thus not merely one of technical efficiency of irrigation management.

[19] Micro-rationality under capitalism is entirely consistent with macro-irrationality!

Why is this so? After all, traditionally, farmers used to get their water through collective irrigation systems, whether from canals or tanks, which moreover were set up and managed by governments, and provided to farmers at a very low tax-rate. As we have seen, there was also a culture of local collective management of mini-irrigation systems.

The increasing use of tube wells changed all this. Three decisive changes explain this development:

1. The digging of wells was made much cheaper through the use of dynamite for digging and of boring machines to drill tube wells.
2. The method of lifting water from wells shifted from the use of less efficient bullocks and manual labour (the *kavalai* system) to the use of motorised pumps in wells.
3. The cost of electricity to run the pumps, through political decisions, became almost nil. In Tamil Nadu, as in many other Indian states, farmers get electricity more or less free of cost, since there are no tariff costs and only a one-point installation cost.[20]

This is the "infrastructure" of the organisational efforts described above, made up of the ecology and technology of the agricultural system and its changes over time. It is not nature-given but, to a large extent, set by the political economy of the system.

Take the massive proliferation of wells, for example. In Tamil Nadu, the digging of wells is regulated by law in terms of distance rules, in order to protect groundwater and its sustainable use. This rule has been followed in the case of wells financed under institutional loans for construction or deepening. However, state control is defunct in the sense that many more wells have been dug and deepened with non-institutional loans than is allowed by the regulation. Surveillance and punitive actions are nowhere in sight. The main issue here is the involvement of the local community in the management of the whole aquifer. The State government passed an Act in 2003, but has done nothing to see to its implementation (cf. Kulkarni and Vijayashankar 2009).[21]

Another indication of the ambivalent attitude of the state is the pricing of electricity. Since the breakthrough of the green revolution, farmers have organised themselves as an interest group to reap the greatest possible benefits from state intervention and support of agricultural production. In Tamil Nadu, the first State to get a powerful farmers' association (TNFA), the struggle was mainly about the cost of electricity, since the use of motorised pumps in bore wells had developed relatively early in the State. In 1989, after a massive and successful mobilisation in the 1970s and political

[20] That power supply is erratic and often available only in the early hours of the morning is another story.
[21] Tamil Nadu Groundwater (Development and Management) Act-2003.

competition to attract farmers, the newly elected DMK State government gave in to these demands (cf. Lindberg 1999, p. 278).

Technological development, the lack of legal rules to define the right to withdraw water resources (especially groundwater) and their firm enforcement, and the lack of proper taxation and pricing of water due in part to successful farmer mobilisation, undermine the incentive for farmers to come together for local collective action. Individual farmers with adequate resources can go it alone by boring their own wells and drawing as much water as they can find. The recharge of the aquifer is left to others to care for. This is the real "free-riding" problem of collective management of local irrigation systems that we have seen in the Cauvery delta.

Perhaps the only solution to the problem, besides properly enforced rules for well-digging (distance, etc.) and a proper costing structure, is to make membership in local water users' associations a precondition for the use of water resources, and to provide legal and administrative backing for such a system.

Conclusions

As we have seen above, a fair amount of research into participatory water management has focused on organisational factors like internal democracy and administrative efficiency, and not much on institutional dynamics and the political economy within which it is operating.

This paper shows that irrigation institutions and collective action are shaped by a number of factors, such as the distribution – both spatial and across size classes – of land in an irrigation system, the land tenure system, relative access to new technology like bore wells, the availability and cost of electricity and other energy sources for lifting ground water, and above all, the state policies related to them. In both dry and wet areas, the head-reach farmers showed less interest than tail-enders in collective action, as head-reachers generally had better access to water than others. Among them, big farmers were in the lead in establishing irrigation organisations and undertaking related functions, such as the maintenance of systems and the management of water allocation, as they stood to benefit the most. However, in the process, the benefits also reached small farmers, though to a lesser extent.

Wells as a conjunctive source of water use in both canal irrigation in wet areas and tank irrigation in dry areas have played an important role in reducing the incentive for collective action. The ownership of wells and modern water lifting devices enabled, for their owners, a cost-effective solution to the problem of access to irrigation water.

In dry areas, liberal credit, both for digging or deepening wells as well as for purchase of pump sets, helped the expansion of area irrigated by wells during the green revolution. In wet areas, there was no necessity for the conjunctive use of wells

until recently, as water was adequate. However, due to the Cauvery water dispute, the need for well irrigation has increased as canal water supply is less reliable. As a result, farmers have opted for the conjunctive use of wells; however, only a few big farmers could benefit from this, as state policies relating to agriculture and the shrinkage of institutional credit made it difficult for small farmers to undertake the necessary investments. Also, while electricity was free, only a few could benefit from electrification and free electricity, again due to state policy on sanctioning electricity connections. Tenant farmers, who are significant in wet areas, lacked the incentive to invest in wells or other forms of land improvement, the benefits of which would ultimately accrue to the landowner. Most of them, therefore, did not benefit from the use of wells as a conjunctive source.

In sum, the rapid and mostly unregulated development of well irrigation without any concomitant change in the legal framework and costing structure, and the lack of an objective basis for all water users to come together in collective action, given their different and often potentially conflicting interests, are the major causes of the weak development of water users' associations in the area.

The unregulated use of groundwater, especially in dry areas, has resulted in an ecological crisis, due to competitive deepening, that has affected mainly poor farmers. Watershed programmes undertaken in dry areas to prevent this problem have not been very effective, for reasons discussed earlier. Overall, state policy and the political economy of the system play an important role in the functioning of irrigation institutions and the possibility and the efficacy of collective action in water management.

A water management organisation functions in a social and material context, from which it derives its basic features. These, in turn, relate to the ownership and control of productive assets as well as to the distribution of power to make or influence decisions, which itself is not entirely independent of asset-ownership patterns. Any analysis of the success or failure of "participatory irrigation management" that ignores these key aspects, and takes a simplistic "new institutional economics" approach, is unlikely to be of much help.

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Abbreviations and Glossary

PIM	participatory irrigation management
IMT	irrigation management transfer
WUA	water users' association
CADP	Command Area Development Programme
WDP	Watershed Development Programme
kudimaramat	community labour for maintenance of irrigation